Washington State Transportation Commission

Washington State Comprehensive Tolling Study

Volume 2 – Background Papers

Interim Report

prepared by

Washington State Transportation Commission

by

Cambridge Systematics, Inc.

CAMBRIDGE SYSTEMATICS
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with

PBS&J
IBI Group
Texas Transportation Institute
Frank Wilson & Associates

January 31, 2006

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100 CambridgePark Drive, Suite 400
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Preface

A team of consultants led by Cambridge Systematics, Inc. was hired by the Washington State Transportation Commission to conduct a Comprehensive Statewide Tolling Study. The study is being done at the direction of the Washington State Legislature who directed the Commission to conduct a: "…study of the State's transportation system to determine the feasibility of administering tolls on specific transportation facilities or a network of facilities" (2005-2007 Transportation Budget, Chapter 313, Laws of 2005, Section 206(1)). This study will also serve as the comprehensive tolling study required for the new Transportation Innovative Partnerships Program (TIPP) (Chapter 317, Laws of 2005, Section 9(2)(a)), and as the tolling study necessary to implement toll facilities within the Regional Transportation Investment District (RTID).

The second deliverable in this study is an *Interim Report*, which has two volumes. Volume 1 is the *Policy Report,* and is separately bound. This is Volume 2, which is a set of background papers. These papers are intended to provide the reader some background on national perspectives on various aspects of tolling as well as detail related to tolling in Washington State.

The next deliverable will be the Final Report, which is due to the Legislature in July 2006.

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Background Paper #1
National Perspective: Uses of Tolling and Related Issues

Tolling Background and History

Tolling has been used for centuries to finance highways. For example, early road building in the United States relied heavily on private, profit-seeking entities, and the historical remnants of these early turnpikes can be seen in the numerous roads with the "turnpike" moniker. The earliest turnpike in the United States was the Philadelphia and Lancaster Turnpike Road, built in 1795. These early turnpikes ultimately failed, as more efficient canals and then railroads were developed in the mid-1800s.

It was not until the popularization of automobiles in the early to mid-20th century that toll-backed financing gained renewed popularity. Starting with the Pennsylvania Turnpike in the 1930s, state after state embarked on building intercity highways using toll revenue bonds. For the most part, these new highways were developed by special purpose authorities and were financed with bonds backed by the anticipated toll collections. This era of turnpike building extended into the 1950s and early 1960s, but was mostly extinguished by the advent of the Interstate Highway System begun in 1956. Though some of these early turnpikes paid off their debt and removed their tolls, most still operate as tolled facilities, since the need to upgrade, expand, and extend could be funded through continuing toll collection on the original facilities.

The late 1970s and 1980s saw another revival of the toll financing concept, this time focusing on urban expressways in a few fast-growing areas, where traditional revenue sources were inadequate to meet growing traffic demands.

In the 1990s and continuing into the early part of the 21st century, toll facility development continued, this time enhanced by the promise of electronic toll collection to reduce or eliminate the delays commonly associated with traditional toll roads. Electronic toll collection also opened the opportunity for new concepts in tolling, such as high-occupancy toll (HOT) lanes, express toll lanes, truck only lanes, cordon tolling, and mileage-based pricing. Innovations are proceeding at a pace, whereby, it soon may be technically feasible to toll a broad spectrum of other roads, using global positioning satellites (GPS) or roadside short-range radio methods. Though the more recent activity has been more widespread than that in the 1970s and 1980s, tolling continues to be a solution primarily being done by a few states with intense traffic needs.

The advent of electronic toll collection has broadened the potential policy rationale for tolling. Whereas, the historical use of tolling has been to fund high-cost projects, it can now be used to manage congestion on a network with limited capacity. Economists have long argued that using flat user charges (the gas tax) does not reflect the true value of highway travel under congested conditions. Using price to manage demand is used in the airline, hotel, and telecommunications industries, to name a few. With electronic tolling, it can now be used in the highway industry, and many regions are starting to move in that direction.

Definition of Key Terms

There are a variety of terms used to describe the different types of tolling projects in use around the country, and everyone using them does not necessarily use the same terminology. As such, we have provided these definitions as they will be used in this report:

- **Tolling –** This involves charging a direct fee to use a highway, bridge, or tunnel (generically referred to as a "highway" or "toll road" for this report).

- **Pricing –** A subset of tolling, pricing focuses on the use of tolls to manage traffic demand, with revenue generation being a secondary objective. Various adjectives are sometimes used to modify the term pricing: variable-, congestion-, and value-. They all essentially mean the same thing: varying the toll charged based upon the time of day, day of week, and/or real-time traffic conditions in order to appropriately manage traffic. Pricing can be applied to traditional toll roads, bridges, tunnels, or designated highway lanes (i.e., managed lanes as defined below).

- **Traditional Toll Road (or Bridge/Tunnel) –** A highway that requires toll collections from all drivers (usually with the exception of emergency vehicles). Typically, those tolls are used to support operations and maintenance, as well as to pay debt service on the bonds issued to finance the toll facility. The toll rate does not vary by time of day or day of week. Tolls may be collected at a flat rate at toll plazas, or based on distance traveled using tickets, electronic transponders, or video recording of license plates. Many existing traditional toll roads are converting to some form of electronic toll collection, and most new toll projects incorporate the option to pay electronically.

- **Managed Lanes –** Any type of highway lane that is set aside for special use. A managed lane could be a traditional high-occupancy vehicle (HOV) lane (i.e., a lane restricted to vehicles that carry 2+ or 3+ passengers), a truck-only lane, or a bus-only lane. More recently, managed lanes also may refer to highway facilities for which tolled lanes are adjacent to free lanes. Drivers have the option to either pay the toll and use the toll lanes (to take advantage of travel time savings), or use the toll-free lanes instead. HOVs, transit buses, and motorcycles often are allowed to use the toll

lanes at no charge. The appropriate toll amount may be determined according to actual real-time traffic volumes.

The method used to select which highway projects may be good candidates for tolling varies widely from region to region. A comprehensive regional tolling plan could be developed, or the selection process could be done on a case-by-case basis.

The revenue generated from tolls may be used in ways that include, but are not limited to, the following:

- Debt service on new stand-alone projects;
- Debt service on toll road extensions and expansions;
- Capital renewal that does not involve new capacity;
- Operating and maintenance expenses; and
- Cross subsidization of other transportation projects and services, including transit.

Current Trends in Tolling Applications

There are several current trends in the planning and development of new tolling projects, as discussed below.

Existing Systems Leveraging New Capacity

Regions with successful and mature toll roads have a significant advantage when trying to develop new toll projects. Historically, many of the nation's toll roads were developed using revenue bonds, which meant that projects needed to generate enough revenue to cover debt service in the early years. However, once they got through these early years (sometimes with the help of general obligation guarantees), they quickly became money makers, and had excess revenue. Depending on the enabling legislation or relevant bond documents, this excess revenue from the existing system often could be used to subsidize extensions or entirely new toll projects. A few recent examples of new toll projects being developed using system financing or guarantees are highlighted below.

In Texas, toll road authorities in both Houston and Dallas have continued to build new facilities backed by revenue streams from existing systems. In Dallas, the Metroplex Toll Financing System (MTFS) allows TxDOT and/or the North Texas Tollway Authority (NTTA) to make toll projects available for investment by other entities that would then receive returns on their investments, as well as benefit through accelerated project development and completion. Candidate MTFS projects would be those toll projects that can reasonably be expected to generate toll revenues beyond the level necessary to pay debt and expenses. These candidates could be designated MTFS projects and represent an

opportunity for local entities to partner in the investment, thereby, sharing in any surplus revenues generated by the toll project. For example, if City A were to contribute 10 percent of the funding for Project X, then that city would receive 10 percent of the surplus revenues from Project X. This surplus revenue could provide an ongoing funding source for the city to use in other transportation projects. In keeping with the premise of regional project support, first choice to invest in a MTFS toll project would belong to those cities and counties directly affected by a project. Contributions are not limited to cash, but include donated right-of-way, design, or other contributions to the value of the total project.

Also in Texas, the **Texas Mobility Fund** is a revolving fund that is designed to back bonds that are pledged towards the construction of highway projects. The proceeds from the sale of these bonds could be used to finance construction on state-maintained highways, publicly owned toll roads, and any other project that is eligible for the State's Highway Fund.

Other examples of using leverage from mature systems include:

- Florida's Turnpike and other agencies in Florida have built extensive systems of toll projects by using established revenue streams from earlier projects;
- In Massachusetts, excess revenues from the Massachusetts Turnpike Authority, obtained from toll increases, have been used to help close the funding gap in the Central Artery/Tunnel project, most of which is untolled; and
- In New York City, the MTA uses toll revenues from its bridge and tunnel crossings to subsidize its transit operations.

Leveraging the revenue of an existing system can create concerns about interregional and intraregional equity. People may not always be willing to have the tolls collected on "their" part of the system used to support projects on a part of the system that they do not use.

Startup Traditional Toll Facilities

Many regions are turning to tolling to enable construction of limited access highway projects (or bridges/tunnels) that are not being funded through general funding mechanisms. When funding highway projects on a pay-as-you-go basis, it can often take years or decades for enough dollars to be available to pay for a project. With tolling, the dedicated future revenue stream can be bonded, enabling the project development to be accelerated. Recent projects are being developed through the public sector, as well as through public-private partnerships.

Public Sector

Historically, toll roads were developed by special purpose public authorities that raised capital either through the sale of non-recourse revenue bonds backed by toll collections. With non-recourse bonds, shortfalls in toll revenue could result in default. This was the case in most of the major eastern toll roads, such as the Massachusetts, Pennsylvania, and New Jersey turnpikes. In some cases, projects mitigated some of the default risk with backup pledges from government, either through general obligation bonds (where state or local governments pledged tax revenues to make up for any revenue shortfalls from tolls), or limited obligations of specific revenue sources (such as gas taxes).

In the mid-1980s, the toll road system in Harris County (Houston), Texas was financed with bonds backed by both toll revenues and a general obligation pledge of the County. Likewise, in the mid-1990s, the E-470 Public Highway Authority developed a startup toll facility in the Denver region with partial support from a regional vehicle registration fee.

In contrast, the Foothill/Eastern and San Joaquin toll roads in Orange County, California were developed by two public authorities (one for each corridor), largely through the use of non-recourse toll-backed debt.

For some projects, a combination of factors led to toll revenue in the early years to be considerably lower than forecast. Both Houston and Orange County toll road systems opened in the midst of severe economic recessions. This resulted in both financial and public relations difficulties. The E-470 project, in some ways, was the most speculative, as it was heavily dependent upon future traffic growth that would result from development spurred by the road itself. However, the risks inherent in the project were mitigated somewhat by both the pledge of the vehicle registration fees and the funding of deeply subordinated loans by the state DOT and local governments.

It is becoming increasingly difficult for new standalone projects to be self-supporting without revenue pledges from other sources (either non-toll or existing, mature toll facilities). This is probably due to the higher cost of road development. The rates on the Harris County system are about $0.08 to $0.14 per mile, while those on the Orange County projects are $0.13 to $0.23 per mile and the Denver project is $0.18 per mile. By comparison, the toll rate on older, established facilities is much lower: the Illinois Tollway charge has been $0.03 per mile until recently, and the toll rate on the New Jersey Turnpike is $0.04 per mile. Rates on these older facilities have not had to keep pace with inflation.

Public-Private Partnerships

The mid-1990s brought greatly increased interest in the role of public-private partnerships (PPP) in the development of toll facilities. The interest in PPPs for this study is limited to situations where the private sector is responsible for contributing some or all of the capital needed to build a project. This may be contrasted with the *governmentally funded* design-build projects. In design-build projects, the private sector takes responsibility for delivering a project for a fixed price and a fixed date, but the funding ultimately comes from public sources, such as taxes (Federal, state, or local grants or tax-supported bonds).

For PPPs, where the private sector contributes capital, the level of private involvement varies considerably from project to project. For example, the Dulles Greenway project in Virginia and the Camino Colombia project in Texas were actually owned by private investors. Other PPPs have made use of 63-20 corporations, where ownership of the project resides in a publicly appointed nonprofit corporation, such as the Greenville Southern Connector in South Carolina and Pocahontas Parkway in Virginia.

All of these toll PPPs have struggled in their early years, with the Greenway project requiring restructuring of its debt, and the Camino Colombia project recently going bankrupt and closing. The Camino Colombia project was recently bought by the Texas Department of Transportation (TxDOT) for less than one-quarter of its construction cost, and has been reopened.

Many other attempts at developing toll roads as PPPs have failed or been derailed, due to adverse public reaction or the changing needs of the public sector. In recent years, potential public-private toll road projects in Minnesota and Arizona were canceled. The Tacoma Narrows Bridge project in Washington started out as a PPP, but was converted to a traditional, publicly financed toll bridge after public protest over the private sector profiting from a public project. In Chesapeake, Virginia, the Chesapeake Expressway went through its development process with the intent of being financed and operated through a 63-20 corporation, but ultimately, the project ended up being developed and owned by the City of Chesapeake, since much of the risk that was to have been transferred to the private sector had been reduced through the project development process.

Developing toll projects as PPPs is still in its infancy in the United States, with techniques and legislation evolving.

Recent Innovations in Tolled Managed Lanes

The advent and rapid advancement of electronic toll collection technology allows for tolling to be applied in ways that were not possible a decade ago, making tolling faster and more convenient for both the drivers and the operating agency. In addition to the increased convenience to toll-paying customers, electronic toll collection allows for pricing to be used for traffic management purposes, in addition to, or even instead of, revenue generation.

Some of these new concepts have been implemented, while others are the subject of proposed legislation or policy discussion. The focus of this working paper is on these recent innovations in tolling, which have primarily been new or enhanced tolled managed lane applications. There are several types of such applications, described below.

HOT (High-Occupancy Toll) Lanes

HOT (High-Occupancy Toll) lanes grew out of the recognition that some traditional HOV lanes were underutilized. HOT lanes allow a single-occupancy vehicle (SOV) to pay a toll to use HOV lanes which have excess capacity. Three HOT lane projects were developed in the mid-1990s: SR 91 Express Lanes, I-15 HOT Lanes, and Katy Freeway QuickRide. In May 2005, the first MnPASS lanes on I-394 in Minneapolis opened to traffic, and the I-25 HOT lane is due to open in Denver this fall. Each of these is described below.

SR 91 Express Lanes

This was the first PPP to emerge in California, and involved the construction of four new express lanes (two in each direction) in the median of the heavily congested SR 91 freeway that connected homes in Riverside County to jobs in Orange County. The express lanes were about 10 miles long, and provided only one entry and exit point at each end. Toll rates were set based on historical traffic information to ensure free flow of traffic, and were intended to maximize revenue for the owner/operator, while maintaining a high level of traffic flow. The project combined innovations in PPPs (design-build development, private operations) with innovations in tolling (variable pricing and all-electronic collection).

The California Private Transportation Company operated the project as a business, focusing on customer satisfaction. They provided such a high level of emergency/safety surveillance that some drivers chose to pay to use the toll lanes even during periods when there was no congestion on the adjacent free lanes. The company also frequently surveyed customers to enhance the customer experience.

The project was an unqualified success. The typical customer used the facility once or twice a week (rather than everyday), but felt as if they received value for the money they paid when they needed to avoid congestion on the adjacent free lanes.

Over time, however, the project came under increasing criticism, especially from commuters residing in Riverside County. A clause in the franchise agreement entered into between the company and the California DOT (Caltrans) limited Caltrans' ability to provide capacity enhancements that competed with the HOT lane project (a so-called "non-compete" clause). Ultimately, the project was sold by the private developer to the Orange County Transportation Authority (OCTA) for a profit. OCTA is moving forward with the capacity enhancements, and has modified the tolling policy to increase traffic flow at lower toll prices.

I-15 HOT Lanes

Around the same time, the San Diego Association of Governments (SANDAG) moved forward with a demonstration project funded in part from the Federal Highway Administration's (FHWA) congestion pricing pilot program (now called value pricing). The project involved conversion of the existing reversible HOV lanes to about eight miles

of HOT lanes. Toll prices are set dynamically, meaning that the traffic volume on the HOT lane dictates the toll price, changing every six minutes to keep traffic at free flow in the HOT lane. This project is not a private venture, and the upfront capital costs were not extensive since the lanes already existed. The only costs were for toll collection and enforcement. Excess revenue from the project is used to support improved transit service in the corridor.

Katy Freeway QuickRide

Another variety of HOT lane project was built in Houston, where an existing reversible single-lane HOV lane was modified to increase the number of drivers using the lane. On the Katy Freeway, HOVs were defined as cars with three or more people during certain peak hours. With the QuickRide program, HOVs with two or more could pay to use the HOV lane during those hours. Use of the lane is by subscription only, and the lane has a few hundred paying customers a day. The program was extended to the U.S. 290 reversible HOV lane in 2000 (for the a.m. period only).

I-394 HOT Lane (MnPASS)

The first HOT lane to open for quite awhile just opened recently in Minneapolis, where the existing HOV lane on I-394 was converted to a HOT lane. The project extends for nine miles in one direction (11 in the other), with part of the project a single lane in each direction, and the remainder two lanes reversible. I-394 is different from previous HOT lane projects in these ways:

- Most of it is a single lane in each direction, with only a double-white stripe separating the HOV/Toll traffic from the general purpose traffic.

- There are zones where there are breaks in the striping to allow drivers to enter or exit the facility. This is in contrast to the single on- and off-points on previous projects.

- There are two tolling zones, and prices change dynamically every three minutes, based on traffic density in the HOT lanes. Drivers are shown the price to use either one or both tolling zones at the beginning of their trip, with the price at entry guaranteed, regardless of any price changes by the time they get to the new section.

- Enforcement of the HOV and tolling is done by roving patrol vehicles. Some patrol cars are equipped with enforcement transponders that allow them to query the transponders of vehicles in the toll lane that do not have more than one occupant.

The project is still new, but early indications have found that about 4,000 people per day use the facility, and that the buffer-separated design is generally being heeded by the public. The algorithms that modify the tolls have been found to be very sensitive to short-term variations in traffic density that result from the "platooning" or grouping of vehicles behind slower vehicles (particularly buses); alternative approaches are being studied. A

recent study by a television news team found that the HOT lane saved about an hour of time over the course of a week's worth of commuting at a cost of about $12.00.

The HOT lanes originally ran for 24 hours a day; whereas, the HOV lanes they replaced only operated during peak hours in the peak direction. However, this has now changed, such that the traffic in the non-peak direction is allowed free access to the HOT lanes. This is because traffic conditions in the general purpose lanes were found to worsen with the take away of the previously non-restricted HOV lanes.

Early findings also are that the lanes are not generating enough revenue to cover operations expenses. This may be due to the change in hours of operation described above.

I-25 HOT Lane

The I-25 HOT Lane Project in Colorado is scheduled to open in spring 2006. This project is a conversion of the existing I-25 HOV facility. State law currently maintains free access for HOV2+, motorcycles, Inherently Low-Emission Vehicles (ILEV), and hybrids. Colorado DOT currently is seeking a change in state statutes for the hybrids to become tolled. The important constraints on this project are as follows:

- The full funding grant agreement between the Federal Transit Administration (FTA) and the Regional Transportation District (RTD) specifies that net revenues must go to transit;
- Bus travel times take precedence over all others using the facility, meaning that the addition of SOV traffic should not impact bus operations; and
- Entering and exiting loading constraints for the facility into the downtown Denver grid network mean that the pricing for this facility will be on a published toll schedule to be updated periodically, rather than with dynamic pricing.

The revenue priorities for this project are to cover operations, maintenance, enforcement, and rehabilitation. The project is not anticipated to generate additional net revenue within the first 10 years of operation.

Summary of HOT Lane Experience to Date

HOT lanes are not one-size-fits-all. Each of the three HOT lane projects developed to date has had different policy motives. The SR 91 project grew out of a desire to increase capacity in a heavily congested corridor, and provided a way for a private partner to develop the project motivated by profit. The I-15 project grew out of a desire to utilize spare capacity on the HOV lanes, as well as the desire to cross-subsidize transit service in the corridor. The Katy Freeway QuickRide program was a way to obtain more productivity out of underutilized HOV lanes during the hours when HOV2s were not permitted to use them.

Express Toll Lanes

As with HOT lanes, express toll lanes are situated next to regular highway lanes. The difference from the HOT lane concept is that with an express toll lane, all personal automobiles using them pay a toll – there are no exceptions made for HOV vehicles. However, transit vehicles and/or registered vanpools would usually be allowed to operate for free. While these lanes typically represent added highway capacity, existing toll-free lanes also could be converted to toll lanes. Express toll lanes also could be located adjacent to traditional toll roads, but employ variable pricing (based on time of day and/ or congestion levels) to maintain free-flowing traffic.

The Tampa-Hillsborough County Expressway Authority currently is building three express toll lanes elevated over the existing Lee Roy Selmon Crosstown Expressway (a toll road), and plans to charge premium tolls for the express service. The Miami-Dade Expressway Authority also has been studying a similar project on its SR 836 toll road. Express toll lanes also are being actively studied in Maryland, Georgia, and Minnesota.

Truck-Only Toll (TOT) Lanes

Truck-Only Toll (TOT) lanes have the potential to improve safety and increase productivity in the trucking industry. One concept is dedicated toll truckways for long-haul truck movements. The toll truckways would be built next to existing roadways, but would be barrier-separated from general traffic to improve safety. The toll truckways could potentially be built to withstand greater vehicle weights, thus, enabling a single truck driver to carry several times the payload than currently is permitted in most states. In theory, truckers would, therefore, be attracted to use the TOT lanes, because the toll cost would be offset by the additional safety and productivity. With the TOT lane concept, a single truckway lane would be provided in each freeway direction of travel, with frequent passing lanes and staging yards near cities or major highway junctions. The concept also could involve a rebate of fuel taxes for mileage spent on the toll truckways. Separating truck traffic from auto traffic also has potential safety benefits by separating vehicles with different operating characteristics into separate traffic streams.

TOT lanes have been studied in the Los Angeles region on SR 60 and I-710, both of which are heavily utilized by trucks accessing the Ports of Los Angeles and Long Beach. The preliminary Los Angeles region studies found that urban TOT lane facilities would need to overcome challenges that include truck trips of short lengths, limited travel time savings during off-peak periods, and significant construction costs and geometric constraints related to adding lanes in an urban environment.

Another TOT lane concept involves urban corridors, which do not necessarily allow longer or heavier vehicles. Such a system of TOT lanes has been recently studied in the Atlanta metropolitan areas, with the findings that TOT lanes had a high potential for relieving congestion, potentially even more than HOV or HOT lanes. Some of the scenarios studied involved the conversion of existing and planned HOV lanes to TOT

lanes. Such a policy would be unprecedented, and be politically very difficult to implement. However, the study does point the way towards the potential for TOT lanes in dense urban regions with heavy truck demands.

Tolled Managed Lane Issues

Tolled managed lane facilities in their various forms are an exciting and promising mechanism to generate revenue, manage traffic congestion, and improve operational efficiency. Some members of the public continue to be skeptical with respect to paying tolls, particularly when toll-free alternatives are available. One of the biggest challenges with tolling involves creating a common understanding of what is being proposed, and the policy or strategic basis for the particular proposal. Some of the key issues surrounding tolled managed lane concepts are discussed below.

All Express Toll Lanes Depend on Congestion

Express toll lanes, whether HOV are allowed in for free or not, depend on congestion to be successful. It is congestion that creates the value offered by a lane managed through pricing. If there is no congestion, there is no need for such a facility. This means that express toll lane solutions are best suited in corridors where there is no opportunity to expand capacity, and where the traffic management potential of toll lanes provides a benefit to all travelers at some time when their personal value of time is high enough to warrant paying extra to be somewhere on time.

Traffic Management Benefits of Toll Lanes Depend on Tolls Forever

Traditionally, people expect tolls to be removed once the debt to finance a facility has been paid off. In the case of express toll lanes, the value of the project depends on the tolls staying on. It is the tolls that create the traffic management benefit, and that benefit will be lost if tolls are removed. This leaves the question of what should be done with the money collected by tolls on a managed lanes system.

Revenue Productivity

How much of the capital cost of a highway improvement can a toll lane project generate? Can it produce excess revenue to subsidize other highway or transit projects? There is a tendency to think that tolling projects can be big revenue generators, but in fact there are likely to be very few applications for which tolling could be fully self-supporting, except for projects that simply involve a conversion of existing general purpose lanes to tolling lanes. The success of express toll lanes depends largely on congestion levels in adjacent lanes. In most metropolitan areas, such congestion only lasts for an hour or two during morning and evening rush hours – typically not enough to pay for an expensive infrastructure project. In addition, the sections of highway with the greatest need for capacity expansion are often the ones with the most geometric constraints – meaning that

the upfront design and construction costs will be high. Increasingly, pricing projects are being considered for their potential traffic management capabilities, regardless of their ability to fund new infrastructure construction.

Policy Justification

It is important to clearly articulate the policy rationale for considering a tolling project. One rationale might be to simply provide a supplemental revenue source to enable a project to be built sooner than it would otherwise. Another might be to provide a congestion-free alternative in places where "building your way out of congestion" with conventional freeway lanes is not possible. Whatever the policy objective is for a particular project, it must be clearly articulated and justified for both decision-makers and the public in order for a new tolling project to be approved.

Equity

Equity considerations may emerge in public discussions, including "Lexus Lane" concerns (i.e., providing a highway lane that is only affordable to the wealthy) and geographic concerns (i.e., why travelers must pay a toll for certain parts of the transportation network, while other parts have no tolls). In some cases, the public also has expressed concerns about the private sector being in the business of collecting and setting tolls for a profit. They may not understand why, if the private sector is able to make a profit on such projects, the public sector does not simply develop the project on its own.

Implementation

Implementing new tolled managed lane projects often have particular challenges. For example, how would cars get in and out of the lanes – any time they want, via special ramps, or with merge/weave zones? Would tolling just happen during peak periods or all day? How would safety be affected? What happens if an accident blocks one or more tolled managed general purpose lane(s) for some period of time?

■ Cordon Pricing

Cordon pricing is a relatively new concept; whereby, vehicles are charged a toll to enter a highly congested area. The concept has been in use in Singapore since 1975, and recently enacted in the central business district portion of London. The concept in London involves a flat toll of £5 to enter the cordoned area during normal business hours. The toll has resulted in a significant reduction in congestion, with the revenue being used to subsidize additional transit services. Generally considered a success, the London cordon charge is expected to be expanded to a larger area.

Conclusions: Tolling Opportunities and Constraints

Clearly, the use of tolling in numerous forms is under intense consideration in many regions of the country. Some states and regions have been successful at advancing the idea that tolls can be used to finance desired highway improvements, while others have struggled to advance proposals beyond the discussion phase. This section explores some of the lessons learned from recent toll project development activities, and the opportunities and constraints for such activities in the future.

Underlying Conditions

Leveraging Existing Toll Facilities Provides a Head Start

Regions that have existing toll assets have an advantage over those just starting out, because they have the ability to leverage the revenue stream from the current facilities. The ability to provide system financing (i.e., apply excess revenues from other parts of the toll enterprise) or to provide loans or seed money, provides new projects in such communities a "head start" over other areas. Areas with existing toll facilities also have a head start on the public relations and political battles regarding the use of tolls in the first place.

Heavy Traffic Congestion Breeds a "Last Resort" Mentality

Places with intense traffic congestion have a greater incentive to move to tolling than those that do not. Especially in areas with rapid growth, traditional public funding is often inadequate to keep up with traffic needs. Often, tolling is a way to advance a project that cannot be afforded for 10 or 20 years. Where congestion is not as pressing an issue, communities may make the choice to wait the extra time for the desired highway projects.

Political Champions Needed

It usually takes an elected official to champion a particular toll project. Without the benefit of an elected champion, projects are less likely to advance.

Electronic Toll Collection Removes One Big Objection

Many people still equate toll roads with congestion at toll booths. With electronic toll collection, most new toll projects are able to offer highway-speed toll collection facilities, which eliminate this objection.

Expectations Versus Reality

It is rare for a startup toll project to be able to be fully self supporting without some kind of credit enhancement or financial contribution. The difficulty of startup toll projects has been demonstrated repeatedly around the country. Various factors contribute to this reality:

- Development costs are high, especially in congested urban areas.

- Projects being built in anticipation of (or to accommodate/encourage) future development are inherently risky. Although development costs in these areas may be lower, potential revenue from traffic also is likely to be more speculative. High population and employment growth rates over extended periods of time are no guarantee of future continuation of such trends. Indeed, normal trends in the business cycle might lead to a situation where the high growth that leads to the pent up demand for a startup toll road stalls by the time the road opens, thereby, impacting early year revenues from a project.

- The full and timely payment requirements of traditional municipal bonds set a high bar for feasibility. Credit enhancements that give projects time to mature are likely to be critical for most projects to be acceptable to investors.

Attempts to mitigate these factors also may exacerbate the toll facility's financial problems in later years. For example, the San Joaquin Hills toll road was built in anticipation of a continuation of intense traffic growth in Orange County. The debt service was structured so that early year payments were lower, but later year payments were higher. The financing also assumed toll rate escalation over time. When growth stalled in Orange County at the opening of the toll road in 1997, the agency struggled to make debt service payments. In traditional financings, this early year pressure ultimately would ease, as traffic grew sufficiently to meet a level debt service payment schedule. However, in the case of the San Joaquin Hills toll road, since debt service increases over time, and toll rates increase over time, traffic never really had a chance to catch up.

The growing acknowledgment of traffic uncertainty in the ramp-up period is being reflected in recent initiatives in the various states. The Florida and Texas case studies show that the states are willing to contribute to the development and early year support of new toll projects. Colorado allows state and local support for toll projects up to 10 percent of the cost (and is exploring how it might incorporate Federal assistance).

Recent activities with FAST lanes projects are recognizing that such projects are unlikely to be self supporting. In Minnesota, a PPP program designed to attract private partners initially anticipated 100 percent private funding; however, over time, the financial realities of such lanes have migrated that thinking toward "how much" the public subsidy will need to be.

Outlook

Whether, where, and how to use tolling to fill gaps in funding for expansion of highway infrastructure comes down to how different regions treat the financial, philosophical, and political questions that toll financing entails.

Questions

1. Should funding for building or expanding corridors be paid from general fuel tax revenues (general user fees), or from user fees generated in the corridor (tolls)?

Texas has all, but made the policy decision to fund new limited-access highway capacity at least partially through tolls. A number of states may be creeping towards that idea, and yet others are not ready to embrace such policies. An important consideration in this question has to do with equity between corridors or regions. Should one corridor be expected to pay its own way, while others benefit from traditional DOT revenue streams? When DOTs do provide backstop financing or seed money, how can they ensure equity around their states?

Such issues are not new, and are not limited to toll finance. When projects are funded with general user fees, the same issue of social equity must be dealt with in the intrastate distributions of public funds. With projects that are partially funded by tolls, another equity issue that arises is related to double taxation – if drivers are paying gas taxes, why should they have to pay again with tolls? If they pay tolls, are they entitled to a rebate on gas taxes? The Massachusetts Turnpike, for example, offers rebates on fuel taxes for drivers that provide documentation of using the Turnpike. Ultimately, the answers to these questions are political, but there are potential answers to why tolls may not be double taxation. For instance, most new toll facilities will not be self-supporting from tolls for many, many years, and the fuel taxes cover the costs not paid for through tolls – thereby allowing the project to be built and provide mobility benefits earlier than with tax-only projects.

One key difference between discussions of toll finance today and a decade or two ago revolves around government involvement. Federal policy still prohibits tolling the Interstates (with the exception of a few pilot projects). States are beginning to realize that they need to play an important role in project finance if new projects are to succeed, and are more open to supporting projects financially through a combination of toll and other tax-based revenues. For example, the Chesapeake Expressway in Virginia is a tolled facility, but state policy-makers recognized early on during project development that it could never be self-sustaining. The State contributed public funds to cover 75 percent of the total capital costs.

2. To what extent should projects have to be self-sustaining?

It is much easier to finance a new toll project if there is an existing stream of revenue from a mature project to provide a source of funds for pooled financing. Such cross-subsidies, while financially desirable, can bring out interregional and intraregional concerns

regarding the allocation of scarce dollars. As noted above in the Dallas/Fort Worth region with the Metroplex Toll Financing System, carefully crafted agreements are possible.

3. What role should the private sector play in developing projects?

Public-private partnerships typically bring innovation, risk transfer, and accelerated completion to the project development process. If the project is financed with toll revenue bonds, PPPs can help structure the debt financing so that it avoids state borrowing limitations. They allow states to avoid debt cap limitations. However, the price of private involvement can include a real or perceived loss of public control. The successful SR 91 project in Southern California is an example where the public gave up control over toll setting and improvements to competing routes, with the ultimate result being a perceived need to buy out the private involvement. Washington and Virginia also have backed out of potential PPP deals to some extent motivated by issues of control. Though not a U.S. project, the current lawsuit in the Province of Ontario between the private owners of the Highway 407 ETR in Toronto and the government over who has the right to set toll rates is a telling example of privatization issues.

4. Are toll lanes an appropriate response to traffic congestion in urban areas?

Toll lanes provide an interesting response to a difficult problem. The conventional wisdom is that "you can't build your way out of congestion," and indeed, the increase in new lane miles has not come close to the increase in vehicle miles of travel over the last few decades in the United States. Toll lanes serve a dual purpose – they bring a funding source (tolls and possibly up-front capital from private partners), and the ability to manage demand through variable pricing.

The use of variable pricing to offer improved reliability to those willing to pay is a new concept in highways, but not new in other arenas, such as air travel and hotel pricing. It also has a long history in other public utilities, such as telecommunications and electricity. While the telecommunications industry has moved away from "congestion pricing" in recent years, and has embraced more of a flat-pricing model, this is because of intense competition among providers, and the fact that the telecommunications system now has lots of excess capacity – certainly not the case for highways.

In the constrained capacity environment of urban highways, using tolls to provide a measure of reliability to the public could be a creative compromise. Most people acknowledge that enough capacity cannot be built to ward off congestion problems. However using prices to keep lanes flowing when people really need them is a concept that might gain favor over time. The policy rationale for providing partial public subsidies for such toll lanes is fairly solid as well – when people pay to use the express lanes, they free up capacity in the "free" lanes, thereby, benefiting everyone. And when a particular traveler really needs the uncongested capacity in those cases where their own value of time is high enough to warrant paying the toll, they will be happy the lanes are available.

Express toll lanes are being advanced in several places right now, and time will tell the extent to which they can achieve political acceptance and achieve the objectives intended.

At current and anticipated future levels, the motor fuel tax will be inadequate to satisfy all the highway construction demands in areas where new highways are still needed. In most of the country, toll-revenue financed projects can be expected to be successful at closing some of this revenue gap in a limited number of locations where conditions are most favorable.

Section prepared by Cambridge Systematics, Inc., with assistance from PBS&J and Texas Transportation Institute.

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Background Paper #2
Ascertainment Interviews: Opinion of Washington's Community Leaders

Executive Summary

This report summarizes the results of an Ascertainment of Stakeholder Views and includes a Situation Analysis for consideration of the issues facing the implementation of tolling in the State of Washington. Frank Wilson & Associates conducted 16 interviews with community leaders and interest group representatives from all areas of the State. Interviews took place between October 13 and November 16.

What Was Most Important to Interviewees?

- **Safety –** Transportation system has been ignored for a couple of decades, making some roads and bridges downright dangerous – especially vulnerable in a seismic event.

- **Economy –** An efficient transportation system and the ability to move product to market is critical to the economy and future of the State; the need to accelerate projects through toll financing should consider these economic factors.

- **Congestion Relief –** Congestion has worsened considerably, with travelers in the Puget Sound area most affected by delays on a regular basis.

- **Fairness is Important –** Tolling the Tacoma Narrows Bridge is acceptable, but there was not a bigger context of tolling to reassure Kitsap Peninsula residents that other areas also would have tolled projects. As a result, most interviewees identified fairness as important in implementing tolling in all areas of the State.

- **Congestion Management is Inherently Fair –** Most interviewees who were familiar with the concept of congestion management thought it is a fair way to add capacity to existing roads. They believe it is a low-cost, practical way to fix existing roads – and it represents a choice. Those who were unfamiliar with congestion management had a harder time imagining how it would work, but liked the idea if it could show itself to work in certain environments.

- **Tolling is the Way of the Future –** It is inevitable – and has been the tradition for funding bridge construction in Washington. There is no other way to build what we need.

- **Acceptance of Tolling among the General Public will Take Time –** The State should do some pilot projects first. Many interviewees consider the Tacoma Narrows Bridge and SR 167 as defacto demonstration projects.

What Projects are Conducive to Tolling?

Interviewees indicated that bridges are natural – they have traditionally been tolled and it may be the only way to pay for them. Projects with a clear need and conditions that make tolling practical were mentioned. Interviewees were not in favor of tolling an entire road, but did like the idea of HOT lanes, where drivers had a choice. Projects that add capacity or relieve congestion should be the priority. Some projects that received frequent mentions were:

- SR 520 and I-90 bridges (These were mentioned sometimes separately and sometimes together – with SR 520 mentioned more frequently because of more urgent safety issues. Some interviewees thought a toll would have to be placed on both bridges to avoid congestion on one or the other.).

- SR 167 HOT lanes.

- I-5 through Seattle (problem of Convention Center was mentioned by several interviewees).

- I-405 for its entire length.

- I-90 additional capacity from Lake Washington across Snoqualmie pass.

- Columbia River bridges.

- A new north-south corridor through eastern Puget Sound linking Kent and Everett, possibly as a Truck-Only Toll (TOT) project.

Issues

The following issues were raised by interviewees and reflect personal views and opinions. While they do not reflect the views of everyone who was interviewed, they should be considered to see if they carry any weight with the public. They are listed in order of frequency of mention by interviewees.

- **Parallel Facilities –** Regarding parallel or alternate facilities, a dilemma exists between the belief that an alternative is needed for those who don't want to use a toll facility,

but also the need to toll parallel facilities (as in 520 and 90 bridges) to avoid "toll avoidance" impacts on the toll-free alternative. Important to this discussion was the need to offer choices to travelers.

- **Captive Audience –** The "captive audience" dilemma is a desirable condition for tolling, but also lends itself to the outcry of unfairness for the same reason that makes it desirable. In the view of some, Vancouver, Washington faces the same potential dilemma as Kitsap Peninsula if bridge improvements toll both the I-5 and I-205 bridges. This would affect the 60,000+ people who commute daily across the river from Vancouver to jobs in Portland, Oregon.

- **Impact of RTIDs –** If Regional Transportation Investment Districts (RTID) receive tolling authority, some people foresee the possibility of the RTIDs becoming the preferred source of funding for local projects wherever they are created. The fear is that if they were to be created in the more populous counties of the State (which are the only places they are seen as feasible), then we could see the development of a series of fiefdoms that help themselves, with no one willing to pay for statewide improvements. This could leave the less populated rural areas without transportation funding.

- **Communications –** Communicating with the public about tolling is important. Not only is there an information void about how modern toll-collection systems work, there is little knowledge about tolling for congestion management purposes. The comprehensive tolling study is a good vehicle to use to initiate a discussion tolling in all its forms. The Tacoma Narrows Bridge and SR 167 projects are viewed as good test cases from which people can learn the practical side of how tolling works.

- **Overall Need for Transportation Improvements –** Communicating the need for transportation improvements in general also is important. Many interviewees understood the importance of goods movement to the State's economy and to the future transportation system, and they believe that raising awareness about the importance of the economy and goods movement to the State of Washington is an important rationale for explaining why we need tolling. If we don't pay to improve the transportation system, Washington will simply lose business to competing states and countries.

Introduction

Frank Wilson & Associates conducted 16 interviews with community leaders throughout the State to identify concerns and preferences about tolling, and to elicit suggestions for criteria that could be used to identify specific projects for possible tolling. These opinions do not represent a statistically valid sample of opinion in Washington State. Rather, these interviews provide a flavor for the kind of issues that WSDOT will face as it explores tolling in the Comprehensive Tolling Study.

The interviews were conducted in October and early November of 2005, coinciding with a statewide election that included Initiative 912 that sought the repeal of a recently enacted gas tax hike. The election heightened awareness of transportation funding issues, and sometimes offered campaign-induced information (or misinformation) as a backdrop for the interviews. This backdrop is important context for some of the responses provided by interviewees.

How Does the Future Look for Tolling in Washington?

The pieces of a hypothetical picture of the future of tolling in Washington include:

- Introducing statewide tolling to the public in Washington by positioning the successful Tacoma Narrows Bridge and SR 167 as examples of possible future projects;
- Successfully implementing a network of toll roads and bridges in Washington that will keep the State competitive and traffic and goods moving; and
- More equitable distribution throughout the State of gas tax resources and toll projects.

These potential elements of a successful implementation of tolling in Washington were among many suggested by interviewees. They are not meant to suggest a particular direction for implementation, nor are they meant to imply that the path taken to this vision was an easy one; rather, they represent one possibility that emerged through responses from interviewees.

As seen through the collective eyes of interviewees, this hypothetical future looks something like this:

> *Washington State, the first state in the country to establish a statewide tolling policy framework, now features a comprehensive network of toll facilities that share a common electronic toll collection technology. Toll bridges across Tacoma Narrows, Lake Washington and the Columbia River connect seamlessly with HOT lanes, especially on several roads in the Seattle area. With these successes in the State's most populous areas, transportation planners are now working on new toll projects in other areas of the State. To determine the feasibility and desirability of toll projects, they apply the tolling framework developed by the Commission as part of the comprehensive tolling study.*
>
> *The common electronic toll collection technology lets drivers travel an array of roads and bridges without having to stop and pay tolls. Visitors to the area are able to request a transponder for their rental car so they can take advantage of the congestion-free driving on the HOT lanes and bridges.*

Methodology

This report is based on interviews with stakeholders from across the State. The views and perceptions of stakeholders are documented and synthesized. Current and future issues that WSTC may face in the development of a statewide tolling framework also are identified, as well as strategic steps for moving forward.

Between October 13 and November 16, 2005, Frank Wilson & Associates conducted 16 interviews to gauge the perceptions of stakeholders on a number of topics related to the Washington State Transportation Commission's ("the Commission") comprehensive tolling study. The Commission's Tolling Committee together with Commission and WSDOT staff provided names of initial interviewees. Second-tier interviewees were those suggested by initial interviewees. Questions probed these areas:

- Level of awareness about the Comprehensive Tolling Study and tolling;
- Perception of the need for transportation improvements in interviewees' areas, as well as statewide;
- Strengths and weaknesses of using tolls to finance road improvements and as a congestion management tool;
- Possible support or opposition to tolling in their community;
- Perceptions about the fairness of tolling and ways to implement tolling so that it is fair to users and non-users; and
- Possible criteria to use in evaluating whether or not tolling should be used in a particular area, and projects that might meet those criteria.

Additionally, every interviewee was asked if there was anyone else that we should talk to whose perspective they thought would be important to the study.

Synthesis of Information

Awareness About Tolling in Washington and the Comprehensive Tolling Study

All but one interviewee was following the subject of tolling in the State of Washington, and most had heard about the comprehensive tolling study and thought it was a good idea. Many interviewees mentioned the Tacoma Narrows Bridge, and several noted the SR 167 HOT lane project.

When asked what they thought when they first heard about the study, many interviewees said they thought the time had come for tolling. They mentioned the Tacoma Narrows Bridge and the need to find a balance about who should pay. Several interviewees mentioned that tolling should be done everywhere so there are fewer objections to it in a specific area. One interviewee said they favored lower tolls without a sunset, rather than higher tolls that are removed sooner.

What Are the Transportation Problems Throughout the State?

As might be expected, the Puget Sound area had the highest number of problems identified by interviewees. Whether the discussion centered on freight mobility or commuters, the Puget Sound region always came up for discussion, even among interviewees from other areas of the State.

In addition to naming specific roads or projects, many interviewees commented on the transportation system in general, often citing specific priorities related to their industry or profession:

> "When we deal with transportation problems, we tend to look at level of service and accidents. We need to ask, 'What does it mean to the economy and how will it attract business and promote business growth?'"
>
> "We need ease of access in and out of our marine ports and airport."
>
> "We live in an earthquake-prone area. We have to shore up and replace bridges."
>
> "People are paying more for time [spent in congested traffic] than it would cost in higher tax."
>
> "Safety is the number one concern. Something has to be done for travelers using the highway."
>
> "The Puget Sound problem is obvious, but there are needs in Vancouver, Blaine and Spokane, too."
>
> "Two decades of no investment in infrastructure has caused problems everywhere."
>
> "So many years of nothing, and now we have to catch up."

The chart below lists the transportation problems identified by interviewees, and some comments made with reference to those problems. Comments in the right column reference the priorities listed in the left column. Priorities reflect the frequency of mention by interviewees.

	Interviewee Comment
Seattle-Tacoma	
In priority order according to interviewees' mentions. SR 520 across Lake Washington	• Don't just replace the bridge. That just moves the bottleneck. 520 should be widened from 10 miles east of the lake to I-5 on the west. • 520 safety issue has raised it in public awareness. This project (520 bridge) is special and should be handled differently, maybe from the feds. Go outside the regular sources for funds. Maybe a FEMA-type funding to prevent a costly failure instead of waiting for the disaster to replace it.
Alaskan Way Viaduct	• Like 520 bridge – Alaskan Way Viaduct should be handled differently because of the safety issue and costly replacement. Sea wall is important to this area, too. • The Viaduct is a safety issue.
I-90 between I-5 and Issaquah	• I-90 needs HOV lane, use of center lane to increase capacity across Snoqualmie Pass.
I-405 for the entire distance	• I-405 is closer to being built than some of the other projects. Widening has been on hold, but there is a record of decision already. Move forward with the ones that are ready.
I-5 through Seattle (from Marysville to Olympia)	• I-5 problem goes without saying – you can't get through the city without changing lanes.
SR 167 extension and add HOT lanes	• SR 167 HOT lanes are a good idea. They offer a choice. • We need east-west access to get into port facilities – like SR 167 and SR 519.
I-90 Bridge across Lake Washington SR 18 between I-5 and I-90 – complete bypass SR 509 extension between SEATAC and I-5 Mentioned only once: Highway 9 in Snohomish County I-605 – talked about but never done SR 519 – important for sea port SR 518 – Build 3rd lane out of SEATAC	
U.S. 395 Improvements	• North-south freeway is needed. • U.S. 395 has been on the books for years. It goes to Canada and is needed for goods movement (e.g., timber, fruit, hay and mining and cattle), as well as an alternate route around Spokane.
I-90 from Idaho border to 10 miles west of Spokane Grade separation at train crossing	

	Interviewee Comment (continued)
Vancouver/Clark County	
I-5 corridor	• Capacity needed through the corridor, including the Columbia River crossing.
Yakima	
I-90 crossing the Snoqualmie pass	• I-90 improvements across the Snoqualmie Pass are most important, especially for trade/moving goods to port. Also, a national security issue.
U.S. 12 at 40th Avenue and 16th Avenue	
Blaine/Whatcom County	
I-5 border crossing	• The issue is security versus traffic flow. It's not just a transportation problem. • Capacity is a problem. There are not enough personnel; there is more of a focus on the southern U.S. border.
Kitsap Peninsula	
SR 305 from Poulsbo to Bainbridge Island Ferry Terminal	• There should be more terminals in other areas to relieve traffic on the access roads to the ferries.
SR 304 from Highway 3 to Bremerton Ferry	• People are resistant to traffic improvements through their communities to terminals.

What About Using Tolls for Raising Revenue and Congestion Management?[1]

Interviewees were asked to identify the strengths and weaknesses of using tolls to raise revenue for transportation projects and as a traffic management tool. Virtually everyone realized the need to find alternative funding mechanisms for transportation projects. Many also mentioned the reality that the toll revenue is not likely to be the only source of funding for the biggest projects. For those who understood the distinction between the two types of tolling, there was support for HOT lanes because of the new alternative they offer for those who choose to use them. Interviewees did not identify many weaknesses of HOT lanes; rather, they brought up operational issues related to the change from HOV to HOT. Some typical comments included:

[1] Two separate questions were asked in the interview related to the use of tolls to raise revenue and tolls for congestion management purposes. It was clearly understood among interviewees that toll revenue would be used to pay off the bonds that finance construction of the tolled facility, making the toll a user fee.

"In the long term, reliance on gas tax is not sustainable. Consumption is declining…"

"If the public is not willing to tax, then this is a good option…we pay our fair share."

"Public acceptance will be difficult for revenue generation purposes. They're already paying taxes. Why toll?"

"Travelers would be made aware of the economics of their travel decisions…"

"If you do dynamic tolling, then there is better mobility and reliability…it's efficient."

"There's a lot of abuse of HOV. How will we manage it?"

Strengths and Weaknesses of Using Tolls

Following is a collection of the comments from interviewees regarding the strengths and weaknesses of using tolls. The comments about using tolls for revenue generation are listed first, followed by comments about tolling for congestion management. Comments also are grouped into categories that reflect the general nature of the comment.

Tolling for Revenue Generation

Strengths	Weaknesses
Tax versus Toll	
• If the public is not willing to tax, then this is a good option. We want it to be fair – we pay our fair share – like a user fee. • You don't have to raise other taxes. It's easier to get support for tolls than for taxes. • In the long term, reliance on gas tax is not sustainable. Consumption is declining with hybrid cars. • You can target major projects – leverage toll money with other local funds. Target big projects. • Tolling really means that you get the project sooner rather than later. • For very expensive projects tolls are appropriate and fair. • Don't go into tolling with the thought of getting a lot of revenue.	• In today's dollars, will tolling ever pay debt service? • Don't go into tolling with the thought of getting a lot of revenue. • Tolls on specific facilities reduce the case for a tax to address a statewide transportation system. Voters won't support an additional tax once they start paying tolls for "their" roads.

Tolling for Revenue Generation (continued)

Strengths	Weaknesses
Operational Factors	
• Tolls also can pay for operations. • Be efficient in collection and moving traffic through the toll area. Leave space for an approach on both sides (bridge). • It can induce carpool (if they ride free or reduced toll). • Travelers would be made aware of the economics of their travel decisions – it would force a mode choice. • Done right, it could make a difference.	• Costly to staff the facility. Slows traffic down. • If you toll one route, then the nearest parallel would get all the traffic. This also could be a safety issue. • If the focus in only on revenue, then bus, van and carpools aren't a prioritized and you're not looking at multiple goals.
Fairness/User Pays	
• There is a direct relationship between what you use and what you pay – where and when. It's fair and reasonable. • Pay as you go. If you choose it, you pay. • Shifting users from general purpose lanes to an HOT lane benefits those who don't use it. • It's philosophically good because you raise some revenue from people who benefit.	• Fairness is an issue if it's the only alternative. • I live on the west side of the Sound. We're used to paying for a ferry. That's really a toll. Our run subsidizes more than its cost to support less profitable runs. • Charging a toll invalidates the land use decisions. When people purchase lower-cost homes in outlying areas, they make a decision to spend their time rather than their money (for a closer-to-work home). This gives rise to a legitimate outcry when the rules are changed (by charging a toll for what was previously "free"). • Depending on the users' income level, it can be the most regressive form of taxation.
Public Acceptance	
• Sends a clear message that there is inadequate funding for transportation. • It acknowledges that the transportation system has limited capacity. With tolls you meter usage through fees.	• Acceptance of the technological shift or the pain of implementation. Toll facility users must use a technology that wasn't needed before the toll. For some, that step can be daunting. • Biggest obstacle is people don't like tolls. We're not from the east coast. Even though technology makes it more efficient, it will take getting used to. • Public acceptance will be difficult for revenue generation purpose – they're already paying taxes. Why toll? • People have to get used to paying for it. Be prepared for sticker shock. Transportation has been so cheap for so long. There's no good mass transit. • Problem with tolling on I-5 is how do you package tolling for an old, paid-for road?

Tolling for Congestion Management

Operational Factors

Strengths	Weaknesses
• If you do dynamic tolling, then there is better mobility and reliability, which equals an advantage to carpool, vanpool and bus. It's efficient. • It's efficient. Reduce congestion without new construction. • Some people will choose mass transit to take advantage of the HOT lane by paying transit fare rather than toll.	• HOT is sometimes difficult from an engineering perspective. There's a lot of abuse of HOV. How will we manage it? • Tolling would be wasteful if it is a new highway. People already violate HOV lane restrictions. It could be a safety issue. • Economics drive a lot of decisions. People will be driven to mass transit. The new facility could go without sufficient revenue to pay the debt.
Fairness/User Pays	
• The only type of congestion pricing that's good is HOT lane because there is an alternative to paying the toll. • Theoretically this is the highest value use, the best use of resources for goods movement. We have not seen good analysis on system management and freight. What pricing mechanisms work? Tolling freight has other implications. • Congestion management with free parallel lanes is OK. We don't have a problem with HOT lanes.	• Equity – captive audience. If they don't have an option, there will be problems • If it's not done right, then fairness and mobility (multiple modes) will be an issue. • Little concern for lower-income people. They already pay a higher proportion of taxes. We have the most regressive tax structure in the country. • The big kicker is if there are no alternatives. There are no other mode choices. • A huge hot button in the 90s was when Public-Private partnerships were proposed. There was strong opposition. The State Patrol had to keep order in the hearing room. • The concept of paying more at one time of day.
Public Acceptance	
• I'd like to change the name – discuss it as "congesting pricing" rather than "congestion management." • Don't have the toll in effect during off-peak. Then they're paying to enter a particular zone at a specific time. This would be more easily accepted by the public – their decision. • It's a cultural change. Folks in our state are tired of traffic. It's really bad and they're ready for it. • Communication is the key. • HOT lanes should be tested. Will it be widespread or only in certain areas? Target projects where it makes sense for efficiency. • HOT lanes are less objectionable than full toll road. • The alternative parallel route is an escape valve for political steam. You pay with time instead of money. • Public more willing to accept the cost for congestion pricing.	• People adapt to change slowly. They're not going to accept it. • Don't use HOT lanes as a stick to get people out of cars. • Don't use revenue for other than road-related operation and capacity purposes.

Educate the Public

A significant number of comments were related to raising public awareness about tolling – from the need for it to the obstacles preventing it, to operational features that interviewees thought the public would like or dislike. Certainly the approach to communicating about tolls could make or break the program. Citing the failed attempt to implement tolling through public-private partnerships in the 1990s, some interviewees believe a one-project-at-a-time approach would be more likely to succeed in gaining public acceptance.

Find Champions and Identify Potential Opposition

Interviewees, themselves, were relatively well informed about the interest in implementing tolling in Washington. However, they were often hard pressed to know what might form the basis for opposition to tolling because the concept has not been widely publicized. The only public response to tolling to date has been reaction to the attempt at public-private toll projects in the 1990s and the decision to toll the new span of the Tacoma Narrows Bridge to finance its construction. So much of what interviewees anticipated in the way of future public response about tolling was based on their observation of these experiences.

Supporters	**Opponents**
• Don't know yet – it's not tested. • Mayor of Vancouver, Royce Pollard, likes the user fee concept and recognizes the constraints in the corridor to manage congestion. • Environmentalists are likely to support it if it is implemented fairly. • Environmentalists will understand the positive effect on pollution. • Transportation planners. • State patrol will be an ally on safety issues, but how hard are you making their enforcement job? • Business will support it. They need transportation improvements to meet their business goals.	• Trucking Industry – British Columbia to Tijuana. • Trucking industry will be fickle. • Vancouver – captive audience for Columbia River crossings much like Gig Harbor. 60,000 people commute from Vancouver to Oregon every workday. • Some people might like the idea until they have to pay the toll. • In the 1990s local action groups opposed the public-private toll projects and might do so again. Source of opposition was the perception that the corporations would be enriched in the paying of the tolls. • Community-based organizations and advocacy groups – for their constituencies it is another hit they can't afford. They're already paying a higher proportion of their income for daily living costs. • Anti-tax folks. • Initiative writers and talk radio hosts who pump people up with false statements. • Maybe AAA. They won't want tolls on existing facilities. • Fiscal conservatives will say they've already paid.

It is generally believed that it is important to identify "champions" for tolling as implementation of various projects moves forward. However, potential champions also were not easy for interviewers to name. Nevertheless, there were a few potential opponents and supporters identified.

Fairness – Equity on Three Fronts

Interviewees were asked about fairness twice in the formal questions. First, they were asked whether they felt that tolling, overall, was a fair or unfair way of providing financing for transportation projects. The second question deliberately asked them to consider whether tolls placed a disproportionate financial burden on minorities and economically disadvantaged groups. But by far the greatest concern voiced about equity could be called "geographic equity." This type of equity has at its source the idea that a captive group (on the Kitsap Peninsula, in the case of the Tacoma Narrows Bridge; and on one side of the Columbia River, in the case of Vancouver) should not be unfairly burdened with a toll that only they have to pay.

On the fairness of tolling in general, most interviewees thought that tolls are fair, but often added a caveat to their response, such as:

> "Depends, it should be an added part of a revenue package. Roadways are like utilities. Everyone uses them. How do you determine who pays and how much?"
>
> "Philosophically, if you're a user, you should pay more than someone who doesn't use it. If one region goes to tolling, what are the implications for the rest of the State?"
>
> "Modest tolling is not unfair. You could provide a subsidy for older people or poor people based on frequency."
>
> "It depends how you implement it. Don't just shift congestion and environmental/ social impacts to other routes."
>
> "Gas tax is more fair."
>
> "The devil is in the details. What can you use the money for? In the geographic area? On transit?"
>
> "With caveats: that the tolling is in response to constraints in the corridor to manage congestion, and that it assures a structured process to address all issues."
>
> "It's fair because there are more choices."
>
> "If I had my druthers, I'd say no."

Regarding a potential disproportionate financial burden placed by tolls, some interviewees mentioned this possibility even before they were asked. None felt that tolling was inherently unfair to anyone, but that the potential for unfairness should be addressed up front so that there is a ready response if there is a need to take specific action in any individual community. The key for many was to offer options so that the toll facility is framed as a choice. Several people did mention that they thought that a toll is like a sales tax – regressive in nature. Some comments:

"Should everyone pay? We (who use the road) all benefit."

"There's never a fair tax. It may not be possible to make it fair. People will just have to make a choice."

"Have components that allow choice and level the playing field."

"If you tolled everything it would be bad. It's OK if it's an option."

"Mitigate any impacts through the use of revenues. Offer better transit service."

"Maybe try a reduced fee structure?"

"Just help people move from point A to point B."

"If you transition to an enterprise system (paying a toll to use the road), then people who receive assistance might qualify for a discount based on some needs-based criteria."

"HOT lanes are fair. The decision is always yours."

Criteria for Evaluating Projects for Tolling

As one might expect, interviewees' criteria for evaluating possible projects for tolling reflected the concerns and interests they raised in other areas of the interview. Together, the comments and suggestions begin to form a loose structure around several possible criteria that answer the questions that interviewers posed. The question posed most frequently was, "Is it politically acceptable?" This question was repeated various ways, indicating the importance of this factor locally, regionally and statewide. The overarching question was, "What are the goals with the toll/project?" Once the goal(s) are established, the following questions and concerns can be seen as a test for determining whether or how a project will meet them.

Public and Political Acceptance

- It has to be politically acceptable in the area.

Benefits

- What safety enhancements would be gained?
- Would it facilitate goods movement?
- Would it help or expand industry?
- Look at economic indicators – would it help the economy?
- Capacity should be increased.
- Does it provide a new facility? Replacement is not as justifiable.
- Improve mobility for the most people.

Feasibility/Practicality

- Tolls have to be easy to collect.
- Make sure there are no other options or no one will use it.
- Is there a viable place to toll?
- Would it pilot a new technology?
- Congestion management projects must have limited access.
- Facility has to be well marked, simple, and efficient.
- Use technology to keep it simple and keep costs down.
- Increase traffic flow and reduce emissions.
- How can tolling make a difference on existing chokepoints?

Financial

- Does the financial modeling indicate that tolling will meet the stated goal?
- Is there another way of funding the project?
- Does funding one project shift impacts to another?
- Using tolls for operations is appropriate.
- It's a matter of timing. Eventually, everyone will get their local project built.
- There has to be a resolution of how we're going to handle transportation funding. Will it be statewide or RTID with tolling authority?

Location

- Where can you make the biggest difference in congestion?
- If widening isn't possible, then would congestion management be a good alternative?
- Look at the total transportation problem and funding mechanisms.
- Are there substitute routes?
- There should be no other route options for a tolled facility.
- How would placing a toll in one area affect others?

Projects That Meet the Criteria

After interviewees had offered some criteria that reflected their priorities, they were asked again about the projects they had identified as possible tolling projects. Did they still seem appropriate after considering them against the yardstick they had just named? Many people believed the projects they had originally named could stand the test of the criteria they had mentioned. The candidates are:

Puget Sound Area

- I-5 from downtown to Northgate – Figure out a way for a new lane, then tweak it to make it politically acceptable.
- I-405 for its entire length (HOT pilot).
- I-90 from Seattle to Issaquah.
- I-90 across the Cascades.
- SR 167 – Extend and add capacity.
- I-90 and 520 bridges (These were often named in tandem because of the belief that one could not succeed as a toll project without the other because of expected toll avoidance behavior.).
- Alaskan Way Viaduct.

Clark County/Vancouver

- I-5 and I-205 in Vancouver.
- Columbia River bridges.

What Should be Done to Address Concerns About Tolling?

Finally, interviewees were asked, "What one thing should be done to address the concerns people might have about tolling?" Responses to this question related to two primary areas, public acceptance and operational issues/suggestions.

Public Acceptance

- The need to have a plan.
- The plan should offer a clear picture of expectations and goals.
- They should articulate to the public what those expectations and goals are. Example: SR 167 toll project will maximize the use of the free lanes.
- Establish a long lag time. Sensitize the public that tolling is coming.
- Start with a project people understand.
- No ambiguity.
- People aren't going to like paying tolls.
- Make sure people understand what they're getting for their tolls.
- Get better at explaining the issues. Some will consider it a double tax. Be up front about problems.
- Have a structured public process that includes the business community.

Operations

- Do it in a way that one region doesn't feel they're singled out.
- Explain how the electronic device works.
- Give options for tourists.
- Number and location of access points is important.
- Try a vehicle miles tax – Germans use it on heavy vehicles.
- Don't repeat the mistakes of TNB – net gain is one HOV.
- For HOT lanes, provide incentives to get cars into the lane.
- WSDOT should stay the course. They're heading in the right direction: implement tolling in places where it makes sense, like the 167 HOT lanes, Hood Canal Bridge, 520 Bridge.
- In the last couple of years WSDOT has listened – like replacing the Hood Canal bride ahead of time and budget.
- First improvements should be additional general-purpose lanes on I-5, I-405, and I-90.
- If the RTIDs have the power to levy taxes then they could become the only game in town – the power will be where the money is.
- Adopt a set of guidelines and a structured process to help agencies around the State that are making transportation decisions. Identify criteria that must be addressed – a checklist.
- First, have a level playing field.

Situation Analysis: Strengths, Weaknesses, Opportunities, Threats

Identifying strengths, weaknesses, opportunities and threats is an effective format for building a thorough inventory of issues facing WSTC as it seeks to establish a statewide tolling framework. It takes the perceptions provided by interviewees and synthesizes them so that they become useful and actionable.

Strengths

The time for tolling has come. The legislature has recognized it and Washington is among the first states (if not the first) to attempt to establish a framework to guide the selection and implementation of tolling projects. The results of the comprehensive tolling study have the potential to guide this effort toward a comprehensive framework for a system of toll roads with interoperable electronic toll collection systems. Some strengths that will support the study's goals are described below.

Two toll projects already underway can serve as real-life success stories. The high visibility of the Tacoma Narrows Bridge and its successful execution thus far are great strength for the prospect of implementing tolling statewide. A successful marketing phase and launch will raise interest and awareness throughout the State – both on tolling and on electronic toll collection. The SR 167 HOT lane project will serve as the second example of tolling, and will introduce the HOT lane concept to the State of Washington.

Tolling is seen as the way of the future – but not a panacea. There was awareness among several interviewees that even projects with a toll component as part of a financing package cannot be built on tolls alone. A combination of funds, including taxes, will be required to make most projects feasible, and to allow for tolls low enough that they don't price the project out of the market.

A plan for statewide tolling would make individual projects fair. As was evidenced by Tacoma Narrows Bridge, any single proposal could be viewed as unfair. The statewide tolling framework provides a potentially welcome response to the concern that a specific geographic area is paying a disproportionate share while others get "their projects" build through tax dollars.

Weaknesses

There are no tolling champions. Outside of the obvious interest groups (such as transportation planners and economic development advocates) there were no groups who came to mind as advocates for tolling and/or transportation improvements. There also were no advocates identified at the state level who could champion the concept. To the extent that there are recognizable champions, they should be identified. A champion can

be the person to carry the banner for tolling projects, and speak up when misinformation is circulated by detractors.

There is little public knowledge about tolling for congestion management. Most interviewees believe that public is not well informed about congestion management tolling. And even though most interviewers knew about the Commission's tolling study, they voiced concerns about implementation (especially of HOT lanes) that revealed their lack of knowledge about electronic toll collection and the operation of HOT lanes. Introducing HOT lanes must address the lack of a local reference point about how such projects will work.

Opportunities

There is still time to frame tolling vis-à-vis the future economy of the State. The information void about tolling provides opportunity on two fronts. Funding improvements to existing facilities as well as new projects is important beyond what is obvious to most citizens. As a trade-dependent state, Washington's entire economy depends on a viable transportation system. An understanding of the importance of this factor is very important, and can be a part of the framing of tolling in the State of Washington, whose thriving ports face worldwide competition.

Information void about tolling. The Commission, in communicating about the study, and WSDOT, in communicating about specific tolling projects moving forward have the means to brand and position tolling firmly on the side of the public good – as a practical, fair way to bring projects to life that had languished for decades without sufficient resources.

Public awareness is high about the need for safety improvements. Although many major projects have languished for at least a couple of decades, the need for improvements has been raised recently through revelations about the potential for failure of the SR 520 Bridge. This was reflected in interviewees' comments about safety being a primary criterion for determining which projects should be considered for tolling. Interviewees also mentioned the fact that the condition of the SR 520 Bridge had helped to generate support for other projects that pose safety concerns – especially in the event of an earthquake.

Threats

There currently are no interest groups formed specifically to support or oppose toll roads in Washington. (At least interviewees were unable to identify any.) The threat to tolling comes in the possibility of overlooking potential issues and misreading or underestimating community concerns. Among the possible threats to the successful implementation of the recommendations of the tolling study is the defeat of the attempted gas tax repeal, since people may feel that the revenue issue is now "solved."

Information void could be filled by detractors. The flip side of the coin regarding the information void about tolling is the opportunity it offers to others. It could become a threat in the form of detractors to specific projects or opponents of tolling in general. Either could gain an upper hand in the presence of such a void, and could fill it with rhetoric to suit their cause.

We have the tax now. Why do we need tolls? When the gas tax hike faced possible repeal, several interviewees anticipated its passage as a boost to the introduction of tolling statewide. Likewise, its defeat also could cause people to believe that the retention of the tax revenue will solve Washington's gridlock. If such a belief were to take hold, it could stand in the way of public acceptance of the tolling solution.

Preliminary Recommendations

The strengths, weaknesses, opportunities and threats, when viewed together, reveal a potential strategic path that will help establish a statewide framework for tolling. Strengths and opportunities include the "right track" that WSDOT is on with regard to execution on the TNB project and the widespread desire for transportation improvements. Weaknesses and threats include the absence of a champion for tolling, and the information void about tolling. The preliminary recommendations that follow reflect ways in which the opportunities and strengths can be put to work to overcome the weaknesses and threats.

Do it right, and even credible detractors can be won over or positioned appropriately. Do it wrong, and the detractors will end up with their message in the lead, and toll projects potentially DOA.

Ensure success on TNB and publicize it. The Tacoma Narrows Bridge project is the best possible publicity for tolling in Washington. Ensuring broad distribution of transponders in advance of opening will go far to quell the perception that Gig Harbor people don't like paying to use the bridge. If other Washingtonians see this as a success, and hear people talk about its convenience, which will be more powerful than any example of success from some other state like California, Florida, or Minnesota. Likewise, the 167 HOT Lane project's implementation should be portrayed as an important demonstration project that is successfully moving forward with public and commuter support.

Raise public awareness about tolling. This is a simple proposition with enormous consequences. Every interviewer said that gaining public support for tolling and specific toll projects was essential for tolling to succeed in the State. Many of them acknowledged that it was the one thing that should be done to ensure the successful implementation of tolling. It means branding tolling in terms that are meaningful and relevant to citizens, identifying their preferences for local projects, expressing the benefits, winning over detractors, involving citizens in the statewide effort from grass roots to the state level,

responding and inoculating on the fairness and equity issues, and remaining vigilant for signs of discontent so that issues don't become crises.

Identify local projects with the most local and statewide support. With fairness a primary concern of interviewees, attention should be given to identifying the projects with the most support, as well as the local projects with the most support from citizens throughout the State. Some people viewed the implementation of tolling in different areas throughout the State as a way of leveling the playing field and making tolling fair.

Develop proactive community outreach and participation for statewide tolling. As communication strategies about tolling are implemented, a framework for citizen involvement should be devised that includes local groups as well as a statewide citizens group. These groups could be a formal part of the tolling framework. Local citizen committees can help broaden support for tolling and keep WSDOT apprised of local issues and concerns as projects move forward.

Comprehensive Tolling Study Ascertainment
Stakeholder Interviewee List

Steve Appel	Washington Farm Bureau
Jeannie Beckett	Port of Tacoma
Rick Bender	Washington State Labor Council
Jeff Brody	Bremerton Sun
Don Brunnell	Association of Washington Business
Stan Finkelstein	Association of Washington Cities
Robert Frank	Everett Herald
Mark Hallenbeck	University of Washington and Washington State Transportation Center
Peter Hurley	Transportation Choices
Pat Jones	Washington Public Ports Association
John Okamoto	Port of Seattle
Mary Place	Yakima Councilwoman and Immediate Past President, Association of Washington Cities
Larry Pursley	Washington Trucking Associations
Janet Ray	AAA
Thayer Rorabaugh	City of Vancouver Transportation Services
Karen Schmidt	Freight Mobility Strategic Investment Board

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Washington State Comprehensive Tolling Study

Ascertainment Questionnaire

Stakeholders/Community Leaders

Thank you for taking the time to visit with us today.

1. First of all, how closely have you been following the issue of using tolls to help finance or manage traffic on new or upgraded roads and bridges in the State – very closely, somewhat closely or not very closely?

   Very closely.....1
   Somewhat closely.....2
   Not very closely.....3

   _____

2. Looking at the area of the State where you live or do business, are there transportation problems that you want to have solved? How about other areas of the State?

   _____

   _____

   _____

3. Are you aware of any projects that have been discussed for years, but that have not been built yet for one reason or another? (If so, name projects or areas.)

   _____

   _____

   _____

4. Among the traffic or transportation problems you just named, do you think any of them are more important than any others? Which ones, and why?

   _____

   _____

   _____

5. Are you aware of state legislation requiring the State Transportation Commission to look at the merits of tolling in Washington?

   [If yes] When you first heard this – was your first impression positive or negative?

   Positive 1
   Negative 2

   _____

   _____

   _____

6. Among the traffic problems you first mentioned, do you think any of them might be good candidates for a toll project?

   _____

7. As you see it, what are the strengths and weaknesses of raising revenues for transportation projects through tolling? First the positive things.

   _____

   _____

   _____

8. And what do you see as the negatives?

   _____

   _____

   _____

9. As you see it, what are the strengths and weaknesses of using tolling to manage traffic? First the positive things.

   _____

   _____

   _____

10. And what do you see as the negatives?

   _____

   _____

   _____

11. As you talk to people in your community, is there any group individual who you feel would oppose tolling?

_____

_____

_____

12. All in all, do you feel that tolling is a fair or unfair way of providing financing for transportation projects?

Fair 1
Unfair 2

_____

IF UNFAIR, ASK:

_____

13. And what makes it unfair?

_____

_____

_____

14. Some people say that tolls place a disproportionate financial burden on minorities and economically disadvantaged groups. Others say that tolls are a fair way of having users pay for what they use. As you think about the issue, do you feel that tolling can be implemented in a way that is fair to users and non-users of all income levels? (IF YES: How do you feel that could be done?) (IF NO: Why do you feel that can't be done?)

Yes: _____

_____

No: _____

_____

15. If you were on the Transportation Commission charged with recommending some projects for tolling, what criteria do you feel should be used in evaluating whether or not tolling should be used in a particular area?

_____

_____

_____

16. Now let's talk again about the problems you mentioned, and the projects you thought might be good candidates for tolling. Considering the criteria you just mentioned, do you still think those projects would be good candidates? [Repeat areas or problems raised earlier in #6.]

    _____

    _____

    _____

17. If the State were to change one thing about tolling that would do the most to address the concerns people might have about tolling, what would that one thing be?

    _____

    _____

    _____

18. This process of deciding which other roads and bridges, if any, should involve tolls will be playing out for some time yet to come. Would you like to stay abreast of the progress of this issue in the State, or not? (IF YES:) And what would be the best way to stay in touch with you? (WRITE NAME AND PHONE, E-MAIL ADDRESS, REGULAR MAILING ADDRESS, ETC.)

    _____

    _____

    _____

19. Periodically we may bring people together in small groups to discuss this issue. Would you ever like to be a part of such a group? (IF SO, GET PHONE, E-MAIL OR ADDRESS IF NOT CAPTURED IN Q 12 ABOVE.)

    _____

    _____

    _____

20. We are interested in talking to additional opinion leaders such as yourself in your community. Who else would you recommend that we talk to about this issue? (GET NAMES AND GET PHONE NUMBERS IF POSSIBLE.)

    _____

    _____

    _____

That completes our interview. Thank you for helping us.

Section prepared by Frank Wilson and Associates, Inc., with assistance from Cambridge Systematics, Inc.

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Background Paper #3
Organizational and Administrative Structures

The first part of this chapter is a national perspective of toll organizational models around the United States, to gain a sense of the pros and cons of these models under various circumstances. The next part considers Washington-specific projects and goals, and leads with documentation of interviews with stakeholders in Washington. This chapter concludes with descriptions of organizational models that would appear suited for application in Washington State.

National Perspective

This section is intended to provide concise baseline information on the alternative organizational models for toll road implementation, highlighting the financial, operational, and policy-setting functions that must be addressed in developing new tolling entities. The paper also will address the toll organization's relationship to Department of Transportations (DOT) with respect to issues, such as outsourcing, budgeting, administrative responsibilities, and jurisdictional boundaries. The paper draws on and presents the experiences in other states and local jurisdictions in establishing new or enhanced tolling organizations. While the emphasis of the paper is on state-level initiatives, it provides an overview that includes state, local, and private toll organization structures being used in the United States.

Overview of Tolling Practices in the United States

Many state and local governments rely on user tolls as a supplement to motor fuel taxes for funding transportation infrastructure construction and operations. The manner in which tolls are applied reflects historical trends, state and local legislative requirements, and policy priorities within individual states and local jurisdictions. This section provides an overview of the range of state- and local-level approaches currently in use across the United States for tolling highways, bridges, and tunnel facilities. While the examples presented in this section capture significant examples of the practices found throughout the United States, they are not all-inclusive. Moreover, the complexity and variations found among institutional arrangements prevents a total categorization of some organizations into a specific type.

Historical Perspective on Tolling Practices

Throughout the 1930s, states followed the Federal lead in using tolls to finance only very special and high-cost and otherwise very special links, mainly tunnels and bridges. In the 1940s and 1950s, prior to the interstate construction era, many eastern states adopted tolling as a primary means for developing major state "turnpikes," while western states used gas tax revenues to develop "freeways." Development of tolled highways stagnated, however, following passage of the 1956 Federal-Aid Highway Act, which began development of the Interstate system supported by Federal gas tax revenues.

Interest in tolling as an alternative mechanism for funding transportation infrastructure reemerged in the 1980s and 1990s as states faced growing budgetary and congestion pressures. This was particularly true in rapidly growing urban and suburban areas. In addition, there exists substantial public pressure not to increase fuel taxes.

Tolled facilities also can support efforts in the area of urban traffic management, as witnessed by the increasing interest in high-occupancy toll (HOT) lanes and variable pricing on bridges. The "managed lanes" concept is intended to provide the optimum level of traffic service to the users, along with providing financial support to payment of the project's construction and operational expenses. In effect, the level of service of the managed lanes is controlled by the level of toll imposed on the user.

Despite previous limitations on the use of Federal funds to construct and operate tolled highways, state and local jurisdictions have experimented with a broad variety of alternative mechanisms for financing their road networks. Thus, tolling practices vary considerably from state to state. However, with the passage of SAFETEA-LU in 2005, there is continued support for potential tolling of Federal facilities and the integration of Federal funds with toll revenues.

Current Practices

What has been the response to the interest in tolling? The response has taken shape through several actions, including:

- **Legislation –** Adopting policies that promote the use of tolling as a revenue source and traffic management tool, and establishing efficient organizational models for implementing policy directives.

- **Finance –** Expanding finance opportunities for all levels of agencies – Federal, state, regional, and local – to participate in meeting the mobility needs of the users.

- **Technology –** Advancing the use of express toll lanes and open road tolling concepts through an integrated electronic payment system, often with the result of changes in organizational approaches to include additional outsourcing and collaborative

operations plans. However, the issue of governance has not reflected the influence from technology as readily.

- **Risk Sharing –** Creating opportunities for public-private partnerships that promote risk sharing between public and private sector groups most qualified to address various risk factors and deliver transportation systems faster and more efficiently.

A review of practices within the U.S. toll industry identified current trends with regard to how the above responses shape organizational practices. The following subsections highlight these trends.

Organizational Approaches

The U.S. toll industry can be segmented into broad organizational categories as described below.

- **Statewide Turnpike Authorities (Independent and DOT-Sponsored State-Level Organizations) –** Statewide turnpike authorities can be separate entities from the state DOT, as is the case in Pennsylvania, Georgia, and North Carolina; or they can be departments within a state DOT, as in Texas and Florida. Statewide authorities and enterprises can often leverage their revenue stream to provide statewide service. Toll revenues collected in portions of the system with higher use can be utilized to improve or construct new facilities in areas where the early revenues do not meet project-specific debt service requirements.

- **Regional Toll Authorities (Regional- and Local-Level Independent) –** Strong local and regional support for meeting regional needs is the bases for regional toll authorities. These authorities may consist of a single county or entity, several jurisdictions, or a semiautonomous board with specific geographic boundaries. Regional authorities are focused on the regional system and promote projects that benefit the region. Texas, Florida, and Colorado allow regional or local agencies to be developed. In Texas, regional or local toll agencies can be created within a county as in the case of the Harris County Toll Road Authority in the Houston area, or for a region of the State as with the Central Texas Regional Mobility Authority in the Austin area, or as a regional agency outside a county government structure as in the case of the North Texas Toll Authority. Florida also has provisions for local and regional toll road organizational approaches.

- **Public-Private –** The need for additional funding partners has facilitated an acceptance of public-private toll road initiatives in some states. While the model varies by state, the intended result is to involve private sector participation in various forms for the advancement of projects that can be paid for over time by a dedicated revenue stream such as toll collections. The final ownership model also may vary by location and the financial plan submitted by the private partner/developer; however, even privately owned and operated facilities must conform to public standards to ensure the safety of the traveling public. Today, we see public-private partnerships

being pursued with greater acceptance by many states and their long-term potential to be a strong component within a State transportation system appears promising.

The public-private partnership approach may require a change in existing toll organization structure in order to proactively oversee public-private partnership activities. The Virginia Department of Transportation, while not a traditional tolling agency, has created special divisions within the Department to address this need. Likewise, the Texas Department of Transportation has recognized the need for specialized expertise on its "side of the table" when negotiating public-private partnerships. Existing toll-only organizations may not need any changes if adequate expertise exists in the form of internal or outsource staffing.

Examples of Legislation and Organizational Approaches

As examples of the above three broad categories of toll organizational structures, recent legislation has been passed to address the renewed interest in using tolls to finance needed transportation improvements and increase the options available to agencies for the implementation of tolling solutions. Legislative actions involving tolling opportunities also determine the organizational structures to be enacted.

These recent legislative actions have shown the strong interest in establishing state-level tolling agencies as well as local/regional agencies. A summary of selected recent legislative actions include:

- **Colorado –** Established a statewide tolling enterprise to focus on urban transportation needs. The distinction between an "enterprise" and an "authority" is largely in how the individual states recognize a revenue-generating operation. However, in some cases, it is meant to promote a more business-like approach. The Colorado Tolling Enterprise (CTE) is a DOT-Sponsored agency – the Director of CTE is an existing director-level employee of the Colorado DOT.

- **North Carolina –** Established a state turnpike authority to address transportation needs in both large urban and smaller urban areas. The NC Turnpike Authority is an independent authority with nine board members appointed by the Governor, President of the State Senate and Speaker of the State House.

- **Texas –** Passed a broad transportation bill (HB 3588) in 2003 that provides for the organization of regional mobility authorities (RMA), empowers state DOT Districts to analyze and institute toll roads, establishes a mobility fund to serve as project start-up funding, allows for public-private project development agreements, and established a cross-state corridor for multi-purposes. HB 3588 has added capabilities to existing toll organizations within the State, such as the ability to utilize public-private partnerships.

- **Florida –** Empowered the long-standing Florida's Turnpike, a District within Florida's Department of Transportation, to organize and operate more like a business enterprise, reorganizing into the Florida Turnpike Enterprise (FTE). This move was

aimed at allowing the FTE more business-like freedoms of operation, such as: a reduction in project development and delivery schedules through increased completion of tasks in parallel; opportunities to enhance nontoll revenue streams through development of property along the Turnpike; greater focus on customer service; and the flexibility to enter into business relationships with other toll agencies. These can be undertaken while still being organizationally associated with the Florida Department of Transportation.

- **Georgia –** Broadened the powers of a State Road and Tollway Authority (SRTA) to expand its financial authority; and, under separate legislation, established a public-private initiative law that allows for unsolicited proposals to be received and considered by the State. The SRTA is a state-level independent authority.

- **Virginia –** Has been a leader in the development of legislation encouraging the involvement of private ventures into the public transportation arena. Virginia has a fully private toll road operating in the State, the Dulles Greenway, and one public-private toll road, the Pocahontas Parkway (Route 895), the latter being a nonprofit corporation established specifically to develop the Pocahontas Parkway project.

Case Studies

A review of toll and turnpike actions taken during the past few years in Texas, Florida, and Virginia helps to define the current changes being undertaken in U.S. toll industry. The following summary of those case studies is representative of actions being taken in the United States to address the provision of needed transportation projects.

Texas House Bill HB3588: Omnibus Transportation Bill

HB 3588 was adopted June 2003, establishing a framework for broadening the application of tolling across the State as well as establishing a funding mechanism for supporting the broader use of tolls in the state's transportation system. The primary items of HB 3588 as they relate to this study include:

- Establishment of the Trans-Texas Corridor;

- Establishment of guidelines for the creation of Regional Mobility Authorities (RMA);

- Provision for the use of public-private partnerships through the use of comprehensive development agreements;

- Creation of the Transportation Mobility Fund to provide toll equity money for new toll projects, with an annual dedicated revenue of $250 million;

- Advanced right-of-way acquisition opportunities; and

- Ability to place tolls on non-tolled roads (conversion).

In addition, the Texas Transportation Commission established a policy directive requiring that all new highway projects be assessed with regard to the ability and level of funding that could be achieved from tolling. This directive has essentially put all Texas DOT District Engineers into the business of assessing the use of toll roads with the Texas Transportation Commission acting as the governing body.

Florida's Toll Industry

Florida's toll industry is varied, offering a number of ways of conducting the business of planning, designing, constructing, and operating toll facilities. The Florida "approach" came together over a long period of time through a series of actions and decisions, including:

- **Statewide System Perspective –** Florida's Turnpike – today referred to as the Florida Turnpike Enterprise (FTE) – was created in the late 1950s to provide a limited access roadway that connected central and southern Florida. FTE has shown continued evolution to meet the needs of the State – serving as both Florida's "mainstreet" and its leader in innovative transportation practices and the incubator for change in delivering transportation systems. FTE continues to stress delivery of highway systems along with enhancement of service to its customers through the convenience of electronic payment systems. FTE's successful marketing of their signature "SunPass" transponder serves as a model to all toll agencies. While significant growth and expansion are the norm for FTE, so is continued improvement in their financial standing, as evidenced by continued high ratings from the bond market.

- **Regional Systems Perspective –** Regional Expressway Authorities began in the 1960s as regional leaders saw the need and opportunity to enhance their quality of life and economic opportunities through toll roads. This approach continues today, over 40 years since the initial efforts by the Orlando-Orange County region. Today's regional toll authorities include systems operated by the Orlando-Orange County Expressway Authority, the Miami-Dade Expressway Authority, and the Tampa-Hillsborough Expressway Authority.

- **Local, Stand-Alone Project Perspective –** The enactment of local bills in the Florida Legislature has allowed creation of authorities with specific project purposes. Local tollway authorities have become more prominent since the early 1990s. These authorities often serve to provide connections for specific, significant needs. They can exist under the umbrella of a county government or as an independent board. These have largely consisted of toll-bridge authorities, such as the Mid-Bay Bridge Authority in Okaloosa County and the Garcon Bridge Authority in Santa Rosa County.

Florida's toll industry continues to evolve to meet statewide and regional needs for improved transportation. Florida's flexible implementation options have been created to meet the continued demand for growth in the State.

Virginia's Public-Private Initiatives

Virginia's recent tolling approach includes development of the "public-private transportation act," or PPTA. The PPTA, initiated in 1995, allows private entities to enter into agreements to construct, improve, maintain, and operate transportation facilities. Virginia has not developed a statewide tolling or turnpike authority and there appears to be no movement in that direction. However, the Virginia Department of Transportation (VDOT) has created two special divisions within the Department to review and manage the PPTA program.

The precursor to Virginia's PPTA was development of the Dulles Greenway, a privately owned toll road in northern Virginia. The Dulles Greenway was created prior to the 1995 PPTA and is not subject to oversight by the Virginia Department of Transportation]. Oversight of the Dulles Greenway is provided through the Virginia State Corporation Commission. Seeing the need to enhance upon the approach used to develop the Dulles Greenway and give the State of Virginia more control over the development of publicly accessed highways, the PPTA act of 1995 was passed.

The following observations can be made of Virginia's toll road experiences since passage of the PPTA:

- The State has received 43 unsolicited proposals (through August 2005) and VDOT has issued one RFP for a public-private project. However, only one PPTA project, the Pocahontas Parkway has been developed and opened to traffic to date. It should be noted that the Pocahontas Parkway project has had financial difficulties due to slow growth in traffic demand. Eight additional proposals have resulted in comprehensive development agreements with a total value of approximately $2 billion (August 2005).

- PPTA proposals submitted to VDOT during the early years of the program were proposals to use VDOT's state and Federal funds to develop and construct toll projects that required additional funds beyond those generated by toll revenues. After acceptance by the State, state funds were essentially earmarked to the specific PPTA project, preventing the use of the earmarked state funds on other VDOT projects.

- A noticeable change in the nature of PPTA submittals has occurred in the past year as private sector teams are starting to include international tollway and financial firms in partnership with U.S. firms. This is consistent with the public-private activities noted in Texas.

- There currently are six PPTA proposals under consideration and review by VDOT (August 2005).

Overview of Organizational Models

Introduction

Tolling entities share common functions: they charge user fees (i.e., tolls), to help finance debt associated with facility construction, operation/management, expansion, and major rehabilitation; and, providing opportunities for enhanced traffic management. While they share common defining functions, tolling entities follow different organizational models. Tolling organizations are sometimes differentiated by their transportation function (e.g., turnpikes that traverse a state, urban expressway systems that connect commuters to an urban core, and urban bridge structures that provide access to and from urban centers and for trade routes). For the purposes of this working paper, tolling entities are described by their governance and structural form rather than by function.

The broad organizational categories described previously can be further divided into six organizational types:

1. **State-level Independent Public Toll Authorities –** Independent state agencies established to build and/or operate a comprehensive facility and/or system of toll roads.

2. **State DOT-Sponsored and Operated Toll Entities –** Subunits of state DOTs or other state agencies (with varying levels of autonomy) that are charged with building and operating a toll facility or system.

3. **Regional-Level Independent Public Toll Authorities –** Independent authorities established to construct and/or operate a toll facility, via a combination of state legislation and local mandate.

4. **Local Agency-Sponsored and Operated Toll Entities –** Subunits of city or county governments that are charged with constructing and/or operating a toll facility or system.

5. **Multipurpose Independent Public Authorities –** Authorities that construct, manage, or operate toll facilities along with other public infrastructure (e.g., port authorities).

6. **Public-Private Ventures –** Private organizations that build and/or operate a toll facility, generally through various forms of public-private partnership with the state or local jurisdiction. While there are a limited number of active 100 percent private facilities, particularly for bridges, this is not the focus of this paper. Public-private ventures, or partnerships, that are being formed and allowed in the U.S. report to an agency/organization that represents the public good. Public-private toll road ventures are different from purely public ones in that a private entity typically builds and/or operates the facility. It also is possible that the private entity have responsibility for operation and maintenance of the facility.

While the construction and operation/maintenance of facilities built via a public-private partnership model may fall under private interests – most likely the investors – the government will likely need to ensure that the private partners are living up to their end of the bargain. Thus, the public sector's role shifts from one of direct governance to regulation and oversight. The effects of public-private ventures on an existing transportation organization vary with the level of expertise available on-staff. There must be recognition that conducting business in a public-private partnership, even in an oversight role, requires the financial and engineering expertise of the agency to be on par with the private sector's team. One aspect of the public-private partnership that must be carefully considered is assigning roles between the public and private sectors. From a financial management perspective, the private sector prefers to have the authority to manage the facility on a daily basis without direct, hands-on involvement from the public sector sponsor. This does not eliminate the negotiation of specific operational performance and financial terms and conditions to protect the public users and public sponsor.

As with the governance options, this role may be performed at a state- or local-level depending on the nature of the facility and the sponsoring agency. It also could be performed by an existing or newly formed regulatory body, as well as an existing policy-making board. Thus, the public agency/organization typically falls under one of the categories outlined above.

For purposes of the Washington Tolling Study, the organizational categories associated with Local Agency-sponsored/operated Toll Authorities and Multipurpose Independent Public Authorities are not addressed within this Working Paper.

No rules exist for how a tolling entity should be organized and operated, although three considerations tend to drive both organizational structure and agency (or subagency) management:

1. **Mission and Responsibilities –** The organizational structure must be consistent with anticipated functions and objectives of the entity;

2. **Type of Facility –** The nature of the facility or system (e.g., single bridge or highway structure, cross-state thruway, urban commuter route) can influence the selection of governance and management structure; and

3. **Legal Barriers and Requirements –** Laws, constitutional provisions, and current policies and regulations that may drive the selection of some organizational options over others.

These considerations influence nearly every decision about the organizational structure, governance, financial policies, institutional relationships, and responsibilities of a tolling entity. These are discussed further below.

Governance Requirements

The governance of public toll entities is typically split between a policy-making body and a chief executive. Policy-making bodies for public toll entities take many different forms and have varying responsibilities, but are typically multi-member boards responsible for strategic-level decision-making and oversight of the toll authority. Structural options for policy-making bodies are identified in Table 3.1.

Table 3.1 Tolling Entity Governing Bodies

Organizational Type	New Independent Board	Existing Independent Board	Other Governance Options
State-level Independent Authority	Members selected by governor/ approved by legislature to govern new toll entity	Transportation commission or other existing board governs new tolling entity	
State-DOT Tolling Entity	Typically governed by existing Transportation Boards or Commissions	Transportation commission or other existing board governs new tolling entity	
Local-level Independent Authority	Members selected by governor and/or mayor, city council, or county commissioner(s)	Established local authority assumes governance responsibilities	County commission or city council governs new tolling entity
Existing Multipurpose Authority	Typically governed by the authority under which the toll organization is created	Established authority assumes governance responsibilities with possible expansion in representation	

Similarly, toll entity chief executives typically report to the agency's governing body (i.e., the policy body), but also may be selected and/or accountable to a jurisdiction's elected executive (and, in some instances, legislative body). Specific options for selecting tolling entity chief executives are identified in Table 3.2.

Table 3.2 Chief Executive Models

Organizational Type	Director Selected by Elected Executive	Entity Managed by Existing Executive	Other Director Selections Approaches
State-level Independent Authority	Governor appoints (legislature may have a confirmation role)	DOT secretary/director serves as toll authority director	Selected by governing body/authority members Selected by DOT secretary
State-DOT Tolling Entity	Typically selected by DOT's senior leadership	DOT secretary serves as toll authority director	Selected by DOT secretary
Local-level Independent Authority	Governor, mayor, or county commissioner(s) select	Director of public works or director of existing authority serves as chief executive	Selected by governing body/authority members

Financial Requirements

Most tolling entities carry out similar financial roles – they finance construction (generally through debt issuance) and manage the collection of tolls to repay debt and fund maintenance and operations. Financial considerations that influence the selection of the preferred organizational structure for a tolling entity include:

- Anticipated mix of funding sources (100 percent toll-financed, hybrid of public funds and tolls, application to higher-level political jurisdictions for financial support (e.g., Federal credit provisions, state financing authorities, etc.));
- Level of financial support (i.e., guarantee) anticipated from the sponsoring state or jurisdiction;
- Debt issuance limitations and procedures of the sponsoring state and/or jurisdiction;
- Underlying creditworthiness of the sponsoring state and/or jurisdiction;
- Interest in pursuing joint development, facility concessions, etc.;
- Role and potential reach of public oversight commissions, including but not limited to the approval of toll rates; and
- The autonomy of the agency also might impact the financial market's level of comfort with regard to receiving higher bond ratings.

If direct affiliation with the sponsoring jurisdiction is advantageous, a beneficial organizational model is one where the tolling entity is a subunit of an existing agency (e.g., a department within a state DOT). A key issue to consider is the degree of autonomy

needed to satisfy investors that political influence is not overriding financial security versus the degree to which integration into the state organization is desirable for management of the state or regional system. A related factor is the extent to which the sponsoring jurisdiction is willing to extend financial support to the tolling entity in the form of financial guarantees and/or direct support. Conversely, to the extent that direct affiliation with the sponsoring jurisdiction is not advantageous, an independent organizational structure may be more appropriate (e.g., an independent public authority). The latter model is not found in its purest form. For example, the North Carolina Turnpike Authority (NCTA), while sponsored legislatively and funded by the North Carolina Department of Transportation (NCDOT), is authorized to have independent staffing, location, and policy Board. However, the NCTA is required to have its annual budget and work program approved by the NCDOT Board of Transportation.

The organizational structure of a tolling entity may affect the availability of non-debt sources for project funding. For instance, it may be easier to commit state funds to a toll project if the tolling entity is part of, or has a close alliance with, the state transportation department. The organizational structure also can determine the taxing capabilities of an entity and, most importantly, the ability of the entity to adjust toll levels to meet debt covenants and/or debt service responsibilities.

Management and Operational Requirements

As with models for governance and finance, models for management and operations of toll entities vary considerably – from large bureaucracies that mirror state transportation departments in terms of scope and capabilities, to small management organizations that outsource nearly every function of operations, to private industry and/or to the state DOT. In establishing a toll entity, public officials will need to consider two important questions about each major functional area:

- **How are policies, procedures, and rules established?** At one extreme, a new tolling entity could be completely autonomous from other areas of government and have full responsibility for establishing its own rules and procedures. At the other end of the spectrum, an entity could be established as part of an existing agency and simply adopt that organization's operational and administrative framework, including detailed policies and procedures, for example. There also are many options along the spectrum where an agency has autonomy in some operational and administrative areas, but falls under the rules and regulations of an existing organization for others.

- **Who performs functions?** There are essentially three options for who will perform operational and administrative functions: internal forces, personnel from other agencies, or the private sector (i.e., outsourcing).

Table 3.3 identifies the key operational and administrative areas a tolling entity may be responsible for, gives examples of specific activities performed in these areas, and where applicable, provides comments on organizational or managerial options. Tables 3.4, 3.5, and 3.6 depict a summary of how three different organizational models address the use of in-house and outsourcing to perform these basic functions.

Table 3.3 Operational and Administrative Functions Common to Tolling Organizations

Managerial and Operational Areas	Types of Activities	Comments Regarding Organizational Approaches
Maintenance	Pavement repair, sign replacement, mowing, snow removal	Geographic extent of toll facility/system influences cost-effectiveness of who performs the work
Traffic Safety/ Enforcement	Speed and toll enforcement, truck weight oversight, accident management	State constitution may define who must provide police service
Technical Services	Planning, design, environmental review, etc.	One-time, periodic demand for services may encourage outsourcing
Toll Operations	Manual toll collection, automation equipment, electronic payment and backroom financial systems	Outsourcing prevalent for toll collection, particularly automatic collection systems
Right-of-Way Acquisition	Condemnation proceedings, utilities relocation	Only government entities have eminent domain authority, but acquisition activities are frequently outsourced
Asset Management	Pavement, structures, toll collection facilities, fleet/equipment/building management	Outsourcing of other activities may reduce asset management needs
ITS	Traffic operations centers, information kiosks, dispatching emergency vehicles, traveler information systems	Need for coordination with regional ITS operators encourages outsourcing to state, regional government, or private sector
Contract Management	Oversight and direction of contracted construction, design, systems development, etc.	Outsourcing of other activities may increase importance of this function as an "in-house" activity
Procurement	Construction, services, equipment, supplies	State and/or local laws may dictate rules and regulations
Legal Services	Rulemakings, law suits, condemnation proceedings, legislative support	Some states dictate role of Attorney General with respect to legal matters
Human Resources	Recruitment, hiring/firing, promotions, training, grievance issues, pay and benefits	State and/or local laws may dictate rules and regulations
Managerial and Operational Areas	Types of activities	Comments regarding organizational approaches
Fiscal Services	Accounting and audit, financial estimates, payroll, accounts payable	Portions of fiscal services functions commonly outsourced; integration with other state agencies critical
Information Technology and Other Support Activities	Hardware/software policies, network development and administration, systems development, web site maintenance	Increasingly, this set of functions at least partially outsourced; integration with other state agencies critical
Marketing and Public Affairs	Advertising and promotions, media relations, intergovernmental coordination	Marketing role not typically a core competence for state and local transportation agencies; staff marketing/ communications director utilizes private sector resources

Table 3.4 Operational and Administrative Functions
In-House and Outsourcing within a State DOT-Sponsored Tolling Organization

Managerial and Operational Areas	Types of Activities	In-House and Outsourcing Comparison
Maintenance	Pavement repair, sign replacement, mowing, snow removal	Can be in-house or outsourced; primarily in-house activity today; may be supported by sponsoring DOT
Traffic Safety/ Enforcement	Speed and toll enforcement, truck weight oversight, accident management	In-house or sister state agency assigned to the toll facility; not outsourced
Technical Services	Planning, design, environmental review, etc.	In-house or outsourced; outsource is common with in-house management-level staff oversight
Toll Operations	Manual toll collection, automation equipment, electronic payment and backroom financial systems	In-house or outsourcing are used; outsource is more common and growing in use, particularly enhanced backroom operations
Right-of-Way Acquisition	Condemnation proceedings, utilities relocation	In-house or outsourcing are used; in-house staff management of outsource acquisition firms
Asset Management	Pavement, structures, toll collection facilities, fleet/equipment/building management	In-house with outsourcing of data collection, condition assessment, and system development is common
ITS	Traffic operations centers, information kiosks, dispatching emergency vehicles, traveler information systems	In-house more common than outsourcing in these agencies
Contract Management	Oversight and direction of contracted construction, design, systems development, etc.	In-house and outsourcing is common; project and program management roles often use outsource professionals
Procurement	Construction, services, equipment, supplies	In-house; some cases of outsource support here also
Legal Services	Rulemakings, law suits, condemnation proceedings, legislative support	In-house or from sponsoring DOT staff
Human Resources	Recruitment, hiring/firing, promotions, training, grievance issues, pay and benefits	In-house with support from sponsoring DOT staff
Fiscal Services	Accounting and audit, financial estimates, payroll, accounts payable	In-house management with outsource of production items, accounting
Information Technology and Other Support Activities	Hardware/software policies, network development and administration, systems development, web site maintenance	In-house, or combination of in-house management and outsource
Marketing and Public Affairs	Advertising and promotions, media relations, intergovernmental coordination	In-house most often with support from sponsoring DOT; some outsourcing for newer agencies

Table 3.5 Operational and Administrative Functions

In-House and Outsourcing within an Independent State-Level Tolling Organization

Managerial and Operational Areas	Types of Activities	In-House and Outsourcing Comparison
Maintenance	Pavement repair, sign replacement, mowing, snow removal	Can be in-house or outsourced; primarily in-house activity today
Traffic Safety/ Enforcement	Speed and toll enforcement, truck weight oversight, accident management	In-house or sister state agency assigned to the toll facility; not outsourced
Technical Services	Planning, design, environmental review, etc.	In-house or outsourced; outsource is common with in-house management-level staff oversight
Toll Operations	Manual toll collection, automation equipment, electronic payment and backroom financial systems	In-house or outsourcing are used; outsource is growing in use, particularly enhanced backroom operations; some areas and existing agencies have labor union issues
Right-of-Way Acquisition	Condemnation proceedings, utilities relocation	In-house or outsourcing are used; in-house staff management of outsource acquisition firms
Asset Management	Pavement, structures, toll collection facilities, fleet/equipment/building management	In-house with outsourcing of data collection, condition assessment, and system development is common
ITS	Traffic operations centers, information kiosks, dispatching emergency vehicles, traveler information systems	Varies with agency size and maturity, but in-house more common than outsourcing in these agencies
Contract Management	Oversight and direction of contracted construction, design, systems development, etc.	In-house appears most common; limited u se of program management outsource professionals for this
Procurement	Construction, services, equipment, supplies	In-house; limited cases of outsource support here also
Legal Services	Rulemakings, law suits, condemnation proceedings, legislative support	In-house staff
Human Resources	Recruitment, hiring/firing, promotions, training, grievance issues, pay and benefits	In-house staff
Fiscal Services	Accounting and audit, financial estimates, payroll, accounts payable	In-house management with outsource of auditing and accounting
Information Technology and Other Support Activities	Hardware/software policies, network development and administration, systems development, web site maintenance	In-house, or combination of in-house management and outsource
Marketing and Public Affairs	Advertising and promotions, media relations, intergovernmental coordination	In-house and some outsourcing for newer agencies

Table 3.6 Operational and Administrative Functions

In-House and Outsourcing within an Independent Regional-Level Tolling Organization

Managerial and Operational Areas	Types of Activities	In-House and Outsourcing Comparison
Maintenance	Pavement repair, sign replacement, mowing, snow removal	Can be in-house or outsourced; recently moving toward more outsourcing activity
Traffic Safety/ Enforcement	Speed and toll enforcement, truck weight oversight, accident management	Outsource to sister regional or state agency assigned to the toll facility; not outsourced to private sector
Technical Services	Planning, design, environmental review, etc.	In-house or outsourced; outsource is common with in-house senior management-level oversight
Toll Operations	Manual toll collection, automation equipment, electronic payment and backroom financial systems	In-house or outsourcing are used; outsource is growing in use, particularly enhanced backroom operations. Some areas and existing agencies have labor union issues
Right-of-Way Acquisition	Condemnation proceedings, utilities relocation	In-house or outsourcing are used; in-house staff management of outsource acquisition firms very common
Asset Management	Pavement, structures, toll collection facilities, fleet/equipment/building management	In-house management with outsourcing of data collection, condition assessment, and system development is common.
ITS	Traffic operations centers, information kiosks, dispatching emergency vehicles, traveler information systems	Varies with agency size and maturity, but in-house management with outsourcing of operations is growing
Contract Management	Oversight and direction of contracted construction, design, systems development, etc.	In-house appears most common; growing u se of program management outsource professionals for this
Procurement	Construction, services, equipment, supplies	In-house with outsource support here also
Legal Services	Rulemakings, law suits, condemnation proceedings, legislative support	In-house staff counsel with outsourcing for needed support
Human Resources	Recruitment, hiring/firing, promotions, training, grievance issues, pay and benefits	In-house staff
Fiscal Services	Accounting and audit, financial estimates, payroll, accounts payable	In-house management and CFO with outsource of auditing and accounting support
Information Technology and other Support Activities	Hardware/software policies, network development and administration, systems development, web site maintenance	In-house, or combination of in-house management and outsource services
Marketing and Public Affairs	Advertising and promotions, media relations, intergovernmental coordination	In-house management/director with outsourcing

Organizational and Implementation Lessons Learned

Organizational lessons learned are outlined below.

- The organizational and governance structure must be selected to support the vision, mission, goals, and objectives of the tolling agency.

- While some state-level toll agencies continue to support primarily "mainline" and connected facilities, others are charged with developing regional facilities to address specific transportation capacity and traffic management needs. This is the case in Colorado and North Carolina where these new authorities have clear directives to address regional needs rather than to develop a "statewide" turnpike facility.

- Other states have created the ability for local and regional decision-makers to develop independent authorities to address local needs. Florida, Texas, and others have taken this approach. This puts local support of specific projects into the forefront. It also allows for a greater regional base for financial participation and investment, as well as governance models.

- The use of "outsourcing" for multiple elements of the tolling agency's organization, project/program delivery, and operation continues to grow. Outsourcing utilizes private sector performance, flexibility, and efficiencies to support of a more streamlined public sector management team. Florida and Texas are two states that are utilizing the outsourcing approach to achieve faster program delivery and more efficient operations.

- The potential use of public-private partnerships requires enhanced skills in several areas (financial, project delivery, for example). Therefore, an agency's organizational structure should consider the potential for public-private partnership models. Those enhanced skills are needed to support specific methods of advertising, reviewing, and approving both solicited and unsolicited proposals for public-private partnerships and concession agreements for transportation projects. Without the proper support of technical, financial, and policy expertise, agencies at all levels of government may not be prepared to successfully perform the financial and engineering negotiations required to assess the overall viability of potential public-private project opportunities.

Summary

The ultimate question with respect to organization and governance is often, "can an existing agency/organization, transportation or otherwise, perform in a more business-like manner as required by the toll industry?" While traditional transportation agencies are adept at managing large-scale transportation programs, their organizations may not be structured to respond quickly to daily changes and the varied demands of customers of a toll road system.

Recently enacted tolling organizations have selected an organization and governance model that allows the merging of strengths from an existing multipurpose transportation

agency alongside a new organization focused solely on tolling opportunities. The reasons for selecting this approach have included:

- The desire to use available technical resources from an existing agency rather than create duplicate capabilities. In this manner, only tolling-specific skills need to be added within the new organization.
- The desire to develop greater synergy in integrating long-range goals and transportation system improvements.
- The desire to have greater control from a centralized transportation agency rather than a more independent agency, whether statewide or regional in nature.
- Providing a means of funding start-up activities, from administrative to project feasibility assessment.

The most current trend for startup tolling agencies also includes the use of outsourcing for general tolling expertise and support. Outsourcing for special tolling skills also supports the need for a streamlined, flexible product delivery and customer service approach. This approach supports the continued implementation and updating of challenging technology advances.

However, one size does not fit all. Thus the best organization model for a new toll agency is one that meets the stated vision and mission of the agency while providing customer and production services in the most efficient manner. As Washington State considers the best governance and organizational approach, discussion of these measures will be conducted to assure the best approach is considered and selected. These discussions and assessment of Washington State's vision for a tolling agency will be documented in later reports.

Tables 3.7, 3.8, and 3.9 present a summary of operational characteristics for representative organizational models that were identified in previous sections.

Table 3.7 DOT-Sponsored Model Examples

Organizational Issue	Texas Turnpike Authority (TTA)	Florida Turnpike Enterprise (FTE)
Governing Board	Texas Trans. Commission	FDOT Secretary/Commission
CEO Selection	Texas Trans Commission	FDOT Secretary/Commission
Admin. Procedures	Follows TxDOT policies and procedures	Follows FDOT policies and procedures
Debt Authority	TxDOT and Texas Trans Commission	Florida Division of Bond Finance issues debt
Financial Partnership	TxDOT funding eligible for toll roads	DOT funds available under certain conditions
SUPPORT Services	Use TxDOT resources, internal staff, and outsourcing	Use FDOT resources, internal staff, and outsourcing
Project Selection	Texas Trans Commission	Internal with Commission approval
Physical Location	Co-located w/TxDOT	Separate

Table 3.8 Regional-Level Independent Model Examples

Organizational Issue	Orlando-Orange County Expressway Authority (OOCEA)	North Texas Tollway Authority (NTTA)
Governing Board	Appointed Board 3 plus Elected official and FDOT District representative	Appointed Board
CEO Selection	Selected by Board	Selected by Board
Admin. Procedures	Independent	Independent
Debt Authority	Issues own debt	Statutory, Board approval required
Financial Partnership	FDOT, public and private partnerships	TxDOT, local public entity partnerships
Support Services	Internal staff and outsourcing	Internal staff and outsourcing
Project Selection	Internal; consistent with MPO plan	Internal; consistent with MPO plan
Physical Location	Independent offices	Independent offices

Table 3.9 State-Level Independent Model Examples

Organizational Issue	Pennsylvania Turnpike Commission (PTC)	Illinois State Toll Highway Authority (ISTHA)
Governing Board	Independent Board appointed by Governor and State Senate	Independent Board appointed by Governor and State Senate
CEO Selection	Selected by PTC Board	Selected by Governor and Board
Admin. Procedures	Independent	Independent, with assistance by State Contract Management Services agency on major procurements
Debt Authority	Self-authorized	Self-authorized via statute
Financial Partnership	Use of State and Federal funds allowed	Toll revenues only, no mix with state or Federal funding
Support Services	Internal; some outsourcing	Internal, some outsourcing of services such as VES and toll system maintenance
Project Selection	Independent; directed by Legislative action	Independent on existing system; extensions or new routes by Legislative approval
Physical Location	Independent offices	Independent offices

Washington State Perspective

The following section summarizes a series of interviews with stakeholders in Washington State regarding tolling organizations and the Washington State context regarding tolling. The interviews were performed in a conversation-like manner beginning with asking participants about their ideas about the vision and mission of tolls in Washington State. Discussions also covered the areas of organization and governance, interagency coordination, public interaction and expectations, and staffing and operational responsibilities of tolling agencies.

We interviewed a member of the Washington State Transportation Commission, representatives of various divisions of the Washington State Department of Transportation, staff from the Puget Sound Regional Council (PSRC), a representative of the Regional Transportation Investment District (RTID), and senior management from King County's Department of Transportation.

Each interview brought different issues and key points to the forefront. Key points from the interviews are summarized below. The primary concerns are identified below.

Financial Control

There were several issues surrounding the financial control of funds flowing to and from toll agencies:

- **Control of Financial Information and Use of Funds Over Time –** The need to provide ongoing monitoring of fund uses and for appropriate information to be made available to all parties was stressed.

- **Controlling income, Expenses, and Cash Flow Schedules –** This issue addresses the need to ensure that project and system funding include planning of income and expenses through the use of detailed schedules.

- **Protection of WSDOT Non-toll revenue Sources if Tolls Fall Short of Meeting Debt Payments –** The concern here was to make sure that appropriate financial safeguards of WSDOT non-toll resources are included on any project that includes a combination of toll revenues and other funds, including WSDOT non-toll resources.

- **Financial Control Requirement Impacts to Toll Organization Structure –** This topic questioned the way in which the financial requirements of a toll organization impact the organizational and operational responsibilities of an agency. Financial requirements are specifically spelled-out in any bond sale. Furthermore, the activities leading up to a bond sale will dictate that the appropriate financial expertise be available to the toll agency.

Regional Focus

The importance of addressing regional issues related to tolling was brought out within every interview. The principal issues were:

- **Importance of Customer Service and Relations at the Regional Level –** This issue addresses the need to be close to the customer with the ability to promptly respond to customer needs. Given that the more urban regions will more likely have tolling systems to assist with traffic management and congestion, the location of customer service and public relations staffing in the regions was viewed as important.

- **Setting of Toll Prices or Pricing Strategies for Managed Lanes –** Traditionally, the setting of toll levels is determined by the need to cover operations and maintenance costs plus Meet debt payment schedules. However, where managed lanes and traffic management are the principal reasons for tolling, there is a need to consider the full impact of price variations upon the transportation network not just the toll system. The interviews brought out the interest in regional involvement in establishing appropriate toll rates and pricing strategies for the managed lane systems.

- **Establishment of Policies at the Regional Level –** This is related to the issue of setting toll levels and managed lane pricing. Regional-level policy setting was viewed as more Responsive to the local users than a state-level agency with no regional representation.

- **The Puget Sound Region May be More Open to Tolling than other Regions of the State –** This observation was made due to the increasing congestion on the urban freeway and interstate corridors and general responsiveness to financing transportation system improvements.

There would appear to be support of a regional transportation entity in the Seattle area with a range of powers available to it. Authority could be for planning and programming only; or, include the authority to plan, design, construct, and operate/maintain tolling systems. A regionally based tolling agency would likely be supported within the Puget Sound Region. The form and comprehensive nature of such an agency's authority would have to be determined.

Public-Private Partnerships

The nature of public-private partnerships (PPP) is unique and continues to evolve throughout the United States. Further, the interviews indicated that the case of PPP in Washington State also will bring its own unique features to the practice. Rules for PPP application in Washington State are in draft form at the time of this writing. Specific issues were:

- **Ability within the Toll Agency to Engage in and Manage Potential Public-private Partnerships –** While not all PPP in Washington State will involve transportation toll facilities, there is a recognized need to have adequate expertise available to the tolling agency(s) to address potential PPP activities involving toll systems.

- **Establish a Separate Public-Private Partnership Oversight Entity that Coordinates with Tolling Experts for Toll Road Projects –** It was suggested that a separate entity could coordinate with a tolling agency(s) as needed for specific expertise related to tolled PPP projects.

Operation

The operation of modern toll facilities and systems has changed considerably over the past decade. In this sense, the expectations of the users often dictate the "viewable" end product, thus influencing the behind-the-scenes operation of payment systems. In particular:

- **The "backroom" operation should appear seamless to the user, providing for a single statement for multiple uses if necessary –** As multiple payment systems are linked together for the benefit of the user, there will need to be a single-statement of transactions. To do this, the backroom operations must become fully integrated at the point of payment level. Fortunately, this approach is well developed in many locations and the art and science of the payment transactions are being enhanced.

- **Coordinate the payment systems with the Washington State Ferry System payment mechanism –** Similar to the previous issue, it would be desirable to incorporate the Washington State Ferry System payment into a multi-agency and use mechanism.

- **What impact would potential union involvement play in a toll agency organization?** This issue will need to be defined as the tolling agency(s) approach is developed. For example, we understand that the Washington State Ferry System currently has contracts involving 20 different workers unions. This is addressed by many states and their approaches can be studied alongside the Washington State labor laws to determine an appropriate answer.

Policy

The issues related to policy areas included those statewide in nature as well as regionally important topics:

- **Would there be free alternate routes to tolled roads?** This is primarily an issue with new alignment facilities, but also could be important on major systems improvements and bridge crossings. The answer, of course, is a policy decision and must be considered on a case by case basis.

- **RTID supports managed lane projects for traffic management purposes –** Puget Sound region policy documents are very clear in their support for pricing for traffic management.

- **Must define the purpose and role of tolling –** This statement is related to the need to clearly delineate the overarching vision of a tolling agency(s). It also can speak to individual projects and systems.

- **Tolling should be introduced as part of the transportation finance package rather than sent to a statewide referendum for approval –** Concern was expressed over the need for statewide referendum for the tolling question and the need for tolling as part of the finance package.

- **Insulation from Politics –** There should be some level of insulation of the tolling agency(s) from purely political decision-making, allowing for full consideration of all technical and financial merits of projects and systems alongside realistic political considerations. While the political nature of our governing process is needed and brings value to the overall process, the issues of technical and financial merit must be weighed alongside the political will to implement a project. Investors will quickly read the political landscape for these signs of support.

- **Who would own and/or operate tolled facilities at the regional level when they consist primarily of tolled lanes on State roads?** Again, a question to be answered in the development of projects of this nature. Ownership of the actual facility will most likely remain with the WSDOT. The operating party for the tolling system can vary.

Statewide Role

The potential role that the State should play was expressed in these ways:

- **Oversight agency at the state level that establishes general tolling policies and operational guidelines, with possible regional representation –** This oversight was seen as a way to provide continuity and consistency among toll systems across the State.

- **Coordination with multi-state or multi-regional issues –** The potential for toll facilities that cross state lines, such as bridges, should be considered and the involvement of state-level agencies made a part of understandings among states.

- **Establishment and oversight of public-private partnership arrangements –** A statewide role in providing consistency and expertise in the area of PPP is important to the tolling agency.

Tolling Systems

Tolling systems are important part of the operation of a toll organization. Some of the issues raised included:

- **Facility-based tolling will grow to become system-based tolling in the urban regions –** Washington State's historic approach to tolling single projects is viewed as turning to become an approach of developing tolling systems with the urban regions and perhaps the State.

- **Need to consider the ability to leverage revenues among systemwide facilities –** The use of revenues among a system of toll facilities is an important consideration. Many agencies use this approach to leverage excess revenues on existing, mature systems to support newer projects during the early years of traffic growth. As toll systems are developed, the approach to leveraging revenues will be important to timely development and stronger financial ratings.

- **Regional managed lane systems are key elements to traffic management using tolling –** A system of managed lanes is envisioned by many at the regional level as a means of addressing travel demand and improving the quality of travel service through variable pricing strategies. Variable tolling rates are used to ensure a higher quality level of service to the user willing to pay a toll.

- **HOT lanes are supported and dynamic tolling/pricing is appropriate to protect the traffic management and managed lane goals –** This is a general statement from the interviews that confirms what many have suspected in the major urban regions.

Common Themes

Some common trends emerged from those interviews:

- State-level oversight and guidance is needed on all tolling-related issues.

- Regional-level representation is needed on toll pricing, traffic management systems, and customer service.

- Electronic payment systems should be developed, with a single statement of activities for multiple modes and open fiscal accountability.

- The organization should have some insulation from purely political decision-making, allowing for full consideration of all technical and financial merits of projects and systems alongside realistic political considerations.

Potential Organizational and Administrative Models for Washington State

Governance and organizational issues must be addressed if tolling in Washington is to move beyond the Tacoma Narrows Bridge and SR 167 Pilot Project. In considering this issue, we investigated trends in the tolling industry around the United States and also interviewed various transportation leaders in Washington.

Historically, tolling in Washington State has been used to finance major bridges. Once the debt was paid, tolls were removed, resulting in the owner, normally WSDOT, to take over maintenance and operation responsibilities. This is the model being used for the new Tacoma Narrows Bridge.

Recently, Washington State initiated a managed lanes pilot project on SR 167, which is different in that tolls are not being used to pay off capital. Rather, they are being used to manage congestion, with the toll revenue being used to pay off expenses, operate and maintain the managed lane, and increase transit, vanpool, carpool, and trip reduction services in the corridor.[2] In addition, the Tacoma Narrows Bridge project is being developed to allow open road tolling in addition to traditional manual toll collection. These developments are part of the evolutionary change to tolling approaches and pave the way to a modern tolling policy and approach in the State, including addressing the issue of organization and governance models.

Currently, the Washington State Transportation Commission is the Toll Authority. As such, they have the responsibility to set tolls. Selection of toll projects is the prerogative of the legislature.

The results of our national research and state-level stakeholder interviews indicate the growing acceptance of tolling as a means of project finance and traffic management in congested urban regions. Nationally, recent trends point to the development of statewide tolling agencies that have regionally based representation. The continued growth in urban regions and desire for continued mobility with personal automobiles has moved the focus of tolling agencies from statewide turnpikes to urban projects with stronger emphasis on traffic management. In Washington State, we found a clear desire for regionally specific policies for pricing and traffic management, with some level of state oversight.

A significant desire expressed during our work was to have objective criteria applied consistently around the State. The balance between local or regional initiative and consistent policy at the statewide level should account for these concerns:

- A way to combine funds from regional or local entities with state or Federal funds.

[2] 47.66 RCW.

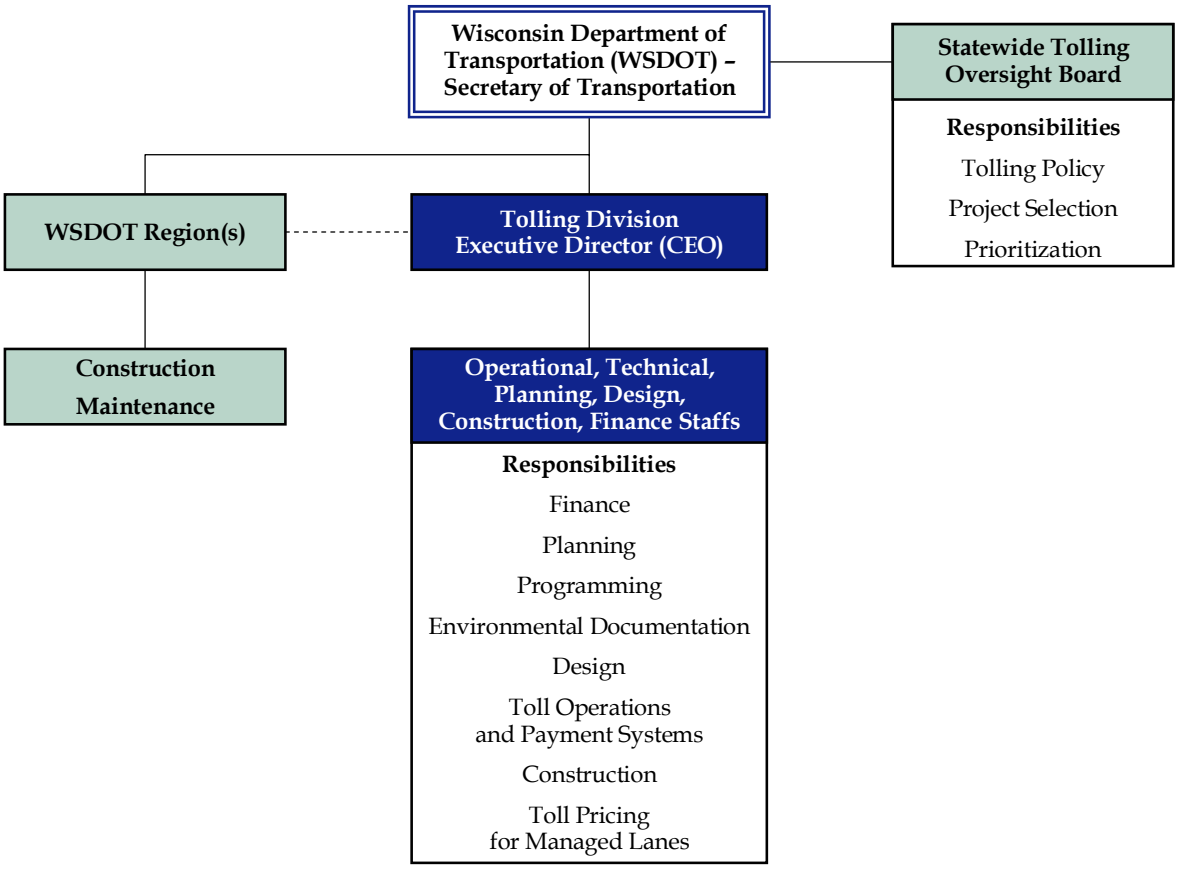
- A set of specific, consistent criteria that should be met before tolling or pricing were implemented, potentially administered through WSDOT.

- A means of advancing projects that meet the policy criteria without Legislature action. The authority to approve such projects should rest with the Commission or some other statewide tolling authority, working with information provided by WSDOT.

As a result, two similar, yet subtly different, approaches to governance surfaced as the best candidates for consideration.

Centralized Statewide, whereby all project selection and configuration decisions are made centrally. Within this state-level control, however, localities or regions would have the ability to initiate projects and work with the central administration to advance them through the planning, design, construction, and operation process. Ultimate decision authority, however, would reside within this central body. This organizational model is depicted in Exhibit 3.1

Exhibit 3.1 Centralized Statewide Organization

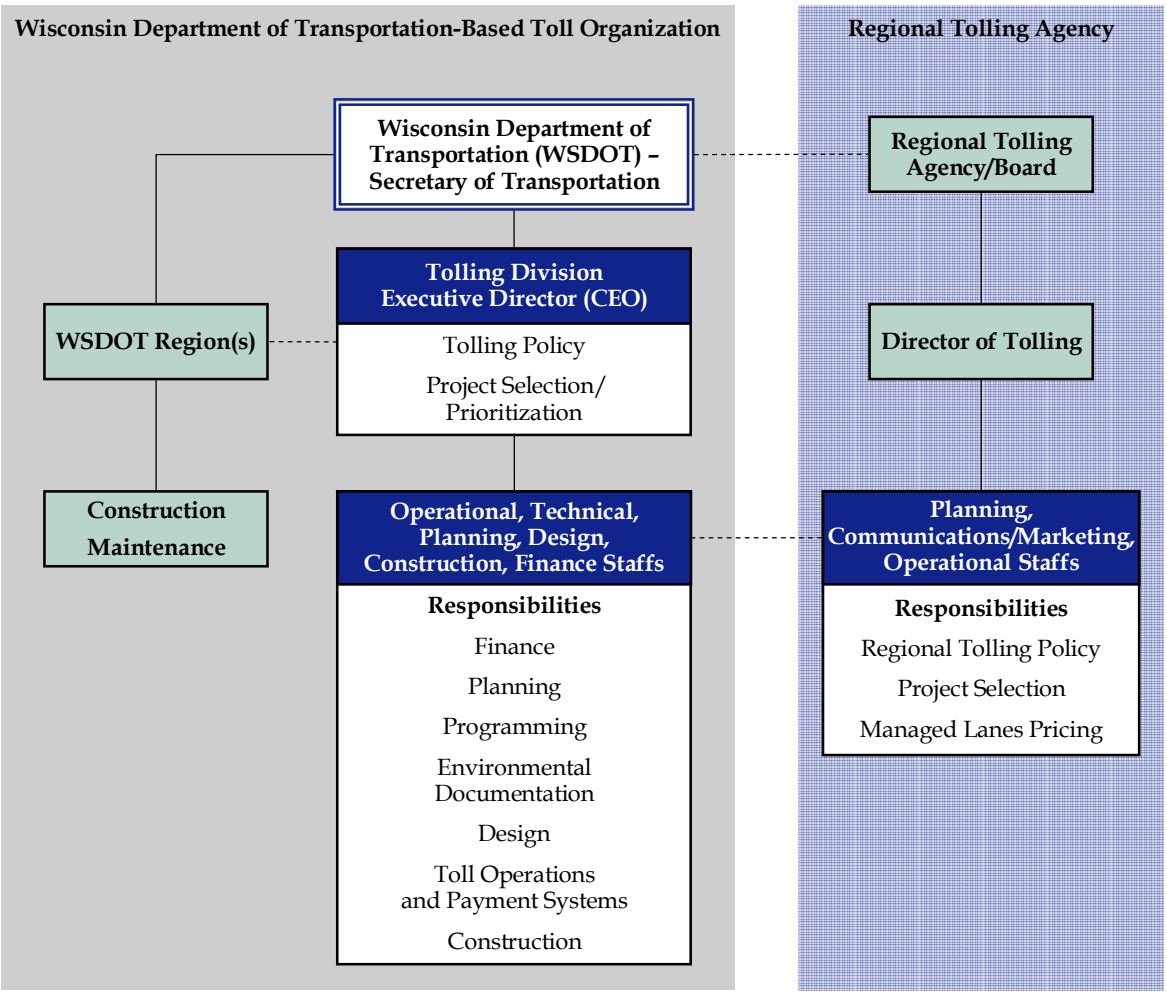


The advantages of this governance structure are that there is a single tolling agency for all levels of project and system development with the potential for close coordination with overall WSDOT project programming. Regional representation can be accomplished through a Statewide Tolling Oversight Committee. Also, tolling expertise can be assembled in a single organization rather than distributed across multiple agencies.

The disadvantage of a centralized governance structure is that there may be a perception that tolling is being imposed from the outside, rather than developed based on local decision-making. This could ultimately make it more difficult to advance worthy projects.

Regional plus Statewide, which allows local or regional tolling authorities to be created to advance projects or systems, with the State leading decision-making in rural areas or other appropriate circumstances. To avoid duplication of specialized functions and expertise, detailed project development, operations, and maintenance activities would always be carried out by WSDOT. This organizational model is shown in Exhibit 3.2.

Exhibit 3.2 Regional Plus Statewide Organizations



The chief advantage of this approach is that it allows regional champions to move projects and systems into the forefront rather than waiting for a state-level champion. The closer connection to the regional support base is viewed by many experts in the toll industry as critical to the success of urban toll facilities. As with the centralized statewide concept, the tolling expertise can be kept centralized.

The disadvantage of this approach is that it requires commitment to continual organizational and operational communication between the regional- and state-level toll agencies. There also is the potential for some redundancy in skills between the state- and regional-level.

Commission Recommendation

The commission weighed the desire for regional initiative with the importance of consistency of policy setting around the State. It recommends that governance of tolling be carried out through a centralized authority with robust and continuous regional input that includes the right to propose projects. In practice, this would mean that the centralized authority would set forth overall policy and criteria for determining which parts of the system could be tolled. Regions could initiate and pursue studies in accord with those criteria, and ultimately apply to the centralized authority for permission to toll. The centralized authority would be responsible for determining consistency with the criteria, and for setting toll rates.

The day-to-day administration of tolling operations, including system development functions (i.e., studies, design, system architecture, technology) would be by WSDOT.

Section prepared by PBS&J, with assistance from Cambridge Systematics, Inc.

Background Paper #4
Equity, Fairness, and Uniformity in Tolling

National Review of Equity and Fairness

Unlike most other issues initially raised with regards to tolling and pricing, such as privacy and the reliability of technology, issues of fairness and equity continue to be raised as an issue in tolling as often today as they were 10 years ago. Left unanswered, equity and fairness concerns can constitute an insurmountable barrier to implementation.

The Policy Foundation

The analytical basis of equity and fairness in transportation infrastructure and services is found in several policies and directives, in chronological order:

- ***Title VI of the Civil Rights Act of 1964***, which states, "No person in the United States shall, on the ground of race, color, or national origin be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance."[3]

- ***National Environmental Policy Act of 1969***, which decided in favor of community-oriented analysis of policy-making.[4] For proposed major transportation facilities, an analysis of environmental impacts was now required that went beyond the infrastructure itself to include a broader geographic area.

- ***Federal Aid Highway Act of 1970,*** which assured that transportation facilities be approved "in the best overall public interest" with efforts to eliminate or minimize effects on community cohesion, employment effects, and displacement of people.[5]

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[3] United States Code. *Title VI: Nondiscrimination in Federally Assisted Programs*, Civil Rights Act of 1964, 42 USC 2000(d) – 2000(d)(1).

[4] United States Code. *The National Environmental Policy Act*, 42 USC 4321-4347, Public Law 91-190 (1970), Public Law 94-52 (1975), Public Law 94-83 (1975), and Public Law 97-258 (1982).

[5] United States Code. *Federal-Aid Highway Act of 1970*, 23 USC 109(h), 1970.

- ***Civil Rights Restoration Act of 1987***, which identified the extent to which Title VI applied, to include all Federal-aid recipients, sub-recipients, and contractors regardless of whether specific activities in question are Federally funded or not.[6]

- ***Executive Order 12898 of 1994***, which established the precedent that environmental justice consideration be extended to low-income populations and to avoid "disproportionately high and adverse" effects.[7]

- ***U.S. Department of Transportation implementation actions***, which provided requirements upon and guidance for transportation agencies and professionals in incorporating environmental justice principles in all transportation activities.[8],[9]

These actions combine to provide the fundamental concerns of Environmental Justice:[10]

1. To avoid, minimize, or mitigate disproportionately high and adverse human health or environmental effects, including social and economic effects, on minority populations and low-income populations;

2. To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process; and

3. To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority populations and low-income populations.

Environmental Justice may be the basis for issues of equity and fairness in the consideration of funding and planning process; however, the concepts of equity and fairness are not wholly comprised by Environmental Justice when interpreted literally. For example, if a project has benefits to a low-income population (defined by FHWA to mean a population below the Department of Health and Human Services' poverty guidelines)[11] yet is detrimental to a community just above the poverty level, does this

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[6] United States Public Laws. *Civil Rights Restoration Act*, Public Law 100-259 (S. 557), March 1988.

[7] Executive Order 12898. *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, Federal Register, Volume 59, Number 32, February 16, 1994.

[8] U.S. Department of Transportation. *DOT Order on Environmental Justice to Address Environmental Justice in Minority Populations and Low-Income Populations*, DOT Order 5610.2, April 1997.

[9] U.S. Department of Transportation. *FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, DOT Order 6640.23, December 1998.

[10] Federal Highway Administration. *Questions and Answers on Environmental Justice and Title VI*, http://www.fhwa.dot.gov/environment/ejustice/facts/index.htm, accessed October 9, 2005.

[11] U.S. Department of Transportation. *FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, DOT Order 6640.23, December 1998. This order references eligibility criteria for the Community Services Block Grant Program, found at http://aspe.os.dhhs.gov/poverty/poverty.htm.

make the project a fair and equitable project simply because it achieves the literal definition of environmental justice? In order to account for issues similar to these, many practitioners advocate for considering the context, perspective, and timeframe of policy decisions on the broader definition of disadvantaged groups. Another related equity issue is the situation of two communities with similar demographics, where one community has extensive toll facilities and the other community does not.

As articulated by a publication from the Institute for Transportation Studies at the University of California at Berkeley, equity and fairness issues most frequently arise when:[12]

- Some communities get the benefits of improved accessibility, faster trips, and congestion relief, while others experience fewer benefits;
- Some communities suffer disproportionately from transportation programs' negative impacts, like air pollution;
- Some communities have to pay higher transportation taxes or higher fares than others in relation to the services that they receive; or
- Some communities are less represented than others when policy-making bodies debate and decide what should be done with transportation resources.

These four issues are generally identified within the concepts of ***geographic equity***, ***income equity***, and ***participation equity***. However, there are additional measures of equity and fairness.

The Victoria Transport Policy Institute identifies ***opportunity equity*** issues as they pertain to mobility need and accessibility, whereby certain communities may disproportionately benefit from actions taken by the State. In a violation of opportunity equity, the extent of mobility needs may be greater for population A than population B, but mobility enhancements are offered disproportionately to population B.[13] Put differently, if a toll road is implemented serving a high-income community rather than a needed road from a low-income community solely due to cost recovery, this would violate the concept of opportunity equity.

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[12] Cairns, Shannon; Greig, Jessica; and Wachs, Martin. *Environmental Justice and Transportation: A Citizen's Handbook*, Institute of Transportation Studies, University of California at Berkeley, January 2003, http://www.its.berkeley.edu/publications/ejhandbook/ejhandbook.html, accessed October 9, 2005.

[13] Littman, Todd. *Evaluating Transportation Equity: Guidance for Incorporating Distributional Impacts in Transportation Planning*, Victoria Transport Policy Institute, September 2005, http://www.vtpi.org/equity.pdf, accessed October 9, 2005.

In a study for the Santa Clara Valley Transportation Authority in regards to the specific evaluation of equity for High-Occupancy Toll (HOT) lane facilities, researchers identified a fifth type of equity consideration: ***modal equity***, which pertains to the perceived attractiveness of commuting by single-occupant vehicles in HOT lanes relative to the travel-time benefits extended to high-occupant vehicle users under HOV lane operations.[14] In other words, public opinion on the part of carpoolers and bus riders may be predisposed against toll roads, as they feel that one should "do the right thing" in order to have the travel-time benefits these facilities provide. This would be an example of perceived modal equity.

Equity Issues in Toll Proposals

A fair and equitable policy regarding tolls must be viewed under a contemporary context. Eighty years ago, publicly financed roads were perceived as unfair, as an extremely small portion of the population owned an automobile. Tolls were used extensively in the first few centuries of this country's existence, into the first five and a half decades of the 20th century. Eventually, however, fuel taxes won out as the primary financing tool for the development of the modern highway system, as the correlation between road use and fuel was viewed as a sufficient nexus. Today, vehicle ownership is pervasive, and the vast majority of the adult population personally drives a vehicle at some point on a public road.[15] As a result, public opinion now tends to view roads as a public good. Due to rising fuel efficiencies and fixed taxation levels, fuel tax revenue as a percentage of transportation need has been declining substantially, and actual tax receipts may soon be in decline.[16],[17] As governments turn to tolls as a way of shoring-up transportation funding, public opinion concerns with equity also have risen with it.

Tolling has many applications currently in the United States. The various applications can be summarized into four general categories, with the understanding that some proposed projects do not fit neatly in these four categories: flat-rate tolls on highways and bridges

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[14] Weinstein, Asha and Sciara, Gian-Claudia. *Assessing the Equity Implications of HOT Lanes*, Santa Clara Valley Transportation Authority, November 2004.

[15] According to the 2000 Census, Summary File 3 data, approximately 96 percent of owner-occupied households and 78 percent of renter-occupied households throughout the United States have a personal vehicle available. In the State of Washington, an even greater share of the population uses the roads, with 97 percent of owner-occupied households and 84 percent of renter-occupied households have a personal vehicle available.

[16] Oregon Department of Transportation. *Road User Fee Task Force*, Office of Innovative Partnerships and Alternative Funding, http://www.oregon.gov/ODOT/HWY/OIPP/ruftf_faq.shtml, accessed October 9, 2005.

[17] Taylor, Brian; Weinstein, Asha; and Wachs, Martin. *Reforming Highway Finance: California's Policy Options*, University of California Transportation Center, 2001, http://www.uctc.net/papers/488.pdf, accessed October 9, 2005.

(traditional toll facilities), variable-rate tolls on highways and bridges (value pricing), variable tolls on exclusive facilities within corridors (express toll lanes), and variable tolls on exclusive HOV facilities (HOT lanes). A fifth category also deserves mention – vehicular use pricing – which includes advanced implementations such as a Vehicle Miles Traveled (VMT) toll and cordon toll. These applications have not been implemented in the United States or Canada, but have had some limited applications in Great Britain, Singapore, Norway, and Germany.[18]

Although different in their implementation and focus on the five areas of equity outlined above, these categories all face the same test of fairness: the distribution of costs and benefits and the public acceptance of that distribution. Public opposition has been the overriding factor in tolling projects that have failed to come to implementation, rather than a technical evaluation of equity. As a result, the review of equity issues in toll projects is largely a study of public opinion.[19]

The concept of tolling is new in many states, and proposed projects have inevitably been controversial to one extent or another everywhere they have been considered. A variety of reasons contribute to toll projects remaining controversial. As it pertains to equity and fairness, this includes concerns for low-income individuals; geographic distribution of toll benefits and costs; and fairness to user classes. Addressing concerns of equity and fairness has taken a considerable amount of time to nurture in states even with implemented projects, such as California, New York, Minnesota, and Texas. In all states, public opinion was generally lukewarm, at best, to start.[20],[21],[22]

Limited studies have been conducted regarding the fairness of new toll facilities. Generally, proposed new road or bridge projects with a tolling element have been successfully criticized on established environmental documentation procedures, even if the principal (unofficial) objection on the part of opinion-setters has been the fairness of tolling. Examples can be found with the Jefferson Parkway (W-470) proposed toll corridor

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[18] California, Colorado, Minnesota, Oregon, and Washington additionally studied applications of areawide pricing in the past 10 years. No specific proposals ever moved forward, and as such, data is conceptual only.

[19] It is not the purpose of this section to review public opinion and attitudes regarding tolling and pricing in general. Rather, this section reviews public opinion strictly from the perspective of equity and fairness.

[20] Munnich, Lee and Loveland, Joseph. *Value Pricing and Public Outreach: Minnesota's Lessons Learned*, Transportation Research Board, Paper 05-0394, 84th Annual Meeting, January 2005.

[21] Ungemah, David; Swisher, Myron; and Tighe, Charles Daniel. *You're Making Me HOT: Talking High Occupancy Toll (HOT) Lanes with the Denver Public*, Transportation Research Board, Paper 05-1191, 84th Annual Meeting, January 2005.

[22] Stockton, W.R.; Grant, C.L.; McFarland, F.; Edmonson, N.R.; and Ogden, M.A. *Feasibility of Priority Lane Pricing on the Katy HOV Lane: Feasibility Assessment*, Research Report 2701-F, Texas Transportation Institute, Texas A&M University, June 1997.

in Colorado, the Mid-State Tollway in Alameda and Contra Costa counties in California, and the Trans-Texas Corridor in Texas. As a result, separating issues of equity from other facility development issues is difficult.

By comparison, a greater amount of data is available regarding the study of equity for recent Value Pricing Program projects. Extensive evaluation efforts of the State Route 91 (express toll lanes) and I-15 (HOT lanes) have yielded significant data. Additional efforts to investigate and document equity issues have been conducted for I-394 (HOT lanes), I-25 (HOT lanes), Tappan Zee Bridge (value pricing), and Leeway toll bridge (value pricing). Some of the more conclusive findings from this body of research are reported below:

1. The Center for Transportation Research at the University of Texas conducted a statewide public opinion assessment of new toll roads, new toll lanes, and HOT lanes in various areas of Texas for the Texas Department of Transportation. In general, a majority of respondents throughout Texas indicated that toll roads were unfair (55 percent), should not be used to finance new roads (51 percent), and should not be used to finance improvements to existing roads (71 percent). Negative perceptions of the fairness of toll roads occurred more often for respondents in areas currently without toll roads (such as Lubbock, Corpus Christi, and San Antonio) than areas with toll roads (such as Houston and Dallas), typically by 10 to 15 percent. Although the negative responses are strong, and indicate a clear public perception issue with the fairness of tolls, it should be noted that Texans favored tolling over fuel taxes in all areas except San Antonio. Finally, although support for tolls on new and existing roads was low, support for HOT lanes was much stronger, with 52 percent in favor.[23]

2. The California Polytechnic State University evaluated the user profiles of travelers on State Route 91, an express toll lane, immediately following implementation and opening of that facility. Findings from this evaluation, repeated often to counter criticism of equity and fairness issues in express toll lanes and HOT lanes, indicated that low-income drivers use the express lanes and that they approve of them as much as those of higher incomes. Over 50 percent of commuters with household incomes less than $25,000 approved of the express toll lane concept on SR 91, again similar to opinions of those with higher household incomes.[24]

3. A Villanova University study of transponder acquisition on the SR 91 express lanes found an inequitable hurdle for low-income to access the facility due to the unavailability of credit cards, checking accounts, or sufficient cash savings to pay for

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[23] Podgorski, Kaethe and Kockelman, Kara. *Public Perceptions of Toll Roads: A Survey of the Texas Perspective*, Center for Transportation Research, University of Texas, 2005, http://www.ce.utexas.edu/prof/kockelman/public_html/TRB05PublicResponsetoTRs.pdf, accessed October 9, 2005.

[24] Sullivan, Edward. *Continuation Study to Evaluate the Impacts of the SR 91 Value-Priced Express Lanes Final Report*, California Polytechnic State University, December 2000, http://ceenve.calpoly.edu/sullivan/SR91/final_rpt/FinalRep2000.pdf, accessed October 9, 2005.

transponder deposits. These barriers become a greater barrier to usage of the facility than trip cost when modeled for lower-income users.[25]

4. Research efforts for the I-15 HOT lanes included attitudinal and use studies of the existing I-15 HOT lanes, and, stated-preference surveys for the I-15 Managed Lane expansion proposal. Results showed lower-income drivers used the HOT lanes (as toll-payers) less than a normalized model would reflect for the facility, but expressed opinions favorable to the program and to its fairness.[26] This attitude was confirmed in an extensive stated-preference survey for the proposed managed lane expansion. This survey found 60 percent of low-income respondents approved of the HOT lane concept (roughly equivalent to the percentage of higher-income respondents), 78 percent of low-income respondents believed the concept of using the lanes for a toll was fair (no statistical difference between income levels), and 75 percent of low-income respondents expressed support for the concept of managed lanes in general (higher than middle-income respondents).

The highest stated desired uses of revenue were:

- Improve all San Diego freeways (31 percent);
- Improve I-15 general purpose lanes (28 percent);
- Improve I-15 express lanes (20 percent);
- Extend I-15 express lanes (15 percent); and
- Add more general purpose lanes to I-15 (12 percent).

Overall, this survey found significant evidence that HOT lanes do not negatively impact lower-income communities.[27]

1. Researchers at San Jose State University and the University of California at Berkeley investigated equity issues regarding HOT lanes in particular for the Santa Clara Valley Transportation Authority. Their findings indicated that:

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[25] Parkany, Emily. *Environmental Justice Issues Related to Transponder Ownership and Road Pricing*, Transportation Research Board, 84th Annual Meeting, January 2005.

[26] Supernak, Janusz; Brownstone, David; Golob, Jacqueline; Golob, Thomas; Kaschade, Christine; Kazimi, Camilla; Schreffler, Eric; and Steffey, Duane. *I-15 Congestion Pricing Project Monitoring and Evaluation Services Phase II Year Two Overall Report*, San Diego Association of Governments, May 2000, http://argo.sandag.org/fastrak/pdfs/yr2_overall.pdf, accessed October 9, 2005.

[27] Redman, Deborah; Norman, Judith; and Wilson, Frank. *I-15 Managed Lanes Value Pricing Project Planning Study Volume 2 Public Outreach*, San Diego Association of Governments, February 2002, http://argo.sandag.org/fastrak/pdfs/concept_plan_vol2.pdf, accessed October 9, 2005.

- Income equity is the most frequently cited equity concern.
- Geographic equity concerns arise where project benefits and costs have strong spatial patterns or where different constituencies are noticeably segregated. For example, the authors specifically cited an example of proposed HOT lanes in Maryland. Residents who lived closer to Washington, D.C. feared that the toll rate for them to use the HOT lanes would be made higher by the volume of travelers commuting from further out. As a result, they perceived HOT lanes to be inequitable as the proposed lanes would not benefit them (on a cost-per-use basis) as much as it would residents further out from D.C. This is similar to complaints often heard on the city's Metro rail system – trains already are full by the time they reach the inner stations.
- Modal equity is a real concern to groups that promote transit, carpools, or other modes. Concerned participants do not believe it is fair to offer the same travel-time savings to those who pay a toll as for those that "do the right thing" by sharing a ride or riding the bus.[28]

2. For new toll roads and bridges, the World Bank identified toll roads as a way to positively impact equity by supporting infrastructure networks in areas that are less wealthy than others. In order to accomplish these objectives, toll revenues must be redistributed with the expressed goal of aiding less developed areas. Additional ways tolls can be used to benefit equity include financial support and/or lower tolls for targeted communities.[29],[30] This concept is counter to the conventional wisdom in the United States, where there is a strong bias towards the idea that toll revenues should be used within the corridor or area where they were generated.

Addressing Equity Concerns

National experience has shown that equity issues can become a factor in the consideration of proposed toll projects. Often, these concerns may derive from a poor understanding of the potential benefits from tolling. Regardless, careful and deliberate planning may help mitigate equity concerns. As Washington moves forward with the consideration of tolls in the State, planners and policy-makers should address key questions designed to identify:

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[28] Weinstein, Asha and Sciara, Gian-Claudia, November 2004.

[29] The World Bank. *Review of Recent Toll Road Experience in Selected Countries and Preliminary Tool Kit for Toll Road Development*, Asian Toll Road Development Program, Draft Final Report, May 1999.

[30] The World Bank. *Toll Roads and Concessions*, unknown date/ongoing knowledge base, http://www.worldbank.org/transport/roads/toll_rds.htm, accessed October 9, 2005.

1) potential equity concerns, and, 2) ways to mitigate those that may occur.[31] Some of these questions include:

- Are proposed toll facilities located in the areas of highest need?
- Are proposed facilities disproportionately influenced by potential cost recovery?
- Are the distributions of benefits aligned with the principles of environmental justice?
- Are there ways to redistribute revenues to disadvantaged communities?
- Have alternative access options been considered for the facility, such as free use by HOVs or discounted toll rates for low-income households?
- If electronic tolling is included, have issues related to credit cards and account debits been resolved in order to permit the broadest opportunity as possible to participate?
- Are interest and citizen groups properly involved throughout the process of identifying projects and considering the impacts on their communities?

Although no assessment can completely address all potential issues or equity and fairness, the principle of environmental justice requires transportation professionals to evaluate proposed toll projects with an open eye and open mind. Ultimately, no project needs to be unnecessarily delayed or tabled due to issues of equity. Rather, correctly identifying concerns and mitigating them through deliberate action can ensure a win-win solution for project development.

Equity of the Current Financing System

Any analysis of the fairness of toll projects needs to consider the fairness of the current system of financing. Washington is one of only four states without an income tax, declared unconstitutional in the 1930s. Given the State's reliance upon property and excise taxes, the State has been criticized for relying on regressive taxes, which place a greater burden upon lower-income citizens. In 2002, the Washington Tax Structure Study Committee found the state taxation system to contain significant inequities: "*The finding for the Washington State tax system is that there are inequities for households and businesses. Washington's tax structure is regressive. The lowest-income households pay 15.7 percent of*

[31] The consideration of equity concerns does not occur within a vacuum. Certainly, any proper policy decision must evaluate concerns in the context of benefits. The discussion of benefits from tolling, unless particular to disadvantaged communities, is a topic of Background Paper #1: The Uses of Tolling.

income for total excise and property taxes, while the highest-income households pay 4.4 percent of income for the same taxes."[32]

One particular criticism from the statewide evaluation was that taxes based upon sales (for which, fuel and vehicles taxes could be included) fluctuate with economic performance, with no correlation to need. As it pertains to transportation, the committee articulated the desire of correlating the payment of fees with those who receive the benefit of services:

> Taxes and user fees are different. Taxes are compulsory payments to fund public services, and by definition there is not any necessary connection between those who pay taxes and those who receive services. User fees are charges paid directly by those who receive specific goods or services from government or by those whose activities burden the public.
>
> User fees often make sense, given the public's increased concern about the level of taxes and the feeling that it is more fair to allocate costs to consumers when users can be readily identified. At the same time, the most important public goods, like schools and libraries, should remain as public goods financed by taxes.
>
> The State should consider shifting a greater share – perhaps the entire share – of all highway and roads costs to motor vehicle users. This could be accomplished by higher gas taxes, tolls, and congestion pricing, or by fees that have an even closer relationship to impacts on our roads, such as weight-and-mileage charges. It would permit a reduction in the property tax. If motor vehicle user fees and taxes covered more of the cost of city and county roads, local property taxes could be reduced and/or shifted to other purposes. User fees also can be effective in allocating costs of environmental protection and clean-up directly to the activities that harm the public's natural resources.[33]

Policy-makers generally consider fuel taxes to be a reasonable proxy for use fees, as the more one travels on the state highway network, the greater the taxes that will be paid. Although fuel taxes do correlate use with payment, they are a "brute-force" tactic that poorly conforms to the actual cost of building, maintaining, and operating facilities at maximum effectiveness.

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[32] Department of Revenue. *Tax Alternatives for Washington State: A Report to the Legislature*, Washington State Tax Structure Study, November 2002, http://dor.wa.gov/content/statistics/wataxstudy/volume_1.pdf, last accessed November 22, 2005.

[33] Ibid.

Examining national trends, a Brookings Institution report identified state gas taxes as only covering one-third of total highway investment revenue.[34] Washington reflects this trend, with only 34 percent of all highway funds in 2001 coming from the state fuel tax.[35] Even accounting for Federal sources, almost half of all highway revenue in Washington is derived from nongas-tax sources. Thus, highway improvements in Washington are only partially funded by direct user fees.

In addition to overall funding of transportation investments, the fuel tax itself is a poor proxy for the actual *value* of transportation services and resources. As indicated by the Brookings Institution report, and confirmed by other resources, the growth in vehicle miles traveled (VMT) has greatly outpaced the growth in gasoline consumption. Through the 1970s, VMT growth tracked nearly one-to-one in gasoline consumption growth. Starting in the 1980s, though, increasing fuel efficiencies of automobiles and use of alternative-fuel vehicles widened the gap between VMT and gasoline consumption. To the extent that VMT reflects actual use of the transportation system, the fuel tax became less of a direct payment for use. According to the California Policy Research Center in 1999, "The result is that, as less tax revenue per gallon is generated, Americans drive about twice as many miles per gallon; therefore, fuel tax revenues have plummeted when measured per mile of driving. What is more, congestion is worsening throughout the nation as revenues from user fees level off in current dollars and decline in buying power, and decline even more per vehicle-mile traveled."[36]

The imbalance between use of highway facilities and payment for those facilities has been manifest in increasing congestion. Congestion reflects a market-based shortage between capacity (supply) and vehicular volume (demand). Provided fuel taxes remain a poor proxy for use, the "price" of using any given highway at any given point in time is set too low relative to demand and supply. Travel-time delay is the unintended consequence from the inability to meet use with payment through fuel taxes. FHWA estimated that auto users only paid 70 percent of their use of highways, with certain classifications of trucks contributing only 40 percent.[37] Travel-time delay resulting from the inefficient use pricing not only affects the actual users of highways at the time of use, but also nonhighway users (such as transit riders) and consumers (reflected as an indirect cost of goods movement). Altogether, congestion creates an inequitable consequence – nonusers are penalized by the inability to correctly price users.

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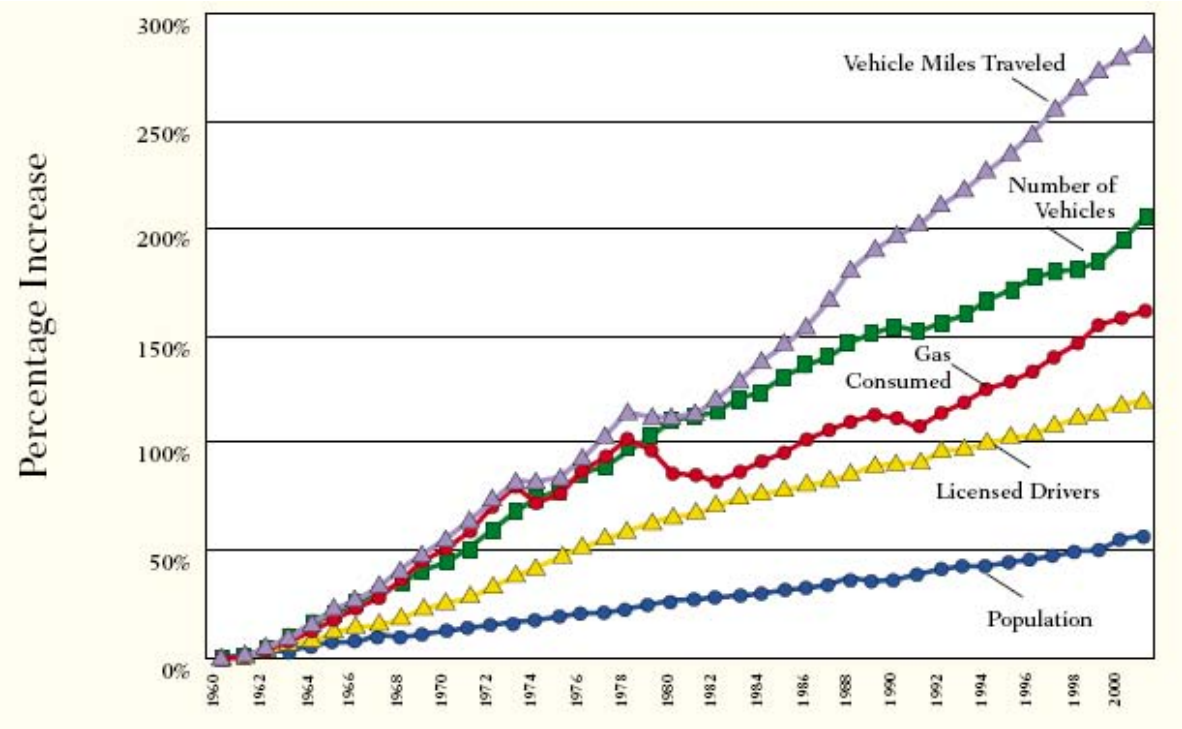
[34] Puentes, Robert and Prince, Ryan. *Fueling Transportation Finance: A Primer on the Gas Tax*, Brookings Institution, 2003, http://www.brookings.edu/es/urban/publications/gastax.pdf, last accessed: November 22, 2005.

[35] Ibid.

[36] As reported by: Wachs, Martin. *Improving Efficiency and Equity in Transportation Finance,* Center on Urban and Mobility Policy, Brookings Institution, April 2003, http://www.brookings.edu/es/urban/publications/wachstransportation.pdf, last accessed November 22, 2005.

[37] March, James. *Federal Highway Cost Allocation Study*, Federal Highway Administration, Public Roads, Volume 61, Number 4, January/February 1998, http://www.tfhrc.gov/pubrds/janpr/cost.htm, last accessed: November 22, 2005.

Exhibit 4.1 Growth in VMT and Fuel Consumption at the National Level[38]



In the long term, pricing and tolling offer opportunities to address this inequity, best summarized by a separate Brookings Institution paper:

> Some argue that congestion pricing discriminates against the poor. Yet the current system of transportation finance is not at all neutral with respect to income, and a system of direct charges for actual benefits gained from using the system is inherently fairer than a complex system of cross-subsidies. For many trips, the proposed approach would lower trip costs compared with the current means of pricing travel…
>
> As recognized in the 1920s, directly charging users at the time and place of use is the fairest and most efficient way of financing transportation systems. A change over time to electronic user fees could correct other inequities in the current system of user charges.[39]

[38] Ibid.

[39] Wachs, 2003.

Analysis and Recommendations for Washington

The National Review of Equity and Fairness issues identified five principal types of equity considerations, all related to the *distribution of benefits and costs*:

- **Geographic Equity –** Concerning the distribution throughout the State of Washington. Are improvements distributed in a logical and rational manner, based upon some objective and measurable criteria?

- **Income Equity –** Concerning the distribution upon economically disadvantaged communities. Do improvements negatively impact disadvantaged communities? Are improvements with negative consequences necessary for greater state or regional vitality?

- **Participation Equity –** Concerning the involvement of affected communities in the decision-making process for the distribution. Do disadvantaged communities have a voice in the decision-making process, and, is that voice adequately represented relative to the scale of impact?

- **Opportunity Equity –** concerning the specific distribution throughout the State relative to decision criteria. Are decision-making criteria, such as cost recovery, influenced by secondary affects, such as income status?

- **Modal Equity –** concerning the distribution upon preferred travel behavior. Do activities conflict with public perception for the encouragement of multimodal transportation?

All five equity and fairness issues can pertain to the consideration of toll and pricing concepts. Furthermore, these five issues are not separate from one another. For example, determining what is fair regarding the geographic distribution of toll projects (geographic equity) invariably involves the public participation process, an element of participation equity. In order to minimize confusion, we focus the discussion on geographic and income equity, with the remaining elements covered in the context of these two focus areas.

For proposed toll corridors in the greater Puget Sound region, we have built upon the established project identification, selection, and allocation process already in use in the region, to show how toll corridor selection can conform, where appropriate, to established procedures. By maintaining a consistent and knowable ***process*** in selecting toll projects, it should be possible to minimize fairness and equity controversy

Framework for Analysis

WSDOT currently has primary responsibility for planning and financing toll facilities in Washington. When particular regions are involved, such as the Puget Sound,

Portland/Vancouver metro area or the Spokane/Coeur d'Alene metro area, then additional agencies may be involved, including the respective Metropolitan Planning Organizations (MPOs), Oregon Department of Transportation (ODOT), and the Idaho Transportation Department (ITD). The specific detail for each corridor and/or selection may be different, but the general process of evaluation outlined in this report will not differ.

The existing planning process provides the framework for analyzing fairness and equity. To the extent toll projects are considered within the normal planning process – a known system with established rules – fairness can be readily evaluated and acted upon by regional and statewide decision-makers. In other parts of the country, fairness concerns in tolling arose precisely because toll decisions where conducted outside the normal planning process.

Many of the projects under consideration are in the Puget Sound region, so our analysis includes a special focus on procedures in that region. Puget Sound Regional Council's (PSRC) planning process provides the established framework prioritizing transportation investments, though two sources:

- **Vision 2020.** Vision 2020 established that regional transportation resources are to be distributed consistent with a four-part policy direction:
  - Optimize and manage the use of transportation facilities and services
  - Manage travel demand addressing traffic congestion and environmental objectives
  - Focus transportation investments on supporting transit and pedestrian-oriented land use patterns
  - Expand transportation capacity offering greater mobility options
- **Destination 2030.** Destination 2030 provided greater specificity for Vision 2020s direction, through a "*sequence for the development of new facilities: maintaining and preserving what we have, optimizing systems, and investing in capacity.*" Additional principles to guide investment include:
  - The first priority should be to maintain, preserve, make safe, and optimize existing transportation infrastructure and services.
  - Investments should emphasize continuity and complete discrete elements of the transportation system. Completing missing pieces of larger systems is a regional investment priority.
  - Appropriate investments in all modes should be emphasized to provide an array of travel choices.
  - Transportation investments should be directly linked with measurable transportation, environmental and land use outcomes, and should support the achievement of regional and state benchmarks.

- Cost-effective transportation options for addressing identified problems should be demonstrated and implemented.
- Compact development of designated urban centers, high-capacity transit station areas, and other communities should be supported through direct investment.

The planning process in the Puget Sound region serves as the template from which the equity analysis of tolling is applied in the area. Relevant regional planning processes and documents would be utilized as the starting point for equity analysis in other regions throughout the State.

Geographic Equity

Geographic Equity as Reflected by Public Opinion

Geographic equity is guided by public opinion and awareness. Public opinion shapes local policy choices, which are then articulated on the regional level in the pursuit of projects. If a local population believes they are not receiving their "fair share" from Federal and state transportation financing sources, this concern will inevitably be raised with regional, state, and in some cases Federal policy-makers. In the regional and statewide planning processes, geographic equity is one of the principal considerations for Federal and state project selection. Given the desire to apply a consistent project selection process, the existing planning process has a significant role in geographic equity.

Put simply, geographic equity, as manifest in public opinion, addresses two basic types of concerns:

- **Geographic Impacts of Deciding to Toll a Facility –** The public often express concerns about 1) the fairness for charging a toll on one facility, but not another; 2) the use of transportation funding "freed-up" by tolls on a facility; and 3) local accessibility burdened by tolls, which are in turn, addressing regional demand.

- **The Selection Process for Toll Projects –** The public also express concerns regarding the selection of toll facilities and consistency in application and process.

Prior to understanding how tolling and pricing of transportation facilities may detract or enhance geographic equity, it is necessary to understand the fairness of the current distribution of transportation resources. If the general public does not believe the current system is fair, then their evaluation of toll concepts will be influenced by this determination. Toll equity cannot be examined in a vacuum independent of the current distribution of resources.

The first step involves defining *fair* in the regional and statewide transportation planning and financing processes. A dictionary definition of *fair* uses descriptors such as: "lack of favoritism," "free from preference in judgment," "dictated by reason," and "unbiased." The public may hope for an idealized decision-making process that is applied upon

objectively established criteria, but when transportation funding is limited, some form of preference is inevitable. Even an objective process will have criteria measured by subjective weighting: how much preference is given to regional congestion relief, for example, as opposed to local accessibility?

Basis for Concern on Toll Corridors

Geographic equity has been a key concern on the Tacoma Narrows Bridge project. The legislation directing this study requires the development of *"equitable policies regarding the distribution of financial obligations imposed on those paying the tolls"* and investigation of *"options for reducing the outstanding indebtedness on the bride project, including… means of spreading the cost of the project more equitably."* Clearly, if this is an issue on Tacoma Narrows Bridge, it will continue to be an issue anywhere tolling is proposed in Washington.

There has been a considerable amount of market research and outreach conducted recently of Gig Harbor residents and Tacoma Narrows Bridge users.[40] The prevailing public attitude is that if Bridge users are to be charged tolls to finance a project that benefits them, then other projects in the State should likewise be financed with tolls. In short, this implies that an equitable geographic distribution of toll corridors would involve the identification of toll corridors throughout the State where a definitive need can be determined. However, installing toll projects around the State may not completely satisfy the public attitude towards unfairness. Tellingly, the market research indicates that Bridge users have moved beyond opposition to the project, to trying to negotiate the best deal for them as individual users, including the request for toll buy-downs from the State.

Although the Tacoma Narrows Bridge community has opposed the use of tolls on the bridge, there is historical precedent for tolls in this location. The original Tacoma Narrows Bridge and its successor were financed by toll revenue, as established by the Washington Toll Bridge Authority. Another 13 bridges have been financed statewide by tolls since 1930. Once tolls are in place on Tacoma Narrows Bridge, Kitsap Peninsula travel to and from the east of Puget Sound have to pay a toll, either on the bridge or on the Washington State Ferries. Interestingly, this pay-for-use is more readily accepted on ferries than on bridges, at least in today's environment where there are no more toll bridges in Washington.

Like all transportation facilities, the ferries and toll bridges can serve two purposes: accessibility for local trips and mobility for regional trips. Addressing geographic equity

[40] Market research activities are a component of this Interim Report to the Washington State Transportation Commission.

involves examining toll proposals that enhance regional mobility, but have the perceived impact of burdening local accessibility (or, potentially, vice versa). In other words, if a new toll project involves improvements to better serve regional trip-making, local residents may perceive themselves as unreasonably paying for a regional improvement, as they may have no realistic option to avoid the toll. This is primarily a public opinion challenge. Understanding what is acceptable for local communities is ultimately addressing public education and attitudes, and these already will be influenced by the perceived fairness of regional tax dollars distribution for transportation.

Invariably, the issue of geographic equity for all transportation improvements is a matter of political choice: when resources are less than needs, choices must be made. In addressing geographic equity for toll projects, the Statewide Tolling Study is not the appropriate forum to evaluate the fairness of existing political choices. However, it does provide an opportunity to evaluate the geographic distribution of toll corridors based upon the underlying principles of those political choices. To that effort, this section will address the following three questions:

- By what process are current transportation resources allocated?
- Are potential toll corridors allocated in a consistent manner?
- Do toll corridors carry new and significant local concerns?

By What Process are Current Transportation Resources Allocated?

Three levels of geography relate to transportation improvements: 1) statewide, 2) regional, and 3) local. These geographies do not necessarily correspond with the funding source, just the type of project.

Statewide improvements are those transportation facilities and corridors of significant value to either person- or freight-movement between regions. Obvious facilities in Washington include the interstate and U.S. highway network (I-5, I-90, I-82, U.S. 97, etc.) as well as less-obvious state ferry and aviation systems. Statewide improvements generally fall to investments that ensure efficient and effective travel throughout the State of Washington. Although many (if not most) state residents will never directly use the specific improvement corridor, especially if outside the interstate network, the secondary effects of improvements on goods and person movement will be realized throughout regional and local economies.

Related in purpose to statewide improvements, but whose benefits are primarily identified within confined areas, *regional* improvements involve transportation facilities that enhance person and goods movements within a prescribed region. Certainly, many regional improvements will benefit residents outside of the region, much as statewide improvements do. However, the intent of regional improvements is to benefit travelers and freight movement for trips within the region. These trips will likely extend across multiple jurisdictions, but be contained within the extended regional area.

Local improvements rarely involve the broad mobility enhancements of statewide and regional improvements. Rather, these improvements offer local accessibility to regional and statewide corridors. Wholly contained within one or two jurisdictions, local improvements will provide a service or facility whose benefits are likely tendered to the residents or businesses within a short distance of that facility.

All three types of transportation improvements are important to the public, yet the funding mechanisms for these improvements are relatively discrete. Federal and state funds are generally applied to regional and statewide improvements (with exceptions), and local funds are generally applied to local improvements (again, with exceptions). Generally, the public does not understand these distinctions. For example, a resident may equally desire improvements to local and regional facilities – and believes a decision for both comes from the same "pot" of funding (e.g., "my gas taxes"). This can lead to equity-related questions that may not be appropriate to the scope of project, leading to inappropriate comparisons, such as: "it's not fair" that community X on the opposite side of town has congestion-free arterials when my arterials are clogged daily (local versus local fairness, viewed under an incorrect regional-lens).

As illustrated in the example, the public perception dilemma with fairness is not easily addressed within the context of only one or two of the geographic applications – what may be perceived by the implementing agency as a fair distribution of regional or statewide resources may not be viewed as fair by residents. However, the existing system of funding transportation improvements requires this geographic separation.

The consideration of toll corridors primarily involves the consideration of regional and statewide improvements. As a result, the context of improvements should address regional and/or statewide mobility and efficiency.

Policy Basis of Distribution

Altogether, fairness in transportation finance, with a new layer of toll financing, can be simplified to three fundamental categories of questions for application on a geographic scale. These questions remain at the forefront of the planning process, and equally involve the consideration of tax- or toll-financed projects:

- **Current Allocation of Benefits and Costs –** As any decision-making process involves some allocation of preference, is the current system of distribution based upon a selection system that is *applied* in a just and consistent manner with transparent and measurable criteria? Is there an opportunity for input into this selection process?

- **Future Allocation of New Benefits –** Is the allocation of new project concepts (in the context of this study, toll corridors) likewise based upon a selection system that is applied justly and consistently? Is the selection process compatible with the existing system? Again, is there an opportunity for input into this selection process?

- **Future Allocation of New Burdens –** Are there statewide or regional needs that are unjustly ignored or penalized in the consideration of the new project concepts? Are

> local communities, who may be dependent upon regional facilities for local access, unjustly financing regional improvements for their access? Or, is the burden for the regional improvement shared throughout the region? And, has the previous distribution of statewide and regional resources for local accessibility potentially offset this concern?

As applied in Washington, statewide improvements are identified by the appropriate agency (WSDOT) and financed using state and Federal funds. Planning for statewide facilities involves the adoption of the Washington Transportation Plan (WTP) – a 20-year planning horizon document. Three-year funding programs of projects included in the WTP are completed by the Statewide Transportation Improvement Program (STIP). The STIP and WTP identify a variety of transportation improvement projects with activities, including preliminary engineering, right-of-way acquisition, operations and other service implementation, and construction.

The process for project identification involves a decision-making process that is refined and updated through public comment:

> WSDOT uses a priority programming process that first identifies needs for a 20-year period that can be accomplished within financial constraints. This is done through the State Highway System Plan (HSP). In order to be eligible for programming, a need must be first identified in the HSP. The needs contained in the HSP do not have start dates and can occur anytime during the 20-year period. The HSP is updated every two years and defines service-level objectives, action strategies, and costs. It includes an extensive public involvement process. From the HSP, a six-year implementation plan is developed. The Six-Year Plan is constrained to the investment level for a three-biennium period and is used in the budget development process. Only the first two years of the Six-Year Plan contains specific projects. The last four years contains funding levels for the different programs. Projects are then included for programming in the two-year budget from the Six-Year Plan.[41]

Of significant note, all improvements included on the National Highway System (NHS), including Interstate and U.S. highways, are selected and prioritized by WSDOT even if the project has a regional application. This includes construction, maintenance, and bridge projects. WSDOT receives the NHS allocation of funding in the STIP, providing a compensatory amount to regional entities from the Surface Transportation Program (STP). For any highway or bridge project that is designated for improvement, WSDOT prioritizes improvements based upon, "*available revenues and cost/benefit analyses. Each subprogram uses benefit/cost methodologies applicable to the specific subprogram. From the list of Benefit/Cost (B/C) prioritized projects, the Transportation Commission selects a mix of projects providing the*

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[41] Washington State Department of Transportation. *Statewide Transportation Improvement Program 2005–2007*, Section I: Introduction, http://www.wsdot.wa.gov/TA/ProgMgt/STIP/STIPHP.htm, last accessed: November 20, 2005.

greatest net benefit to transportation users. This prioritized program is submitted biennially to the Legislature for funding authorization and is included in this STIP."[42]

Regional improvements are identified by the appropriate agency, such as the regional Metropolitan Planning Organization (MPO) or Regional Transportation Planning Organization (RTPO). Each regional entity provides regionally significant projects from the Metropolitan Transportation Improvement Programs (MTIP) to the STIP. As a result, the STIP reflects both regional and statewide improvements. The MTIP not only reflects regionally significant highway and bridge improvements, but also local accessibility projects (using Federal or state sources of revenue) that include local funding. As most of the proposed toll corridors under active discussion are in the Puget Sound region, we reference PSRC's MTIP process for the remainder of this section.

PSRC is responsible for the distribution of STP, Congestion Mitigation Air Quality (CMAQ) and Federal Transit Administration (FTA) funding. These categories comprise the facility improvements typically associated with regional enhancements, in addition to NHS improvements identified by WSDOT. PSRC refines its project selection criteria every two years, concurrent with the adoption of the TIP in the following year. For the 2005-2007 Regional TIP, PSRC established the following process:

> The PSRC coordinates a shared regional/countywide process to recommend and select projects to receive STP and CMAQ funds. The total estimated STP and CMAQ funds are split between the regional and countywide forums based on a preapproved funding split, and competitive processes are used by the forums to identify and recommend projects to receive the funds, as follows:
>
> - Regional Process – The PSRC's Regional Project Evaluation Committee (RPEC), with support from the PSRC, is responsible for coordinating a Regional Project Competition to identify and recommend projects to the Transportation Policy Board (TPB) to receive the regional portion of the STP and CMAQ funds.
>
> - Countywide Processes – The four countywide forums are responsible for coordinating countywide project competitions to identify and recommend projects to the TPB to receive the countywide portions of the STP and CMAQ funds.[43]

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[42] Ibid., Section III: Consistency with Statewide Plan.

[43] Puget Sound Regional Council. *Policy Framework for the PSRC's Project Selection Process*, Section: PSRC's STP and CMAQ Funds, http://www.psrc.org/projects/tip/selection/2005/2004policyframeAmend4.05.pdf, last accessed: November 20, 2005.

Transportation Funding as Applied

The policy basis for statewide and regional transportation funding indicates a process that is identifiable, compatible with preestablished criteria, and offers an opportunity to comment and revise consistently over time. The next step reviews how resource allocation has occurred in practice.

One common concern cited by many within the Puget Sound region is that the region already is a net-donor of transportation funding to the State. Recent study by PSRC indicates this is correct, with an average return of only 91 percent. Furthermore, particular counties within the region contribute an even greater net share of revenue to the State than the region in abstract.

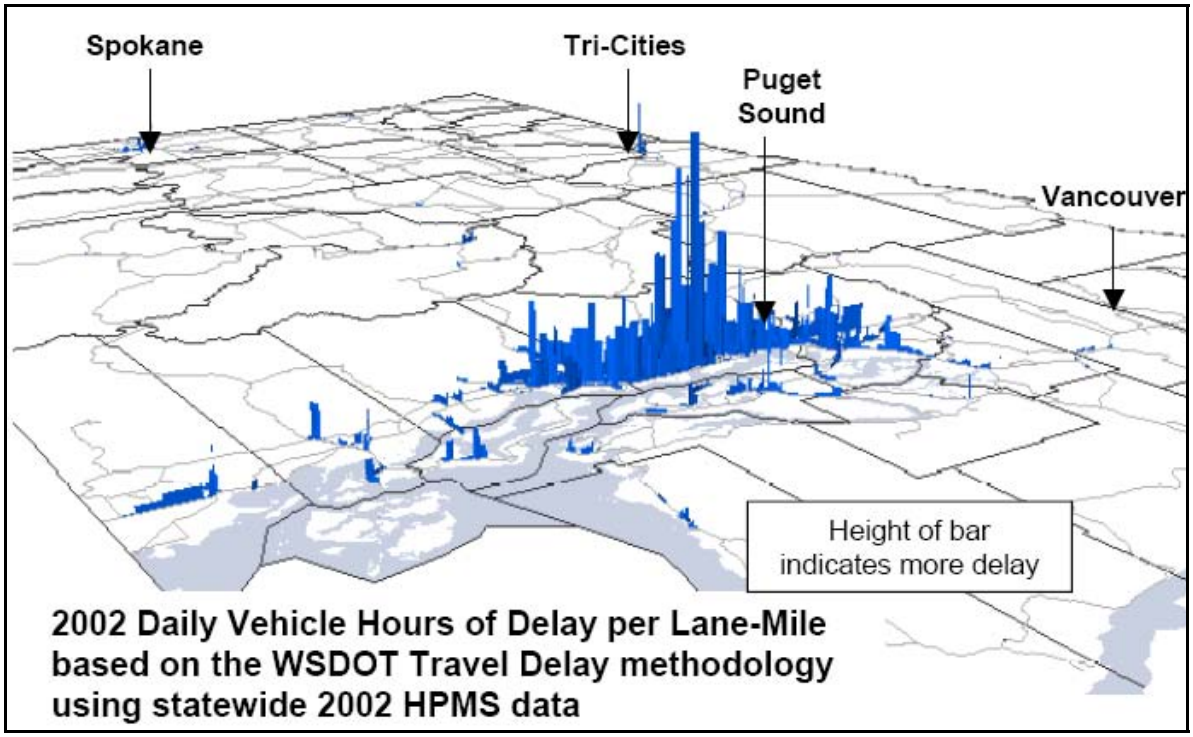
If the region already is not receiving its "fair share" from tax revenue, tolls then represent an additional cost on the region. However, the elimination of the Motor Vehicle Excise Tax (MVET) revenue from statewide funding indicates highway and ferry program funding also will decrease. PSRC identified the dilemma facing the region from the imbalance between need and known funding:

> [This places a greater] reliance upon operating revenues, sales tax, and other (general tax) sources. The data also shows a declining reliance upon fuel taxes and vehicle registration charges (as proceeds shrink against inflation), as well as revenues from taxes on vehicle value (a result of the elimination of the statewide motor vehicle excise tax). These changes are structural, and are expected to continue to be reflected in future data. These changes are resulting in an increasing reliance upon funding sources that fluctuate with regional economic performance. This has both positive and negative implications. Sources that track with economic performance grow at the same time that the expanding economy puts greater general demands upon infrastructure investment. On the down side, these revenues do not necessarily match the demand driven investment needs that are specific to individual transportation facilities. In addition, fluctuations in economic performance create greater fiscal uncertainty, and suggest the need for different approaches to agency-level fiscal management. And in the mid- to long range, the nature of urban transportation needs (large capital projects in physically constrained urban environments) may require new finance instruments that free public agencies from the limitations of a pay-as-you-go investment approach.[44]

This approach is not as simple, though, as it may otherwise appear. As the Puget Sound region accounts for the greatest percentage of statewide population, and, economic activity, statewide investment in the Puget Sound region is high, but so is congestion (see Exhibit 4.2).

[44] Ibid.

Exhibit 4.2 Statewide Congestion[45]



Altogether, this implies that regional need is high. Even with a 100 percent return to source of statewide funds, it is unlikely that funds would be sufficient to meet needs. *Destination 2030* indicates over $100 billion in needed transportation investments, yet even a 110 percent distribution would not even account for 10 percent of the projected shortfall. Furthermore, *Destination 2030* already shows an increasing reliance on nonstate funds, with only 11 percent of all regional transportation funds derived from the State.[46]

In short, new funding sources have been identified as necessary in order to resolve Puget Sound regional mobility needs. Sufficient funding is unlikely to come from the State, even with a "more equitable" distribution of revenue from the source.

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[45] Puget Sound Regional Council. *Destination 2030 Update: Congestion, Mobility, and System Efficiency*, September 14, 2005, http://www.psrc.org/projects/mtp/presentations/congestion.pdf, last accessed November 20, 2005.

[46] PSRC. *Transportation Finance 1989–2000*.

Are Potential Toll Corridors Allocated in a Consistent Manner?

Destination 2030 identifies six financial principles for funding the shortfall between needed facilities and anticipated revenues. Four of these principles are directly relevant to tolling:

1. New revenue sources must bear a relationship to system cost and system use;

2. System financing must be sustainable;

3. New financing tools or changes to the financing structure should strive to simplify and add flexibility to the overall structure; and

4. Ensure a reasonable rate of return on revenues raised within a region, for investments within the region.[47]

Of particular note in Destination 2030 is a policy declaration to "promote transportation financing methods that are based on use, and help optimize system efficiency with the long-term goal of introducing variable roadway pricing."[48] This is coupled with a caution that tolls can have a "punitive [effect], penalizing travel without offering substantially improved mobility."[49] This caution is less grounded in transportation economics (which would argue in favor of social utility as a result of system management) than it is in public opinion (which views tolls without a means of avoiding tolls as punitive).

As an application of public opinion, the Tacoma Narrows Bridge project provides valuable data. A public vote of approval for the Tacoma Narrows Bridge expansion project has indicated support for tolls for system finance amongst those who were included in the voting area.[50] Pricing for system management, except for High-Occupancy/Toll (HOT) lanes where tolls extend use to new vehicle classes, has been generally opposed nationwide. It can then be argued that tolls are acceptable when they improve reliability and offer new options.[51] As indicated in the ETC Market Survey Research conducted in February 2005, in the case of the Tacoma Narrows Bridge improvement, public concern is more about how toll financing of the bridge may be freeing up tax revenue for projects elsewhere.

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[47] PSRC. *Destination 2030*, Chapter 6: Finance.

[48] Ibid.

[49] Ibid.

[50] It should be noted that criticism of the Tacoma Narrows Bridge project has included concern that the election boundaries were not representative of the users of the bridge.

[51] Podgorski, Kaethe; and Kockelman, Kara. *Public Perceptions of Toll Roads: A Survey of the Texas Perspective*, Transportation Research Board, Paper 05-1857, 84th Annual Meeting, January 2005.

Destination 2030 answers the concern about revenue reallocation through its proposed use of new toll-based revenues for projects of regional and statewide significance: "*Investments in new or expanded state highways could in part be financed through user fees other than the statewide gas tax. This is a finding supported by the Blue Ribbon Commission Final Report. Use-based financing of new capacity will require regional implementation of these new financing tools.*"[52] This policy guidance establishes three important precedents: 1) that new capacity could be financed *in part* by use fees coupled with gas tax; 2) new and expanded facilities are equally eligible; and 3) that pricing should be implemented regionally. It should be noted that this policy does not establish a procedure or preference for regional implementation, but simply a policy option for the region.

Applying this policy guidance, prospective toll projects should be derived only from improvements of regional significance appearing on the *Destination 2030* plan. As tolling and pricing concepts can change the operations and design of facilities, it is not as important to discuss the specific implementation as identified in the plan, as it is to identify how the toll corridor achieves the mobility enhancements that serve as the foundation of the project in the plan. The purpose of this effort is not to identify the specific project selection process, but to underscore that the process itself conforms to the established regional planning process.

Do Toll Corridors Carry New and Significant Local Concerns?

Certain corridors identified in the Destination 2030 plan require significant resources to address transportation deficiencies. Although a regional nexus may be present for the toll facility, local perceptions of equity may be exacerbated if that toll corridor is viewed as "the only option" for residents or users. A toll corridor will be fair for local users if they:

1. Are impacted to a similar degree as regional users; or

2. Have received a net increase in mobility options.

For the case of Tacoma Narrows Bridge, Gig Harbor residents previously expressed concern regarding the fairness of use fees (tolls), for the bridge expansion (especially if one does not account for state improvements to the highway on either side of the bridge). These residents will use the bridge frequently, so there is an anticipated exacerbation to existing travel options – that the toll is a *new* cost. However, Tacoma Narrows Bridge also serves Kitsap County residents. Previously, Kitsap County residents could either travel via ferry (which requires payment of a use fee) or use the Bridge. Gig Harbor residents, although on the same side of the Sound as Kitsap County residents, had a built-in advantage insofar as the bridge was a convenient and less expensive alternative than the ferries. Tolls on the bridge can be considered as balancing the responsibility of Kitsap County ("impacted to a similar degree" criterion). Furthermore, the Bridge satisfies the second criterion ("net increase in mobility options") as the expansion provides new

[52] PSRC. *Destination 2030*, Chapter 6: Finance.

capacity and travel options (through the extension of HOV lanes) consistent with Destination 2030.

For a toll project to be geographically fair, the local social cost of paying a toll should be similar to the regional social cost. As proposed toll corridors are identified on major regional corridors, specific implementations that enhance travel options are preferable. Toll corridors also may improve local system efficiency, even if travel options are not enhanced by the toll. The local social cost of paying the toll should reflect the extent local system efficiency improvements create a net benefit on the community.

In short, there are no easy answers to what is fair from a geographic perspective. As stated at the beginning, selecting any project (tax- or toll-financed) involves a political choice. Therefore, the framework for choosing projects must be consistent and the process fair, which has been outlined here. What this means is that any toll policies that might emerge from this study should be carried out statewide, and incorporated into the larger project development and selection process.

Income Equity

Unlike Geographic Equity, the analysis of which is primarily in the realm of public opinion and policy setting, Income Equity analysis is based within the principles of environmental justice. Following Federal and state action since 1964, fundamental policy-making principles have been articulated for environmental justice:

1. To avoid, minimize, or mitigate disproportionately high and adverse human health or environmental effects, including social and economic effects, on minority populations and low-income populations;

2. To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process; and

3. To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority populations and low-income populations.[53]

Earlier, we identified key questions pertaining to the potential effects of tolling upon lower-income and poverty-stricken communities, consistent with the application of environmental justice. For toll projects, the particular question is whether payment of a toll may be an additional cost. The evaluation needs to consider the net benefit or net cost of the toll itself upon these communities; the access to the system because of the ability (or lack thereof) to pay a toll; and available alternatives to paying the toll.

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[53] Federal Highway Administration. *Questions and Answers on Environmental Justice and Title VI*, http://www.fhwa.dot.gov/environment/ejustice/facts/index.htm, accessed October 9, 2005.

Toll projects are not necessarily negative for low-income populations. Particular situations in which toll projects avoid negative impacts upon low-income populations include:

1. **Toll projects create a positive spillover effect on adjacent facilities –** If demand management through tolling creates net-localized or net-systemwide benefits to traffic, congestion, and mobility, low-income travelers may benefit from toll facilities even if they never actually paid the toll charges. This scenario typically occurs in capacity enhancement projects, but also can occur in system management toll applications.

2. **Lower-income situational value of time is higher than the prevailing toll charge –** As witnessed on SR 91 in California, low-income drivers use and benefit from the toll facilities because their situational value of time sometimes exceeds the toll charge. For example, qualitative research on SR 91 indicated that low-income, working, single parents had a high value of time in the p.m. peak period, when the threat of overtime charges at day care facilities was greater than the prevailing toll charge. In this situation, lower-income travelers still have a net financial benefit from the use of the facility. Situational value of time comes into play more often for lower-income travelers than higher-income travelers, as the willingness to pay may depend upon certain travel situations only.

3. **Toll projects provide an enhancement of mobility options –** The principles of environmental justice ensure that benefits are not reduced or delayed. In the situation of toll projects that enhance mobility options (such as advancing new regional capacity for travel-time savings or extending modal benefits), the net effect is positive regardless of the mechanism of payment, provided the alternative (existing) options are not harmed by the enhancement. HOT lanes are almost always a net enhancement, provided existing benefits to carpools and vanpools are maintained, accessibility is not made more difficult, and travel times are sustained on the HOT lane facility.

New toll roads also may be net enhancements; however the key comparison here is the proposed funding and development situation without the use of toll charges. The net present value of the facility with tolls should be compared side-by-side with the net present value of the facility without tolls constructed at a later date.

Conversely, particular applications of tolling which hold the prospect of burdensome impacts on lower-income communities include:

1. **Toll projects which do not ensure accessibility to the facility, independent of ability to pay –** One pervasive concern of income equity in toll projects is the use of electronic tolling. To the extent that electronic tolling completely replaces cash-based transactions, then the criteria necessary to obtain an account undergoes scrutiny for disproportionate effects. If mechanisms are embraced that minimize hardship (such as ability to obtain transponders for a minimal cash outlay – without need for credit cards or checking accounts for validation), then these concerns become moot.

2. **Toll projects on existing capacity –** There may be situations whereby tolling existing capacity or infrastructure is prudent for policy-making, such as building revenue for rehabilitation, or managing system capacity. However, these situations could lead to burdens on low-income communities when the traveler's cash outlay needed to use a particular facility increases. Even though pricing may improve overall system effectiveness (such as spreading peak periods and reducing congestion), and thereby deliver net economic benefits to society at large, the out of pocket cost to low-income travelers may far outweigh their own value of time. Hence, the price to use the facility is a net cost on the low-income traveler in this scenario.

3. **Projects that jump to the head of the priority queue because of toll revenue –** Cost recovery from tolls is one of the primary reasons to pursue toll-financed projects. However, it also is the clearest path to disproportionate harm to lower-income communities. To the extent that traffic and revenue models use income as a component to willingness to pay, then it is likely toll projects adjacent to or contained within higher-income communities will show greater cost recovery than lower-income communities. In these scenarios, projects are chosen not so much for overall need as they are an ability to pay to meet improvements. If a project in a low-income community could significantly enhance mobility, but is passed by due to cost recovery concerns, this is a net cost on the low-income community.

To evaluate these circumstances, three analytical questions have been identified:

1. How are lower-income communities defined?

2. What are the net effects upon mobility for lower-income communities?

3. How is system accessibility addressed in toll projects?

How are Lower-Income Communities Defined?

The standards established in the environmental justice context prevail when discussing income equity. PSRC uses two approaches for defining and measuring communities by income in the Puget Sound region:

> *The first is a measure of poverty status from the 1990 Census. This analysis examines census block group data to understand spatial patterns of poverty concentration. Within the central Puget Sound region, 9.3 percent of all persons were under the poverty threshold in 1989. The second measure is regional median household income – which was estimated to be $52,335 in 1997, using a Regional Council model to update 1990 Census data. This analysis examines census tract-level estimates of household median income when comparing income levels to the regional median. Low-income populations are identified as census tracts where the median household income is at or below 50 percent of the regional median.*[54]

[54] PSRC. *Destination 2030*, Appendix 2: Environmental Justice.

PSRC's analysis indicates that low-income populations are concentrated in Seattle, Tacoma, and Everett.

What are the Net Effects upon Mobility for Lower-Income Communities?

Destination 2030 provides a graphical representation of impoverished block groups and lower-income census tracts, consistent with the definition above, relative to regional transportation improvements in the 30-year plan (2001-2030). For each measure (poverty and income), there are two corresponding infrastructure analyses – roadway improvements and transit facilities. Of particular note in the plan is the correlation between rapid transit facilities and areas of lower-income populations. PSRC argues this shows a positive benefit to environmental justice, as these facilities not only address regional mobility needs but also connect lower-income communities with employment opportunities.

The consideration of tolling and pricing in any given region requires a similar analysis for that of transportation infrastructure allocation. Following a similar analysis, we must consider the net effect of tolling on lower-income communities. Do investments enable disadvantaged residents to more efficiently and effectively access opportunities for income advancement? Are existing costs addressed through the allocation of facilities and/or revenues? To answer these questions of income equity, we must understand the nature of the type of toll proposed. The impacts for these general classifications will differ. General guidance by type of project include:

- **New Facility Tolls –** provide a mobility option that currently does not exist. Provided the facility itself is warranted and meets geographic equity analysis, the only question that pertains to mobility is how toll operations affect the community's mobility options and efficiency.

- **Truck Only Toll (TOT) –** The concept of a TOT lane is to help reduce traffic and congestion *in* the general purpose lanes. This objective is counter to the prevailing wisdom of High-Occupancy Toll (HOT) lane facilities, where the express lane is viewed as a traffic relief option *from* the general purpose lanes. The basis for the TOT lane policy is the perspective that by consolidating truck and freight operations into a separate facility, vehicular throughput on the general purpose lanes is benefited to a degree greater than simply the difference in vehicular density. If TOT operations are shown to reduce traffic and congestion in the general purpose lanes (of which users will include lower-income travelers), while maintaining or improving net economic cost to freight movement, then TOT operations would likely be a net positive action for general-purpose lane users.

- **High-Occupancy/Toll (HOT) –** HOT lanes with free access to HOV users provide a new mobility option for avoiding congestion within a corridor, with little or no effect on general-purpose lane users. Provided HOT lane operations enhance HOV lane operations, with no net harm to HOV lane users by the increased travel on the facility, then HOT lanes provide a new mobility option without detriment. Furthermore, to

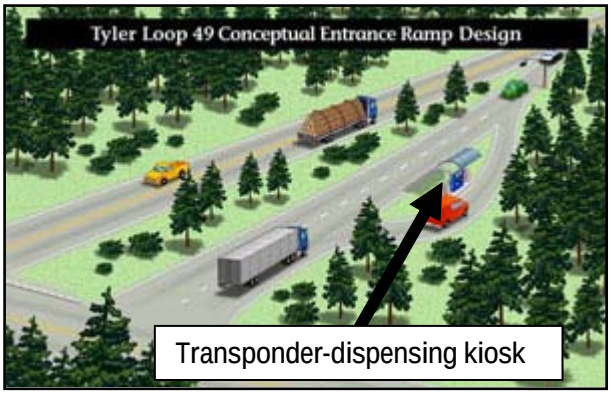
the extent that HOT lane revenues can be used to pay for more corridor-based services (such as improved transit services, park-and-rides, or operational improvements), this will only further extend the equity to lower-income communities.

- **Express Toll –** Express Toll lane (ETL) concepts involve charging all users for use of the lanes. The principal purpose of ETL is congestion relief and revenue generation. ETL analysis and net impacts will differ significantly, depending upon the specific proposal. For example, if the ETL involves new capacity construction, then the net effects of TOT and New Capacity tolls apply. If an ETL also involves the conversion of an HOV lane, the loss of free use of the HOV lane constitutes a loss of congestion relief for those unwilling to pay the toll. Although capacity enhancement will have occurred in this corridor, the loss of a mobility option today may constitute a social cost on lower-income communities. However, as with any toll project, the use of revenue can offset impacts. For example, if ETL revenues advance the construction of new transit facilities or enhance transit services (such as Bus Rapid Transit), then lower-income community affects may be minimized, depending upon the nature and routing of the services.

- **System Management Tolls –** System management tolls involve tolling all users to a facility in order to reduce congestion and enhance throughput. Like ETL tolling, system management tolls have too many variables to generally classify the concept as a net benefit or net cost to lower-income communities. For example, if tolls may be avoided through the use of HOV3+ and transit modes of travels, net mobility may been improved – either through a reduction in congestion as an SOV or HOV2 user, or, as an HOV3+ user with toll avoidance. However, if the value of time for lower-income travelers is significantly less than the prevailing toll charge and there is an economic cost to carpool formation, even HOV3+ use without toll may still yield a net cost on lower-income communities. It also should be noted that as indicated in public research, any applications of tolling on existing nontolled, general-purpose lane capacity is extremely controversial and rarely successful.

How is System Accessibility Addressed in Toll Projects?

In addition to the ability to access and use toll facilities, addressed as a mobility question above, system accessibility is an important consideration in income equity. For this purpose, "system accessibility" is defined as the specific procedures employed for toll payment. For most of the proposed toll corridors, electronic toll collection will be the primary method for toll payment. However, as indicated in the national research, barriers to the acquisition of transponders and toll accounts constitute a social cost to lower-income communities. These barriers include the requirement to maintain checking and/or credit card accounts for automatic debits, or even the outlay of a substantial volume of cash if automatic debits are not mandated. To many lower-income households, these barriers are significant.



WSDOT has opted to use the "eGo" tag for the Tacoma Narrows Bridge. A relatively inexpensive transponder option, this technology selection allows WSDOT an opportunity to address system accessibility concerns. The Texas Department of Transportation selected the eGo tag for a small-city toll road, partially due to the fact it can be dispensed without human interaction and can be done with minimal cost. Through the use of in-road kiosks and/or retail outlets, travelers can obtain an account with a minimum of $20.00 cash, with no requirement to register or provide any additional financial information. For communities along toll corridors, WSDOT could decide to make a similar acquisition policy, or even reduce the initial cost of acquisition. Either way, WSDOT has the ability to overcome this concern through its selected technology.

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Background Paper #5
National Perspective: Review of Public Attitudes and Perceptions

The "new era" of tolling largely began since the adoption of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, wherein the Congestion Pricing Pilot Program, later renamed the Value Pricing Pilot Program, endorsed an expanded investigation into new tolling and pricing applications throughout the United States. The new era involved the use of electronic toll collection, toll rates for traffic management, and different applications of infrastructure additions or conversions. By the decade's end, 15 states had enrolled in the program, and each attempted some facet of tolling or pricing on their highway and road systems.

Through the systematic study of feasibility, as required by the program, definitive public attitudes emerged regarding tolling and pricing in the new era. This section identifies the prevailing trends in public opinion for tolling.

Background

In the 1970s, the Federal government offered grant funding assistance to cities to support demonstrations of road pricing. However, "the opposition was so great from businesses, community groups, and the media that all studies were terminated before demonstration plans could be developed."[55] Twenty-five years later, the idea of road pricing has risen again, due to greater flexibility in constructing or converting capacity as provided by electronic technologies. Road pricing now not only includes traditional toll roads, but also variations on toll lanes within existing facilities – generally termed managed lanes.[56] In the 1990s, the greatest momentum can be attributed to the potential to combine pricing with high-occupancy vehicle (HOV) facilities, a resulting concept called High-Occupant Toll (HOT) lanes. Although the HOT lane concept has received considerable praise for its

[55] Higgins, T. J., 1994, *Congestion Pricing: Implementation Considerations*, Transportation Quarterly, Volume 48, Number 3, Eno Transportation Foundation, summer.

[56] *Managed lanes* may include variants, such as *Express Toll Lanes*, *Value Express Lanes*, *High-Occupant/Toll* lanes, and other names. Each nomenclature maintains different assumptions regarding vehicle and user class preference; however, this has not been uniformly applied in either the transportation literature or media.

applications in California, Texas, and very recently Minnesota, it is still subject to significant public acceptance barriers that originally prevented widespread introduction of such projects in this country.

The concept of tolling is new in many states, and proposed road pricing projects have inevitably been controversial to one extent or another everywhere they have been considered. Public and political support has taken a considerable amount of time to nurture in states with implemented projects, such as California, New York, Minnesota, and Texas. In all states, public opinion was generally lukewarm, at best, to start.[57,58,59] Only through the concerted efforts of agency champions, project managers, and political leaders are toll concepts able to progress positively in public opinion.

Public acceptance of toll roads, managed lanes, and other concepts may be more elusive than they would otherwise seem. One explanation for low levels of acceptance is that the nature of government in the United States is inherently biased against significant policy change. The closer any agency is to implementing a new toll facility, the greater the agency is at risk of sudden loss in political support due to public opposition.[60] Within any given state, this scenario can be found in areas with or without existing toll roads.[61]

A variety of reasons contribute to road pricing and other toll concepts remaining controversial, including concerns regarding equity for low-income individuals, geographic distribution of toll benefits and burdens, privacy of electronic toll collection, and taxation implications of the public highway system. Every proposed toll corridor will have its own dedicated user groups (including commuters, transit riders, truckers, and communities served by the facility) that expect their interests to be protected at all costs. Experience nationally has shown that toll projects are an easy target for criticism, which exacerbates the last minute withdrawal problem. It is easy to make headlines that are critical to the concepts, but rare to find lead stories favoring the implementation of tolling, pricing, and their variants. Similarly, politicians can make a name for themselves by

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[57] Munnich, L., and J. Loveland, 2005, *Value Pricing and Public Outreach: Minnesota's Lessons Learned*, Transportation Research Board, Paper 05-0394, 84th Annual Meeting, January.

[58] Ungemah, D., M. Swisher, and C. D. Tighe, 2005, *You're Making Me HOT: Talking High-Occupancy Toll (HOT) Lanes with the Denver Public*, Transportation Research Board, Paper 05-1191, 84th Annual Meeting, January.

[59] Stockton, W. R., C. L. Grant, F. McFarland, N. R. Edmonson, and M. A. Ogden, 1997, *Feasibility of Priority Lane Pricing on the Katy HOV Lane: Feasibility Assessment*, Research Report 2701-F, Texas Transportation Institute, Texas A&M University, June.

[60] Cain, A., 2005, *Achieving Majority Public Support for Urban Road Pricing: Preserving the Driver's Right to Choose*, Transportation Research Board, Paper 05-1791, 84th Annual Meeting, January.

[61] In Texas, toll roads and managed lanes have proceeded in the public realm with relatively little controversy in Houston and Dallas. However, significant public opposition in San Antonio, Austin, and Waco has made political support tenuous at best.

criticizing and even legislating against toll roads and managed lanes, such as in Minnesota and Maryland.

Selected National Experience

The purpose of this section is to review how different projects have measured public acceptability, both before and after implementation of toll projects. Despite the differences in the methods, there are similarities in the findings from these evaluations and lessons to be learned about the willingness of the public to accept the new era of tolling.

California: State Route 91 Express Lanes

The SR 91 Express Lanes facility was originally conceived during the 1980s as a HOV facility by the California Department of Transportation (Caltrans). Following an environmental review, Caltrans endorsed the proposal to construct a four-lane HOV facility for 10 miles in the median of SR 91. At the time, controversy ensued regarding HOV lanes, with the end result of money earmarked for the new lanes being redirected. Following the passage of California's bill that authorized up to four public-private partnerships for transportation projects,[62] the California Private Transportation Corporation (CPTC) proposed building and operating the lanes as a tolled facility, with discounts for HOV3+. The subsequent changes to environmental documentation did not include substantive public outreach efforts, despite two separate lawsuits with fairness implications, but did collect enough information to provide before-and-after comparisons.

In cooperation with the Federal Highway Administration's (FHWA) Congestion Pricing Pilot Program, Caltrans worked with the California Polytechnic State University to review public attitudes regarding SR 91 after opening. The evaluation study included traveler opinion surveys to measure commuters' views on the project and associated public policies, and to compare pre-project opinions with later personal experience. Surveys were conducted in late 1995, spring 1996, late 1996, and spring 1997 in sample categories of single-occupancy vehicle (SOV), HOV2, and HOV3+. The study also included an opinion survey of area business representatives, conducted in late 1996, to measure their views on the impacts of the express lane facility.

Levels of approval for various aspects of the project rose throughout the course of the study. Although the idea of variable tolls was initially unpopular (with a 45 percent approval rating), later surveys showed a significant increase in approval (to about 60 percent). Approval levels for operating the highway as a private business also rose in

[62] Assembly Bill 680, passed in 1989.

the 35 to 45 percent range, both before and five months after the facility's opening; and the winter 1996 survey showed that approval levels had since increased to 50 to 60 percent.

Opposition to toll financing was recorded, expressed as a general sense of "unfairness." However, 60 percent of commuters believed tolls were an effective means to address congestion problems, and this percentage increased as commuters witnessed the tangible travel time savings in both HOT and general purpose lanes. Overall, there was a high level of acceptance for congestion pricing.

California: Interstate 15 FasTrak HOT Lanes

The I-15 HOT Lanes (FasTrak) facility in San Diego was one of the original pilot projects of the Congestion Pricing Pilot Program, and the first dynamically priced HOT lane facility in the world. To this day, the I-15 FasTrak project provides the greatest amount of information on public acceptance for HOT lanes, and by extension, express toll lanes.

The eight-mile, two-lane barrier separated, reversible flow HOT lane facility was implemented in phases on the existing I-15 HOV lanes. The first phase involved a sticker-based, fixed monthly price for access for SOVs, called ExpressPass. Within a year, the second phase of implementation began: a dynamically priced HOT lane system offering toll access to SOVs (HOV2+ remained free to use the facility). By 2001, a third phase was under study, which included the construction of managed lanes and Bus Rapid Transit (BRT). The latter study summarizes the evolution of public attitudes for the concept since 1996.[63]

Focus groups of I-15 commuters were conducted in mid-1997 prior to the switch from monthly pass (Phase I interim operations) to a per-use dynamic fee system. Participants comprised the following categories: current ExpressPass users, past ExpressPass users, HOV users, and SOV users. According to the study, the project was perceived as successful in pursuing congestion relief, improving existing facilities, and generating revenue. At that point in the project, there were some reservations expressed for the planned switch to the per-use trip fee.

As part of the focus group effort, the participants were guided through a "bidding game," meant to show how the project might be affected by real preferences and actions. To determine pay-per-use preferences, moderators asked respondents how much they would be willing to pay to use the Express Lanes once during an average morning commute. Respondents were then provided different information that might affect the price they were willing to pay. The game demonstrates the learning process consumers go through when they consider purchasing a good. This process involves a base valuation of the

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[63]San Diego Association of Governments, 2002, *I-15 Managed Lanes Value Pricing Project Planning Study: Volume 2, Public Outreach*, February, http://argo.sandag.org/fastrak/pdfs/concept_plan_vol2.pdf, accessed October 5, 2005.

good, a second valuation once information on the product is provided, and a series of further valuations due to strategic bidding for a limited good or product.

Results of the overall focus group study indicated the following.

Before Project Implementation

- Public opinion generally favorable;
- Existing carpoolers less favorable;
- Solo drivers who were likely to use the facility more favorable; and
- Indications of price sensitivity.

At Conclusion of Phase I

- ExpressPass users remain enthusiastic about program;
- Carpoolers have not reported negative impacts;
- Evidence of price sensitivity – some users left program because of cost;
- Low level of understanding and knowledge of project (particularly by non-ExpressPass users);
- General support for the principle of pricing; and
- Project's objective to support transit service is not widely known or supported.

After Phase II Implementation

The I-15 Attitudinal Panel Study began in the fall of 1997 as the first of five series of surveys to be completed by the end of 1999. In addition to the categories of users identified in the focus groups described above, the telephone surveys included other I-15 users, and I-8 users (as a control corridor). A total of 1,500 commuters were surveyed in each series.

Results revealed the following:

- Eighty-nine percent of ExpressPass users viewed the project as a success.
- Seventy-seven percent thought the program was fair to both travelers in the Express Lanes and in the I-15 general purpose lanes.
- Very few respondents (four percent) were aware that revenues were being used for improved I-15 transit service. Only two percent of all respondents favored using

excess revenue for transit, while a combination of 46 percent favored extension of the HOT lanes or improvements to the main lanes of I-15.

- The only negative feedback or negative media coverage on the project had been related to the expanded bus service, which had not gained the expected ridership.

I-15 Managed Lanes Extension Research

In 2001, a study of a proposed extension to the initial facility was conducted with an accompanying public outreach and assessment component. The project included focus groups, stakeholder interviews, intercept surveys of users, and a telephone-based stated-preference survey. Significant findings from the surveys included:

- Sixty-six percent of respondents approve of the I-15 HOT Lanes program.
- All income groups maintained at least 60 percent approval of the FasTrak program, with higher-income groups more likely to be supportive.
- Higher percentage of respondents approved of the concept of tolling on I-15 than of the FasTrak program itself (77 percent versus 66 percent).
- The majority of the respondents have no objection to the FasTrak concept, either philosophically or practically. They consider the extension fair to general purpose lane users (71 percent) and managed lane users (75 percent).

Texas: Statewide Toll Program

Texas currently has 160 centerline miles of toll roads. These roads are located primarily in the metropolitan areas of Houston and Dallas, operated by the Harris County Toll Road Authority and the North Texas Turnpike Authority, respectively. Central Texas has 77 miles of toll roads under construction, and many smaller communities have projects under development. The toll authorities in Houston and Dallas have been in existence for over 15 years, while new regional mobility authorities are a new mechanism for addressing mobility needs. To date, all of the toll roads in operation have been constructed as new alignment, greenfield projects. Public opinion has been generally accepting of these toll roads and appreciative of having additional travel options.

However, due to increasing demands on the highway system and decreasing tax revenues for funding new construction, the Texas Transportation Commission has asked each district of the Texas Department of Transportation (TxDOT) to consider toll financing for all added capacity projects. This directive has led to considerable discontent among the public, as well as some local officials.

Several market research techniques have been employed around the State to assess the public's opinion on tolling. These have included focus groups, stakeholder interviews, telephone surveys, written surveys, and web-based surveys. As might be expected,

reactions have been as diverse as the State. Generally, opinions are within a few percentage points difference between Texan metropolitan areas,[64] but those areas with existing toll facilities are not as likely to contain highly visible and vocal opposition to new projects.

The public appears accepting of new toll roads, but the majority remains skeptical of added toll lanes on non-toll roads. According to an ongoing research endeavor in Texas, 71 percent of residents oppose tolling existing roads and 51 percent oppose tolling new roads; 82 percent agree that Texas should expand and improve existing roads before building new roads; and 75 percent feel tolls should be reduced after construction costs are paid.[65]

Focus groups and surveys across the State demonstrate the misunderstandings the public has regarding transportation finance. Common questions include:

- Why doesn't gas tax revenue cover the cost of maintenance and construction?
- Isn't tolling double taxation?
- Why wasn't the shortfall anticipated?

Each of these questions represents a "big picture" perspective, with citizens struggling to ascertain plausible answers to these questions. In focus groups where participants were educated on transportation finance, many participants were surprised to learn the rate of population increase, the increase in vehicle miles traveled, and the fact that gas tax revenues also fund other programs such as the Department of Public Safety and public education. Moreover, many people did not realize how expensive it is to maintain the roads.[66]

Attempts to answer the big picture questions have fallen short, primarily because there was not a concentrated, consistent message at the statewide level to address the knowledge gaps. Each district of TxDOT has pursued and is pursing toll projects without the benefit of clearly identified messages from the Department that address the public's concerns. On a more local level, the areas of the State that currently have toll roads appear to be more accepting of additional toll roads. However, in many instances, the Department is considering adding toll lanes to freeway lanes or building toll lanes on facilities that the public expected to be upgraded to freeway facilities. This has led to cries of double taxation, allegations of neglect on adjacent free roads, and accusations of

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[64] Podgorski, K., and K. Kockelman, 2005, *Public Perceptions of Toll Roads: A Survey of the Texas Perspective*, Transportation Research Board, Paper 05-1857, 84th Annual Meeting, January.

[65] Draft findings from TxDOT Research Project 0-4817, conducted by Dr. Kara M. Kockelman, University of Texas – Austin, 2005. Final documentation not yet published.

[66] Collier, T., 2004, *Focus Group Testing of Messages on Tolling in Austin*, Texas Transportation Institute, December.

attempts by the Department to force motorists onto the toll roads. Each of these concerns is indicative of the ever widening knowledge gaps in the public.

Minnesota: I-394 MnPass HOT Lanes

Minnesota Department of Transportation (MnDOT) opened its first HOT Lane in May 2005 on I-394 in western Minneapolis. The project is similar to the intended operations on the SR 167 HOT lane pilot project in the Puget Sound area. Like Washington, Minnesota has had a long experience with the Congestion Pricing and Value Pricing Pilot Programs. Beginning in 1994, MnDOT explored different pricing applications – new toll corridors, variable bridge pricing, and even areawide pricing for the Twin Cities metropolitan area, but have never had a project actually implemented until the I-394 project. With an intended purpose of improving mobility and enhancing the efficiency of I-394, MnPass provided the country's first buffer-separated HOT lane facility in the United States.

Public opinion in Minnesota has typically been strained as it regards tolling and pricing. In 1996, a proposed public-private partnership to build a toll road on SH 212 was blocked by a city council veto in the proposed corridor. Enabling legislation provides for cities to veto MnDOT projects – that legislation is still in place. In 1997, the initial proposal to convert I-394 HOV lanes to HOT lanes was withdrawn after public opposition emerged. Minnesota redirected its public outreach strategy in 2001 to facilitate the development of political leadership and champions through a citizen advisory task force. Findings from this effort included:[67]

- Top-level champions (such as the Governor) are helpful for setting the tone;
- Outreach to those with influence provide support to top-level champions;
- Coalitions must be maintained through direct action; and
- Preparation must proceed promotion, including letting no question go unanswered, and for correctly tailoring a message to the different audiences.

With new political support for the implementation of the MnPass project, a new public-private partnership was initiated, and the facility opened in spring 2005. A survey of residents was conducted in December 2004 to ascertain perspectives on the upcoming project. Echoing findings from the San Diego surveys, 64 percent of respondents thought the MnPass concept was a good idea, with only 28 percent opposing. Furthermore, support did not vary across income levels. Messages that were reinforced by open-ended responses included "better use of carpool lanes" (24 percent), "adds capacity to the roadway" (19 percent), and "only users pay, not everyone" (12 percent). By comparison,

[67] Munnich, L., and J. Loveland, 2005, *Value Pricing and Public Outreach: Minnesota's Lessons Learned*, Transportation Research Board, Paper 05-0394, 84th Annual Meeting, January.

negative messages, such as "it only benefits the rich" and "carpool lanes should be free for all to use," were cited by less than eight percent of respondents.[68]

Lessons Learned

Barriers to Public Acceptance

Opposition to tolling remains a stubborn public opinion problem. Some opposition may be ideological in basis (such as the perception of tolls as an additional tax); whereas, other opposition may be based upon misperceptions regarding implementation (such as variable pricing being too complicated or unfair). The precedence of tolls in an area can be an advantage if the public is familiar with the concept; however, the only equivalent for the Washington resident is fares on State ferries, or those with long enough memories to recall facilities where tolls have been removed.

Value pricing and tolling overall tends to be more acceptable on new facilities than existing ones. In the case of managed lane and HOT lane projects, pricing is applied to only a portion of the facility, resulting in more choices for the driver, and is, therefore, more likely to be seen as an improvement on the existing facility if it is correctly positioned as such. The availability of a "free" option coexistent with the priced lane or lanes is a significant distinguishing factor in the public acceptability of HOT lanes versus wholesale facility or network pricing. Learning the lesson from Texas, however, it is important to distinguish improvements in a corridor that have been previously promised with gas tax revenue versus those that could become reality quicker with tolls.

Equity issues primarily relate to who gets to use the lanes, at what cost, and how the generated revenues are used. Some fear that tolling and value pricing is too restrictive, benefiting only the more affluent drivers. Observed data on SR 91 and I-15 discredit these concerns from a user perspective, but the conventional wisdom of disproportionate benefits to wealthier commuters can kill a project before it has an opportunity to prove itself, as what happened in Maryland in 2002.[69] For instances of managed lanes, some entirely oppose the concept of providing any benefit to carpoolers, and instead support express toll lanes without carpool discounts; whereas, others insist upon providing free access for all carpools.

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[68] Hubert H. Humphrey Institute of Public Affairs, 2005, *I-394 MnPass Project Evaluation Attitudinal Panel Survey Final Report*, March.

[69] Baltimore Sun, 2004, *Give Toll Lanes a Try*, as reported on TollRoad News, July 28, http://www.tollroadsnews.com/cgi-bin/a.cgi/Z7qKEOVgEdiRW6r2jfFwDw, accessed October 5, 2005.

Other issues of opposition are less clearly related to equity, but still have a perceived "unfairness" about them. As a private facility, SR 91 faced initial opposition specifically to private, for-profit projects. I-15 researchers found opposition to the inclusion of toll-free HOV2s. The I-15 focus group participants responded negatively to dynamic pricing, which was seen as "price gouging." They were unclear about why this was so unacceptable, but for them it was.

Public acceptance issues are often location specific. A report from the Claremont Research Institute shows variation in travel among different corridors, indicating "a geographic dimension to travel behavior."[70] In another report that studied five counties in California, researchers found that "[Toll lane policies] were strongly disliked in Ventura County," whereas, they had support from the majority of residents in the other four counties surveyed (Los Angeles, Orange, San Bernardino, and Riverside). Other factors, such as the local political context of a project, can create barriers to public acceptance. The SR 91 project, for example, was initially opposed by residents of Riverside County, because it replaced an originally planned HOV lane to be funded by Orange County, as identified earlier in this document. Riverside County residents were especially disturbed since it already had funded and partly built the HOV lane on its side of the county border. Opposition post-implementation from Riverside County helped contribute pressure on CPTC to sell its facility to Orange County Transportation Authority, which reintroduced HOV3+ discounts; however, this action did not completely assuage the concerns of Riverside County residents.

The Selling Points of Tolling

HOT Lanes and Value Pricing

In Washington, HOV options and tolling can be powerful allies in terms of obtaining public acceptability for value pricing. Washington has a rich history of HOV benefits and services, extending from the State's extensive HOV lane networks to include HOV preference on ferries and extensive vanpool programs. The HOT concept in particular seems to provide a feasible compromise between HOV and toll road advocates, improving on (or in some cases even resuscitating) underutilized HOV lanes, and allowing for limited tolling opportunities where it has not otherwise been applied. Furthermore, additional toll opportunities exist in extremely congested corridors with little political or public appeal for grand capacity expansion projects. Continuing the application of HOV-related preference and/or treatment may provide the sufficient weight to encourage these toll applications.

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[70] Horan, T., L. Chang, and G. McMurran, Grant, 1997, *Land Use and Equity Issues in Congestion Pricing: A Compositional Analysis of Five Corridor Markets in Southern California with an Exploration of the Equity Considerations for High Occupancy Toll (HOT) Lanes*, Claremont Research Group for the University of Minnesota, November.

Value pricing projects have the potential to provide benefits to the following:

- The individual driver, who receives additional choices and predictable travel times;
- The HOV network, which has the potential to benefit from more riders, and the riders themselves will have faster and more predictable travel times; if new transit services are included or if transit travel times are improved, potential increased bus ridership also is likely to increase support for transit, thereby, improving service even further; and
- The "whole" system – by providing more person-based capacity for the system, HOT lanes can potentially offer benefits to the remaining components of the network.

In addition to the general value pricing concept, specific projects have their own selling points. For example, SR 91 and I-10 in Houston use preset toll schedules, which at least in the initial stages of a project tend to be more easily understood than dynamic variable pricing, although Minnesota has not reported any problems with public understanding of their dynamically priced systems. I-15 and I-394 can emphasize that their distribution of revenue will benefit the public, especially transit programs. Respondents in the I-15 study increasingly recognized the benefits of the program and encouraged its continuation to help fund BRT service throughout the corridor. At first, the groups felt the program would "reduce stress, save time, and improve the safety of their commutes." By the end, they had added that it would "help emergencies, get people to work on time, ease congestion, maximize utilization of the lanes, and increase the options available to SOV drivers."

Selling points can be reinforced by a positive visual image. When Houston's Katy HOV lane was functioning with additional capacity due to a 3+ occupancy restriction, the transportation agency found that the public is often more concerned with "perceived" failure (the visual image of empty lanes) than figures demonstrating actual efficiencies. Ideally, value pricing mitigates the "empty lane syndrome," encouraging a positive public perception.

If selling points are effectively incorporated into a marketing scheme, they make a significant difference. Two studies in Oahu, Hawaii and in Los Angeles showed that, when presented as "a time-of-day charge to manage congestion by inducing shifts to transit and travel times," only 15 percent (Oahu) and 20 percent (Los Angeles) respondents favored the concept. But when presented as "a user fee wherein those using the facility the most pay the most, and where fees go toward road development and maintenance," 42 percent of the Oahu respondents accepted the idea.[71]

New Toll Facilities

Tolling is often cited as a means of advancing the construction of projects (for those that are planned within a fiscally constrained transportation plan), or for financing projects

[71] Higgins, T. J., 1994, *Congestion Pricing: Implementation Considerations*, Transportation Quarterly, Volume 48, Number 3, Eno Transportation Foundation, summer.

that would not be otherwise constructed. Within the past 10 years, concepts that fall under this category include the construction of new travel lanes (such as express toll lanes) and new toll roads and bridges (outside of any existing travel corridor). Both types of toll facilities have seen recent activity throughout the United States – such as the SR 125 toll road in San Diego, the E-470/Northwest parkway beltway in Denver, the Westpark Tollway in Houston, the Camino Columbia Bridge in Laredo (Texas), and the Dulles Greenway expansion in Washington, D.C. Not all of these projects have been successful, and each has received a share of challenge from public opinion.

The Center for Transportation Research at the University of Texas conducted a statewide public opinion assessment of new toll roads, new toll lanes, and HOT lanes in various areas of Texas for the TxDOT. Majority of respondents indicated that toll roads were unfair (55 percent), should not be used to finance new roads (51 percent), and should not be used to finance improvements to existing roads (71 percent). Negative perceptions of toll roads occurred more often for respondents in areas currently without toll roads (such as Lubbock, Corpus Christi, and San Antonio) than areas with toll roads (such as Houston and Dallas), typically by 10 to 15 percent. Although the negative responses are strong, and indicate a clear public perception issue with the fairness of tolls, it should be noted that Texans favored tolling over fuel taxes in all areas, except San Antonio. Finally, although support for tolls on new and existing roads was low, support for HOT lanes was much stronger, with 52 percent in favor.[72]

As indicated in a study of public opinion for new toll roads to be constructed in the Austin area, messages that tended to enhance public acceptance included:[73]

- The Transportation Department currently does not have any economically feasible and timely alternative funding sources for transportation projects;
- Tolls produce roads faster and help pay off roads quicker;
- Tolls directly connect those who use the facility with those who pay for them;
- Additional revenue generated after roads are paid for helps pay for other local transportation projects; and
- Toll road revenues stay in the local area.

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[72] Podgorski, K., and K. Kockelman, 2005, *Public Perceptions of Toll Roads: A Survey of the Texas Perspective*, Center for Transportation Research, University of Texas, http://www.ce.utexas.edu/prof/kockelman/public_html/TRB05PublicResponsetoTRs.pdf, accessed October 9, 2005.

[73] Texas Department of Transportation, 2005, *Central Texas Toll Road Baseline Marketing Survey*, Final Report, July.

Identifying Potential Advocates and Opponents

All tolling proposals should be viewed in the context of the political environment for which it is proposed. There are inherent differences between traditional toll roads and bridges, value pricing, express toll lanes, and HOT lanes that will change the nature of opposition and promotion. Recognizing these differences has proven to be important for advancing any particular project. Opportunities for coalition-building should be examined, as well as the activity levels of local citizen groups and institutions. Potential opinion-setting advocates and opponents, who will influence the opinion of travelers and commuters, can be divided into the following: business groups, environmental groups, government leaders, and transportation professionals.

Business Groups

As traffic congestion and its related costs increase and former solutions become less feasible, many cities, states, and metropolitan planning organizations (MPO) search for alternatives to government-funded transportation. In some cases, businesses have advocated pricing exemptions for commercial vehicles. But such exemptions may undermine the effectiveness or financial feasibility of the scheme, or may intensify opposition from other motorists.[74] Business groups are typically among the most influential groups to help champion new toll and value pricing initiatives, if those proposals are shown to either advance roadway projects or improve travel time reliability. Although not typically in opposition to toll projects, business groups may oppose specific proposals for concerns regarding disproportionate commercial toll rates, inability to access properties, or express lane facilities not serving key commercial areas. Finally, business groups may withhold support for specific projects if they are not articulated as a part of an overall system.

Environmental Groups

Many environmental groups promote value pricing, although some do not. Those groups that support the concept point to benefits, such as reduced energy use and air pollution; the preservation of open space; and more cost-effective infrastructure investment if the value pricing project serves to reduce overall vehicular use, or allocates use more efficiently throughout the roadway network. Among those who have supported congestion pricing are Environmental Defense, the Sierra Club, the Tri-State Transportation Coalition (in New York City), the Transit Alliance of Denver, the Pennsylvania Environmental Council, the Oregon Environmental Council, and the Clean Air Coalition (in Los Angeles). Some environmental groups support pricing with the goal of setting the tolls high enough to reduce driving, and then using revenues to fund non-highway projects, such as rail, transit, or bicycle improvements.

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[74]Gomez-Ibanez, J. A., and K. A. Small, 1994, *Road Pricing for Congestion Management: A Survey of International Practice*, National Cooperative Highway Research Program: Synthesis of Highway Practice 210, Transportation Research Board.

Although some environmental groups are supportive of value pricing applications when they help provide system efficiency and higher costs of travel by personal automobile, they generally oppose the construction of new highways or lanes that exacerbate greenfield development, encourage urban sprawl, or encourage travel by SOVs. For example, the Pennsylvania Turnpike Commission has been caught in legal battles with environmental advocates regarding the northern expansion of the Mon-Fayette Expressway, with a variety of issues cited, including noise and air pollution and environmental justice. This has contributed to a significant delay in the planned 70-mile, $3.5 billion toll system expansion in Pittsburgh.

This example is not limited to new toll facilities outside of existing travel corridors. Environmental groups have opposed the construction of new express toll lanes on I-10 in Houston and the original SR 91 express toll facility. In both scenarios, only meaningful commitments to HOV benefits have been able to overcome the threat of legal battles.

Government Leaders

In dealing with government leaders, attention should be paid to two current trends: 1) a general distrust of the government at all levels; and 2) the devolution to local governmental control. Reflecting government distrust, the public has questioned the government's ability to effectively manage the revenues, as well as the complex technological systems involved with tolling. Furthermore, as evidenced by recent opposition to tolling in Texas, citizens do not accept at face value the case of declining gas tax revenue as a percentage of transportation need. In fact, with the rapid increase in gasoline prices in 2005, many falsely believe that tax revenue increases with price. But the success of current toll projects in California, Minnesota, New York, and Texas, combined with increasingly localized control, can help to increase the confidence level of both politicians and citizens. Although congestion does not adhere to political boundaries, a shift to local implementation of congestion pricing may be more efficient.

Transportation Professionals

Transportation professionals include planners, engineers, and economists. Transportation engineers and planners are often interested in tolling as it relates to overall system management and revenue generation, as well as the potential to reduce peak-period trips. Although the temptation is present to view tolls as a silver-bullet solution, tolling should be proposed in conjunction with other elements of a regional transportation strategy, such as land use regulations, transportation demand management strategies, intelligent transportation systems (ITS) technologies, and transit. Transportation professionals are a forgotten interest group when it comes to public opinion, yet they have the wherewithal to kill a pricing project before it comes to fruition.[75]

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[75] Ungemah, D., and M. Swisher, 2006, *So You Want to Make a HOT Lane? The Project Manager's Guide for an HOV to HOT Lane Conversion*, unpublished paper submitted to Transportation Research Board's 85th Annual Meeting, January.

When gauging support from different interest groups, it is important to keep the goals of the project in mind. Decisions about the use of revenue will be important in terms of maintaining support for the toll facility – for many groups, their support is almost entirely dependent on it. For example, environmental groups support value pricing with the assumption that revenues will be used to support alternatives to automobile use; whereas, many other supporting interests want revenues to pay for additional highways and expanded toll lanes, let alone the role a particular toll road or bridge will have in supporting toll corridors elsewhere in a region or state. It will be a challenge to retain support from both types of groups without sacrificing the goals of one or the other.

Public Education Approaches

Public education in the new era of tolling is critical. Public education efforts must consider the geographical and historical context of the projects in addition to their related selling points, barriers, and interest groups. Different groups should be targeted in public education efforts to ensure they have information about what concerns them most. In the I-15 project, for example, carpoolers and transit users had the least favorable impression of the program. They were assured that they would retain top priority and continue to use the lanes for free. If it is the policy of the project to use excess revenues to improve transit and carpool service in the corridor, it is important for this particular user group to be aware of that.

In general, few citizens fully understand the current system of transportation financing, and are unfamiliar with issues like marginal cost and price elasticity as they relate to transportation. Many people feel that value pricing – in particular, differing toll rates by time of day or vehicle occupancy – would not change their travel behavior (or that of others). Developing a simple message for communicating the concept of pricing can be valuable in gaining support. For toll facilities, the messages can be simpler, including project advancement and construction timing. However, interest groups disinclined to new facilities in general (regardless to how these are financed) may use general apprehension towards tolling as the weak point of attack.

In the case of Houston's I-10 HOT lane project, it was determined during the evaluation phase that focused marketing and public education regarding the logistics of the program could enhance usage. One-half of the non-users was not aware of QuickRide; 60 percent had not heard of the program via mass media; and 50 percent were either unaware or misinformed regarding the logistics of the program, including the procedure for signing up. Initial and ongoing marketing is a key component of early and continuing success.

Efforts are necessary to increase general awareness of why states and regions are exploring tolling. In the early days of the I-15 HOT lane program, when asked what Express lanes were called, respondents were hard pressed to come up with an official name. The I-15 researchers recommended that the San Diego Association of Governments (SANDAG) clearly communicate the goals of the ExpressPass program, decide on a clear name for the lanes, and tell the public where the money is being spent. Minnesota learned

the lesson of San Diego, and made marketing and branding a key component of its MnPass project development. Similarly, the Colorado DOT also has placed a high value on branding and marketing for its upcoming HOT lane project, to be opened in spring 2006.

Across all efforts, there appear to be some general messages that resonate with the public – values of simplicity, efficiency, reliability, and project advancement. Messages can help to identify that tolling helps bring projects to fruition now – not 10 years from now. Messages can explain the concept of variable pricing, so that the public understands there is a maximum toll rate, and any variance on the price is perceived as a discount. "Travel time reliability" also can be dealt with in messages. The uncertainty of travel times has led to trips that involve large periods of "buffer time," incorporated into the trip, characterized by early departure times from the origin. The reliability provided by value pricing applications substantially shortens that buffer time, and that benefit can be advertised.

There are additional messages that the public does understand and that resonate well. The public recognizes that toll projects can be built much faster than traditionally funded projects. In many cases, this has been the only selling point for a toll project in Texas, especially when coupled with the promise that revenues from toll projects will be used in the local area. Most people are knowledgeable of this message, but they are unsure what exactly the revenues will be used for. There are questions of whether revenues will only support toll roads and free roads will be neglected. Preparing answers to these questions will serve to reinforce messages.

Conclusions

The value pricing and tolling projects discussed above have used different methods to measure public acceptance. The I-15 evaluation study pioneered efforts in evaluation for value pricing, placing particular emphasis on the attitudinal and behavioral aspects of both users and non-users of the program. As this data provided important insight into the public acceptability of HOT lane projects, it has become a standard evaluation technique for Minnesota and Colorado, too. A significant lesson in public acceptance of value pricing can be learned from these projects: initial skepticism, as well as openly expressed opposition to the pricing concept, did not prevent the projects from carefully and judiciously moving forward. Post-implementation feedback has revealed a general reversal from negative to positive public opinion regarding the concept of pricing in HOV lanes, a common element across all three states.

New toll roads, lanes, and bridges will face a different type of scrutiny from the public – whether there should be a new facility or not. Ideally, these questions should be addressed in the purpose and need analysis, alternatives assessment, and environmental documentation. The role of tolling should not influence the need for a facility. However, reality does not work this way. Opponents of a facility will use apprehension towards

tolls as a reason to try and kill a project. Again, only through the careful and deliberate process of planning, documenting, and educating on the nature of proposed projects can negative reaction to tolls be overcome.

The political nature of a community and its interest groups should be considered, but not without the acknowledgment that political climates can change rather drastically. In 1978, the California State Transportation Board suggested that "users should be required to pay a fair share of the costs that occur from their use [of transportation facilities]." But this idea was strongly opposed at the time by interest groups.[76] Tolling in this part of California has since received much support, as evidenced by the success of SR 91, I-15, and SR 125.

According to the authors of Road Pricing for Congestion Management, projects that are politically acceptable should exhibit the following characteristics:[77]

- Be fairly simple in design;
- Build incrementally on previously existing arrangements or experience;
- Address clearly understood and widely supported objectives; and
- Involve transparent financial flows that facilitate public trust in the use of the monies.

The successful tolling and value pricing projects implemented thus far exhibit these qualities and consequently enjoy a high level of public support. Projects that have failed to become reality, or are experiencing strong controversy, generally fail one or more of these qualities.

Section prepared by Texas Transportation Institute, with assistance from Cambridge Systematics, Inc. and Frank Wilson & Associates, Inc.

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[76] Fielding, G. J., 1994, *Private Toll Roads: Acceptability of Congestion Pricing in Southern California*, Transportation Research Board Special Report.

[77] Small, K., and J. Gomez-Ibanez, 1994, *Road Pricing for Congestion Management: The Transition from Theory to Practice*, Lincoln Institute of Land Policy.

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Background Paper #6
Limitations of Studies Used to Advance Toll Projects

Developing toll projects rely on studies at every step of the way, and these studies are used by policy-makers to make important decisions about allocating scarce public resources. Those resources might be substantial dollars devoted to construction, or less substantial, yet important dollars devoted to planning and design or marshalling a public-private partnership proposal through review and negotiations. Although perfect information is never possible, it is important to understand the risk factors associated with the information used to make decisions at each stop of the project development process.

There are three legs that hold up the stool of a toll road development project: 1) traffic and revenue estimates; 2) cost estimates; and 3) financial plan. Limitations and risk factors of each of these are discussed below, including the limitations of these kinds of studies in general, as well as the work being done for this Comprehensive Tolling Study in particular.

Traffic and Revenue Estimates

When forecasting demand for any transportation facility, practitioners typically use complex computer models of the transportation system. These models are mathematical representations of the transportation system itself (i.e., the highways, arterials, and transit services), as well as of the demand for travel. The demand for travel is represented by various models of human behavior, including the amount of travel (trip generation), where that travel goes (trip distribution), what mode people choose (mode choice), and the path people choose to take (assignment). None of these models are perfect.

At any level of analysis, forecasting traffic and revenue for a potential toll project involves answering these questions:

- What is the basic demand for travel in the proposed corridor?
- How will that demand change over time?
- How many people will choose to use the facility if tolls are charged, and how will that number change with the amount of the toll?

It has never been easy to answer these questions with any kinds of certainty, and the complexity of toll projects being proposed today make these questions even more complex. Take, for example, a traditional toll road with these characteristics:

- Ten-mile urban limited access highway in a built up area;
- Parallel arterial routes (not limited access) that are heavily congested for many hours of the day; and
- A long-term history of growth in population and employment leading to rapid traffic growth.

Although this may be the simplest situation you can encounter in traffic and revenue forecasting, there are still uncertainties to be answered. For example:

- Is the traffic consistently congested everyday, or are there significant seasonal variations?
- What is the typical length of the trips causing the congestion? The entire length of the highway, or only a few miles?
- Is it easy for travelers to get to the highway? Will all the planned connections to the highway be built on time? Will there be adequate signage and marketing?
- Are the trips mainly by commuters, or for other trip purposes?
- What is driving the big increases in demand? Is the economy highly dependent on one industry, thereby, making it especially vulnerable to economic downturns?
- What is the distribution of income levels in the communities served by the project, and how does that translate into people's willingness to pay a premium to save time?

These factors, and many more cause uncertainty in even the simplest of circumstances. The situation becomes even more uncertain when a toll project is intended to serve traffic demand that has not yet materialized (e.g., for future growth), because even short-term hiccups in the economy can stall demand for traffic for years.

The new breed of toll road proposal adds even more complexity. These often involve tolling individual lanes of a highway, while the adjacent lanes have no toll (e.g., high-occupancy toll (HOT) lanes). In these cases, tolls are varied by time of day, or even dynamically depending on traffic levels. Since traffic levels can vary significantly from day to day, and are influenced by nonrecurring events around the transportation network, it is difficult to even get a good estimate of the time savings that would be realized by a new toll project.

Many of these issues are considerations when planning for non-tolled highways and transit systems as well. However, the consequences of forecasts not being met are less obvious on non-tolled projects. Although an underutilized free facility may cause the

public to receive less benefit from its investment than one that fully achieves its expected traffic levels, there are no impatient investors waiting for full and timely payment on their bonds. This feature of toll facilities puts tremendous pressure on the early years of tolling projects.

Levels of Detail from Exploratory to "Investment-Grade"

Traffic and revenue studies can be done at a variety of levels of detail for different stages in the project development process:

- **Exploratory** studies are typically done with a limited amount of existing data, and simple analysis tools using basic assumptions. These might take existing traffic volumes in a corridor, make some assumptions about potential market for a new facility, assume certain levels of toll, and certain levels of capture. The purpose of such a study would be to gain a sense of the market potential for a project to determine if more detailed studies might be needed.

- **Preliminary** studies provide additional analysis, and typically rely on more and better data, and regional travel demand models. These would use forecasts of population and employment that already have been prepared by others (typically a regional planning agency), and existing transportation models that might be modified to accommodate the analysis of people's choices between toll and non-toll projects. These would typically borrow data from elsewhere about responses to different price levels and time savings.

- **Investment-grade** studies are those used to support financing. The term "investment-grade" actually refers to a rating given by a bond rating agency to a transaction that is better than "junk bond" status. An "investment-grade" study does not guarantee an investment-grade rating. Rather, it is a traffic and revenue study done with the care, sufficient detail, and transparent assumptions so that investors can understand the risks that they are taking. Such studies would include extensive studies with new data regarding traffic levels over the course of the year, travel times by various routes, trip origins and destinations in the corridor, and surveys of people's value of time. One of the most important elements of such studies is an objective assessment of the local economy and growth potential. Investment-grade studies also would explore numerous "what-if" scenarios to explore the potential downside (and upside) risks.

Just as an investment-grade study does not guarantee an investment-grade rating, it also does not guarantee that traffic and revenue will occur as forecast. Any forecast study is built upon layers of assumptions. Some of these assumptions relate to measurement of current conditions, such as traffic counts, traffic patterns, household incomes, and travelers perceived values of time. Even though these represent measurements of existing patterns, there are still bound to be inaccuracies in the measurements, no matter how carefully the studies are done. Even traffic counts, the most basic of measurement, varies from day to day and from season to season, making accurate measurement difficult.

Other assumptions relate to forecasts of the future. When and where will housing and employment grow? What is driving the economy, and how does the economic well-being of the region stack up against competing regions? What other transportation improvements will be built when? What will be the price and availability of fuel in the future? And finally, how will travel patterns change in response? Although sophisticated models can be built to try to anticipate these events, these allow for not much more than informed speculation. Consider the difficulties those top-level policy-makers, such as the Federal Reserve Bank, have of trying to forecast the national economy even quarter to quarter and make policy to try to influence it.

None of this is intended to degrade the value of a traffic and revenue study. These studies are disclosure documents that explore as accurately as they can current conditions, the potential for change in the future, and the traffic and revenue that would result from that change. The studies need to clearly lay out the assumptions used, and the forecasts that would result. Extensive sensitivity testing or the use of risk analysis mechanisms also is appropriate, thereby, providing the investor with a sense of the risks inherent in the forecasts.

Given the complexity and uncertainty of all the elements that go into a traffic and revenue forecast, it is not surprising that many forecasts are "inaccurate." However, since so many elements of the forecasts are out of the control of the analyst, it may be unfair to use the word, "inaccurate" to characterize a particular forecast. It is almost certain that a forecast will be inaccurate and it is prudent for the toll road developer, whether they be the public sector or private sector, to take appropriate actions to mitigate these potential risks. This could include doing enough sensitivity analysis to be reasonably confident that reality will be within the envelope of scenarios tested with some reasonable probability. Monte Carlo simulation techniques, in which numerous sets of assumptions are combined in random ways to simulate potential future outcomes, also have been used to achieve this goal. While inaccuracies resulting from forecast assumptions not coming to fruition are common, it also is possible for inaccuracies to result from flawed analytic tools. This type of issue can be resolved through more thorough quality assurance/quality control efforts, as well as adequate time and resources to complete projects.

Recent Studies of Forecast Inaccuracies

Although numerous projects have been built over the years that have achieved and/or exceeded the forecasts' uses to finance them, there is always more attention paid to the projects that have not achieved their forecasts. In 2002, the bond rating agency Standard & Poor's (SP) published a report on toll forecasting performance.[78] The basic argument in this report, and in three annual updates, has been that there is a considerable

[78]Standard & Poor's, *Credit Implications of Traffic Risk in Start-Up Toll Facilities*, August 15, 2002. Most recent update is *Traffic Forecasting Risk Study Update 2005: Through Ramp-Up And Beyond*, August 25 2005.

amount of optimism bias in toll revenue forecasts around the world. As noted in the discussion on investment-grade forecasts above, there is good reason to understand that actual results would vary, perhaps considerably, from the forecasts. However, if objective and balanced analyses were being performed, one would expect the variation to occur on both the upside and the downside. The point of the SP's work was that there was a considerable trend towards the overestimation of traffic and revenue, leading to their conclusion of an optimism bias.

S&P suggests that first-year toll revenue estimates have been overestimated by an average of 20 to 30 percent over the sample of projects that they studied. In the 2005 update to the study, they tested traffic performance through the fifth year, and did not find any marked improvement. They also looked at truck forecasts in particular, and found that these were a particular concern, because trucks typically pay considerably higher tolls than light vehicles, and variation in this forecast can have a much bigger effect on actual toll revenues. S&P also looked at the potential variation in traffic forecasts done by different consultants (or with different sets of assumptions). They found that the magnitude of the difference in forecasts can be significant over time, even if the differences in the input parameters are not significant.

On a similar note, Fitch Ratings published a report in 2003 that highlighted some of the difficulties associated with achieving "accurate" traffic and revenue forecasts.[79] Among the issues they cited were:

- **Model Input Risk –** Models used for regional planning do not necessarily consider the same factors that traffic forecasters for toll projects consider important. Regional forecasts of population and employment are often used to support other decisions that may not have the same need for conservatism in forecasting. Such models also are not concerned with the up and down cycles of the economy, which can cause significant variation in toll road forecasting.

- **Ramp-Up Risk –** Ramp-up is a term used to describe the period from when a toll road first opens to traffic until it achieves the steady-state traffic flows predicted by rational travel models. It accounts for the time needed for toll paying customers to find and become acquainted with the project, and to decide whether it offers a good value proposition. Ramp up is not well understood, and can last from a few months to several years.

- **Event and Political Risk –** Whereas, the ups and downs of the economy are clearly out of the control of the forecasters, so are the actions of governments. The timing of improvements that access or compete with a toll facility also is uncertain, and can lead to unexpected results.

[79] Fitch Ratings, *Bliss, Heartburn, and Toll Road Forecasts*, November 12, 2003.

The lesson that can be learned from these studies is that recent trends are not necessarily indicative of future performance, and that it is crucial for the traffic and revenue studies to take a skeptical view of locally or regionally driven expectations of performance, and consider the very real potential of changing patterns over the course of the development time horizon of a project.

Limitations of This Comprehensive Tolling Study

This Comprehensive Tolling Study is structured to take a preliminary look at several illustrative examples of potential toll projects in Washington State, with the purpose of guiding overall policy-making with regards to tolling. In the early phase of the project, the consultant team will work with the Commission to recommend the scenarios that best represent the kinds of projects that might be considered in the State in the near, medium, and long term. Since the entire universe of potential projects is not being considered, this study is not intended to definitively determine the suitability of any particular project for tolling or pricing, nor as a means to priority rank projects. And it is certainly not intended to be an investment-grade analysis.

Travel Models

Therefore, the traffic and revenue analysis in this project will use the best models and procedures available within the timeframe and resources of this study. For example, the Puget Sound Regional Council (PSRC) recently updated its regional travel demand model for use in the Congestion Relief Analysis Phase 2. The update now lets the model reflect changes when people travel in response to congestion and pricing. It also uses recent research on elasticity of demand to toll prices.

The revised model is well suited to considering the regional implications of pricing strategies. In addition to addressing time of travel, it also considers changes to travel patterns and travel modes. Regional changes in vehicle miles and vehicle hours of travel can be distinguished.

However, this regional model is not effective at analyzing the detailed operational nuances of a particular corridor. While a lot of congestion can be attributed to traffic demand and too little mainline capacity, the true problems in the system are at bottlenecks and incidents of nonrecurring events. These are interchanges, on/off ramps, lane drops, grades, narrow lanes, solar glare, and other particular highway features. Such features cause traffic congestion that is not well represented in regional travel demand models, and can only be addressed through microsimulation procedures. Such modeling is time consuming and costly, and not feasible for this study.

When we look at projects outside of the PSRC region, they will not have access to the same modeling tools, so more caution is needed. We will consider the specific circumstances of each non-PSRC-region project in developing the appropriate strategy to assess traffic and revenue related to pricing. It may be appropriate for us to migrate toll elasticity factors from similar projects in the PSRC region, or develop other techniques entirely.

Socioeconomic Data

One of the most important drivers of travel demand is growth in household and employment growth and income levels. We are using the socioeconomic data approved for use by the planning agencies within each of the regions. Although these forecasts may be developed with care for the purpose for which they were intended, they have not been evaluated for their suitability for use in traffic forecasts intended to provide conservative assumptions for purpose of revenue estimates. Indeed, planning forecasts for typical projects may be "conservative" in the other direction, trying to anticipate the worst-case situation for future highway needs. An investment-grade study would consider factors influencing the regional economy, as well as factors within a particular corridor that might vary considerably from the generally accepted forecasts.

Verifying Local Conditions and Trends

Since this study is looking at numerous corridors and systems throughout the State, we are not in a position to carefully evaluate current traffic conditions for each project corridor. Although we will attempt to validate the travel models for the corridors, we will not be doing extensive field analysis of travel times and conditions for each.

Values of Time

A key determinant as to whether someone chooses to pay a toll or use an option that does not involve a toll is how they value the time savings (or other benefits, such as reliability or safety) over the alternative. The changes to the PSRC model have reflected the most recent national data for values of time, but do not incorporate local conditions.

Future Travel Behavior Will Be Similar to Current Travel Behavior

This is one of the most troublesome realities of forecasting. The only tools we have are to look backwards, try to forecast today's conditions from history, and assume that those relationships will hold over time as we use forecasts of different parameters (e.g., land use, incomes) to try to estimate future travel patterns. The reality is that things change over time. For example, between the 1950s and the 1980s, women entered the work force at a far greater pace than anyone in 1955 might have anticipated. Increasing disposable income led to higher-car ownership rates and growth in vehicle miles of travel well in excess of what a simple model based on population would have revealed.

Future changes in the social and economic relationships are unknown. We can only speculate, and be sure that we will be surprised in the future. An example apropos of today's headlines would be trying to forecast the price of fuel five years from now, and how that might impact travel behavior over the long term.

Cost Estimates

The cost estimates for this project will be conceptual in nature, based largely upon available data, with some additional analysis where necessary. In the normal project development process, cost estimates are refined as the scope of a specific project is developed and defined to a point where all issues that could influence project costs are known. A tiered evaluation process is used to screen and identify candidate projects early in the process of project development. In the preliminary phases of a tiered process, cost estimates are prepared using existing project documents and planning-level assumptions.

As the project advances, tolling plans are revised and the project is developed through the design process. Generally, the design of tolled highways is nearly completed before the plan of finance is prepared as part of the offering document, thus, allowing detailed estimations of cost with a high degree of confidence.

For planning-level analyses and at the early project screening process, "off-the-shelf" estimates are often adapted from environmental studies, or unit costs derived from comparable projects are used to estimate cost. These cost estimates need to include all related project costs that may be part of the project financing. Related project costs include soft costs (design and professional fees), right-of-way acquisition (including property damages), operating and maintenance costs, capital renewals, payment systems and the costs of administration.[80]

Specific Assumptions and Limitations

The limitations on the cost estimates developed for the preliminary screening process are briefly outlined below.

Project Scope

A limiting factor of the cost estimates is that project scope may change as specific projects advance towards implementation. Projects that are under development through planning studies and environmental clearance process will be reasonably well defined in terms of project scope, including typical sections and alignment. For well developed projects, some adjustments that may be needed are those required to accommodate toll collection systems, specialized signing, advance traveler information systems, back-office needs, and customer service facilities.

[80] The cost of finance is addressed in the subsequent section addressing limitations related to the financial plan.

For other less developed projects, the alignments themselves, along with the basic sections, will have to be established. For this study, it will be important to recognize that project scope may change as specific projects advance towards implementation.

Price Volatility

Construction prices have become volatile due to a wide range of factors that include local construction volume, material supply and demand, oil prices, and environmental issues. To account for this volatility, contingencies are included at the project conceptual level, and, as the design is developed, the contingencies are reduced to reflect an increasing level of confidence in the definition of the scope of the project.

At the conceptual level, cost estimates have a degree of uncertainty that is at least partially addressed by the inclusion of responsible contingencies in the estimate. To manage this limitation, it is recommended that a range of possible costs be developed for larger projects spanning several years of design and construction, and where there is a long-term risk of escalating costs over time.

The Association for the Advancement of Cost Engineering (AACE) publishes risk factors for cost estimates. These recommended accuracy factors are summarized in Table 6.1. These expected accuracy ranges reflect the limitations and uncertainty in predicting construction costs for projects in the screening, or feasibility stages. It is important to understand, however, that even Class 1 cost estimates have had variations greater than those shown here for a variety of reasons. Most recently, this has been caused by many factors, including but not limited to, high fuel costs, "China effect" (increased demand by China for steel and cement), and effects of natural disasters (short- and long-term impact of Gulf region reconstruction).

Table 6.1 AACE Expected Accuracy Ranges for Cost Estimates

Estimate Class	Level of Project Definition	End Usage	Expected Accuracy Range (L = Low; H = High)
Class 5	0% to 2%	Screening or Feasibility	L: -20% to -50% H: +30% to +100%
Class 4	1% to 15%	Concept Study or Feasibility	L: -5% to -30% H: +20% to +50%
Class 3	10% to 40%	Budget, Authorization, or Control	L:-10% to -20% H: +10% to +30%
Class 2	30% to 70%	Control or Bid/Tender	L: -5% to -15% H: +5% to +20%
Class 1	50% to 100%	Check Estimate or Bid/Tender	L:-3% to -10% H: +3% to +15%

Source: Skills & Knowledge of Cost Estimating, AACE International, Fifth Edition.

Right-of-Way Acquisition

The cost of right-of-way and property damages are a very significant component of the overall project cost, and can be subject to great uncertainty, especially if the project's anticipated construction is many years away. For projects in the conceptual stages, right-of-way costs are developed based on per square foot costs from comparable projects. As the candidate projects advance, designs can be optimized to reduce the impact and cost of new rights-of-way and property damages. Toll roads funded without use of Federal funds may be able to take advantage of advance purchase programs and/or more efficient right-of-way acquiring processes. The use of comparable projects, rather than reliance on specific project data to estimate right-of-way costs and property damages, are limitations of the conceptual level cost estimates.

Procurement and Project Delivery

For this study, cost estimates will be prepared assuming conventional design-bid-build project delivery process. In reality, other procurement methods might be used. These methods could change (usually reduce) the cost. However, it is not possible to anticipate what these savings would be without knowing which alternative procurement process is utilized.

Soft Costs and Construction Engineering/Inspection

Soft costs represent all of the design and professional fees that will accrue during the project development process and implementation phases. These costs and the costs for construction engineering/inspection need to be estimated using percentages of the construction cost estimates. For this study, the percentages will be derived from comparable projects. Since these estimates are derived as a percentage of the construction costs, these will be adjusted as the project scope is refined.

Operating, Maintenance, and Administrative Costs

Annual operating, maintenance, and administrative costs need to be estimated for the life of the proposed bond issue and escalated annually. The tolling components of these costs will be derived from comparable toll projects at existing toll agencies, while the roadway and bridge structure components will be based on established WSDOT data. A limitation of this analysis is that technology, the administrative structure of the operating agency, and the size of the system are not certain at the conceptual phase. Also, annual escalation factor can often exceed the rate of inflation, and may vary from the experience of other agencies depending on the administrative structure and technology deployed.

Capital Renewals

The cost of periodic capital renewal for major infrastructure items, such as pavement and bridges can be reasonably estimated based on life-cycle estimates. The replacements of

technology, Intelligent Transportation Systems (ITS), and payment systems are components of the capital renewal estimates. A limitation of the early cost estimates is that technology, ITS, and payment systems are not fully defined at the conceptual phase.

Technology, ITS, Payment Systems, Customer Service, and "Back Office"

Detailed specifications and building programs for these elements will not be available during the conceptual phase. Over time technology choices and the range of available options could change. Also, the "back office" functions can vary in scope and allocation to a single project, depending on whether a single project or a system of projects is evaluated. These factors are all limitations of the estimation of technology, ITS, payment systems, customer service functions, and "back office" facilities.

Schedule Limitations

The length of the construction period from the close of financing through opening of the project (and the collection of toll revenues) is a critical factor in the estimation of finance costs, when sale of bonds is used in financing the project.

In order to minimize the finance costs during construction, the schedule needs to be relatively aggressive, but at the same time responsible and achievable. The potential for weather delays and cost premiums for provisions such as liquidated damages could impact both schedule and the cost of the project.

Financial Plan

For this project, a simplified plan of finance needs to be developed in order to identify the potential bonding capacity of the toll project. To keep things simple, level debt service can be assumed, although more favorable terms can probably be achieved as more detailed finance plans are prepared as projects progress. The factors used in the finance plan used for this study, as well as when individual projects might progress, need to be based on conservative assumptions and include the cost of finance, interest rates, coverage ratios, and reserve accounts.

Most start-up toll projects today need some kind of credit enhancements and guarantees sufficient to gain an investment quality rating of BBB, or above. Absent this level of credit rating, it is practically impossible to market bonds. Even alternative finance strategies involving private equity investments are difficult to structure if the underlying credit rating would not achieve an investment grade.

Revenue guarantees from an established toll system/network can be utilized as toll equity for credit enhancement of a new toll project within that system.

Specific Assumptions and Limitations of Those Assumptions

The specific limitations of the financial plan are as discussed below.

Credit Quality

Most new stand-alone toll projects and projects undertaken by start-up agencies involve project equity contributions and guarantees for both capital investment and ongoing operations. These can take the form of project development costs, direct capital contributions, assumption of schedule risk, operating and maintenance subsidies, and ridership guarantees.

Statutory Limitations

Legislation must be in place to allow an agency to form, issue investment quality debt, and for the State to support the financing of the project at the levels necessary to achieve an investment-grade rating. An element of this study will be to review those limitations.

Debt Service Repayment

For the purposes of this project, level debt service payments may be assumed. As the candidate projects are advanced, the tolling agency will want to hire a Financial Advisor to evaluate other potential debt structures to maximize bond proceeds.

Debt Service Reserve Accounts

The finance plan needs to include debt service reserve accounts funded by the bond issue. The reserve accounts in the preliminary finance plan are usually equal to 125 percent of the average annual debt service amount. In the event that additional reserve amounts are needed to achieve an investment-grade rating, other sources of funds will be needed to create these additional reserves.

Debt Service Coverage

When projects are financed, one of the mechanisms used to protect investors from revenue risk is to require that annual revenues exceed debt service by a certain ratio. The riskier the project, the higher this ratio will be. A debt service coverage ratio range of 1.4 to 1.7 times the annual debt service repayment amount is typically required for senior lien debt. This value could be even higher for a project that is perceived to be riskier. For this study, we will apply an appropriate value to the project within this range. The use of this coverage ratio is appropriately conservative based on the start-up nature of the projects and the underlying assumption of a BBB rating.

Capitalized Interest During Construction

Interest rate payments for the period between issuance of bonds and the start-up of revenue collection need to be capitalized and included in the bond amount. As noted above, it is desirable to minimize the need to capitalize interest during construction without risking the quality of the project itself.

Cost of Finance

Finance costs include bond underwriter fees, rating agency costs, preparation of bond documents, and other costs of issuance. For this project, we will assume that the cost of issuance is 1.5 percent of the bond size. This assumes that the debt is not insured to gain a higher rating. Ultimately, an evaluation as to whether insurance costs are offset by reduced interest rates would need to be conducted by a financial advisor as the candidate projects advance and more detailed plans of finance are prepared.

Period of Finance and Interest Rates

In today's cost and finance environment, a 40-year plan of finance is most suitable for the purposes of this preliminary study. In the past, this was closer to 30 years. Most private concession contracts are now 40, 50, or in the case of the recent Chicago Skyway sale, 99 years. The interest rates used need to be commensurate with a BBB rating, plus 50 basis points. Given current conditions, we anticipate that an interest rate in the range of 5.0 to 6.0 percent is reasonable. Interest rates are volatile, and changing rates over time can impact the feasibility of projects and the financial structure. We will test the impact of higher rates to determine the impact on project finances.

Underlying Revenues

The preliminary finance plan is to be based upon the traffic and revenues that are produced as part of this preliminary study. As the candidate projects advance, more detailed, investment-grade revenue studies need to be conducted, and the plan of finance would be refined accordingly.

Project Equity and Secondary Sources of Funds

Project equity and secondary sources of funds that might include subordinate debt, Transportation Infrastructure Finance Innovation Act (TIFIA) loans,[81] or direct contributions to the project may be required in order to finance the candidate projects. The need for project equity and secondary sources can be identified in the preliminary

[81] TIFIA is a Federal program developed in Transportation Equity Act for the 21st Century (TEA-21) that provides credit enhancements to major projects. Credit enhancements could include subordinate loans or loan guarantees.

screening process, but these strategies need to be addressed in specific detail as the candidate projects advance to the preparation investment-grade revenues and more detailed plans of finance.

Implications for This Study

The overall financial feasibility approach involves screening and evaluating toll policies and candidate toll projects. The ultimate goal of these toll feasibility tests is to provide an estimate of the total project cost compared with the economic value of a candidate toll project, typically expressed as the potential for the project to be funded through bonds. Due to conservative nature of these analyses, a further fine tuning of assumptions and a more detailed screening process may be necessary before an investment-grade analysis leading to a bond sale can take place.

As the results of this study are developed, we will:

- Clearly identify key risk factors in traffic/revenue, cost, and finance;
- For each factor, make conservative assumptions for analysis; and
- Perform range of sensitivity tests for each key factor or identify level at which (say for bond interest cost) project likely to not be viable.

This will provide the audience for the work an appreciation for the risk factors and limitations of the analysis.

Section prepared by Cambridge Systematics, Inc. and PBS&J.

Background Paper #7
Tacoma Narrows Bridge Toll Policy

This contract has a separate and distinct task of addressing specific policy issues related to tolling on the Tacoma Narrows Bridge (TNB). Since the TNB is the first new toll facility to be implemented in Washington State, issues that have been raised on that project will provide insight into issues that might arise statewide.

The legislation *(ESSB 6091, Section 206, 1) (a))* mandating this study, specifically states:

> "*(a) The study must include an analysis of the only currently authorized toll facility, the Tacoma Narrows Bridge project. The study findings must include i) the development of more uniform and equitable policies regarding the distribution of financial obligations imposed on those paying the tolls on the Tacoma Narrows Bridge, and (ii) opportunities and options for reducing the outstanding indebtedness on the bridge project, including the possibility of buy-downs and other means of spreading the cost of the project more equitably*."

From discussions with Commission and Washington State Department of Transportation (WSDOT) staff, as well as discussion at the September 20, 2005 Commission meeting, we understand that the motivation behind this directive is to consider policies to reduce the amount of project funding paid directly by TNB users. To undertake this analysis, we have conducted the following tasks:

1. Describe the TNB new construction project financing, based on official documentation and Washington statutes. This analysis will consider the underlying financial arrangements, payback mechanisms, and guarantees.

2. Describe the current toll policy projected in the TNB Financial Plan and the rationale for the projected toll rates. This will involve a review of available documents and discussions with those responsible for the toll policy.

3. Describe a few alternatives for toll setting on TNB to achieve the objective of reduced financial responsibility borne by toll payers.

4. Evaluate the alternatives identified in Item 3, from the following perspective:

   – Describe the proposed alternative.

   – Quantify or describe the assumptions used to form the alternatives.

   – Develop an approach to how an alternative could be carried out in a practical sense. This might include toll collection mechanisms and fiscal considerations. As part of this, we will identify the strengths and weaknesses of each alternative.

5. Consider the results of the analysis in Item 4 from the perspective of statewide tolling policy.

This analysis gives the Commission and the Legislature the information with which to make informed policy choices on this issue.

What is Equity and Uniformity?

At the heart of this task is the directive for "*the development of* ***more uniform and equitable*** *policies regarding the distribution of financial obligations imposed on those paying the tolls on the Tacoma Narrows Bridge.*" In order to carry out this task, it is important to lay out our understanding about the meaning of the key words "*more uniform and equitable.*"

The implication of these words is that the legislature may consider the current policies to be ***less*** uniform and equitable than desired. Based on our understanding of the criticism of the current policy, we understand the concerns to be as follows:

- The Tacoma Narrows Bridge will be the only toll facility in Washington, and tolls pay for almost 100 percent of the new span.[82]
- There are other high-value/high-cost facilities in the State that are not tolled.
- Although there are tolls on the ferries, the cost of operating the ferries is subsidized by fuel tax revenue, and the cost of buying ferries is entirely subsidized by fuel tax revenue.
- Therefore, users of the TNB have been singled out for special treatment, in that they have to pay tolls, while users of other facilities do not. This is the source of the characterization of the tolls on the TNB as less uniform and equitable.

In seeking a <u>*more*</u> uniform and equitable policy, it is important to understand two constraints:

1. The financial plan for the Tacoma Narrows Bridge relies on toll collections to reimburse the motor vehicle fuel tax fund. Any change in the toll policy would require a change in the financial plan for the Tacoma Narrows Bridge.
2. Few revenue collection policies are perfectly uniform and equitable.

Some stakeholders have expressed that TNB users have been singled out in that they have to pay tolls while users of other facilities do not. This is why the proposed TNB tolls are

[82] WSDOT indicates that there are significant portions of the Tacoma Narrows Bridge projects that are paid for by tax revenues; therefore, the project is not 100 percent paid for from tolls. However, this does not change the fact that Tacoma Narrows is currently the only toll project in the State.

viewed as not being equitable or uniform. In seeking a more equitable and uniform TNB tolling policy, it should be noted that equity can be defined in various ways:[83]

- **Geographic –** Are we being treated fairly with respect to other geographic areas?
- **Income –** Are we adversely impacting low-income populations?
- **Participation –** Are we being inclusive with respect to community participation?
- **Opportunity –** Were candidate projects given equitable consideration?
- **Modal –** Are different modes of transport being treated equitably?

The equity concerns that have been raised by stakeholders on the proposed TNB tolls pertain primarily to **geographic equity**, as well as opportunity and modal equity to a limited extent. Since the bridge project was developed with extensive public participation, including extensive evaluation of alternatives, participation and opportunity equity are not really issues here. Income equity has not been raised as a particular concern.

In order to resolve geographic and opportunity equity concerns, policies to expand the use of tolls around the State should be considered. This is exactly the scope of the tolling study as a whole. If multiple tolling projects in the State are implemented, the TNB will no longer be the only toll facility in Washington. A more complete discussion of geographic equity with respect to the TNB is provided in Background Paper #4: Equity, Fairness, and Uniformity.

With respect to modal equity, the key consideration is how the TNB tolls compare to those of the Washington State Ferries. The current round trip vehicle/driver fare between Fauntleroy and Southworth is $20.60 peak and $16.40 off-peak; the round trip vehicle/driver fare between Seattle and Bremerton is $26.60 peak and $21.20 off-peak.[84] These fares do not include other passengers in addition to the driver, who are charged separately. Ferry fares are significantly higher on a per passenger basis than the TNB tolls, which currently are envisioned to be $3.00 in the opening year.

In considering potential ways that could make the TNB toll policy more uniform and equitable, we explore two types of approaches:

1. Various ways of reducing the toll amount to users of the Tacoma Narrows Bridge, both as a whole, and for particular groups; and

2. Various ways of expanding the use of tolls around the State.

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[83]See also *Background Paper #4: Equity, Fairness and Uniformity and Tolling*.

[84]Washington State Ferries web site: http://www.wsdot.wa.gov/ferries/info_desk/fares/.

About the Tacoma Narrows Bridge Project

The TNB connects the Kitsap Peninsula with the City of Tacoma on State Route 16 (SR 16). The existing TNB was completed in 1950 as a toll bridge, with a toll rate of $1.00, which is equivalent to $8.77 in 2005 dollars. Tolls were removed in 1965 after the bonds that financed the project were retired. The existing bridge has four general purpose lanes (two in each direction) and is the only roadway connection between the Kitsap Peninsula and the south and east side of Puget Sound. In 2004, the TNB carried about 86,000 vehicles per day. Ferries serving the Kitsap peninsula carried about 19,000 vehicles per day.[85] Exhibit 7.1 shows the location of the TNB project.

Exhibit 7.1 Tacoma Narrows Bridge Project Location

Source: *Tacoma Narrows Bridge Traffic and Revenue Study Update – Base Case*, Figure 1, Wilbur Smith Associates, September 2005.

[85] *Tacoma Narrows Bridge Traffic and Revenue Study Update – Base Case*, Table 1, page 2; Wilbur Smith Associates, September 2005.

The TNB project involves the construction of a new suspension bridge, adjacent to the existing bridge, to provide three eastbound lanes – two general purpose lanes and one HOV lane. The existing bridge will be reconfigured to provide three westbound lanes – also two general purpose and one HOV. The TNB project also includes improvements to 3.4 miles of SR 16 in the immediate vicinity of the bridge, from the Jackson Avenue interchange in Tacoma to a new interchange at 24th/36th Streets. The provision of additional traffic capacity; standard-width lanes and shoulders; separation of eastbound and westbound traffic; improved pedestrian and bike travel; improved interchange connections; and higher seismic design standards will help improve safety and traffic movement.[86] The TNB project is scheduled to open to the public in April 2007. The legislature has allocated $849 million for the project, which includes project development and financing costs.

The TNB project is one element of an overall corridor improvement on SR 16. The other SR 16 project elements involve widening the highway to accommodate a new HOV lane in each direction between Tacoma and Gig Harbor. These other SR 16 project costs are estimated to be another $384 million, bringing the total cost of projects in the SR 16 corridor to $1,233 million.

Tacoma Narrows Bridge Project Financial Plan

WSDOT has developed a finance plan[87] for the TNB project which assumes the sale of several rounds of general obligation bonds to fund the project. A summary of the plan is provided below.

Capital Funding Sources

In the 2002 session, the Washington State Legislature specified a funding arrangement for up to $849 million for the TNB project. Of this amount, WSDOT was authorized to arrange with the State Treasurer for the sale of up to $800 million in tax-exempt bonds, backed by the State's gas tax issued under the authority of RCW 47.10.843. Not all of the bonds will necessarily be sold. Only those amounts necessary to pay for the project and/or project financing will be offered. For planning purposes, it was assumed that bonds would sell throughout the project at an interest rate of 5.85 percent, a projected interest rate that was 50 basis points above the current market conditions at the time the projection

[86] *Tacoma Narrows Bridge Project Financial Plan Version 1.0*, page 1, WSDOT, July 2002.

[87] *Tacoma Narrows Bridge Project Financial Plan Version 1.0*, page 1, WSDOT, July 2002. Note that this plan currently is being updated by WSDOT to reflect an updated traffic and revenue study and recent trends in bond interest rates.

was made. The balance of the funds will be from state cash sources (the Motor Vehicle Fund and investment income).

In practice, the bonds are to be paid by Tacoma Narrows Bridge tolls. Details on how this works are provided below. This means that tolls will be paying for 94.2 percent of the cost of the Tacoma Narrows Bridge project itself, and 64.9 percent of the entire corridor improvement.

The capital costs are expected to be expended from FY 2002 to FY 2008. About $761 million in construction and development costs and $88 million of financing and toll preparation costs bring to the total cost to $849 million (see Table 7.1).

Table 7.1 Sources and Uses of Capital Construction Funds

State Fiscal Years 2002-2008	Millions of Dollars
Sources of Funds	
Bond Proceeds	$800
Cash Transfer from Motor Vehicle Fund	39
Investment Income	10
Total Source of Funds	**$849**
Uses of Funds	
Design-Build Contract	$615
Construction Management and Oversight	41
Project Contingency and Toll System Supply	64
Phase 1 Development Costs	41
Subtotal	**$761**
Minimum Fund Balance	6
Toll Preparation	1
Financing Costs	8
Reserve for Capitalized Interest	73
Total Uses of Funds	**$849**

Source: *Tacoma Narrows Bridge Project Financial Plan Version 1.0*, page 9, WSDOT, July 2002.

Operating Costs, Debt Service, and Toll Revenue

The revenue expected from tolling the TNB eastbound bridge, starting in 2007, will be used to serve two functions:

1. Payment of ongoing TNB operations and maintenance (O&M) costs; and

2. Payment for principal and interest on the bonds that were issued to fund the TNB project capital costs.

These cost projections, shown in Table 7.2, have been updated since the July 2002 version of the Financial Plan.

Table 7.2 TNB Project Operations and Maintenance Costs

Estimated Operations and Maintenance Costs (Millions of Dollars)				
State Fiscal Year	Toll Operating and Maintenance	Renewal and Replacement (R&R)	Deferred Sales Tax	Total Toll Operations Costs
2007[a]	$8.615	-	-	$8.615
2008	13.961	0.162	-	14.123
2009	14.370	0.251	-	14.621
2010	14.833	0.182	-	15.015
2011	15.290	0.245	-	15.535
2012	15.746	0.304	2.851	18.901
2013	16.264	0.208	5.702	22.174
2014	16.734	0.237	5.702	22.673
2015	17.206	2.193	5.702	25.101
2016	17.789	3.751	5.702	27.242
2017	18.440	2.851	5.702	26.993
2018	18.692	1.654	5.702	26.048
2019	19.170	0.724	5.702	25.596
2020	19.652	0.311	5.702	25.665
2021	20.156	0.549	5.702	26.407
2022	20.678	1.056	2.851	24.585
2023	21.219	2.486	-	23.705
2024	21.773	1.993	-	23.766
2025	22.345	0.977	-	23.322
2026	23.048	2.737	-	25.785
2027	23.687	3.877	-	27.564
2028	24.146	2.683	-	26.829
2029	24.781	1.395	-	26.176
2030	25.434	2.697	-	28.131

Source: *Toll Operations Summary*, Excel forecast spreadsheet, WSDOT, transmitted December 2005.

EHB 2723 and RCW 47.46.060 allow WSDOT to defer payment of state and local sales taxes on construction costs until five years after the commencement of tolling (FY 2012).

This tax payment method allows toll revenues to grow before the taxes are paid and is expected to help keep an opening toll rate at $3.00. The deferred sales taxes will be paid back from FY 2012 to FY 2022, as shown in the second column to the right.

The toll schedule assumed in the current finance plan involves an initial TNB toll in the eastbound direction of $3.00 per automobile in 2007, with future increases in $1.00 increments every three years until a maximum of $6.00 is reached. This base case was projected to pay off all TNB project debt service by FY 2030, as shown in Table 7.3.

Table 7.3 shows the sum of FY 2007 to FY 2030 TNB gross toll revenue as being $2.159 billion. While this represents a revision downward of 6.4 percent from the July 2002 version of the Financial Plan, TNB project debt service is still projected to be paid off by FY 2030. This is because the estimated debt service costs were revised downward by 12.0 percent due to a substantial amount of debt having been sold at lower rates than what was originally assumed.[88] The year all debt will be paid off will ultimately be determined by the final financing costs of the project and the actual toll revenue collected.[89]

Relationship Between Bonds and the Motor Vehicle Fund

Through **EHB 2723** and **RCW 47.46**, the State Legislature requires that the gas tax revenues used for debt service on bonds sold for the TNB project be reimbursed from future deposits to the Tacoma Narrows Toll Bridge account (from tolls and other revenues). Furthermore, RCW 47.56.165 (4) states that the fund must be replenished on or before each debt service date:

> *Toll charges must remain on any facility financed by bonds issued by the State for a length of time necessary to repay the motor vehicle fund for any amounts expended from that fund for the design, development, right-of-way, financing, construction, maintenance, repair, or operation of the toll facility or for amounts transferred from the motor vehicle fund to the highway bond retirement fund under RCW 47.10.847 to provide for bond retirement and interest on bonds issued for the Tacoma Narrows public-private initiative project.*

This implies that the tolls <u>must</u> stay on until all of those expenditures occur. It does not necessary say that they must be <u>taken off</u> after a specified period of time. However, RCW 47.46.110(3)(a) provides that once the Tacoma Narrows Bridge bonds are repaid, the facility must be operated as a toll free facility.

Buying down the debt on the TNB would mean that the legislature would need to appropriate funds into the MV fund specifically to pay for debt service. Funds would have to be transferred into the TNB account, then transfer them back when debt is due to reimburse the MV fund. This would be a complex arrangement but would not require any changes to underlying laws.

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[88] *TNB Financial Plan 2005 JULY Forecast*, Excel spreadsheet, WSDOT, transmitted September 2005.

[89] *Tacoma Narrows Bridge Project Financial Plan Version 1.0*, page 11, Washington State DOT, July 2002.

Table 7.3 Expected Use of TNB Toll Revenue Through 2030

Net Toll Revenue and Debt Service Coverage (Millions of Dollars)					
State Fiscal Year	Gross Toll Revenue	Projected O&M Costs and Deferred Sales Tax[b]	Net Toll Revenue[c]	Estimated Debt Service	Debt Service Coverage[d]
2007[a]	$10.215	$8.615	$1.600	(e)	0.0%
2008	43.177	14.123	29.054	21.390	135.8%
2009	45.070	14.621	30.449	30.254	100.6%
2010	53.173	15.015	38.158	37.746	101.1%
2011	61.777	15.535	46.242	44.440	104.1%
2012	63.349	18.901	44.448	42.929	103.5%
2013	72.519	22.174	50.345	48.094	104.7%
2014	82.127	22.673	59.454	56.026	106.1%
2015	84.005	25.101	58.904	55.794	105.6%
2016	92.977	27.242	65.735	62.574	105.1%
2017	101.878	26.993	74.885	71.525	104.7%
2018	103.053	26.048	77.005	74.040	104.0%
2019	104.240	25.596	78.644	76.247	103.1%
2020	105.441	25.665	79.776	78.009	102.3%
2021	106.837	26.407	80.430	79.098	101.7%
2022	108.439	24.585	83.854	82.339	101.8%
2023	110.066	23.705	86.361	84.522	102.2%
2024	111.717	23.766	87.951	85.166	103.3%
2025	113.392	23.322	90.070	87.654	102.8%
2026	114.814	25.785	89.029	86.692	102.7%
2027	115.962	27.564	88.398	86.092	102.7%
2028	117.122	26.829	90.293	87.643	103.0%
2029	118.293	26.176	92.117	89.367	103.1%
2030	119.475	28.131	91.344	88.394	103.3%

Source: *Toll Operations Summary*, Excel forecast spreadsheet, WSDOT, transmitted December 2005.

Notes: [a] It is assumed that the project will be ready for tolling April 2007. The base toll is scheduled to increase from $3.00 to $4.00 in January 2010, from $4.00 to $5.00 in January 2013, and from $5.00 to $6.00 in January 2016.

[b] O&M costs and deferred sales taxes displayed previously in Table 7.2.

[c] Gross toll revenue minus O&M costs and deferred sales taxes.

[d] Ratio of net toll revenue to debt service.

[e] Paid from escrow.

If the tolls turn out to be inadequate to meet the debt service payment schedule, the toll levels may need to be adjusted upwards or else the transfers described above would need to take place. Since the projected debt service coverage ratio through 2030 from the original Financial Plan is 1.04, the risk of inadequate toll revenue (assuming the base case toll structure) is not insignificant.

What is the Tolling Policy for the Tacoma Narrows Bridge?

The Transportation Commission is the State's tolling authority, and as such, has the responsibility of setting tolls:

> *(1) The commission shall fix the rates of toll and other charges for all toll bridges built under this chapter that are financed primarily by bonds issued by the State. Subject to RCW 47.46.090, the commission may impose and modify toll charges from time to time as conditions warrant.*[90]

A governor-appointed citizen advisory committee consisting of nine permanent residents of the affected area is to be established to provide advice to the Commission on the toll to be set.[91] As of this writing the Commission has not yet taken action on toll setting for the Tacoma Narrows Bridge. WSDOT staff advised us that the anticipated schedule of toll setting activities is as follows:

1. Governor appoints Citizen Advisory Committee (CAC): Early 2006;
2. CAC Workshops: Spring-summer 2006;
3. Transportation Commission workshops on toll setting: April and July 2006;
4. CAC recommends toll amounts to Commission no later than 90 days prior to toll commencement (about December 2006 based on an April 2007 opening);
5. Commission hearing on toll setting: January 2007; and
6. Commission sets tolls: March 2007.

Toll Rates Assumed in the Financial Plan

The Financial Plan assumes the collection of tolls from all vehicles on the new eastbound bridge, with the following conditions (see Table 7.4):

- The completed TNB project will be open to the public and tolls will be collected on the eastbound bridge starting on April 2, 2007.
- The toll rate for all vehicles will be $3.00 for all of 2007.

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[90] RCW 47.46.100.

[91] RCW 47.46.090.

- The toll rate per automobile will be $3.00 from 2007 to 2009, $4.00 from 2010 to 2012, $5.00 from 2013 to 2015, and $6.00 from 2016 on.

- Beginning in 2008, vehicles with more than two axles (i.e., autos with trailers; trucks) will be charged higher tolls than two-axle vehicles in proportion to the number of axles (capped at a maximum of six axles). For example, a four-axle vehicle is charged twice the auto toll; a vehicle with six axles or more is charged three times the auto toll.

Table 7.4 Tacoma Narrows Bridge Toll Rates Assumed in Current Financial Plan

	2007	2008-2009	2010-2012	2013-2015	2016-2030
Automobiles (Two Axles)	$3.00	$3.00	$4.00	$5.00	$6.00
Three-axle Vehicles	$3.00	$4.50	$6.00	$7.50	$9.00
Four-axle Vehicles	$3.00	$6.00	$8.00	$10.00	$12.00
Five-axle Vehicles	$3.00	$7.50	$10.00	$12.50	$15.00
Six- or More Axle Vehicles	$3.00	$9.00	$12.00	$15.00	$18.00

Source: WSDOT.

Note: The toll would apply to all vehicles that use the eastbound TNB. Automobiles with a trailer would be charged according to the total number of axles (two axles for the auto plus the axle(s) for the trailer).

Development of the initial TNB $3.00 toll and the graduated toll schedule was the result of planning, engineering, financing, and public involvement work by the United Infrastructure Washington, Inc. (UIW), their subconsultants, and WSDOT prior to the 1998 Public Advisory Election that proposed the improvements and imposition of tolls. Those conditions were maintained as the project transitioned to public financing since public expectation had been set – especially with respect to the opening toll of $3.00. The Commission has yet to take a formal action on setting the TNB tolls.

Public Attitudes Regarding TNB Tolls

A survey of 800 TNB users conducted in March 2005 by Lawrence Research regarding the TNB project found that:[92]

- Sixty percent were under the impression that the initial toll would be $3.00;
- Twenty-three percent thought the initial toll would be more than $3.00;
- Five percent thought the initial toll would be less than $3.00; and
- Twelve percent had no opinion.

The same TNB user survey also asked respondents to pick a statement that came closest to their own feelings regarding the plan to increase the toll from $3.00 to $6.00 in dollar increments every three years. The survey found that:

- Forty-six percent dislike the plan but will live with it;
- Thirty-two percent dislike the plan and intend to complain;
- Ten percent thought this was a good plan;
- Ten percent thought the plan was not a big deal; and
- Two percent had no opinion.

Evaluation of Alternative Toll Structures

Cambridge Systematics worked with the Commission and with WSDOT staff to develop several policy options that would reduce the amount of project funding that is paid directly by TNB users:

1. Reduced toll for frequent users;
2. Buying down the toll amount for everyone;
3. Subsidizing the toll during the later years of operation; and
4. Policies to expand the use of tolls around the State.

The primary rationale of policy Scenarios 1 to 3 is clearly to reduce TNB tolls for affected groups. Scenario 1 targets a specific group; Scenarios 2 and 3 are more general.

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[92] *A Study of Tacoma Narrows Bridge Users*, Lawrence Research, March 2005.

Scenario 4 is different. Rather than developing toll reductions, it looks to achieve geographic equity by expanding the use of tolls around the State. This is a potential outcome of actions that evolve from this Comprehensive Tolling Study.

Scenarios 1 to 3 are each evaluated to follow based on the following perspectives:

- **Description** – What is the illustrative toll policy being tested?
- **Equity and Uniformity –** Is the proposed policy more uniform and equitable than the base case?
- **Operational Impacts –** What effects would the proposed policy have with respect to TNB operations (i.e., toll collection and enforcement processes)?
- **Traffic Impacts –** What effects would the proposed policy have on traffic volumes?
- **Fiscal Impacts –** What effects would the proposed policy have on toll revenue, and the ability of toll revenue to pay back the motor vehicle fund for bond repayment?

In evaluating the traffic and fiscal impacts, we made use of the most recent traffic and revenue study prepared for the project:

- In August 2002, WSA prepared the *SR 16 Tacoma Narrows Bridge Traffic and Revenue Study*. Traffic and revenue projections for the expanded TNB were developed from 2007 to 2030 on the basis of data that included extensive travel pattern and trip characteristic surveys, historical traffic trends, projections of regional economic growth, and stated-preference surveys conducted by Resource Systems Group on motorists' value of time and willingness to pay tolls.[93]
- In September 2005, WSA prepared the *Tacoma Narrows Bridge Traffic and Revenue Study Update – Base Case* which updated the 2002 results by taking into account more recent traffic volume data and demographic forecasts.[94] The primary impact of the study update was a reduction in the projected traffic volumes and toll revenue due to lower experienced traffic growth than previously expected and reductions in regional employment and housing growth forecasts.

Our analysis is based on the WSA forecasts prepared in 2005. WSA projected that if the TNB toll was held at a flat rate, TNB traffic volumes and toll revenue would increase by 2.5 percent annually from 2007 to 2015, by 1.2 percent annually from 2016 to 2020, by

[93] *S.R. 16 Tacoma Narrows Bridge Traffic and Revenue Study*, Transmittal Letter page 1, Wilbur Smith Associates, August 2002.

[94] *Tacoma Narrows Bridge Traffic and Revenue Study Update – Base Case*, page 3, Wilbur Smith Associates, September 2005.

1.5 percent annually from 2021 to 2025, and by 1.0 percent annually from 2026 to 2030.[95] The forecast period for this analysis is through the year 2030, which is when the TNB bonds are projected to be paid off (i.e., all debt service payments have been made).

The WSA report also investigates the elasticity of traffic and revenue to higher toll rates. Elasticity is the percent change in traffic volumes resulting from every one percent change in the toll rate. The WSA study does not provide TNB elasticity estimates directly. However, background data provided by WSA does contain sufficient information for the elasticity to be derived.[96] The elasticity used for TNB is about -0.07, meaning that a 100 percent toll increase (i.e., doubling the toll) would result in a 7 percent drop in traffic volumes. This is relatively inelastic (a limited reduction in travel relative to the change in toll) when compared to other tolling applications, but makes sense for TNB given the absence of alternative routes in the area.

Note that WSA currently is under contract to WSDOT to study alternative toll schedules, including discounts for specific types of travelers and time-of-day pricing. These estimates were not available in time for this report.

Scenario 1: Reduced Toll for Frequent Users (TNB Discount Program)

Description

Various means to provide frequent users with a toll discount were considered. The scenario that is presented for this analysis is based on the Chesapeake Expressway Discount Program in Virginia. Users of the Chesapeake Expressway have the option to enroll in the discount program with payment of an upfront membership fee each month, and are then entitled to tolls that are significantly discounted from the regular tolls.[97]

The scenario selected for this analysis is shown in Table 7.5:

- The TNB Discount Program membership fee starts at $9.00 per month in 2007, escalating to $12.00 per month in 2010, $15.00 per month in 2013, and $18.00 per month from 2016 on.
- TNB Discount Program members are then entitled to tolls that are 50 percent of the regular TNB tolls. For two-axle automobiles, this equates to $1.50 in 2007, escalating to $2.00 in 2010, $2.50 in 2013, and $3.00 from 2016 on. For vehicles with more than two axles, the discounted toll is higher in proportion to the number of axles (capped at a maximum of six axles).

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[95] *Tacoma Narrows Bridge Traffic and Revenue Study Update – Base Case*, Table 3, page 11, Wilbur Smith Associates, September 2005.

[96] *Annual Transactions and Revenue_To Client.xls*, transmitted by WSA, November 2005.

[97] http://www.chesapeakeexpressway.com/discount.cfm.

Table 7.5 Potential TNB Toll Structure
Scenario 1: Reduced Toll for Frequent Users

	2007	2008-2009	2010-2012	2013-2015	2016-2030
Regular Toll	$3.00	$3.00	$4.00	$5.00	$6.00
Or: Monthly Membership Fee	$9.00	$9.00	$12.00	$15.00	$18.00
Plus Discounted Toll	$1.50	$1.50	$2.00	$2.50	$3.00

Source: Cambridge Systematics.

Note: Enrollment in the TNB Discount Program is voluntary. Users who enroll in the program pay an upfront membership fee each month and pay the discounted toll (instead of the regular toll) each time they cross the eastbound TNB.

Starting in 2008, vehicles with more than two axles are charged a toll in proportion to the number of axles (capped at a six-axle maximum toll). This is applicable to both the regular toll and the discounted toll.

As with the Chesapeake Expressway, enrollment in the TNB Discount Program is voluntary. In order to receive savings from enrolling in the program, users must make an average of roughly two round trips across the TNB per week (i.e., eight round trips per month). The total savings each month for users of two-axles automobiles in the year 2007 are roughly as follows:

- **Two trips per week** (8 trips per month) – $3.00 monthly savings (13%)
- **Three trips per week** (12 trips per month) – $9.00 monthly savings (25%)
- **Four trips per week** (17 trips per month) – $16.50 monthly savings (32%)
- **Five trips per week** (22 trips per month) – $24.00 monthly savings (36%)
- **More than six trips per week** (30 trips per month) – $36.00 monthly savings (40%)

Total monthly savings will increase from the year 2010 on. The percent savings will remain roughly the same.

Equity and Uniformity

By reimposing a toll on the Tacoma Narrows crossing, the State is changing the rules. For people that use the bridge infrequently the toll amount may be uncomfortable, but may not be a significant factor. For people that rely on crossing the Tacoma Narrows on a regular basis, the higher level of toll is seen by some as a burden. The discount concept in Scenario 1 is intended to mitigate this burden.

A toll system based on frequency of use is less uniform that a flat toll schedule. In terms of equity, travelers that have built their lives around crossing the Narrows without tolls

may be seen as having inequitable treatment from others around the State that can cross other bridges for no toll. It is important to remember, though, that Washington has a history of using tolls to finance bridge crossings. The current situation of having no tolls on any bridges is actually an anomaly. Depending on the decisions taken by the legislature after this study is completed, it could be that more bridge crossings will be tolled in Washington as the need to fund improvements continues.

Washington may choose to allow a frequent user discount for business reasons. Businesses often use frequent-user programs to encourage customer loyalty (such as airline clubs). Since there are no other business alternatives to the TNB (aside from the ferries, which also charge tolls, the revenue for which goes to the State), there is little case to be made on these grounds. Sometimes, frequent user discounts are used simply as a goodwill gesture. This could be an appropriate use, should the legislatures choose to do so, however as will be shown later, there is a considerable revenue shortfall that will need to be made up to accomplish this.

Operational Impacts

A range of technical and operational issues would need to be addressed if such a frequent user discount program was implemented. The key issues are described to follow.

- **Electronic Toll Collection (ETC) Accounts Only – I**mplementation of this discount should only be allowed for users whose vehicles are equipped with transponders. This is because the difficulty of tracking and accounting for individual users in the manual lanes would result in a decreased level of efficiency, require cumbersome user identification verification processes, and require extensive modifications to the electronic toll collection software system.

- **Up-Front Processing –** The toll collection system being installed at TNB does not at this time have the capability to address up-front payments to purchase an alternative toll amount. However, changes to the software application would be possible.

- **Who is Eligible for Discounts –** The revenue analysis assumed that discounts would be applied at the vehicle level – meaning that the $9.00 up front payment applies to individual vehicles, not to accounts with multiple vehicles.

In summary, although introducing volume discounts into the tolling system would require changes to the system now being designed, it would not cause significant long-term operational impacts, and the cost of these changes should not be significant in the larger scheme of the project.

Traffic and Fiscal Impacts

The 2002 WSA study found that 40.6 percent of surveyed TNB weekday trips were regular work trips, and the other 69.4 percent were for other trip purposes (mostly personal business, social, and recreation). This helps provide insight on the weekday trip frequency findings, which were as follows: [98]

- **44.2 percent of TNB round trips** involve drivers who make the trip one time a week or less. Such drivers would have no financial incentive to enroll in the TNB Discount Program.
- **9.1 percent of TNB round trips** involve drivers who make the trip two times a week, which is roughly eight to nine trips per month. Such drivers could receive monthly savings of about 13 percent by enrolling in the TNB Discount Program.
- **8.3 percent of TNB round trips** involve drivers who make the trip three times a week, which is roughly 12-13 trips per month. Such drivers could receive monthly savings of about 25 percent from the TNB Discount Program.
- **5.7 percent of TNB round trips** involve drivers who make the trip four times a week, which is roughly 17-18 trips per month. Such drivers could receive monthly savings of about 32 percent from the TNB Discount Program.
- **21.4 percent of TNB round trips** involve drivers who make the trip five times a week, which is roughly 21-22 trips per month. Such drivers could receive monthly savings of about 36 percent from the TNB Discount Program.
- **10.2 percent of TNB round trips** involve drivers who make the trip six or more times a week, which equates to 26 trips per month or more. Such drivers could receive monthly savings of about 40 percent from the TNB Discount Program.
- **1.1 percent of TNB round trips** did not have trip frequency stated. For purposes of this analysis, these trips were not assumed to be made by frequent users.

Assuming that all drivers who could receive monthly savings by enrolling in the TNB Discount Program do enroll (i.e., all drivers who make two or more round trips across the TNB per week), an estimated total of **54.7 percent of total TNB trips** would receive a frequent user discount, with the monthly discount ranging from roughly 13 to 40 percent. This is projected to result in **4.7 million more vehicle trips (+1.18 percent)** and a **$358.3 million loss in revenue (-16.14 percent)** over the 2007 to 2030 forecast period, relative to the base case tolling scenario. There also will be some additional operations costs associated with administration of a TNB Discount Program. The traffic and fiscal impacts of this scenario on an annual basis are provided in the Summary of Traffic and Fiscal Impacts section to follow.

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[98] *SR 16 Tacoma Narrows Bridge Traffic and Revenue Study*, Tables 10 and 11, pages 23-24, Wilbur Smith Associates, August 2002.

Scenarios 2 and 3: Buying Down the Toll Amount for Everyone, or Subsidizing the Toll During the Later Years of Operation

Description

Scenario 2 involves starting with a $2.00 toll in 2007, then raising the toll in $1.00 increments every three years until it becomes $5.00 in 2016, after which it would remain flat. Relative to the base case tolling scenario, this keeps the auto toll amount lower by $1.00 throughout the 2007 to 2030 forecast period. As with the base case, the toll for vehicles with more than two axles would be higher in proportion to the number of axles starting in 2008 (capped at a six-axle maximum toll).

Scenario 3 involves starting with a $3.00 toll in 2007, then keeping the toll fixed at $3.00 through 2030 rather than having the toll escalate over time. The toll for vehicles with more than two axles would be higher starting in 2008.

Equity and Uniformity

As with the base case tolling scenario, Scenarios 2 and 3 provide a toll structure that has a uniform axle-based toll for all vehicles. These scenarios offer a lower average toll to travelers than the base case over the 2007 to 2030 forecast period. This gets the cost closer to the "free" level that other drivers experience currently on other highways and bridges, and is more equitable from that perspective. This distinction would change, however, if additional toll projects, especially for bridges, were developed in Washington.

Operational Impacts

These scenarios have no particular operational impacts that differentiate them from the base case tolling scenario.

Traffic and Fiscal Impacts

With Scenario 2, the TNB toll for autos would be $1.00 lower than the base case when the new bridge opens in 2007, and would stay $1.00 lower through 2030. Doing this is projected to result in **5.5 million more vehicle trips (+1.38 percent)** and a **$391.0 million loss in revenue (-17.61 percent)** over the 2007 to 2030 forecast period.

With Scenario 3, the TNB toll for autos would stay fixed at $3.00 through 2030. Doing so is projected to result in **11.5 million more vehicle trips (+2.87 percent)** and a **$941.7 million loss in revenue (-42.41 percent)** over the 2007 to 2030 forecast period.

The annual traffic and fiscal impacts of these scenarios are provided next in the "Summary of Traffic and Fiscal Impacts" section.

Summary of Traffic and Fiscal Impacts

Table 7.6 shows the projected annual traffic volumes of Scenarios 1 to 3 from 2007 to 2030, as compared to the base case. The scenarios are sorted in order, with the base case having the lowest total traffic volumes and Scenario 3 having the highest.

Table 7.6 Annual Traffic Volumes by Scenario

Year	Base Case: $3.00 Toll Ramping to $6.00 Toll	Scenario 1: TNB Discount Program	Scenario 2: Buy-down Toll by $1.00 Each Year	Scenario 3: Toll Constant at $3.00
2007	10,525,171	10,649,820	10,770,733	10,525,171
2008	14,311,316	14,480,804	14,645,213	14,311,316
2009	14,670,159	14,843,897	15,012,429	14,670,159
2010	14,709,500	14,883,704	14,966,916	14,966,916
2011	15,084,126	15,262,766	15,348,098	15,348,098
2012	15,468,292	15,651,483	15,738,987	15,738,987
2013	15,663,846	15,849,353	15,883,140	16,102,434
2014	16,022,077	16,211,826	16,246,386	16,470,695
2015	16,388,500	16,582,588	16,617,939	16,847,378
2016	16,281,976	16,474,803	16,471,970	16,851,845
2017	16,469,589	16,664,638	16,661,773	17,046,025
2018	16,659,364	16,856,661	16,853,763	17,242,442
2019	16,851,326	17,050,896	17,047,964	17,441,123
2020	17,045,500	17,247,369	17,244,404	17,642,093
2021	17,301,183	17,506,080	17,503,070	17,906,724
2022	17,560,700	17,768,671	17,765,616	18,175,325
2023	17,824,111	18,035,201	18,032,100	18,447,955
2024	18,091,472	18,305,729	18,302,582	18,724,674
2025	18,362,844	18,580,315	18,577,121	19,005,544
2026	18,546,473	18,766,118	18,762,892	19,195,599
2027	18,371,938	18,953,779	18,950,521	19,387,555
2028	18,919,257	19,143,317	19,140,026	19,581,431
2029	19,108,450	19,334,750	19,331,426	19,777,245
2030	19,299,534	19,528,098	19,524,740	19,975,018
Total	**399,896,705**	**404,632,666**	**405,399,809**	**411,381,752**

Table 7.7 shows the projected annual toll revenue of Scenarios 1 to 3 from 2007 to 2030, as compared to the base case. The scenarios are sorted in order, with the base case having the highest total toll revenue and Scenario 3 having the lowest. While Scenarios 1 to 3 all have higher traffic volumes than the base case, the average toll paid per vehicle is lower which has a net result of lower toll revenue.

Table 7.7 Annual Toll Revenue by Scenario

Year	Base Case: $3.00 Toll Ramping to $6.00 Toll	Scenario 1: TNB Discount Program	Scenario 2: Buy-down Toll by $1.00 Each Year	Scenario 3: Toll Constant at $3.00
2007	$31,575,512	$26,480,497	$21,541,467	$31,575,512
2008	$44,522,503	$37,338,365	$30,374,172	$44,522,503
2009	$45,638,865	$38,274,591	$31,135,777	$45,638,865
2010	$61,015,006	$51,169,642	$46,562,076	$46,562,076
2011	$62,568,953	$52,472,845	$47,747,932	$47,747,932
2012	$64,162,477	$53,809,238	$48,963,990	$48,963,990
2013	$81,217,044	$68,111,886	$65,883,266	$50,094,673
2014	$83,074,469	$69,669,597	$67,390,009	$51,240,332
2015	$84,974,373	$71,262,933	$68,931,211	$52,412,193
2016	$101,306,455	$84,959,675	$85,407,167	$52,426,091
2017	$102,473,785	$85,938,645	$86,391,293	$53,030,184
2018	$103,654,565	$86,928,895	$87,386,759	$53,641,238
2019	$104,848,952	$87,930,556	$88,393,695	$54,259,333
2020	$106,057,101	$88,943,758	$89,412,234	$54,884,550
2021	$107,647,958	$90,277,915	$90,753,418	$55,707,818
2022	$109,262,677	$91,632,083	$92,114,719	$56,543,435
2023	$110,901,617	$93,006,565	$93,496,440	$57,391,587
2024	$112,565,141	$94,401,663	$94,898,887	$58,252,461
2025	$114,253,618	$95,817,688	$96,322,370	$59,126,248
2026	$115,396,155	$96,775,865	$97,285,594	$59,717,510
2027	$116,550,116	$97,743,623	$98,258,450	$60,314,685
2028	$117,715,617	$98,721,060	$99,241,034	$60,917,832
2029	$188,892,773	$99,708,270	$100,233,444	$61,527,010
2030	$120,081,701	$100,705,353	$101,235,779	$62,142,280
Total	**$2,220,357,433**	**$1,862,081,207**	**$1,829,361,183**	**$1,278,640,337**

Table 7.8 shows the 2007 to 2030 summary results of Scenarios 1 to 3, as compared to the base case scenario. As indicated previously, Scenario 3 has the largest projected changes from the base case, both in terms of increased traffic volumes and decreased toll revenue.

Table 7.8 Estimated Changes in Traffic and Revenue by Toll-Reduction Scenario
Cumulative from 2007-2030

	Base Case: $3.00 Toll Ramping to $6.00 Toll	Scenario 1: TNB Discount Program	Scenario 2: Buy-down Toll by $1.00 Each Year	Scenario 3: Toll Constant at $3.00
Traffic Volumes	399,896,705	404,632,666	405,399,809	411,381,752
# Change		4,735,961	5,503,105	11,485,048
% Change		1.18%	1.38%	2.87%
Toll Revenue	$2,220,357,433	$1,862,081,207	$1,829,361,183	$1,278,640,337
# Change		-$358,276,226	-$390,996,251	-$941,717,096
% Change		-16.14%	-17.61%	-42.41%

Conclusions

Any scenario that reduces the amount of TNB toll revenue collected would require that the Legislature find substitute funding to cover the lost toll revenue. In summary, our analysis of the Tacoma Narrows Bridge Toll Policy by scenario found that:

- **Scenario 1**, involving frequent user discounts through an up-front monthly payment should be feasible to develop and administer. It would create a toll system that is less uniform than the flat toll system now proposed, but does provide some toll relief to those that use the bridge more frequently. Some basis for this policy could be made from the perspective of a goodwill gesture. The roughly 16 percent in lost toll revenue would need to be made up through legislative appropriations.

- **Scenarios 2 and 3** both involve reduction in tolls, and would create significant cash flow shortfalls that would have to be made up from other sources. Under current conditions, where there are no other tolls in the State, the buydowns could be seen as generating a more equitable transportation funding system, bringing the tolls closer to zero. However, in the longer-term perspective of how major bridge crossings have been funded in Washington, bridge tolls remain an appropriate mechanism. As long

as future bridge projects continue to be advanced through the use of tolling, the current rates are equitable.

- **Scenario 4** does not involve any changes to the toll rate on the Tacoma Narrows Bridge. Rather, it relies on future policy decisions that might be made by the legislature. If significant use of tolls is advanced to fund major projects in Washington, then customers of the Tacoma Narrows Bridge will no longer be a special case. This is not to say that there might not be details to be worked out related to equitable toll amounts on future toll projects, but that issue is being addressed in the remainder of the tolling study.

Section prepared by Cambridge Systematics, Inc., with assistance from Frank Wilson and Associates and the Texas Transportation Institute.

Background Paper #8
Toll Technology Considerations, Opportunities, and Risks

Introduction

This report focuses on the technology required to support the collection of tolls, both manual and electronic, for the range of potential toll facilities under consideration in Washington State. We describe the different types of toll collection methods, how they are applied to various toll facilities, note lessons learned from past experiences, and identify the advantages and disadvantages.

Toll Collection Technology Overview

The appropriate combination of technology and operational procedures is needed to meet the functional requirements of the emerging tolling program in Washington State. Furthermore, the combination also must provide a path for migration from a single facility to multiple facilities, and be able to evolve along with changes in technology. Toll collection, in all of its forms, consists of the following five primary components:

1. **Setting the Toll Rate.** The toll rate must be determined, and the fees clearly conveyed to the user. Traditionally, tolls are fixed amounts based upon vehicle characteristics such as number of axles. Tolls can be assessed at a point on a road, or based upon the distance traveled. Advances in traffic conditions monitoring now allow toll rates to vary based on the level of congestion.

2. **Collecting the Toll.** Toll collection can involve a direct cash transfer at a toll booth or a transfer of data via electronic technology, with actual money changing hands through other means. Either way, it is necessary to ensure the correct toll is collected, and that user and collector fraud is discouraged.

3. **Enforcement against Violations.** Although most users want to be honest, some will try to evade payment. Like any business, toll collection enterprises must identify, quantify, and mitigate these potential losses. The primary goal of enforcement is to ensure that there is an acceptable level of compliance, and enforcement efforts are fair and consistent.

4. **Management and Accounting.** Finally, toll collection, audit, accounting, maintenance, security, customer service, and enforcement must be managed, with a full accounting of all revenue and costs associated with the operation.

5. **Interoperability.** As customers use different toll facilities in the State, they have an expectation that electronic toll collection mechanisms will be fully compatible at all toll facilities.

The remainder of this section provides an overview of the basics of toll collection technology.

Manual Toll Collection

Until somewhat recently, the most common approach for collecting tolls was to have the driver stop and pay a toll collector sitting in a tollbooth. The toll collector determines the amount to be paid by each vehicle based upon its characteristics or classification. Generally, vehicle sensors (called Automatic Vehicle Classification) are used to crosscheck these characteristics against the toll collected by the toll attendant. Enforcement was mainly addressed by the use of gates that were raised after the toll was paid. Manual lanes can accept an extensive variety of payment means, such as cash, checks, credit/debit cards, and smart cards.

A manual lane can process approximately 400 vehicles per hour in comparison to a free-flow freeway lane, with capacity approaching 2,000 vehicles per hour. Meeting peak-period demand required the construction of large toll plazas as illustrated in Exhibit 8.1. Traffic demand, coupled with the need for each vehicle to stop, still resulted in significant congestion at many of these toll plazas.

An early attempt to improve productivity and reduce labor costs involved installing Automatic Coin Machines (ACM) for accepting coin payments in an unattended lane. These lanes can process 600 vehicles per hour for lower value tolls (under $1.00). Again, gates were used as the primary method of ensuring payment. As toll rates increased, the ACM offered less benefit. Newer deployments at lower-volume locations have incorporated automatic card payment machines for payment by credit/debit cards and smart cards.

Electronic Toll Collection (ETC)

Automatic Vehicle Identification (AVI) technology can accurately identify a specific vehicle at highway speeds, thereby, enabling a wide variety of ETC applications. In its basic form, a vehicle passing through a toll collection point has its identification device read, after which the toll is deducted from the customer's preexisting account or the customer is sent an invoice. The driver pays the toll without stopping and tollbooths are not required. ETC also determines whether the cars passing are enrolled in the program, and gathers information on the vehicle for further collection or enforcement action.

Exhibit 8.1 Typical Traditional Toll Plaza
George Washington Bridge

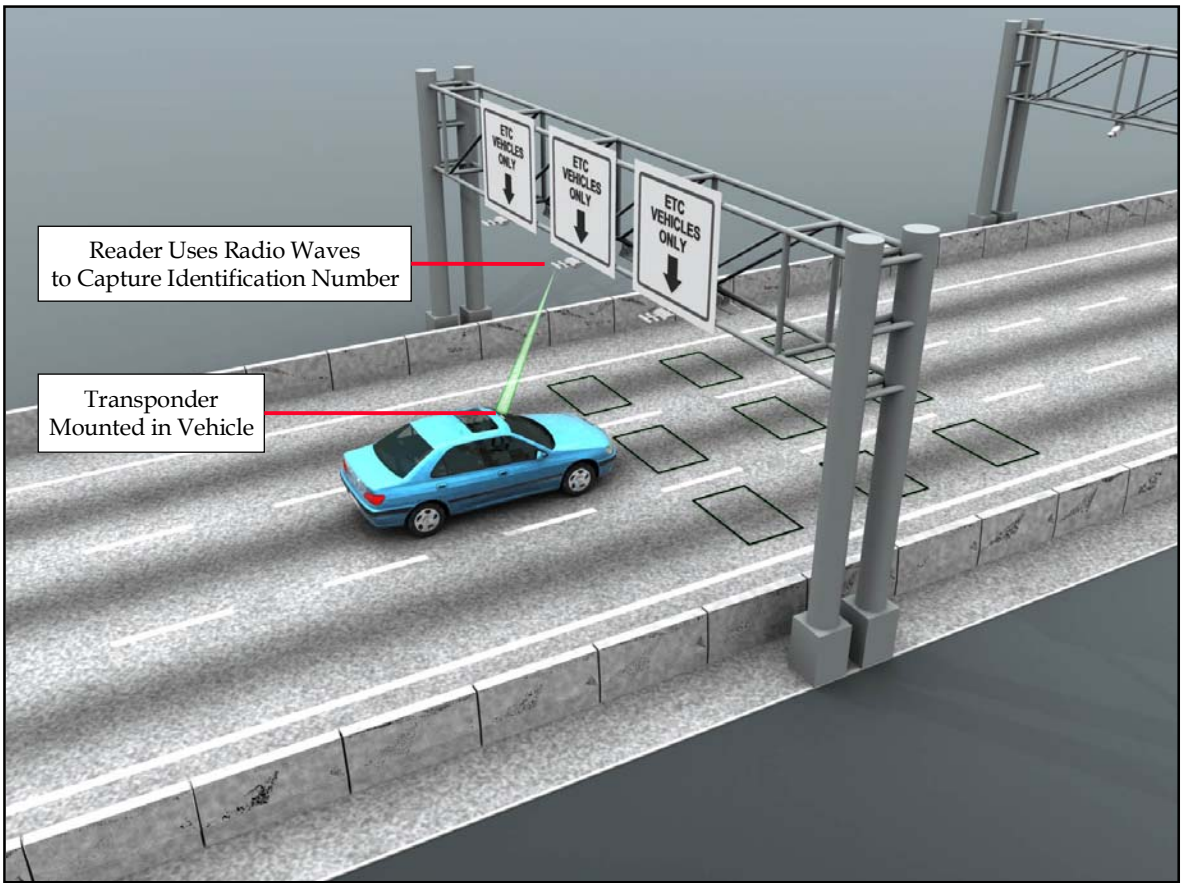
ETC systems incorporate four major components, namely AVI, Automated Vehicle Classification (AVC), Customer Service, and Violation Enforcement. Each component is described below.

Automated Vehicle Identification (AVI)

The automatic identification of a vehicle involves the transmission of an identification code between an in-vehicle device and a roadside reader. Vehicles are identified at fixed points along the roadway as shown in Exhibit 8.2. The in-vehicle device, called a transponder, is a Radio Frequency Identification (RFID) unit that transmits radio signals. The transponder is a two-way radio with a microprocessor, operating in the 900 MHz radio frequency band (within the United States) using dedicated short-range

communication (DSRC) protocols. Stored in this RFID transponder is basic information, such as an identification number, toll facility, vehicle type, etc. The roadside electronic readers use antennas to emit radio frequencies that communicate with the transponder. These two devices, the transponder and the roadside reader, interact to complete the transaction. For ETC, the vehicle identification number is linked to the customer's account from which the appropriate toll is automatically deducted or the customer is billed.

Exhibit 8.2 Automatic Vehicle Identification
Identification Number Used to Charge Customer



Transponders have additional common characteristics:

- Transponders can be read-only or read-write. Read-write transponders allow information to be sent back to and stored on the transponder (e.g., the last time that the transponder was read).

- Nonbattery transponders use radio wave energy to "bounce" information back to the reader. Nonbattery transponders have an "official" life of 15 years but could theoretically last forever.

- Battery transponders can incorporate lights, audible tones, or LED displays that provide information to the driver. However, the initial cost is higher and the overall life-cycle cost is increased because of the need to replace batteries or the entire transponder. Most toll agencies are phasing out transponders that provide driver feedback.

- Transponders, until recently, have been packaged in small plastic cases that are generally mounted with Velcro strips to the windshield of a vehicle. The case is required for the internal electronics, battery and any lights or tones. Recently, nonbattery-powered transponders are packaged as stickers (or decals) that are applied to the windshield of a vehicle.

- Transponders used for high-speed toll collection can range in cost from $10.00 to $40.00 apiece. Most battery powered transponders used for toll collection application range from $20.00 to $35.00 per unit. The sticker tags cost approximately $10.00 per unit.

Over the years, various agencies have expressed an interest in using transponder technology as electronic license plates. There are available transponder models that can be attached to the license plate frame for exterior mounting. This concept is technically feasible, but has policy and cost implication. The decision to install transponders on all vehicles raises privacy concerns. The cost of equipping all vehicles is certainly higher than the cost of equipping vehicles that would use the nearer term toll facilities. The transponders that can be mounted on license plates are more expensive than the newer sticker transponders.

Recently, policy considerations have suggested that vehicles that generate reduced emissions should pay reduced tolls. The identification of "green" vehicles can be accomplished through the use of transponders.

While transponders have many common features, the deployment of five different DSRC protocols for electronic toll collection in the United States have significant impact on interoperability. These deployments are generally geographically separated with limited need for interoperability initially. However, the lack of interoperability among these AVI technologies has been recognized as a significant problem. Accordingly, U.S. Department of Transportation (DOT) has commissioned a consortium of the major transponder manufacturers to develop a national DSRC standard. The device is being built around a newly allocated radio frequency (5.9 GHz) and the specific requirements of DSRC for transportation applications. The new DSRC transponder should be available for testing in early 2006, with a deployment decision by the U.S. DOT and the automotive industry expected in 2008. The new transponders could be part of new vehicles shortly after 2010. This means that it will take until at least 20 years for transponders to be incorporated into

all U.S. autos, since it takes approximately 15 years for the entire America car fleet to turn over.

To bridge this gap between available and future technology, the Washington State DOT has:

- Selected the e-Go™, battery-less, sticker transponders from a single vendor as the primary AVI technology for ETC in the State;
- Installed dual DSRC protocol readers to allow the reading of the existing battery powered, transponders installed on commercial vehicles participating in the WSDOT electronic weigh station bypass program, in addition to the e-Go™ tags; and,
- Developed and implemented a plan for migrating to the new U.S. standard 5.9 GHz transponder so that multiple vendors can supply a standard toll transponder to the State in the future.

Other Approaches to Vehicle Identification

Another approach is to install a Global Positioning System (GPS) in a vehicle to locate itself within a given charge area or network. The on-board unit will contain the appropriate charging structure, as well as information concerning when the vehicle should be charged. Charges are applied using the position information provided by the GPS system. The charge can either be deducted directly from a smart card located in the on-board unit or stored for later uploading and charging against the customers account or billing the customer. Charged corridors can be defined around specific zones in urban or rural areas where all vehicles (or specific categories) using the roadway will be subject to charges. The cost of the on-board units is estimated at between $200 and $400, depending on the level of sophistication of the device.

Vehicle location pricing technology is being used for truck tolling systems in Germany and Switzerland. The Puget Sound Regional Council (PSRC) is conducting a demonstration of value pricing using this approach. The intent of this pilot project is to determine traveler response to value pricing and the effect of pricing on traveler decision-making, and to help identify a potential path towards implementation. This technical approach is better suited to regional pricing applications as opposed to facility-based tolling.

A third approach to vehicle identification involves the use of License Plate Readers to capture an electronic image of a vehicle's license plate. This information is used to charge the accounts of customers who have registered vehicles in advance. For vehicles that are not registered, this license plate number is used to determine the owner's name and address. The owner is then sent an invoice for the toll and a service fee. Highway 407 in Toronto uses a combination of transponders for regular customers and license plate readers for infrequent users to collect tolls. There are no tollbooths on this facility. Some facilities allow infrequent users to register their vehicle for the day over the telephone or

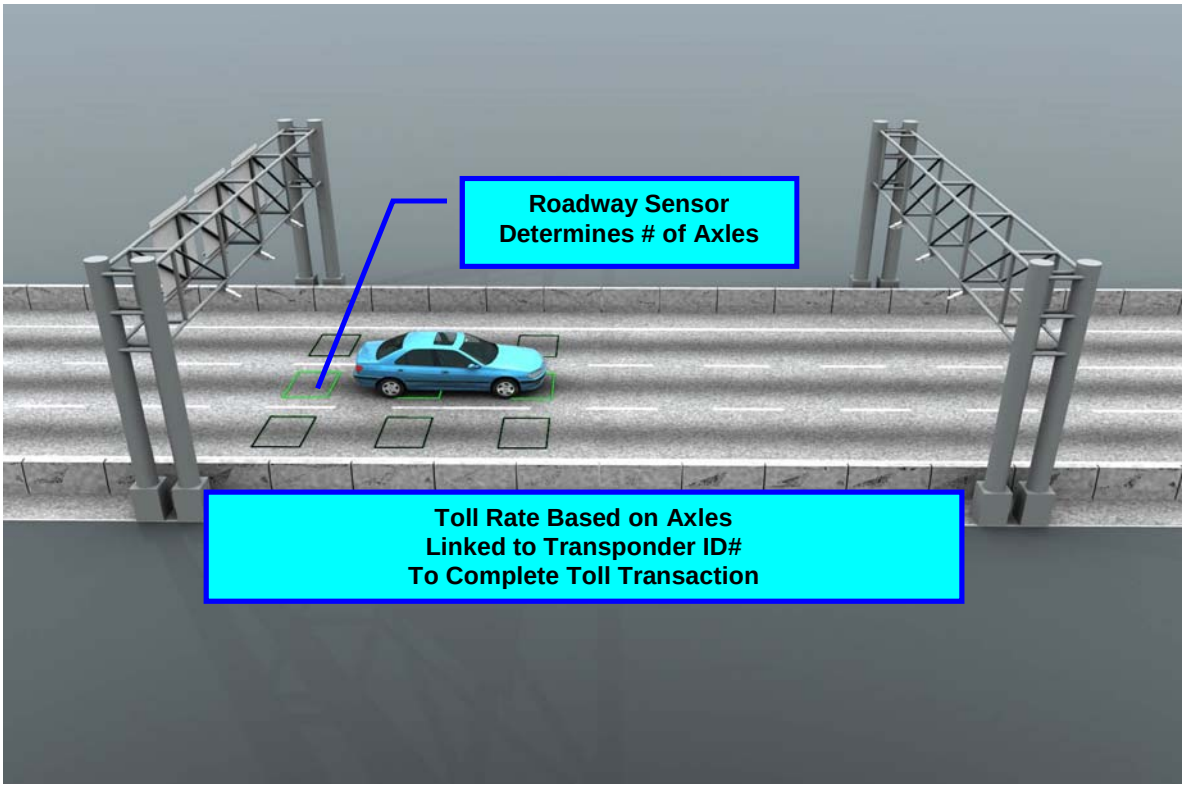
Internet to pay their toll. This reduces the administrative cost of finding the owner and sending an invoice.

Automated Vehicle Classification (AVC)

The inherent potential for fraud on the part of toll collectors led to the deployment of vehicle sensor technology that can classify a vehicle based upon its characteristics. The number of axles is the most common vehicle toll classification scheme. AVC equipment can provide a check on manual toll collection and determine the proper vehicle classification for electronic toll collection. AVC equipment has been demonstrated to work at highway speed and under congested traffic conditions.

A variety of vehicle sensors are used. Treadles count the number of axles as a vehicle passes over them. Light-curtains and laser profilers record the shape of the vehicle, which can help distinguish trucks and trailers. Advanced Inductive Loop sensors embedded in the road surface can determine length, speed, and number of axles of vehicles at highway speeds as illustrated in Exhibit 8.3.

Exhibit 8.3 Automatic Vehicle Classification



Customer Service

Customer service may be provided at a physical customer service center, by telephone, or over the Internet. Most customer service operations provide for all three. The functions of the customer service center include:

- **Creation and Maintenance of Customer Accounts –** The customer service center is responsible for the creation and maintenance of customer accounts, adding funds, and assisting customers with account questions.

- **Issuing Transponders –** The customer service center assigns a transponder to each vehicle under a given account. These transponders must be requested from the toll authority's tag warehouse and tracked as inventory. Once assigned to an account, the status of the transponder (active, inactive, lost/stolen, etc.) becomes part of a customer's account history. For accounts opened via mail or online, the customer service center may mail transponders to customers along with instructions on installation.

- **Accounting –** There is a significant financial element to the customer service center, in regards to accurate reconciliation of toll transactions and payments against customer accounts. Customer account balances are constantly fluctuating in real time as a result of toll transactions, automatic replenishment via credit cards and/or bank account transfers, customer invoicing, and in-person transactions at the customer service center.

Typically, an individual toll authority serves a single region or facility, resulting in multiple authorities and multiple customer service centers across a given state. In order to provide a more seamless customer experience, these disparate toll authorities frequently work together to interface their systems to accept transponder transactions from each other's customers, and to reconcile these transactions "behind the scenes" via a financial clearinghouse. In launching a new statewide tolling program, there is the opportunity to provide toll patrons with a single point of contact (one telephone number, one web site, one account) for their toll accounts.

Many auto manufacturers will be installing transponders as factory equipment in new cars because of the anticipated adoption of the national DSRC standard. These transponders will go far beyond toll payment, potentially to include a wide variety of retail (such as drive-through restaurant service), traveler information, and road safety applications. Essentially, these transponders would function as an in-vehicle credit card, with the likely expectation from the customer that they will receive a single invoice for all of their in-vehicle transactions. With built-in transponders, the state tolling authority would interface with a third-party service provider to bill each customer's account.

Violation Enforcement

Manual toll collection operations sometimes use gates in toll lanes to discourage drivers from driving straight through and not paying the toll. Other systems rely on toll collectors noting the license plate numbers of violators. Some operations work on the honor system, with spot enforcement by police.

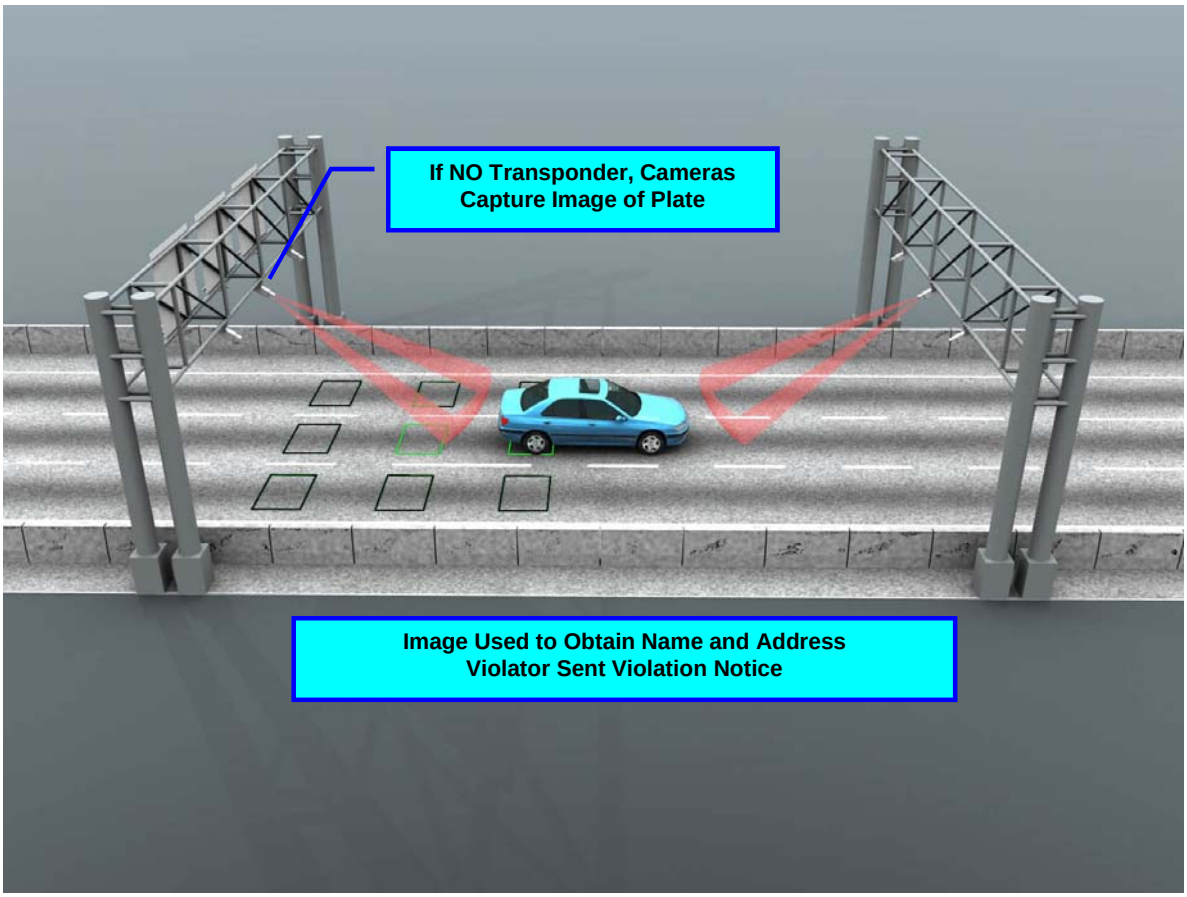
The introduction of ETC without gates and toll collectors has resulted in the deployment of technology to automatically identify toll evaders and demand the payment of the required tolls. The primary goal of enforcement is to ensure that there is an acceptable level of compliance, and enforcement efforts are considered to be fair and consistent. The following are the key elements of violation enforcement:

- **License Plate Image Capture –** When a vehicle fails to pay the correct toll at either a manual or electronic toll collection point, cameras installed at the lane electronically capture images of the vehicle's license plate. The cameras are configured to capture license plates from the full range of vehicle makes and models, to zoom in only on the plate itself, and to capture multiple photos so as to improve the probability of a legible image. Washington State law allows images of the vehicle or the license plate to be used in photo enforcement activities. In-lane image capture for violations enforcement is show in Exhibit 8.4.

- **Name and Address Acquisition –** Critical to the collection of outstanding tolls, fees, and fines is determining the name and address of the toll evader. Using the license plate number obtained from the image of the toll evader's vehicle, an electronic request is made to the appropriate Department of Motor Vehicles (DMV) or other source to obtain the registered owner's name and address. According to the U.S. Bureau of Census, 17 percent of Americans change their residence every year. As a result, hit rates for successfully obtaining current names and addresses from the DMV are generally between 80 percent and 90 percent. The effort is compounded for out-of-state vehicles and vehicles from Canada. The implication is that, for a certain portion of violators, it will not be possible to mail them a notice to request payment.

- **Violator Payment –** Experiences from other toll authorities and similar programs (e.g., parking tickets) indicate that most people will pay their toll and service processing fees upon receipt of a demand letter. At this point, monies collected are remitted to the toll authority. A second means of enforcement for in-state violators is placing a hold on annual vehicle registration renewal process until outstanding tolls and related fees are paid. However, a certain portion will continue to violate. Additional focused efforts to identify and locate flagrant violators will be required for all types of toll facilities.

Exhibit 8.4 In-Lane Violation Enforcement



- **Legal System Interfaces –** While the laws and legalities surrounding the collection of delinquent tolls vary from state to state, at some point, toll violations become a citable offense, generally under traffic or parking laws and regulations. For legal enforcement of toll violations, toll authorities must look to law enforcement officers and the local courts. In jurisdictions where citations may be issued electronically, officers may review an online "evidence package" that includes the photo(s) of the violator's license plate, the date and time of the violation, and the violator's name and address. The officer can use an electronic signature to sign the citation, which is then printed and mailed by the toll authority. This mitigates the resource demands placed on the officers for reviewing citations.

  As with any traffic or parking ticket, some violators will wish to appeal the citation to the courts. New tolling authorities must work with local courts to determine the legal, technical, and resource-related issues surrounding toll enforcement, in terms of how toll violations will be processed in the court computer system, what are the evidentiary requirements, and what is a reasonable violation penalty. The penalty must effectively discourage violators without being so harsh as to potentially tax the resources of the courts with a large number of appeals.

The enforcement program will need to be balanced against the desire to bring more travelers into compliance. Many toll agencies are initially treating violators as potential customers before they start aggressive enforcement measures. The initial enforcement efforts at Tacoma Narrows Bridge (TNB) will be a mixture of education and enforcement.

Interestingly, while the toll authority usually bears the cost of enforcement, the money collected from traffic or parking fines is distributed to the general fund, courts, relevant local jurisdictions, and enforcement agencies, and not the toll authority. Therefore, enforcement costs are a real cost to the toll authority, not completely offset by revenue collection.

Interoperability

The deployment of ETC is well established in North America and overseas. The E-ZPass Program, under the Interagency Group in the eastern part of the United States, involves over 20 separate toll agencies and 11 million transponders. The FasTrak Program in California has over 1.25 million transponders and is statewide. Out of this experience, key customer service expectations have been identified based upon experience at other toll facilities, and market research, including surveys and focus groups.

- **One "Gizmo"** – Only one on-board device (i.e., transponder) would be required in the customer's vehicle for electronic toll collection payment;
- **One Number –** A single customer service telephone number would be available for all tolling customer inquiries; and
- **One Statement –** A consolidated statement would be provided to the customer for all activity at all tolling facilities.

Interoperability issues are in play at several levels.

At the **transponder level**, a customer can use the same physical transponder on all of the interoperable facilities, but the customer must set up a separate account with each agency or facility. This approach is used for electronic weigh station bypass programs, where trucks are equipped with the same transponder, but must register for the program that is used by a specific state. For example, the program in Washington State uses the same transponder for the program in California, but the trucker must be registered with both programs.

Peer-to-Peer interoperability means that separate customer service centers are maintained by agencies that have agreed that they will exchange transactions and account files so that the customer has only one transponder and one account. However, for transaction and violation inquiries, customers may be required to deal with separate customer service centers, depending on the facility that they used. The E-ZPass Program, which extends from Maine to Virginia with over 20 separate toll agencies and 11 million transponders, is an excellent example of the successful implementation of a Peer-to-Peer approach.

Consolidated Operations is the ultimate form of interoperability. It establishes a single customer service organization where there is one account, one system, and one point of contact. The single consolidated operations approach has evolved in many areas, because of the potential cost savings and the provision of consolidated customer service. A recent example is the consolidation of systems and customer service centers in the San Francisco Bay Area from two to one.

Open Road Tolling

Open Road Tolling (ORT) is defined as the collection of tolls by purely electronic means, through the installation of gantry-based electronic tolling and enforcement systems designed to enable unhindered passage of vehicles through the toll gantry at normal highway speeds. ORT is ETC toll collection without any toll plazas. ORT provides the technological approach to enabling the use of pricing for traffic management without requiring vehicles to stop and pay a toll. Exhibit 8.5 illustrates an operational installation in Chile.

The key to ORT is that each vehicle can be uniquely identified as it passes a charging point. In most existing schemes, vehicles are identified via an electronic transponder, which is mounted inside vehicle windshields.

Vehicles without a tag are identified by a video image of the license plate, which is then checked against a record of ETC account holders, or vehicles registered by drivers who have paid a toll over the telephone or Internet. Identifying vehicles and collecting tolls via license plate images is called "pay by plate." License plates that cannot be reconciled to an account and have not registered are identified as violators and processed accordingly.

To avoid the need for transponders, some systems, notably the London Congestion Charge scheme, use Automatic Number Plate Recognition (ANPR). Here, a system of cameras captures images of vehicles passing through tolled areas, and the image of the license plate is extracted and used to identify the vehicle. This allows customers to use the facility without any advance interaction with the toll agency. The disadvantage is that fully automatic recognition has a significant error rate, leading to billing errors. Systems that incorporate a manual review stage have much lower error rates, but require a continuing staffing expense.

Example ORT Implementations

- *SR 91 Express Lane in California USA, opened in 1995;*
- *Westpark Tollway in Houston Texas, opened in 2004;*
- *Highway 407 in Toronto Canada, opened in 1997;*
- *Melbourne City Link in Australia, opened in 2000;*
- *Cross Israel Highway, opened in mid 2002;*
- *Autopista Central in Santiago Chile, opened at the end of 2004;*
- *Costanera Norte in Santiago Chile, opened in April 2005;*
- *Vespucio Sur in Santiago Chile, to be opened at the beginning of 2006; and*
- *Vespucio Norte Express in Santiago Chile, to be opened at the beginning of 2006.*

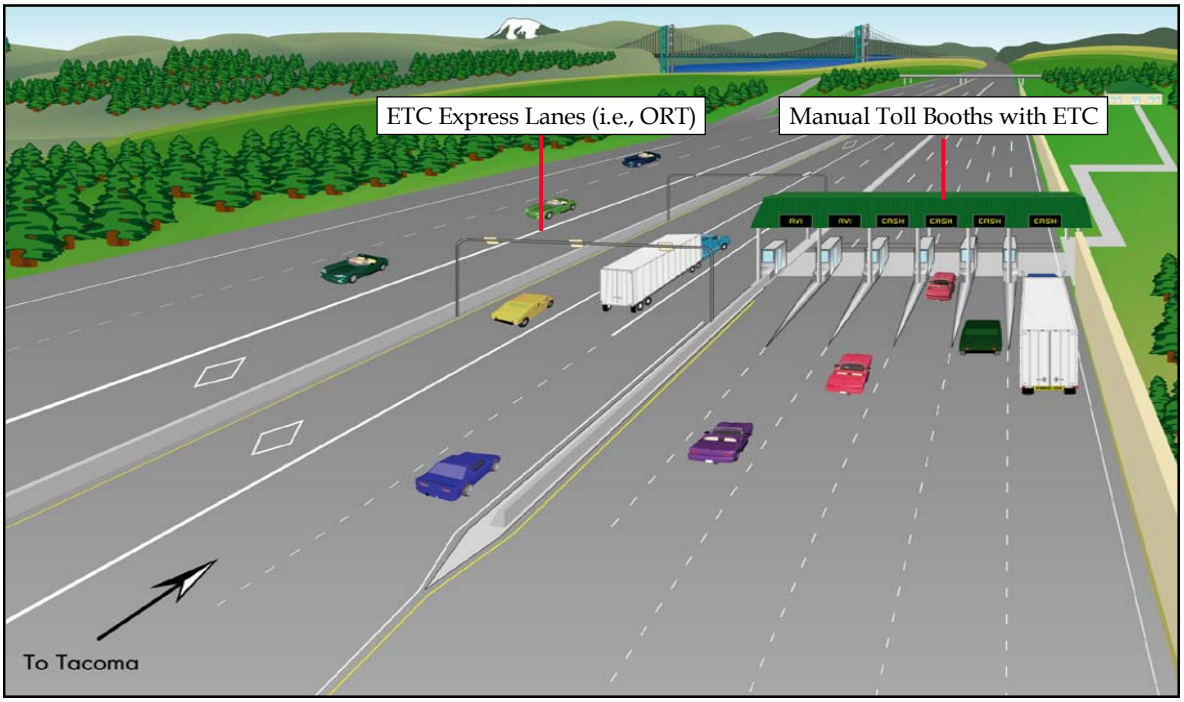
Exhibit 8.5 ORT Gantry Installed on the Santiago Urban Concessions in Chile

The primary challenge with ORT is finding the balance between transponder and image payment methods. Transponders enable the means to pay tolls without requiring human intervention in the payment processing. The use of ANPR requires customer service staff to review images to ensure that the correct customer in charged for the toll. While optical character recognition technology automates much of work in determining license plate numbers, accuracy and quality control do require this level of review. Experience has shown the image processing costs are higher per transaction than transponder-based toll collection.

Electronic Tolling at Tacoma Narrows Bridge

The planning for toll collection at the Tacoma Narrows Bridge (TNB) began near the beginning of the transition period in the industry from manual toll collection to ETC to the current trend of ORT. Given the state of technology at the time and the operational need to accommodate infrequent users, a combination of manual toll collection and ORT lanes was selected as illustrated in Exhibit 8.6. Six lanes of manual toll collection will be provided in a small toll plaza to the right of the mainline of SR 16. Each manual toll collection lane also will be equipped with ETC capabilities to allow these lanes to be operated as manual or ETC-only lanes. The three-lane mainline of SR 16 will continue past the toll plaza for the nonstop collection of tolls using an ORT configuration. The concept does require that a high percentage of users enroll as ETC customers, and install transponders in their vehicles. The approach provides a combination of toll collection capabilities intended to meet the needs for this facility, while minimizing the amount of right-of-way required for the toll plaza.

Exhibit 8.6 Toll Collection at Tacoma Narrows Bridge



The implementation of electronic toll collection at TNB will provide the complete functionality and capability required for a toll customer service center and violations processing. Staff and systems will be in place to perform ETC customer account establishment, transponder distribution, account management, account financial replenishment, call center for customer inquiries, customer Internet-based account access, and statement generation. Violation processing capabilities will include manual and automated license plate image review, owner name and address acquisition, violation notice generation, notice of infraction generation, call center for violator inquires, and interface to the court system. This operation can be expanded to provide service for new facilities in Washington.

The toll collection system for TNB was designed with the capacity to process more toll transactions than the anticipated initial daily volume of 45,000 manual and electronic transactions. The system also has the ability for expansion to handle a higher volume of customers.

The toll collection system also was designed to accept toll transactions from remote toll collection points using a defined data format, and to transmit information on valid transponders to remote toll collection points. Accordingly, the toll collection system can accept toll transaction data from other facilities, post these transactions to a customer's account, and generate a consolidated statement for all of the customer's toll transactions. A toll transaction from another facility would be treated in the same way as a transaction from TNB.

Finally, according to current law, revenue generated at TNB and the associated cost of operations at TNB can only be applied to TNB-related requirements. Accordingly, the operational costs associated with any additional toll facility that uses the customer services and violation-processing services provided by TNB will be required to pay a proportional share of these operational costs.

Beyond the cost aspect is the customer service element. By having a single customer service center, WSDOT can be assured that customers will have a single, consistent point of contact regarding tolling issues. As the additional toll facilities are brought on-line in the State, it is important to provide a uniform, consistent interaction with the public. A single customer service center would provide this single point of contact.

Lessons Learned

Previous implementation of toll collection systems around the world offer valuable lessons for Washington State, including:

- **More Than Manual Toll Collection Is Required –** Manual toll collection alone cannot provide an acceptable solution for toll collection because of the traffic congestion and right-of-way requirements. The toll industry has embraced Electronic Toll Collection as a proven means to provide a better level of service to toll patrons and reduce congestion.

- **Electronic Toll Collection Works –** The deployment of electronic toll collection with the use of transponders has gained the public's acceptance in one toll authority after another.

- **The Public Expects Interoperability –** As more toll facilities implemented electronic toll collection, customer expect that their transponders will work on adjacent facilities.

- **Violation Enforcement Is Required –** There is a clear need for an enforcement program. While enforcement systems have mostly achieved the desired results, there is an operational cost associated with this success. Truly understanding the costs of lost revenue and enforcement actions is important to have a complete picture of the enforcement program. With the proper identification of both, an enforcement program can be tuned to mitigate the potential loss of revenue balanced against cost of enforcement.

- **ORT Is Required for Traffic Management –** The use of pricing to manage traffic congestion in urban areas can only be provided by ORT deployments and not stop-and-go manual toll collection.

- **ORT Presents Technical And Operational Challenges –** ORT represents a significant technical jump, compared with the traditional tolling systems. From an operational point of view, the handling of violators and the control of the operational costs also need to be carefully addressed. The reduction in labor costs for toll collectors might be

somewhat offset by the increase in need for image-based transactions and violation processing.

- **Maximize Transponder Usage –** Costs associated with tolling operations are highly dependant on the level of nontransponder transactions (i.e., those processed using license plate images), as the processing costs of nontransponder transactions are significantly higher than for transponder transactions. There are several reasons for this:
  - Processing transponder data is easy:
    - Simple business rules;
    - No human intervention;
    - Few business interfaces; and
    - Limited customer contact.
  - Processing images is complex:
    - Complex business rules;
    - Multilevel human interventions;
    - Many business interfaces; and
    - Frequent customer contacts.

Assuming that all vehicles in the State would not be required to be equipped with transponders, maximizing transponder usage depends in part on the following:

- A successful marketing and public relations campaign that reaches all prospective customers and clearly explains the ORT system, its services, and its benefits;
- Providing incentives to encourage transponder use, such as issuing tags free of charge, post-payment for tolls charges incurred, and preferential rates for tag users; and
- Limiting the number of times a customer can be charged by video tolling (to a maximum number of transactions per year, for example) without incurring additional fees.

Optimize Back Office Operation. Back office operations include customer service and violations processing. One of the main ways to control operational costs is to optimize the allocation of work between automated and manual processes. This means guaranteeing the minimum level of accuracy and efficiency of the tolling and image capture subsystems. Experience suggests that there is a balance to be struck between investment and operations – there is clearly a threshold beyond which investment in automation costs more than the operational savings it ultimately delivers.

Critical determinants of the efficiency of the back office include:

- Accuracy of the license plate recognition and image validation subsystem.
- Minimizing of customer service center staff time through emphasis on "self-service" techniques, such as online account access and Interactive Voice Response.
- Integration of nonautomated customer service channels for inbound communications (faxes, e-mails, voice recorded messages) with the automated portion. This requires 'connectors,' which are software modules parsing the events from nonautomated channels and generating input necessary for activating back office interventions.
- Efficient use of technology to reduce the costs of communicating with customers (e.g., voice mails with text-to-speech technology).
- Integration of a centralized workflow management tool that monitors and maximizes the efficiency of operational activities at both an individual and departmental level.

Avoid Toll and Violation Processing Errors. Avoiding errors (such as sending an invoice to somebody who has never used the toll road) are of crucial importance, since such errors might induce negative reactions, which could be relayed and amplified by the media. Implementing multiple validations for selected sensitive operations should minimize these errors.

Manual Toll Collection Still Has a Place. Some potential toll facilities may still have a need for manual or self-service toll collection, depending upon the level of demand and characteristics of the users. Lower volume facilities that serve mostly infrequent users would be the best candidates, but in combination with other technologies. This will generally be the case for these specific situations until most vehicles are equipped with transponders.

Toll Collection Requires a Strong Audit Function. Toll collection requires that strong cross checks, using automatic vehicle classification technology, revenue reports, and audit trails are in place to ensure that internal fraud is deterred and identified.

Toll Technology to Support Traffic Management

The advent of electronic toll collection has provided new tools for the traffic management. Manual toll collection's inherent limitations did not provide the flexibility required to use pricing as a means to manage traffic.

Time-of-Day Tolling

With time-of-day tolling, the toll rate is set by a fixed time-of-day schedule. The typical motivation for this tolling strategy is to push traffic demand away from peak hours. Both the New Jersey Turnpike and the Port Authority of New York and New Jersey introduced time-of-day-based-toll price schedules during toll increases over the past several years. The Turnpike Authority reports that traffic growth during rush hours has flattened since it adopted the time-of-day-based toll schedule. Port Authority reports also suggest that relatively lower prices attract some motorists to off-peak driving times.

Under this approach, the toll rates are fixed by time of day and day of week, usually at one-hour intervals. Peak prices on weekdays are generally highest, and pricing is adjusted typically every few weeks based on hourly volumes. Setting price based on time of day is relatively simple to implement from a technology perspective. TNB has this feature included in its toll collection system.

This approach is easy for the driving public to understand, but it does not support more frequent updates to pricing, as rate schedules are generally published. Public outreach efforts are made to publicize the schedule. The concept is relatively easy to convey to the public, and has achieved the desired impact.

Dynamic Pricing

Advances in tolling, traffic management, and traffic sensor systems over the last decade have significantly increased the number of options available in terms of setting the price of using a toll facility. Dynamic pricing adds a level of traffic management sophistication over time-of-day pricing. With dynamic pricing, tolls are based on actual traffic conditions, changing to maximize some specific objective. Typical traffic management objectives are:

- **Speeds –** A classic measurement of the conditions on a facility, is easily collected using available sensor technologies, and is easily understood by the public. It also allows for frequent pricing adjustments based on changing conditions. However, speeds can vary greatly across a facility, particularly between differing sensor sites, and are not always an effective measurement of true level of service. Speeds are generally best used in conjunction with volume and/or occupancy to allow more accurate setting of prices.

- **Volumes –** Can be averaged over time to support less frequent pricing changes, or they can be used together with speeds to set prices on a more frequent basis. Volumes can be relatively accurately measured with existing sensor technologies.

- **Traffic Density –** A measure of speed and volume over a set period of time, and is considered a very accurate measure of actual level of service. Use of traffic density has been proposed for several High-Occupancy Toll (HOT) lane facilities. Its disadvantages include that it requires greater sensor accuracy and reliability, and it is difficult for the driving public to understand when compared with other measures.

- **Travel Time –** Perhaps the truest measure of value to drivers, travel time also can be the most difficult to measure. Travel times can be collected from transponder-equipped vehicles by matching transponder identification numbers at two points. However, this results in a lag in time for availability of the measurement based on the time that it takes a transponder-equipped vehicle to travel the distance. It may be necessary to estimate travel times based on speed/volume sensors placed at regular intervals along the facility with calibration based on less frequent RF tag reads.

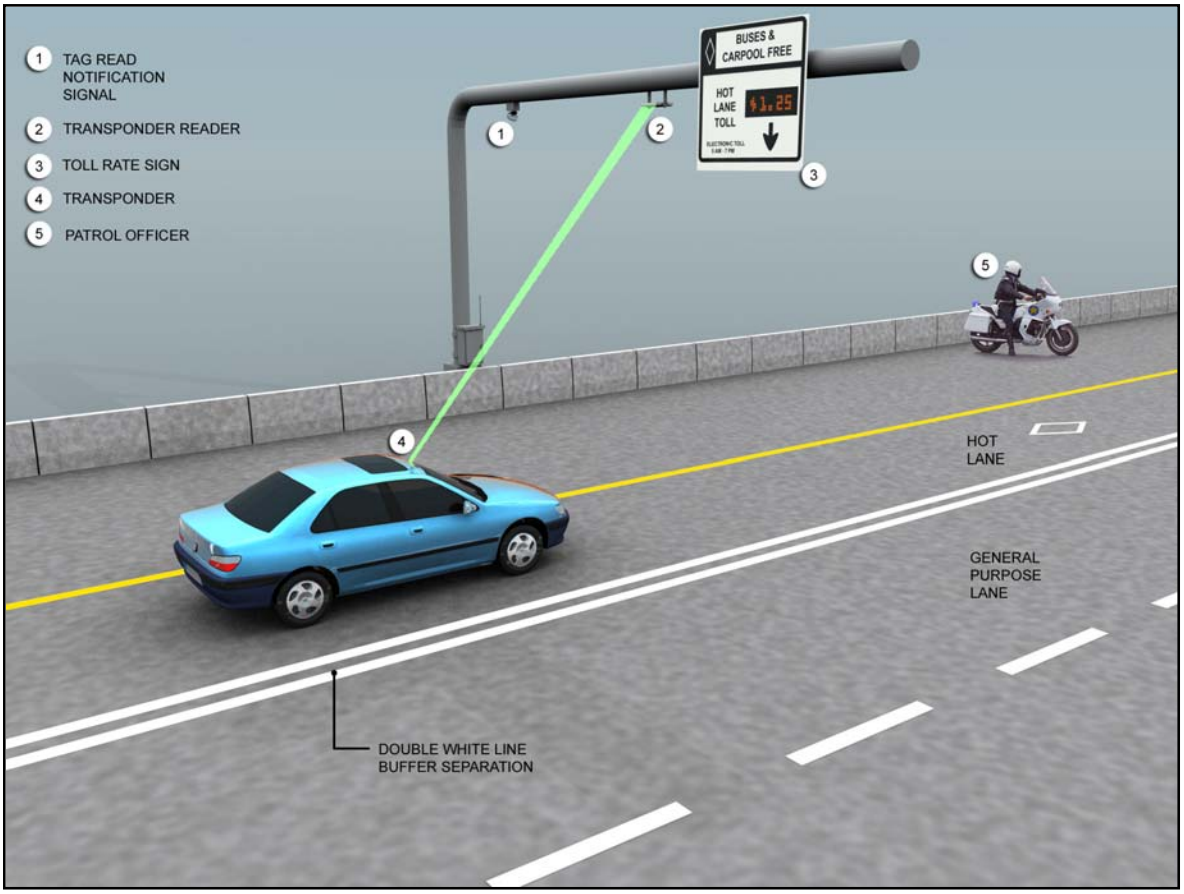
Regardless of the measure used, high levels of accuracy are crucial. Generally, existing field traffic sensor infrastructure needs to be updated to properly support dynamic pricing. Existing infrastructure has generally been deployed for traffic management and monitoring purposes where occasional failure of individual sensors does not drastically impact the overall effectiveness of the system. However, with toll systems, high accuracy and reliabilities of greater than 99 percent are necessary to ensure accurate toll rates and to maintain public confidence. The tighter the frequency or greater the number of segments, the more important accuracy and reliability becomes.

HOT Lanes

Characteristics

HOT lane facilities charge Single-Occupant Vehicles (SOV) for the use of a High-Occupancy Vehicle (HOV) lane. Access into the HOT lane remains free for transit, vanpools, and carpools. The toll charged for SOVs is dynamically adjusted to ensure traffic congestion does not exceed an established threshold for all vehicles in the HOV lanes. Toll collection is done electronically to provide nonstop toll collection. Tolls are charged at fixed points along the facility. The SR 167 HOT Lane Pilot Project will be such an implementation (see Exhibit 8.7). Selected considerations when implementing HOT facilities are discussed next and are under consideration for the SR 167 project.

Exhibit 8.7 SR 167 HOT Lane



Technical Considerations

Pricing for HOT Lane Capacity Versus Corridor Throughput

The first consideration is what will drive the calculations that determine the toll rate at any point in time or along the facility (i.e., pricing algorithm)? With HOT lanes, there are two basic approaches:

1. **Maximize efficient throughput of the HOT lane alone.** Under this pricing philosophy, the goal is to maintain acceptable operations (e.g., level of service (LOS) C, speed or traffic density) on the HOT lanes, regardless of the level of operations on the adjoining general-purpose lanes.

2. **Maximize efficient throughput of the entire corridor.** This pricing philosophy is quite different from the first approach; in that, traffic conditions on the general-purpose lanes more directly influence pricing on the HOT lanes. The overall goal is to

maximize the throughput of the entire corridor (HOT and general-purpose lanes), while maintaining acceptable operations on the HOT lanes. In actual operations, the key difference here is that, if congestion levels are heavy on the general-purpose lanes, prices on the HOT lanes may actually be lowered to try and attract more drivers until such time that the HOT lanes are near-capacity.

It is important to understand that this decision drives the larger pricing concept for the facility, and can result in drastically different toll rates and schedules. The first approach is relatively simple to implement, while the second approach is significantly more complex.

Frequency and Segmentation of Pricing Adjustments

Once a basic pricing approach has been selected, a determination needs to be made regarding how often prices will be adjusted, and whether or not prices will be set for the entire facility or on a segment by segment basis.

- **Frequency of Price Adjustment –** Frequencies for toll rate adjustments can vary greatly from facility to facility. Some set prices based on average volumes across several weeks and establish a time-of-day toll schedule. Some adjust prices every few minutes. As a general rule, allowing frequent price changes can be considered too confusing to drivers. However, frequency can be a key factor in how much the toll rate can influence the amount of SOV traffic that enters the HOT lane. While infrequent price changes can reflect seasonal and growth trends, they do not allow for reactions to abnormal conditions that may occur within any single peak period or day. Increased frequencies also increase the complexity of the required pricing algorithm and the supporting systems (such as traffic sensors and variable toll rate signs).

- **Corridor Segmentation –** Many HOT lane facilities set different toll rates for separate segments of a corridor, as well as the distance or number of segments crossed by drivers. Segmenting facilities allows dynamic pricing to reflect different conditions along the facility. As with frequency, tighter segmentation provides for more control, but segmentation also increases complexity and cost of the supporting systems. Excessive segmentation of a facility can create a confusing pricing scheme that is difficult for drivers to understand, and it also becomes more difficult to provide adequate signage.

Recent deployments of HOT lanes (including the MnPass program in Minnesota) have dynamically set the toll rate based on near real-time traffic conditions.

For single-lane HOT lane implementation, frequent price changes based on actual conditions are probably the only way to reliably kept traffic flowing at some guaranteed performance level. For two-lane HOT lanes, time-of-day pricing based on historical patterns may be possible, since there is more capacity, and hence, more room for demand fluctuations.

Enforcement

One of the challenges for a HOT lane implementation is enforcement. Besides addressing toll evasion, the enforcement of HOV regulations also is required. An SOV must pay to be in the HOT lane. The enforcement official must be able to verify that a transponder has been read and the toll paid. This requirement leads to a two-step process – the enforcement officer visually identifies the SOV, and then verification of payment is determined. This enforcement action must be conducted along the side of the roadway and is a manual process. This manual enforcement requires the deployment of enforcement officers at additional cost to ensure compliance with HOT lane regulations.

Unfortunately at this time, there is not a fully operational mechanism to electronically determine the number of persons in a vehicle. Promising methodologies are being field tested and do offer some potential for automated HOV enforcement in the future.

The second complication is making sure that a transponder-equipped vehicle that is an HOV and can use the HOT for free is not charged. Accordingly, a means to prevent a transponder from being read is required. These operational issues are being addressed as part of the SR 167 HOT Lanes Pilot Project.

Express Toll Lanes

Express lane tolling is just like the HOT approach, but for all vehicles not just SOVs. With an express lanes tolling scheme, tolls are charged to all vehicles using the express lanes. The other vehicles not willing to pay a toll can use an untolled, usually parallel facility. Express toll lanes are designed to guarantee performance on a managed facility. Tolls are collected either by manned tollbooths or ORT.

The SR 91 express lanes in California implement a combined HOT and express toll lanes scheme. During most hours of the day, high-occupancy tolls are charged only to operators of SOVs using the lanes. But during peak commute hours, the lanes turn into a full toll road, charging all users. Projects are under consideration in Maryland and Minnesota.

HOT or Express Lane Systems

Characteristics

The next logical step is the combination of individual HOT or Express lane corridors into a regional system of roadways. As expected, this would add another level of complexity. This complicates the development of pricing algorithms; in that, there is the potential to optimize for the entire network, and not just the corridor. Once the price is set, the next challenge will be to inform the driver of what they are paying. As a driver moves along the network, the price may change. The difficulty is determining when to inform them in a manner that allows for a timely decision. These issues and others are being explored as the San Francisco Bay Area, San Diego County, Texas, and Minnesota consider systems of HOT lanes.

Technical Considerations

Dynamically priced toll facilities implemented to date have been relatively simple, using only one or two tolling zones. As WSDOT looks to potential networks of managed facilities, the technology challenges multiply. The main challenges are to set rates and communicate the price information to the traveling public so that the system is managed to its optimum flow.

Since traffic levels and available capacity might vary over the network, prices should ideally be set by segment. The network could be divided into logical travel segments with prices set based upon maintaining an acceptable level of traffic flow. Before the start of each new segment, travelers could be presented with information on the current toll rate for the next segment. The roadway design would need to allow drivers adequate time to make a decision whether to continue on the tolled portion or move to the free portion of the facility.

The question is: how far in advance can you guarantee a price to the customer for a portion of the network, and how does this uncertainty affect the ability to maintain traffic flowing at the optimum rate? This is a problem that has not yet been solved in the industry, and will require additional research and experimentation.

Pricing All Roads

Characteristics

In response to increasing concerns about the ability of the fuel tax to remain a reliable source of revenue into the future, the idea of pricing all roads, potentially through some kind of fee on vehicle miles, is being discussed in some places. Pricing all roads also raises the opportunity to apply pricing techniques to traffic management problems.

One way to accomplish pricing on all roads involves the installation of GPS in a vehicle to locate itself within a charge area or along the highway network. The on-board unit will contain the appropriate charge structure, as well as information concerning when the vehicle should be charged. Charges are applied using the position information provided by the GPS system. The charge can either be deducted directly from a smart card located in the on-board unit, or stored for later uploading to be charged against the customers account. The charging scheme can be based on location, time of day, distance traveled, type of vehicle, emissions, or any combination.

The charging of drivers based upon vehicle miles traveled has been implemented for commercial vehicles in both the United States and Europe. Some states have added commercial vehicle characteristics, generally weight, to the fee calculations. With weight-distance truck tolling, freight carriers are charged a fee for use of the road system that depends on weight and total distance traveled over a given period. The usual motive for such fees is to recover fully the costs associated with the operation of heavy vehicles on the road network.

Technical Considerations

Pricing all roads would require charging different fees based upon distance traveled on defined categories of road (such as freeways or major arterials) at certain times of day (some roads may only be tolled during peak hours). A means of accurately determining the distance traveled and identifying the class of road is a fundamental requirement of the system. Distance traveled can obviously be measured by a simple odometer reading; however, this does not provide the location information needed to assess a toll for only those miles traveled within the tolled network or the date/time data that is needed to determine miles traveled during peak hours. Additional issues arise about ensuring the accuracy of the data, ensuring that user privacy is not compromised, and communicating the data to a central system for calculating the toll amount due.

- **On-board Equipment Cost –** While the proliferation of vehicles with integrated on-board GPS makes vehicle location data somewhat more available, not all vehicles are equipped. The current cost of on-board units remains expensive and requires custom installation.

- **Accuracy of Location Data –** Highly accurate GPS location data is needed to ensure that drivers cease to be charged once they have left the toll network. This location accuracy requirement is particularly important when considering a roadway that may be tolled in one direction during peak periods, but not in the other, or discerning one lane over another.

- **Informing the Driver of Charges –** Drivers will make cost-effective decisions for travel if they have the cost data required to make these decisions in a timely manner. Providing dynamic pricing information to a moving car before a driver reaches an appropriate decision point presents series of technical and human factor issues. The GPS device only knows where the vehicle is and not where it is going. So providing toll rate information in the vehicle would not work for this purpose. Another approach is to set up a schedule by time of day and route, but this approach is contrary to the desire to provide dynamic pricing.

- **User Privacy –** While privacy laws vary from region to region, many users are not comfortable with the idea of their vehicles' location data being shared with a government agency; and in fact, toll authorities may not wish to have this information due to the liabilities involved. Privacy concerns may be addressed by configuring the system so that no vehicle location data is stored by or transmitted to the authority, and the only information received by the authority is the total miles traveled within a certain pricing zone.

- **Data Communications –** At some point, vehicle use data must be transmitted to a central system for the calculation of the applicable user fees. Cellular networks and DSRC are potential options.

- **System Updates –** Every software application requires periodic updating and refreshing. The task of ensuring timely updates of the software contained in the on-board units presents a technical challenge.

Enforcement

The need for an enforcement infrastructure is common to all road user charging systems – independent of charging policy or the approach used for charging. Although there have been numerous strategies proposed to prevent toll evasion, they can generally be grouped into two categories: 1) designing the On-Board Unit (OBU) that tracks the vehicle's road usage in such a manner as to prevent tampering or disabling, and 2) observing the vehicle from fixed or mobile check points to ensure that charges are being recorded. The two are not mutually exclusive, however, and can be employed in parallel for the sake of redundancy.

Strategies proposed to prevent tampering with the OBU include the following:

- Disabling the engine unless the OBU also is activated;
- Ensuring that the components of the OBU can be accessed only by certified professionals; and
- Checking the OBU's distance monitoring records against the odometer reading each time the unit is turned on, and flagging any discrepancies.

Strategies for observing the vehicle from fixed or mobile checkpoints include:

- Using roadside readers to transmit queries to passing vehicles to ensure that their OBUs are in fact operating as intended.
- Using video cameras to capture images of vehicles that have passed a given check point; this information can later be crossed-referenced against billing records to ensure all identified vehicles did in fact pay the corresponding tolls.

Example Projects and Programs

Two all-road pricing pilot projects currently are underway in Washington and Oregon. The PSRC's Traffic Choices Study investigates whether participants might opt to change their travel patterns (such as opting to telecommute, take transit, or travel during off-peak hours) if they are charged a fee for travel on all freeways and major arterials in the Puget Sound area with higher fees during peak hours. An OBU is installed in each participating vehicle and provides a running tally of the user's assessed cost per trip. This amount is then debited from a prepaid account (funded by the study). At the conclusion of the study, participants will get to keep any money not used in the account. The system architecture uses cellular communications to transmit data from the OBU to the central system for processing. Participants may log on to the project web site to view their "account activity" online.

The Oregon DOT's Road User Fee Pilot investigates the potential for Road User Charging to replace the state gas tax. Participants are assessed a per-mile charge based on miles driven in Oregon by zone. Participating vehicles will be equipped with an OBU that tracks the vehicle's mileage traveled in each zone. This data will be downloaded wirelessly at the gas pump when the vehicle stops to refuel. The usage fee is then added to the total due, while the gas tax is credited. Both amounts are shown on the user's receipt. By collecting the fee at the gas pump, Oregon could continue to charge a gas tax to non-equipped vehicles.

While both ODOT and PSRC are installing a vendor-provided OBU in each vehicle participating in the pilot projects, it is anticipated that the technology provided by the OBU will eventually be standard equipment in all new cars. By continuing to collect the gas tax from non-equipped vehicles, ODOT leaves the door open to implement Road User Pricing without waiting for the majority of citizens to purchase new cars.

Other examples of international implementations include the following:

- **Heavy Vehicle Fee (HVF) or LSVA System in Switzerland –** Switzerland introduced a toll system for trucks over 3.5 tons in January 2001. The supporting technology includes an OBU (mandatory for all Swiss vehicles and optional, though encouraged, for foreign vehicles) featuring GPS and DSRC, as well as a connection to the vehicle's tachometer (including odometer information).

- **"GO" Weight-Distance Truck Toll Program (LKW) in Austria –** Austria introduced an electronic toll collection system for trucks over 3.5 tons in January 2004, based on DSRC microwave technology.

- **"Toll Collect" Weight-Distance-emissions Truck Toll Program in Germany –** Germany followed suit with some delay through technical problems on January 1, 2005. The German Toll Collect system is based on a GPS technology; truck operators may choose to either install OBUs for automated tracking of movements, or to book their route in advance using the Internet or computerized booking terminals.

Toll Technology Considerations, Opportunities, and Risks

The deployment of toll collection technology to meet the operational requirements of the various types of toll collection approaches described above comes with a wide range of potential challenges, issues, opportunities, and risks. Understanding the factors and their implications is required when selecting an overall approach to tolling within the State of Washington. Policy and toll project decisions will influence the technology choices, but technology also will have an impact on policies and projects. The remainder of this section identifies specific areas to be considered and their potential implications.

Toll Collection Methods

State of the Practice

The choice of toll collection method should be based on the operational requirements of the individual toll project, recognizing the need for interoperability with other systems around the State. The following types of systems currently are available:

- **Manual Toll Collection –** This traditional approach has been around for centuries. A driver stops at a tollbooth and pays the required toll directly to a toll collector. Cash and agency issued payment cards are generally accepted modes of payment, and some systems now accept third-party credit or debit cards, though this is rare in the U.S. Toll plazas can be located on highway mainlines or at entrances or exits to the facility. Manual toll collection can accommodate up to 400 vehicles per hour in a pure-cash environment. Credit transactions reduce this rate considerably. Typically, tollbooths are provided in a ratio of three or four for every lane of through travel, which requires considerable right-of-way.

- **Unattended Toll Collection –** An early step in automation was the introduction of automatic coin machines, where drivers placed the required toll payment in a basket and the machine counted the amount. While coin machines have become less popular with toll agencies because of high maintenance requirements and the introduction of ETC, a related approach is still being used at locations and times of low-traffic volume. A self-service machine – similar to parking pay and display machines – is used to allow the driver to pay the toll with currency or credit card when a toll collector is not present. The need for right-of-way remains, but staffing costs are reduced. This practice is used for low-volume facilities and during late night hours at many facilities.

- **ETC –** This method uses automatic vehicle identification technology that identifies a toll customer while the vehicle passes through a toll plaza, sometimes at highway speeds. Customers need to have an identification tag, usually an electronic transponder that is linked to the customer's account, which is automatically debited for the amount of the toll. ETC may be used in dedicated lanes, or combined with manual toll collection. Cameras are used to identify violators.

- **Open Road Tolling (ORT) –** This is a form of electronic toll collection without tollbooths. Customers pass through a highway toll collection zone at full highway speed, and capacities over 2,000 vehicles per hour. Most deployments require vehicles to be equipped with transponders for the payment of tolls, and cameras are used to capture the images of violators. Some installations now allow drivers without transponders to "pay by plate," which allows customers to register their vehicle with the toll authority and pay the applicable toll either before or after they access the facility via telephone or Internet. If customers do not register, their name and address is obtained via the license plate, and they are sent a payment notice.

- **Global Positioning System (GPS) Tolling –** Under this approach, a GPS unit and wireless communication link are installed in a vehicle to track its location within a charge area or network. The OBU will contain the appropriate charge structure, as well as information concerning when the vehicle should be charged. Charges are applied using the position information provided by the GPS system. PSRC is conducting a demonstration of value pricing using this approach, and a countrywide installation of GPS tolling was recently introduced for tolling trucks in Germany.

Methods To Be Used in Washington State

The TNB toll collection system currently under construction will have three ORT lanes for patrons with transponders, and six manual toll lanes for customers using cash. Vehicles without transponders that use the ORT lanes will be treated as violators. Pay by plate will not be allowed, although this approach may be considered in the future based upon operational experience. The SR 167 HOT Lane pilot project will use ORT to allow for dynamic pricing, and to avoid the need for space-consuming toll plazas. HOT lane toll facilities are only being developed as strictly open-road tolling systems.

Interoperability

Washington is moving toward a consolidated operations model for interoperability under which customers will have a single account, transponder and phone number to call. WSDOT has selected a common transponder technology to be utilized at all future toll facilities. The customer service center and related back office system for the TNB will most likely serve as the customer service center for the SR 167 HOT Lanes Demonstration Project. Transaction data from SR 167 will need to be transmitted to the TNB back office system for processing. In turn, transponder status information will be made available at the lane level for SR 167.

An additional complicating factor is that revenue collected at the Tacoma Narrows Bridge (minus operational and maintenance costs) is legally designated to pay back the motor vehicle fund which financed the bridge construction (RCW 47.46.140). Therefore, the costs for providing services to other facilities as part of a statewide interoperable able toll collection system must be fully accounted for.

The consolidated approach is what customers expect. However, as toll facilities outside of the Puget Sound Region develop, there may be a need to consider regional customer service operations. The potential new crossing of the Columbia River in the Vancouver/Portland region is one such example.

Toll Collection Without Toll Booths

Modern technology has eliminated one of the main complaints about toll facilities: stopping to pay the toll. Nonstop toll collection is enabled by either vehicle-mounted

transponders or devices to automatically read license plates. In an urban setting with a primarily local population, projects being developed today can safely do away with manual toll collection, since the majority of the customers can be encouraged to get transponders. Those that choose not to get transponders can have tolls collected through the automated license plate recognition systems. ORT requires less right-of-way, no toll collectors, and no stopping for toll patrons. It is possible that, if the TNB were being designed today, there would be no manual tollbooths.

On the flip side, ORT means that operational costs are shifted to customer service and violation enforcement activities. Violation enforcement activities can be time-consuming, because they rely on people reading license plate images captured by potential violators, and a sometimes cumbersome process to verify, process, and collect tolls and fines. It is still unclear whether current operations that are 100 percent ORT have lower operational costs than manual operations.

As Washington looks forward to projects beyond TNB, it should actively consider whether any manual toll collection should be provided. In the immediate term, 100 percent ORT should be actively considered for all new toll facilities, especially for high volume, urban settings with limited right-of-way, and all HOT lane implementations. The combined manual/ORT configuration might best be used in lower volume locations with a lower percentage of repeat customers. Over time, this conclusion might change, as national standards emerge for built-in in-vehicle transponder technology.

Third-Party Service Providers

Looking towards the future, many auto manufacturers will be installing transponders as factory equipment in new cars, once the national roadside to vehicle communications protocol has been firmly established. These transponders will go far beyond toll payment to potentially include a wide variety of retail (such as using the transponder account to pay for drive-through restaurant service), traveler information, and road safety applications. Essentially, these transponders would function as an in-vehicle credit card, with the likely expectation from the customer that they will receive a single invoice for all of their in-vehicle transactions. In this scenario, the government tolling authority would interface with a third-party service provider to bill each customer's account. The means to securely activate this on-board interface will need to be determined.

Setting the Toll Rate

Traditionally, the toll rate for a facility has been set to pay for the capital, operating, and maintenance costs of the facility or authority. This toll rate has generally been fixed based upon the classification of a vehicle, with heavy commercial vehicles paying more than passenger cars. However, charging drivers a fee that varies with the level of traffic on a congested roadway can allocate roadway space in a more economically efficient manner. Toll rates for individual vehicles can be determined in the following manner:

- **Fixed Toll Rates –** The most common practice is to set a fixed toll rate based upon vehicle characteristics such as the number of axles.

- **Time of Day –** Because travel demand varies based upon the time of day, toll rates can be set based upon historic traffic levels. SR 91 Express Lanes in Orange County, California use a time-of-day schedule. The public generally easily understands time-of-day schedules.

- **Dynamic or Traffic Conditions-based Pricing –** Time-of-day pricing is based upon historical information and does not account for actual conditions each day. By using traffic sensor information, real-time traffic conditions can be determined and used to update prices as conditions change. When developing dynamic pricing algorithms, the balance between revenue generation and mobility will need to be determined. To ensure that a driver is charged the correct toll under a dynamic pricing approach presents a technical challenge. The driver must be informed of the price of the trip, and the price must remain constant for the duration of the trip. This is more easily done for a corridor with limited access points than an entire network of roadways.

Enforcement

Since the first construction of toll facilities, users have attempted to avoid payment of the required toll. The introduction of ETC without gates and toll collectors has resulted in the deployment of technology to automatically identify toll evaders and demand the payment of the required tolls. The primary goal of enforcement is to ensure that there is an acceptable level of compliance, and enforcement efforts are considered to be fair and consistent. The changing attitude in the toll industry is to treat violators first as potential new customers, and secondly as violators. The enforcement program will need strike a balance with the desire to bring more travelers into compliance.

The second aspect of enforcement is the acceptance that not all tolls will be collected. Like any business, this potential loss must be identified, quantified, and mitigated in a cost-effective manner.

Out-of-State Drivers

Infrequent users of a toll facility will have little incentive to enroll as ETC customers and obtain transponders. For tolling projects without manual toll collection, images of their license plates will be captured for further processing. If a pay-by-plate options exists for the facility, the driver may register their vehicle and pay over the telephone, Internet, or upon receipt of a notice. If no payment were received, they would become a violator.

Acquiring information on the registered owner of a vehicle from out of state is a common practice. Within the United States, most state DMVs will accept requests from other states for no or little costs. Once an address is obtained, a demand letter can be sent.

Unfortunately, enforcement mechanisms available against in-state vehicle owners cannot be brought to bear against out-of-state owners (e.g., registration hold, notice of infraction, etc.). The cost to collect these tolls from out-of-state residents will be higher. Particular attention will be required in establishing the bi-state toll enforcement requirements for the potential new Columbia River crossing between Washington and Oregon.

Unfortunately, the ability to obtain names and addresses for the owners of vehicles registered in Canada currently is not available. British Columbia and other provinces are unwilling to share private information on their citizens that would be stored in databases in other countries. Enforcement of violators from Canada will require further attention.

HOT Lanes – Operational Considerations

HOT lanes have specific functional requirements to be considered. Because the concept is to "sell" excess capacity of the HOV lanes, traffic conditions must be monitored in real time to ensure that there is excess capacity available to sell at a given time of day. This information is used to dynamically set the toll rate for SOV drivers who wish to use the HOV lanes. This concept of operations leads to a set of requirements that include:

- **ETC Only –** Stopping traffic to collect tolls is antithetical to the idea of providing a higher level of service for a fee. The HOT lane concept implies that toll collection must be electronic to provide for nonstop toll collection. However, the operational difficulty lies in not charging an HOV vehicle that also happens to be equipped with a transponder for using the HOT lanes. While this issue can be successfully resolved with technology, customer service and driver education issues will need to be addressed.

- **Manual Enforcement –** For now, all HOV enforcement requires a police officer to verify on the spot that the vehicle is an HOV. This places the operational burden of providing enforcement on the Washington State Patrol. This additional duty will require funding and additional staff beyond currently available resources.

- **Notification of Toll Rates –** SOV drivers will need to be notified of the toll rate at a point before they enter the HOT lanes, and be assured that the posted rate is the rate they will be charged. For a corridor, this can be addressed even with multiple access points. For a network of HOT lanes across the region, it will present additional challenges.

Public-Private Partnerships

Under the Transportation Innovative Partnerships Program, Washington State is reviewing and updated its approach to Public-Private Partnerships (PPP) for transportation projects. It is anticipated that some of the potential projects under this program would include a tolling component. The tolling technology and operational

aspects of these projects must be coordinated with the overall WSDOT tolling program. Issues to be coordinated will include toll setting authority, interoperability, customer service, enforcement policy and procedures, cost allocation, and technology upgrades. The first four items are the most critical from a customer perspective.

Proprietary Technology

Currently, there is not a national standard for the sharing of information between the transponder in a vehicle and the roadside transponder reader. There are regional and programmatic standards with a small number of suppliers. The national standard is under development and should be on the market within the next several years. It is anticipated that manufacturers will install transponders that are compliant with the new national standard in new vehicles.

WSDOT has selected as its primary transponder one that is proprietary to a single supplier. This selection was made to provide a shorter-term, cost-effective solution to fill the gap between current technology and the new standard. WSDOT policy is, and should remain, to move to national technology standards in an orderly fashion as they are adopted. In this way, multiple suppliers will become available, and use of proprietary technology can be minimized over time.

Technology Refresh

Within less than 10 years, a technology investment has generally reached the end of its economic life, especially with the rapid advancement of technology. The same is true for ETC systems. The State and any potential private partners should consider this lifespan and be ready to upgrade relevant components of the ETC system at all levels. Flexibility will be required as the technology marketplace moves the toll industry in directions that have not been anticipated.

The State should actively monitor the progress of developing a national standard for transponders and consider becoming a test bed for early deployment of this standard. This would provide an opportunity to fully test the standard and integrate it into toll and other applications. The toll collection system should be reviewed on a two-year cycle to determine its overall performance against current toll technology and operational benchmarks.

Privacy

To date, participation in electronic toll collection programs by equipping a vehicle with a transponder has been voluntary. Any toll system that requires the use of electronic toll collection will mandate the identification of individual vehicles, which in theory could be used to record time, location, and speed of travel. At least some segment of the population will oppose any new technology that may enable the government to monitor their movements.

Current Washington State law provides ETC account protection, which prohibits the release of information to third parties. However, pressure remains to allow the release of individual travel records to third parties. For example, current law allows media access to transit smart card information. Once ORT, which will enable toll collection without transponders, is deployed, the same safeguards provided to ETC accounts should be extended to the patrons without transponders.

Project Cost Allocation

WSDOT is primarily organized to deliver a completed highway project. If more than one toll project is implemented and customer service functions are shared, then a means for the proper allocation of operational and capital costs among the various projects will need to be developed. Many toll projects are financed under strict bonding covenants and enabling legislation that restricts how toll revenue can be spent. TNB is one such example for which revenues and costs cannot be shared with other projects. If the TNB customer service center is used for projects beyond TNB, then a means to quantify and charge other projects for services will be required. This requirement for project cost accounting also implies that an internal means to track operational costs for providing services must exist, in order to provide a basis for the allocation of costs.

Routine Operations and Maintenance

Toll collection programs require a level of overall system and operational availability not generally demanded by most business and government activities. If the components of the toll collection system and operations are not working, then customers are not being served adequately and revenue can be lost. Trained staff provided at adequate levels is required to maintain and operate enterprises of this extent.

Section prepared by the IBI Group, with assistance from Cambridge Systematics, Inc.