Appendix 3 - Eastside Corridor Express Toll Lane Operating and Maintenance Costs

This appendix documents and explains the operating and maintenance (O&M) cost assumptions used to calculate the annual expenditures shown in the January 2010 Eastside Corridor Tolling Study. These annual expenditures were prepared by the I-405 project team, with input from the SR 520 project team, the WSDOT Toll Division, and WSDOT's consultant, Parsons Brinckerhoff.

O&M Cost Assumptions

Uncollectible Accounts
A deduction of 2.5% was applied to gross revenue for uncollectible accounts. This is a standard assumption applied to all WSDOT tolling projects.

Credit Card Fees
The credit card fee is an expense equal to 3.45% of the adjusted gross revenue. Adjusted gross revenue is the gross revenue less uncollectible accounts. This is a standard assumption on all WSDOT tolling projects.

Transaction-based Toll Collection
This category covers the statewide back office operations that are triggered by a vehicle crossing a toll point. The activity costs and processing workflow were estimated for the 2010 Eastside Corridor Tolling Study based on the estimates for the SR 520 project, as described in the attached SR 520 Operations and Maintenance Memorandum dated December 17, 2007 (SR 520 O&M Memo). It is assumed that tolling on SR 520 will begin before tolling on I-405 commences. The SR 520 project includes construction of a new statewide back office and customer service center that will provide tolling support services for all facilities that may have tolls, including the Tacoma Narrows Bridge, SR 520, and SR 99, in addition to the applicable portions of the Eastside Corridor. Support services for the existing SR 167 HOT lanes will be migrated to the new facilities when they are completed. All equipment for the Eastside Corridor express toll lanes will be compatible with these new facilities.

The current assumption is that all vehicles in the express toll lane system will be required to have a transponder, including HOV vehicles. When read, each transponder will declare itself to the toll collection system as either a toll-paying or a toll-free vehicle. This declaration can be done either by switches on each transponder, or a registration program for carpools. Additionally, video enforcement will be used to enforce the transponder requirement. Enforcement of toll-free versus toll paying vehicles will be done manually, as the technology is not yet available that can determine this. It is assumed that 98% of vehicles will have a valid transponder, limiting the amount of video enforcement efforts needed.
The forecasts for O&M costs include an inflation adjustment of 2.5% annually for all activities that require an operations staff such as answering phone calls, viewing license plate images, and

sending invoices. All costs for activities that are fully automated, such as posting valid transponder readings to customer accounts, are assumed to remain constant over time; that is, to decrease in real dollars.

Fixed Back Office Operations

The fixed costs of operating the statewide back office will be divided among all tolling facilities based on the average number of weekday trips recorded at each facility. These fixed costs include general and administrative staff, office space and equipment, and other activities needed to operate a tolling system. These costs also include the administrative cost to the Washington State Patrol (WSP) to review license plate images for the video enforcement.

The costs of operating the back office are based on the anticipated volume of trips taken in 2015 on all facilities that may have tolls, including the Tacoma Narrows Bridge, SR 520, and SR 99, in addition to the applicable portions of the Eastside Corridor. Unlike the other projects, a toll trip on an Eastside Corridor express toll lane facility may more likely involve traveling under more than one toll gantry. Because the majority of the costs of processing a trip are related to the invoicing instead of the electronic reads, it was decided that the share of the costs for operating the back office would be determined by trips, regardless of the number of transponder reads. A trip on the Eastside Corridor encompasses all travel in a single direction, regardless of the distance traveled.

Statewide there will be approximately 300,000 toll trips on a typical weekday in 2015, with Eastside Corridor trips comprising approximately 40% of the total volume. The SR 520 project team estimated that the total annual cost to operate a back office of this size is $2.8M (in 2011dollars). The total annual cost to the Eastside Corridor for Fixed Back Office operations is approximately $1.1M (in 2011 dollars). This cost is assumed to increase by 2.5% annually for the life of the facility.

Transponders

The Eastside Corridor express toll lane project is not intending to give away free transponders to potential users. All users, including HOV vehicles, will be required to have a transponder in order to use the express toll lanes.

Manual Enforcement

Enforcement on I-405 will be both automated and manual. Automated enforcement will be limited to video enforcement of transponder presence at all toll gantries. The video enforcement costs are described in the *Transaction-Based Toll Collection* and the *Fixed Back Office Operations* sections above. Manual enforcement will be provided by the WSP using vehicles to monitor compliance with the buffer, access point locations, and toll-free occupancy requirements. Enforcement hours have been developed by the WSDOT Tolling Group and WSP to ensure long-term compliance. An initial 12-week intensive period will occur at the opening of each section of the corridor, followed by continued long-term enforcement. It is assumed that teams of two vehicles will be needed to patrol the two-lane sections, while a single officer can patrol a single-lane section. **Table 1** shows the hours and schedule for the initial enforcement period, followed by a description of the main assumptions.

Table 1: Initial Enforcement Period

Day	Shift Hours	Officers per Shift	Total Travel Time (Hours)	Total Hours	Rate	Weekly Labor Cost	Weekly Mileage Cost	Total Weekly Cost
Weekday - AM Peak	5	6	3	33	$91	$15,015	$2,370	$17,385
Weekday - Midday	4	2	1	9	$91	$4,095	$790	$4,885
Weekday - PM Peak	5	6	3	33	$91	$15,015	$2,370	$17,385
Saturday	5	2	1	11	$91	$1,001	$158	$1,159
Sunday	5	2	1	11	$91	$1,001	$158	$1,159
				1 WEEK TOTAL		$36,127	$5,846	$41,973
				12 WEEK TOTAL		$433,524	$70,152	**$503,676**

The rate shown is the average rate for troopers, sergeants, and lieutenants. The weekly mileage cost assumes that 100 miles are driven per officer, per shift, at the current operating cost of $0.79 per mile. Travel time is included at 0.5 hours per officer for each non-contiguous shift. Currently, WSP provides manual enforcement of the SR 167 HOT Lanes Pilot Project, using overtime hours for all activities. This study also assumed overtime hours, while intending to discuss moving to normal hours for enforcement efforts.

The hours for the ongoing enforcement efforts are included in the attached details for each study option described in the January 2010 Eastside Corridor Tolling Study. The base estimate for the initial enforcement period and each study option scenario is in 2008 dollars and assumed to increase by 2.5% annually.

Roadway Maintenance

The cost for annual, routine roadway maintenance is based on actual costs incurred on I-405 and SR 167 in the 2007-09 biennium. The actual costs, reported by maintenance control sections, have been prorated to a 12-month period and then converted to a lane-mile basis. The range of costs is between $5,000 and $26,000 per lane-mile (in 2008 dollars), as shown in **Table 2**. This estimate includes all routine maintenance (mowing, snow removal, etc.), plus the cost of operating Incidence Response Team (IRT) service in the corridor.

Table 2: Existing Annual Roadway Maintenance Cost

Corridor/ Control Section	MP Range	Total Lane-miles	Annual Roadway Maintenance Cost per Lane-mile	IRT Cost per Lane-mile	Total Cost per Lane-mile
I-405 A43405	2.6-9.75	59	$9,508	$7,010	$16,518
I-405 A51405	9.75-15.06	40	$14,744	$10,660	$25,404
I-405 A53405	15.06-30.21	111	$6,141	$1,229	$7,370
SR 167 C15167	0.00-11.17	45	$5,460		$5,460
SR 167 A42167	11.17-27.28	86	$6,206		$6,206

Once calculated, the cost per lane-mile was applied to the proposed toll lanes in each section. The highest cost is reported for urbanized Bellevue, while the lowest cost per lane mile is in the more rural, southern portion of the SR 167 corridor. The assumption is that the express toll lanes will cover a portion of the normal maintenance operations of the freeway. Additional service for any specific premium maintenance has not been factored into this estimate. The base cost is assumed to increase by 2.5% annually for inflation.

Toll Collection System Maintenance

The toll collection system will require annual maintenance. This expense is calculated based on the number of toll points on a facility. The WSDOT Tolling Group's standard assumption is a cost of $50,000 per toll point in 2008 dollars. The base cost is assumed to increase by 2.5% annually for inflation.

Periodic Rehabilitation and Repair

Periodic Rehabilitation and Repair (R&R) expenses are recurring, non-annual maintenance activities needed to maintain the roadway and toll collection system, such as re-paving the toll lanes or replacing the toll rate signs. It is assumed that the replacement cost of any item, including the toll software, is equivalent to the current cost, adjusted for inflation at 2.5% annually. **Table 3** shows the assumed replacement frequency for each type of item included based on the SR 520 O&M Memo.

Table 3: Periodic Rehabilitation and Repair Schedule

Category	Sample Items	Replacement Frequency
Central System Hardware	Back office computers running toll software	5 years
Toll Infrastructure	Field hardware, such as antennas, gantries, data collectors, and toll rate signs	7 years
Roadway Infrastructure	HMA Pavement, CCTVs, ramp meters	10 years
Toll Collection Software	Algorithm determining toll rates	12 years
Communications Infrastructure	Fiber backbone, mainline VMS signs	14 years

The timing is based on when tolling operations begin, assuming that all items listed are placed in the final year before operations begin. Costs will be paid as they are incurred, instead of making even annual contributions to a dedicated account.

Operating and Maintenance Costs by Study Option

A complete O&M estimate was prepared using the methods and assumptions above for each study option considered for the January 2010 Eastside Corridor Tolling Study. The study option scenarios vary, building up from the currently-funded projects to a full 50-mile corridor.

Table 4 shows the total O&M cost by category for the years 2015 through 2055. Year 2055 was chosen to allow for 40 years of operations. As expected, the total O&M expenditures increase with each study option, as the tolling system expands.

Table 4: Total O&M Expenditures for Years 2015-2055

Study Option	Uncollectible Accounts	Credit Card Fees	Toll Collection O&M Costs				Roadway Maintenance	Facility Periodic Rehab and Repair	Total O&M
			Transaction-Based Toll Collection	Fixed Back Office Operating Cost	Enforcement	Toll Collection Periodic R&R			
1	$184	$248	$305	$73	$262	$268	$172	$70	$1,582
2	$245	$330	$378	$89	$312	$312	$245	$88	$1,999
3	$280	$376	$326	$77	$312	$320	$253	$92	$2,036
4	$485	$653	$420	$89	$312	$355	$315	$134	$2,763
5	$402	$540	$544	$101	$312	$402	$354	$193	$2,849

Note: All dollars are YOE in millions.

O&M costs are often discussed within the tolling industry as a percentage of the gross revenue. **Table 5** summarizes the major costs identified above, along with the gross revenue, to show the overall percentage of gross revenue for each study option, as well as the total net revenue available for debt service in each study option. This comparison includes the periodic R&R expenditures, which vary annually. Depending on the study option, the revenue percentage ranges from 15% to 22% for all years between 2015 and 2055.

Table 5: Percent of Gross Revenue Needed for O&M

Study Option	Gross Toll Revenue Potential	Less Uncollectible Accounts	Less Credit Card Fees	Less Toll Collection O&M Costs	Less Routine Facility O&M Costs	Net Toll Revenue Potential Before Periodic R&R	Less Periodic Rehab & Repair Costs	Net Toll Revenue After Periodic R&R Costs	% GR Spent on O&M
1	$7,359	($184)	($248)	($908)	($172)	$5,847	($70)	$5,777	22%
2	$9,816	($245)	($330)	($1,091)	($245)	$7,904	($88)	$7,816	20%
3	$11,190	($280)	($376)	($1,034)	($253)	$9,246	($92)	$9,154	18%
4	$19,409	($485)	($653)	($1,176)	($315)	$16,780	($134)	$16,646	14%
5	$16,063	($402)	($540)	($1,359)	($354)	$13,407	($193)	$13,214	18%

Note: All dollars are YOE in millions.

As you can see, the percentage of gross revenue spent on O&M decreases with each study option up to option 4. The increased general purpose capacity provided by option 5 lowers the revenue generated by the system, while increasing the amount of the tolling system that needs to be maintained.