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I-5 Columbia River Crossing Partnership:
Traffic and Tolling Analysis

Identification of Toll Rate Structure Options And Recommended Assumptions

Technical Memorandum 5.5

Prepared by

Vollmer Associates LLP

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INTRODUCTION

The I-5 Trade Partnership Strategic Plan identified the imposition of tolls as a potential financing option for new capacity at the Columbia River Crossing. The purpose of this Technical Memorandum is to identify practical tolling rate options that demonstrate the material differences in tolling policy, revenue generation, and impacts of potentially tolling the I-5 Columbia River crossing or the I-5 and I-205 Columbia River crossings. This paper is a summary of Working Papers (WP) 5.1, 5.2, and 5.3.

WP 5.1 identified and evaluated alternative toll rate structures and recommended a set of options to be examined in this tolling analysis project. WP 5.2 assessed where toll collection facilities could potentially be located. WP 5.3 addressed the sale and distribution of electronic passes, including fees and potential market penetration. Each section that follows will provide a summary of the working papers along with recommended financial and policy assumptions on each of the tolling elements that will shape analyses that will come out of this study

TOLL RATE STRUCTURE OPTIONS (WP 5.1)

WP 5.1 identified tolling rate options that demonstrate differences in tolling policies throughout the United States. Based upon the objectives identified for this study, and common practices for toll facilities in the United States, it is recommended that a toll policy for the I-5 and I-205 Columbia River crossings include the following elements:

- **Vehicle class rate differentials**: Different tolls are charged to vehicles based on their classification. Passenger cars would typically pay a lower toll than commercial vehicles.
- **Time of day pricing:** Toll rates are set based upon the value of the trip, with peak hour trips typically priced higher than off-peak trips.
- **Electronic Toll Collection pricing:** Discounts are used to encourage increased use of ETC lanes.
- **High Occupancy Vehicle pricing:** Discounts for HOVs are used to encourage the formation of car pools.
- **Toll escalation:** Toll rates are increased over time to reflect inflation and properly price the value of the trip.

It is recommended that a base toll rate be established based upon the amount of toll revenue that could be collected annually, versus the relative capital program to be supported by the tolls. Then, policy variations of this base case can be tested to respond to the region’s fiscal and policy needs.

Vehicle Class Rate Differentials

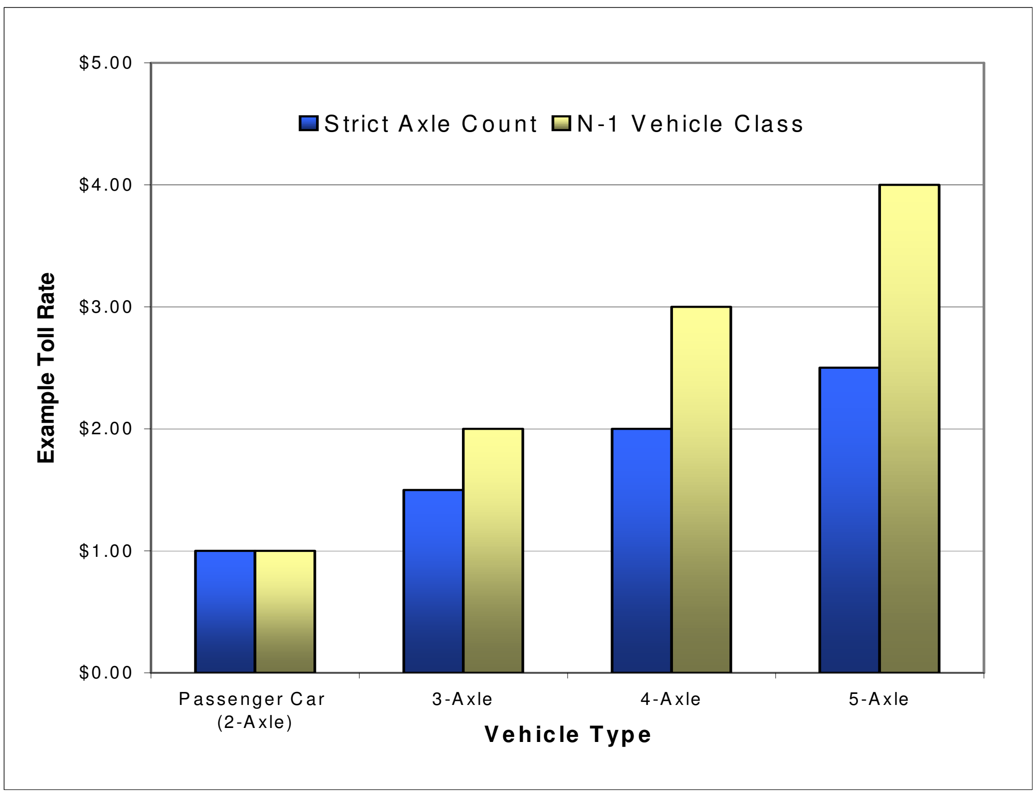
Vehicle class rate differential toll collection has been the dominant toll strategy in the United States throughout its 200-year toll history. It is common for commercial vehicles to pay higher tolls to make up for the additional wear and tear they put on the highway. Although there are no uniform national standards, there are few regional major toll facilities that have the same commercial vehicle toll structure. The Pennsylvania Turnpike is one of the few facilities using weight as a vehicle class delineator. The two most common practices in the United States are: 1) axle-count, and 2) visual vehicle delineator.

Within the axle count method, there are many variations, such as:

- *Strict axle count*. If a passenger car is two-axle, a three-axle vehicle pays 1.5 times that rate, a four-axle vehicle pays two times the rate, etc.
- *N-1 Vehicle class:* In this system, commercial vehicles are charged a ratio of the passenger car rate based upon the N-1 formula. Thus a three-axle truck would pay <3-1>, or two times the passenger car rate.

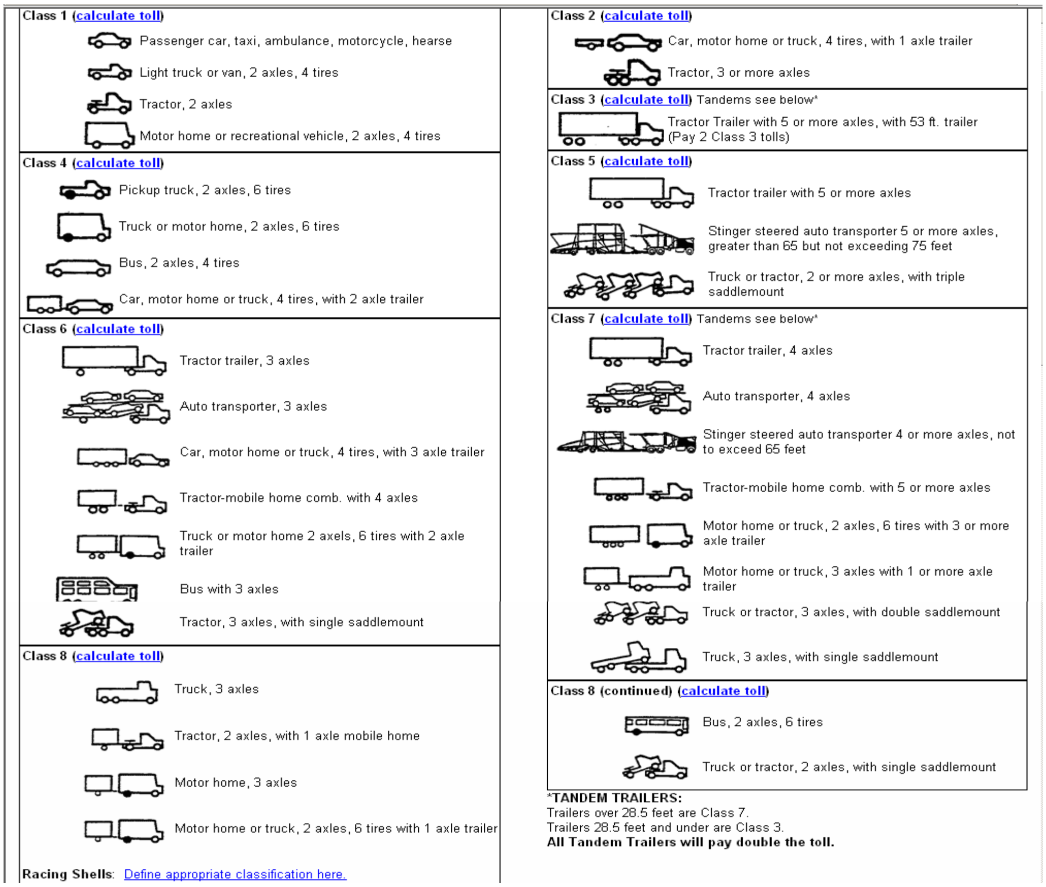
Example axle count toll structures are shown in Figure 1.

Figure 1. Axle Count Tolling Structures



In the visual delineator system, each vehicle class has a visual picture to allow the collector to identify the toll rate for the vehicle. When these types of systems started in the 1950s, truck traffic was composed primarily of three- and four-axle vehicles, and it was relatively easy to define each vehicle type. Beginning in the 1990's, the number of tandem trailer and other combinations of truck categories increased dramatically and special toll rates were established based upon vehicle use as an incentive for industrial development. The best example of this is the rate applied to auto transports. The New York State Thruway Authority (NYSTA) now has more than 40 separate vehicle classes (see Figure 2).

Figure 2. NYSTA Current Toll Classifications



With the advent of Electronic Toll Collection (ETC), many agencies are moving to a pre-processing declaration of vehicle type that is encoded in the ETC tag. Plaza lane and/or back office activity is required to read the tag and compare the vehicle description of the declared vehicle to what information is noted in the lane. For example, a vehicle is declared to be a four-axle tractor-trailer, but registers as five axles as it passes the ETC read zone. The vehicle may then be charged the rate for the extra axles based upon the additional costs for that larger vehicle type. Each agency applies its own policy with regard to such axle count discrepancies.

Vollmer Associates has undertaken several vehicle classification studies for operating toll roads. These studies, performed in close coordination with the staff of the sponsoring agencies, tend to recommend a height-and-axle system, that is, there is one rate per axle below a certain height, and a separate rate per axle for vehicles above that height. This method assures that cars towing a boat are treated differently than heavy trucks with the same number of axles. A major advantage of this system is that reliable detectors for both height and axles are readily available, and it is easy to coordinate with an ETC based system. A major disadvantage is dealing with Recreational Vehicles (RVs) at toll facilities that discriminate by vehicle purpose. Most RVs would break the height threshold and be charged the commercial vehicle rate. The RV problem extends to most electronic detection systems, and RV owners are an outspoken lobbying force.

There are a few toll facilities with very simple vehicle classification systems. The Dulles Greenway in northern Virginia has one rate for passenger cars, and one rate (two times the passenger car rate) for commercial vehicles. A similar three-class system is used on the Toronto 407 project.

Although clearly not freight, most mass transit vehicles are tolled consistently with the rates for commercial vehicles of a similar size. For example, in the NYSTA classifications shown above three-axle buses are classified as Class 6, the same as three-axle trucks. There has been a trend to provide discounts for commuter buses, consistent with public policy of increasing vehicle occupancy, usually in conjunction with an ETC program.

Recommended Assumption

For the purpose of developing revenue projections only, we will use a commercial vehicle classification system that differentiates by class of vehicle. This analysis will toll commercial vehicles based on height-and-axle, using an N-1 toll.

Differential by Time of Day

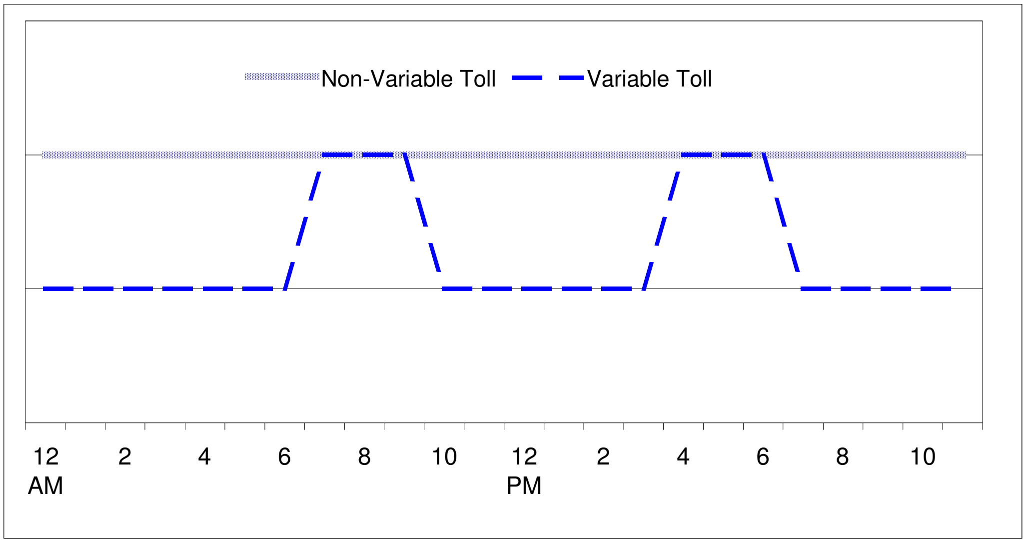
Over the past decade, differential pricing strategies have become increasingly popular. Originally termed "congestion pricing," "value pricing," and/or "variable pricing," they attempt to set rates based upon the value of the trip to the driver, with typically higher tolls during the AM and PM commuter hours.

The purpose of variable pricing is to use price incentives and disincentives to change the pattern of driving or to charge higher tolls during periods with the highest travel demands. The time of passage can be hourly, day-of-the-week, overnight, or any other period of time that meets the specific goals of the program. As shown in Figure 3, toll rates are set so that they are higher during peak commuter periods and lower at other times as an incentive for travelers that have the option to travel at times other than the peak-period. Variable pricing is most readily implemented in ETC systems, and the lower off-peak rates are available to ETC customers only. Cash paying rates pay the higher toll during all periods of the day.

Other terms used in this context include: road pricing, market-based pricing, congestion tolling, incentive pricing, and peak-hour tolling. Variable pricing can also be used to encourage car-pooling or even use of alternate facilities. Some of the existing facilities using incentive pricing include: New York State Thruway Tappan Zee Bridge Corridor, Highway 407 in Toronto, SR 91 in California, and I-15 in San Diego

Variable pricing became a popular concept for consideration upon the advent of ETC, which allows ready changes in toll rates. The process of applying variable pricing to cash toll rates has proven to be extremely problematic. Specific issues relate to the time when the cash rate changes creating opportunity for toll collector fraud. Time changes also cause confusion with motorists. It is very unlikely that any two clocks will show the same time, which may result in the toll collectors becoming the arbiters with the patrons as far as the time of day and when the patron actually reached the toll collection queue. However, even with ETC, high variations in toll rates can cause erratic motorist behavior with drivers speeding or slowing to beat the clock on toll rates.

Figure 3. Variable Pricing by Time of Day



Most successful implementations have maintained the higher "cash" rate to eliminate these issues and have applied the variable pricing incentives to the ETC toll rates. By using the ETC rates, it is possible to smooth the transition period by changing toll rates in small increments (five minutes) and thus eliminating the speed up/slow down activities. The use of ETC also eliminates the potential for toll collector fraud.

Recommended Assumptions

For the purpose of developing revenue projections only, constant pricing will be used in the tolling analysis for this project. Peak surcharges can be introduced later as a strategy for reducing travel demand or opportunity to increase revenues based on policy recommendations.

Electronic Toll Collection (ETC) Discounts

The first ETC system, the Dallas Tollway, added a $.05 surcharge onto the $.50 base toll for the "privilege" of using the ETC payment. Since that time, most other agencies provide a discount for using ETC. Typically, when tolls are raised, the ETC rate is either not changed or increased at a lesser rate, as an incentive to raise ETC usage. The discounts are typically 10% to 20%, and may also be combined with loyalty or resident discounts.

Recommended Assumptions

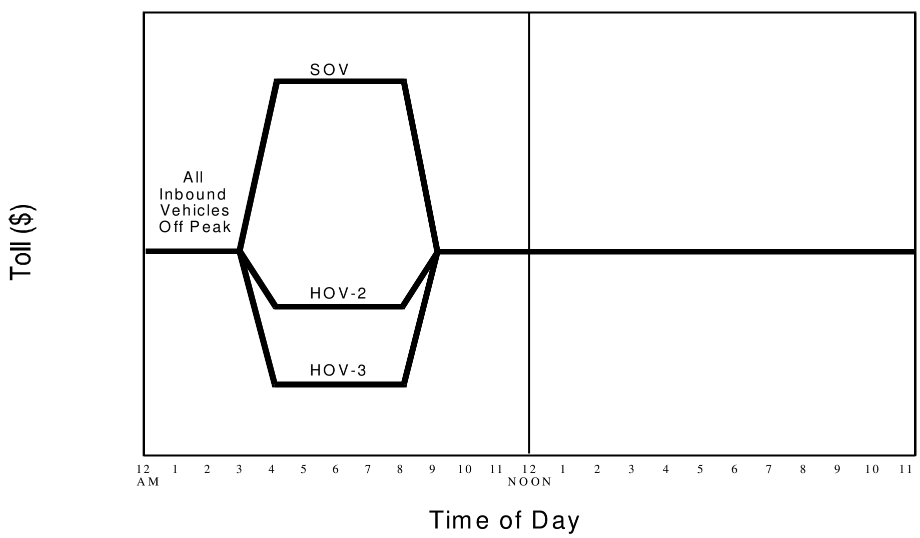
ETC discounts should be assumed in the tolling analysis to encourage ETC use. We recommend the following ETC discounts: 15% for passenger cars and commercial vehicles, and 100% discount for transit buses.

High Occupancy Vehicle (HOV) Discounts

Many regions of the country have established policies to encourage the formation of car pools in order to increase the average occupancy of vehicles so that fewer vehicles will be on the roads at peak hours. The policy measures include High Occupancy Vehicle (HOV) lanes, and where possible, HOV discounts on toll facilities. HOVs often are allowed to travel free, or at a significantly reduced toll rate, as part of the overall carpool policy in a region.

HOV discounts are often paired with time of day pricing to further encourage the formation of car pools. Figure 4 below, "Congestion Pricing HOV Incentive Tolls," shows the relationship between single-occupancy vehicles and HOVs with tolling differentials for two or three people in the vehicles. Again, the variable toll rates are collected electronically, and a gradual step-up and step-down can be applied to minimize the erratic driver behavior.

Figure 4. Congestion Pricing HOV Incentive Tolls



High Occupancy Toll (HOT) lanes are an example of this combined strategy, in this case allowing SOVs to use HOV lanes for a price. The SR 91 Express Lanes are the most well known, and perhaps most effective HOT lanes. The peak hour pricing is the highest rate per mile in the Unites States ($.63 per mile, eastbound 4 p.m. to 6 p.m. weekdays). HOVs are not charged on SR 91 Express Lanes except from 4 p.m. to 6 p.m. weekdays, and then at a 50% discount.

Recommended Assumptions

For the purpose of conducting the tolling analysis, an HOV discount rate will be applied to HOVs equipped with ETC and will be estimated at a 50% reduction of the ETC rate. For the tolling analysis, HOVs are defined as vehicles with three or more people in the car (HOV-3+).

Toll Escalation

Virtually all toll facilities in the United States have had toll increases over their economic lives, but only in the last decade is it common to apply consistent toll increases as part of a new project. Currently, almost every new toll facility assumes a toll schedule of increasing rates throughout the forecast period for the bonds supporting the financing of the project. A typical toll escalation equates to roughly a 3% increase per year, with toll increases applied in round $.25 to $.50 increments. For example, with a base toll rate of $4.00, an increase would occur every two to three years.

Recommended Assumptions

We will use toll escalation rates of 3% increase per year in the tolling analysis for revenue projections. The analysis will assume a rate increase every two to three years based on currently accepted methods.

LOCATION OF TOLL COLLECTION FACILITIES (WP 5.2)

WP 5.2 assessed the operational, revenue, and traffic impacts of collecting tolls for the I-5 Columbia River crossing or for both the I-5 and I-205 Columbia River crossings. Two-direction, northbound and southbound toll collection was reviewed for one or both river crossings. The methods used for toll collection, the rate structure, and the resulting toll plaza footprints influence toll collection options.

For the purposes of this study, reliance on 100% ETC toll collection was not considered a realistic or viable option. WP 5.3 provides typical ETC market share distribution for major facilities located in the Northeastern United States. While there are examples of toll plazas achieving ETC usage as high as 70% in the New York City region, this share of ETC usage is rare. As forecasted in WP 5.3, a more likely target for ETC usage at the end of the start-up period is 35 to 45%, with usage as low as 25 to 30% in the early stages of project start-up. For comparison, the Tacoma Narrows Bridge project in Washington designed their toll collection system for a start-up of 40% ETC market share. Because I-5 and I-205 are large volume interstate highways, even a 40% start-up ETC market share will require a sizeable toll plaza footprint.

Toll Plaza Impacts on Toll Collection Options

Placement of toll collection facilities in both the northbound and southbound directions on I-5 and I-205 may not be possible for the build concepts that may be studied. Adjacent land use in the areas of the Columbia River crossings are urban in nature, with commercial and residential properties abutting the existing I-5 and I-205 corridors. Toll plazas, of necessity and by design, cover a large footprint and create environmental impacts. For safety reasons, plazas need to be highly visible and require high levels of light. The large number of vehicles decelerating and accelerating through the tollbooths adds to noise impacts and raises issues associated with air quality and surface water runoff. Therefore, siting northbound and southbound tollbooths in sensitive urban areas may not be possible for the concepts that have been evaluated to date or may be evaluated in the DEIS.

In order to gain a clearer picture of the challenges associated with toll plaza placement, a toll plaza workshop was held on August 25, 2004 for the purpose of identifying potential toll plaza sites for the concepts that were studied in some detail in the I-5 Transportation and Trade Partnership Strategic

Plan process. The workshop also sought to identify potential toll plaza sites in the I-205 Bridge corridor. The workshop included toll plaza siting experts from Washington State Department of Transportation (WSDOT) and Vollmer and Associates, as well as interstate highway design experts from the Oregon Department of Transportation (ODOT), WSDOT, and the consulting firms that developed the river crossing concepts.

Workshop Assumptions and Conclusions

Assumptions for Siting Toll Plazas

- Tolling options should have the potential to provide sufficient revenue to recover capital, maintenance, and operational costs of the new facilities—within the framework of potential state and regional policies.

- There are no national standards for design of toll plazas. However, guidelines have been developed that are a synthesis of design practices used for existing facilities located throughout the United States. For the purpose of finding acceptable sites for toll plazas, it is assumed that deviations from the guidelines will be acceptable if approved by the state with jurisdiction and Federal Highway Administration (FHWA), depending on whether located in Oregon or Washington.

- Scenarios should include options that allow for the existing bridges on I-5 and the existing bridge on I-205 to be tolled, as well as tolling new capacity across the river.

- Toll plazas can be located either in Washington or Oregon. Tolls can be collected one direction or two directions. If one direction, they can toll either southbound or northbound.

- If tolls are to be collected in both directions, toll facilities should ideally be sited in close proximity to reduce operational costs.

- Efforts should be made to avoid historic places, mitigation areas, and to minimize the impact on other sensitive areas such as neighborhoods, wetlands, and parks.

- All standard options for collecting tolls should be considered, such as ETC, manual, automatic coin machines (ACM), tokens, bar code readers, credit card, and tickets.

- Because of policy issues such as concerns for privacy and the practical limitations of technology, it is premature to assume that 100% electronic toll collection will be practicable in the immediate future. For evaluation purposes, an assumption of 40% ETC is satisfactory for testing toll plaza configurations.

- Toll lane capacities, and the number of vehicles per hour per lane that can be handled, should follow averages as outlined in NCHRP Synthesis 240.

- Innovative methods to minimize toll plaza footprints should be considered.

Conclusions from the Toll Plaza Workshop

- Toll collection facilities were not considered for the concepts outlined in the I-5 Transportation and Trade Partnership. Providing toll facilities will require modifications to the existing concepts.

- In the initial workshop evaluation, no acceptable sites were found that would allow for efficient collection of two-way tolls. This was under the assumption that toll plazas should be located in close proximity for both northbound and southbound traffic to allow for a single administration building and common facilities. If two-way tolls are to be collected under a scenario where only I-5 is tolled, additional work will be required for optimal siting of two-way toll plazas.

- There were no practical northbound toll plaza sites in Washington because the footprint would encroach on the historic properties located between SR 14 and East Mill Plain. Northbound plaza sites in Oregon appear to have greater property impacts than southbound sites.

- Based upon initial analysis of the physical options, it appears more feasible to locate toll facilities in the southbound direction for both I-5 and I-205 in either Washington or Oregon.

- For I-5, Concepts 1, 4, and 7 were assumed to be representative samples of the concepts described in the I-5 Trade Partnership, and evaluated in the workshop. Concept 4, which provided for five new lanes in each direction on a double deck high-span bridge, appeared to provide the most flexibility to site toll plazas. Options that used the existing bridges and options that included arterials were more difficult to design for toll collection due to split alignments.

- All of the toll plaza sites will require further design analyses to confirm their footprint and how they can be integrated into each of the design options.

- All of the toll plaza concepts will require innovative siting techniques that rely on approach and departure taper rates that can be designed to meet acceptable interstate standards and can be approved by the state with jurisdiction and FHWA.

- Placement of ETC lanes that allow for high-speed toll collection in the center lanes will create weave conflicts for vehicles wanting to enter or leave the interstate system in close proximity to the toll plaza. This is due to having eight interchanges within the four-mile long Bridge Influence Area (BIA). Additional traffic analysis will be required to analyze travel demand and assess the impacts of varying toll plaza sites and layouts.

Tolling Both Directions

Traditionally, bridges across major river crossings have been tolled in both directions. Most toll bridges had a combination of manually-attended lanes and exact-change booths. It became obvious to the operators of such facilities over time that the operating costs to collect tolls became an increasingly larger expense, reducing the net revenues available for maintenance and capital needs. One-way tolls reduced the number of manually-attended lanes by 50% (five to six employees are needed to staff one lane 24 hours a day, seven days a week). The one-way tolling resulted in staff savings of between 10-20 toll collectors per bridge. Therefore, most major river crossings have shifted to a directional system to minimize operating costs and driver delays.

If two-way tolls are used, it is more efficient to site the collection facilities opposite each other to reduce operating and maintenance costs as they can use shared administration facilities. Within the BIA on I-5, and similarly on I-205, adjacent land use is urban in nature with commercial and residential land use abutting the existing right-of-way. Finding suitable locations on I-5 and I-205 where toll plazas can be placed opposite each other in both the northbound and southbound directions within these sensitive urban areas will be difficult.

Tolling I-5 Only

Notwithstanding the expense of collecting in both directions, tolling the I-5 Bridge but not the I-205 Bridge would change the nature of traffic patterns in both the Portland, Oregon and Vancouver, Washington area. Traffic, where possible, would attempt to change trip patterns to avoid the tolled crossing, potentially shifting substantial traffic to the I-205 corridor. The amount and time of such shifts will be the subject of future work.

In an interesting parallel case, the Verrazano Narrows Bridge crossing between Staten Island and Brooklyn, New York was changed to a one-way toll, while no other toll collection changes were made in the region. This caused measurable traffic dislocations to other crossings and a significant diversion of trucks shifting in one direction to cross Lower Manhattan. By diverting from the toll bridge, trucks moved from major arterial routes to local streets, therefore adding 10 to 15 minutes onto their travel times in order to save significant tolls (a five-axle truck is currently charged $44 cash/$35.20 *E-ZPass*). This became an issue of interest due to the air quality issues raised by this shift in traffic.

Recommended Assumption

For purposes of revenue projections only, if it is assumed I-5 only is to be tolled, the I-5 bridge(s) would be tolled in both directions, with toll collection facilities located in either Washington or Oregon.

Tolling One Direction (I-5 and I-205)

Considering the above discussion, collecting tolls for both the I-5 and the I-205 crossings in one direction is an alternative that would minimize collection costs and minimize regional shifts of traffic, and therefore is an alternative concept for consideration. This option also has the potential to initially reduce traffic at each river crossing as drivers consolidate trips, and/or eliminate trips, that are currently being made in response to the imposition of tolls across the Columbia River. Further traffic analysis will be required to verify traffic impacts.

Recommended Assumption

For purposes of revenue projections only, it is assumed the I-5 and I-205 bridges would both be tolled. Given the difficulty in identifying apparent northbound toll plaza sites, we recommend assuming they would be tolled in the southbound direction, with toll collection facilities located in either Washington or Oregon.

SALE/DISTRIBUTION OF ELECTRONIC PASSES (WP 5.3)

WP 5.3 discussed the basic components of ETC, identified various approaches to the distribution of electronic passes, and discussed the potential ETC market share penetration that could be achieved in the Columbia River corridor. The information presented reflects tolling experience in the Northeast United States and does not relate specifically to the I-5 Columbia River crossings. However, this history will provide a basis for recommending variable assumptions that will be used in the tolling analysis.

Electronic Toll Collection

The advantage of ETC is that it increases toll lane throughput because vehicles do not need to stop to pay a toll. ETC also reduces costs of collection and enhances auditing and toll enforcement capabilities. Increased ETC market share results in the need for fewer manual tollbooths and reduces the toll plaza footprint.

Electronic collection of tolls is in widespread use today and is performed using a variety of methods. Vehicle operators can mount a transponder to the inside of a windshield, and when the vehicle passes a toll collection point, it is electronically identified by a reader and the proper toll is charged against a pre-established account. Alternatively, vehicles that are not transponder-equipped have a series of video images captured of their license plates, and once the plate is identified, the registration and billing address are found and a bill is sent for tolls and handling fees. These transactions can take place either in a lane within the toll plaza or in a high-speed freeway lane separate from the toll plaza. The latter option is called open-road tolling.

There are many policy decisions that would need to be made before an ETC system could be implemented. Some factors, including the customer service center backroom systems and the tag type, are not required at this point in the project in order to perform the tolling analysis, and are therefore not developed in great detail in this Technical Memorandum. Additional information can be found in WP 5.3.

Electronic Toll Collection Market Share

Vollmer Associates has performed studies of the various *E-ZPass* and other ETC system market shares in the United States, including a review of the historical usage of ETC. This data leads to an examination of the relationship between toll road users and the frequency of trips made. *E-ZPass* is just one of several proprietary electronic tolling systems in use in the United States and is predominant in the Northeast where the studies were conducted. Another example that was not studied for this Technical Memorandum is the *FasTrak* system that is used in the San Francisco Bay Area.

E-ZPass allows users to pre-pay charges incurred at *E-ZPass* facilities. New York *E-ZPass* is operated under the auspices of the MTA Bridges and Tunnels, the NYSTA, and the Port Authority of New York and New Jersey. A customer's *E-ZPass* account is operable on all *E-ZPass* facilities in New York, Maine, Pennsylvania, New Jersey, Delaware, Maryland, and West Virginia. *E-ZPass* toll lanes are identified by a distinctive purple and white logo. In a toll plaza, a sufficient number of lanes will offer *E-ZPass* to accommodate the *E-ZPass* subscribers. These are the only lanes where the *E-ZPass* is accepted. If the *E-ZPass* customer uses other lanes, they will have to pay the full cash toll.

For *E-ZPass*, market share is a dynamic number that is influenced by many factors over time. There is an initial market share that typically includes the most frequent users. Middle frequency users tend to adopt the program during the first year or two of operation, and occasional users would take two or more years to open accounts. There are also some casual users who are *E-ZPass* users from other agencies that are present on day one. In addition, *E-ZPass* market share during specific peak, off-peak, and daily periods may be substantially different.

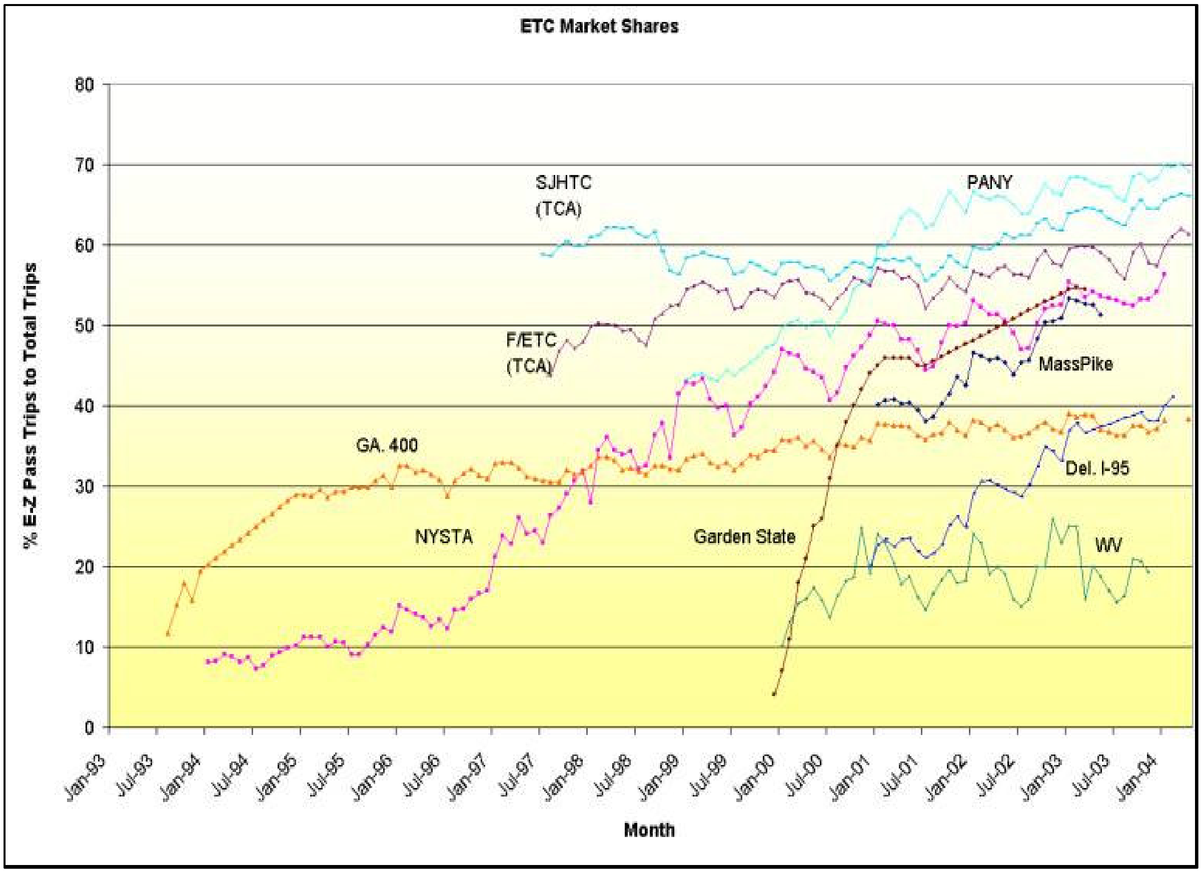
Overall, of the *E-ZPass* markets studied, market share varies between a low of 20% and a high of 70% to 75%. Facilities with very little local (i.e., commuter) traffic tend to experience comparatively low *E-ZPass* market share whereas facilities with a high number of neighboring agencies and captive commuter audiences achieve comparatively high average market shares. This is the case at several New York area bridges and tunnels where *E-ZPass* market shares are considered to be approaching their absolute ceiling.

Many facilities also exhibit seasonal variations in their *E-ZPass* market shares. The West Virginia Turnpike is one of the best examples of this. Summer peak traffic through the corridor typically does not come from an *E-ZPass* agency, and this shows as a reduction in *E-ZPass* market share.

Figure 5 includes the *E-ZPass* facilities on the New York State Thruway, Garden State Parkway, West Virginia Turnpike, Massachusetts Turnpike, I-95 in Delaware, Port Authority of New York and New Jersey crossing, as well as the other ETC systems on the Georgia 400, and the San Joaquin Hills Toll Corridor and Foothills Eastern Tollroad in Southern California. The Georgia facility does not have reciprocal agreements with other agencies and is most similar to the I-5 Columbia River Crossing. In some cases missing data was extrapolated pending the availability of the actual values from each agency.

A review of the figure suggests that several factors are at play in the evolution of a toll system's market share of *E-ZPass* usage. The New York State Thruway continued to grow as other agencies were added to the *E-ZPass* system. However, some of those new agencies have exceeded the system-wide *E-ZPass* market share of the Thruway. Factors such as frequency of travel, proximity to other facilities, discounts and travel time advantages all contribute. In reviewing the data, the single factor that correlates across the data best is frequency of travel. West Virginia's market share when compared to the Port Authority's is a strong example of this.

Figure 5. Historical ETC Market Shares



Forecast ETC Market Shares for I-5 and I-205

Applying all of the factors discussed above and adoption rates of other facilities, order of magnitude estimates of future ETC market shares for a sample toll plaza were made based on experience from the *E-ZPass* studies. Although the information may not reflect what will be experienced at the I-5 Columbia River Crossing, the ranges reflect current trends based on technology currently in use in the United States. These estimates are presented in Table 1. It is reasonable to expect variations on an hourly, daily, and seasonal basis with higher market shares occurring during weekday commuter periods and lower market shares occurring during weekend summer travel periods when there are more occasional users.

Table 1. Total Forecast Market Share

Opening Year	3-5 Years After Opening	5-10 Years After Opening
25-30%	35-45%	50-60%

Recommended Assumption

The above forecasts will be used in the tolling analysis and in making revenue projections where a 15% ETC frequent user discount will be applied.

Marketing

An aggressive marketing program is required to encourage maximum ETC utilization. Far in advance of opening, a formal marketing process is required to sell the benefits of the system and explain its use. Incentive programs to encourage early transponder use should be offered, including free or reduced cost transponders, extended grace periods, discounts for ETC users, and easy access for purchase and account information. Transponders are primarily distributed through a Customer Service Center either via a walk-in procedure or over the phone or Internet. These accounts can be established and secured with a credit card and are then activated when the driver receives the transponder. Other programs that have been proposed involve selling transponders at travel centers and neighborhood outlets. WP 5.3 provides additional information on possible systems that need to be included in a marketing program.

Recommend Assumption

The total forecast ETC market share would require an early and aggressive marketing approach in order to achieve the projections. Beyond recognizing the importance of investing in early and continuous marketing, the details of carrying out the program will not be needed in this I-5 Columbia River Crossing study to complete the tolling analysis.

Customer Service Center

The Customer Service Center (CSC) is responsible for ETC promotion and marketing, patron account management, tag handling, customer service, system performance monitoring, revenue handling and reporting. CSCs can either be established using in-house (Toll Agency) resources or contracting with a CSC provider for the same services. WP 5.3 provides a more detailed discussion about the business conducted at a CSC as well as provides a cost/benefit analysis based upon estimates and assumptions of setting up a CSC using in-house resources versus contracting with a CSC provider for the same services.

In order to prepare the tolling analysis revenue projections, it is necessary to understand the maintenance and operation costs associated with the toll collection facilities. The principle factors determining the size of the CSC operation are the number of accounts, tags, and transactions projected to be processed by the system. There have been several recent procurements for CSCs, each resulting in a very wide range of estimated costs. Some of the variance is based upon the scope of services specified, the anticipated size of the operation, and what appears to be market forces. As such, per transaction costs have ranged from as low as $.045 per transactions to costs in excess of $.25. Clearly, the range is so wide a direct comparison between an outside provider of the service and developing an internal Toll Agency service center is difficult. An overview of CSC options is presented below:

- Establish In-House Operations - The first option evaluates the cost and effort required by the DOT/Toll Agency staff to handle all CSC service activities in-house. Such services will include all basic CSC activities as well as addressing all the basic needs for setting up office space.

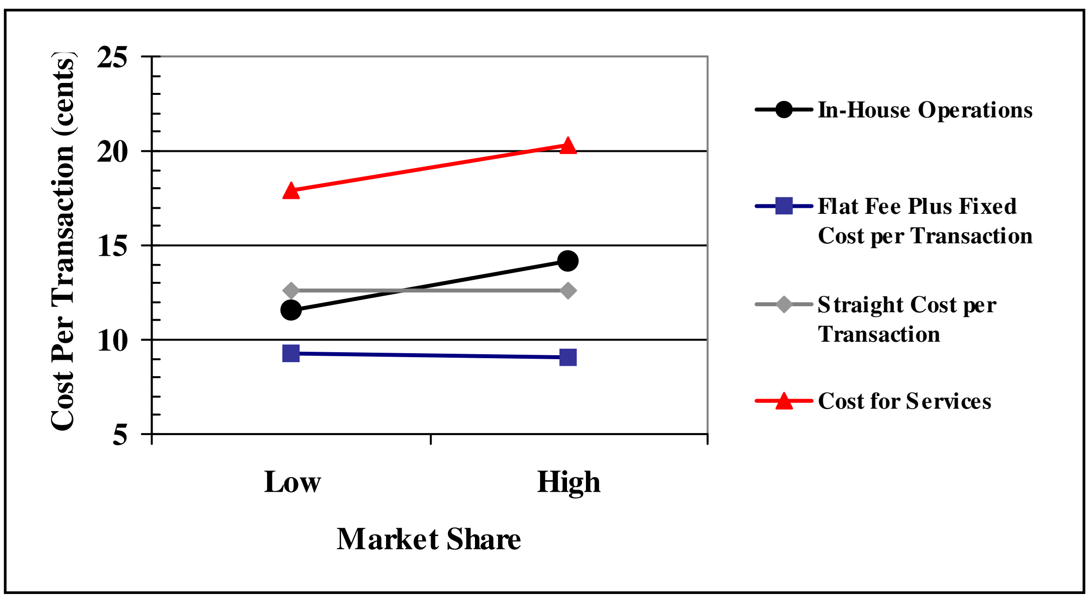
- Flat Fee Plus Fixed Cost Per-Transaction - In this option, a minimum annual fee is set to cover the basic costs associated with another entity operating a CSC. This removes market share risks. Per-transaction costs are then assigned for transactions above a set threshold. The threshold should be established as close as possible to the anticipated market share.

- Straight per Transaction Cost - The purpose of this cost estimate is to "charge" all processing costs. Since this is a charge for services, it is a reasonable method for estimating the anticipated costs for these services. Recently, the compilation of several CSCs resulted in an average cost to be $0.125 per transaction. It should be noted that this is an average cost and should only be used as a reference since it includes agencies with service centers processing from 15,000 accounts to some 3,000,000 accounts in a single service center.

- Cost for Services - Some recent procurements have established a "cost for services" approach as a basis for providing CSC services. Specific services include: start-up costs, per-transaction costs, and cost per new transponder shipped.

Figure 6 is a graphical presentation of the average cost per transaction for a high- and low-range market share case for the in-house, flat fee, and cost for services analyses.

Figure 6. Comparison of Estimated Operating Costs for a Customer Service Center by Operating Scenario



Recommended Assumption

For costing purposes for this study's revenue projections, a conservative per-transaction cost of $.20 should be used in the tolling analysis.

SUMMARY

This Technical Memorandum has summarized the options available for tolling the I-5 Columbia River Corridor. Following is a summary of the recommended assumptions to be used in this tolling analysis:

Table 2. Summary of Recommended Assumptions

Tolling Option	Recommended Assumption
Vehicle Class Rate Differentials	Use a commercial vehicle classification system that differentiates by class of vehicle. This analysis will toll commercial vehicles based on height and axle, using an N-1 toll.
Differential by Time of Day	For the purpose of developing revenue projections, constant pricing will be used in the tolling analysis for this project. Peak surcharges can be introduced later as a strategy for reducing travel demand or opportunity to increase revenues based on policy recommendations.
Electronic Toll Collection Discounts	ETC discounts should be assumed in the tolling analysis to encourage ETC use. We recommend the following ETC discounts: 15% for passenger cars and commercial vehicles, and 100% discount for transit buses.
High Occupancy Vehicle Discounts	For the purpose of conducting the tolling analysis, an HOV discount rate will be applied to HOVs equipped with ETC and should be estimated at a 50% reduction of the ETC rate. For the tolling analysis, HOVs are defined as vehicles with three or more people in the car (HOV-3+).
Toll Escalation	Use toll escalation rates of 3% increase per year in the tolling analysis for revenue projections. The analysis should assume a rate increase every two to three years based on currently accepted methods.
Tolling I-5 Only	If I-5 only is to be tolled, the I-5 bridge(s) would be tolled in both directions, with toll collection facilities located in either Washington or Oregon.
Tolling One Direction (I-5 and I-205)	The I-5 and I-205 bridges would both be tolled in the southbound direction, with toll collection facilities located in either Washington or Oregon.

Table 2. Summary of Recommended Assumptions (continued)

Tolling Option	Recommended Assumption
Forecast ETC Market Shares for I-5 and I-205	The forecasts discussed will be used in the tolling analysis and in making revenue projections where a 15% ETC frequent user discount will be applied.
Marketing	The total forecast ETC market share would require an early and aggressive marketing approach in order to achieve the projections. Beyond recognizing the importance of investing in early and continuous marketing, the details of carrying out the program will not be needed in this I-5 Columbia River Crossing study to complete the tolling analysis.
Customer Service Center	For costing purposes, a conservative per-transaction cost of $.20 should be used in the tolling analysis