



# Toll Avoidance and Transportation Funding

## Official estimates frequently overestimate traffic and revenue for toll roads

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### Introduction

Beginning in December, the Washington transportation department plans to begin tolling the State Route 520 bridge across Lake Washington. State officials predict that the tolls—which will reach \$3.50 during rush hour<sup>1</sup>—will raise revenue to replace the aging bridge, while easing gridlock on one of the Puget Sound’s most congested highways.

But there’s a huge unknown in this tolling experiment: *how will drivers respond?* Will tens of thousands of drivers avoid the tolls, by choosing an alternative route such as SR 522 to the north or I-90 to the south, or by selecting different destinations that don’t require a trip across the lake?

A recent study performed by nationally recognized transportation consultants Wilbur Smith Associates, on behalf of the Washington State Department of Transportation (WSDOT), argues that the tolls will spur massive diversion to other routes, destinations, and modes, with traffic on SR 520 falling by nearly half immediately after tolling begins.<sup>2</sup> (See Figure 1.)

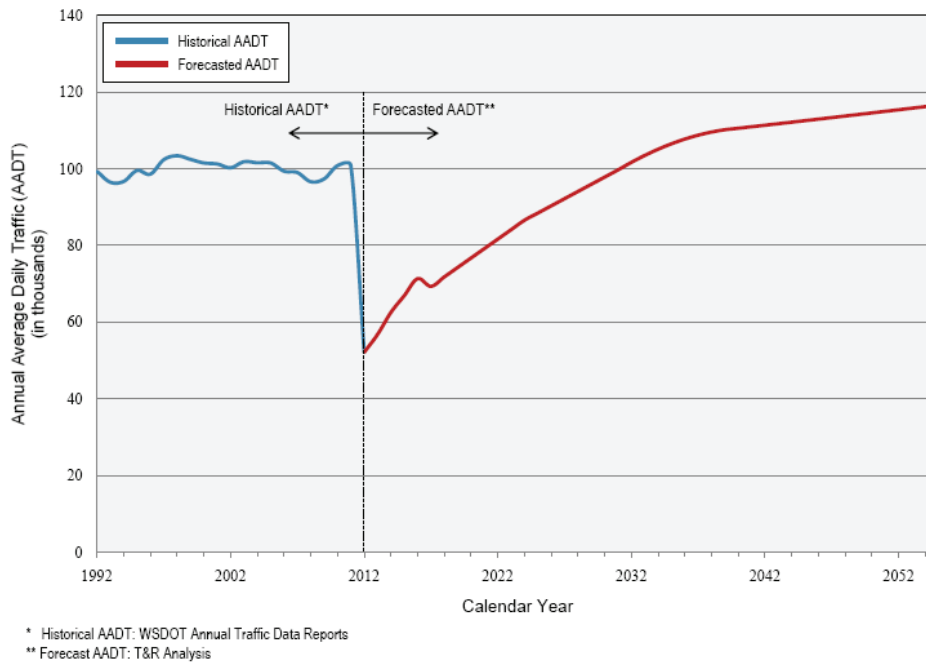
Still, despite the steep projected drop in traffic, state officials foresee no threats to their plans to raise \$1 billion from tolling the bridge. One WSDOT official called the forecast “ultraconservative,” as it was designed as an investment-grade analysis for the risk-averse bond markets.<sup>3</sup>

Only time will tell whether this confidence is justified. Yet a review of the available literature clearly shows that *toll road revenues typically fall short of official projections*—especially when drivers can choose toll-free alternative routes to reach the same destinations.

**Figure 1.** WSDOT projects a 50 percent decline in traffic on SR 520 after tolling starts. (Chart reprinted from WSDOT.)



SR 520 Bridge Investment Grade Traffic and Revenue Study  
Floating Bridge and Eastside Project



WilburSmith  
ASSOCIATES

## HISTORICAL AND FORECASTED SR 520 ANNUAL AVERAGE DAILY TRAFFIC

FIGURE 7-2

## Review of Literature

Standard & Poor's, "Traffic Risks" series ([2002](#), [2003](#), [2004](#), and [2005](#)).

In four reports to potential infrastructure lenders, the US-based securities analysis firm Standard & Poor's examined 104 start-up toll projects, tracked for up to a decade—and found clear evidence that real-world traffic volumes and toll revenues systematically fell short of official forecasts.<sup>4</sup>

The 2005 report, the most comprehensive of the four, succinctly summarized their findings: "Across all case studies, toll road forecasts overestimated Year 1 traffic by 20%-30%." This "optimism bias" persisted for years after toll roads were first opened to the public: projects that underperformed their projections in their first year tended to continue to underperform over time, rather than correcting themselves. Jurisdictions new to tolling produced particularly inflated projections, with an average traffic overestimate of 42 percent.

*Real-world traffic volumes and toll revenues systematically fell short of official forecasts*

Just as important, Standard & Poor's found high margins of error in tolling projections. For the projects studied, actual traffic ranged from 85 percent below forecasted levels, to more than 50 percent above forecasts, with a standard deviation of 26 percent in the first year. Similarly, the Standard & Poors analysts found examples in which different consulting firms produced vastly different traffic forecasts for the same project. These types of errors demonstrate that traffic forecasting is rife with inaccuracy—and suggest that traffic forecasters are engaged in art as much as science.

**Dr. Robert Bain, “[Error and optimism bias in toll road traffic forecasts](#)” (Transportation v.36:5, pp 469-482).**

Written by one of the authors of the Standard & Poor's reports, this paper recapitulates previous findings that toll road traffic estimates suffer from a 20-30 percent optimism bias. But it also presents evidence that toll-free roads do not suffer from this same bias: traffic forecasts for toll-free roads are error prone, but on average they have proven to be reasonably accurate. This pattern—systematic optimism bias for tolled roads, and no such bias for toll-free roads—suggests that political pressures and institutional dynamics tend to favor unrealistically inflated estimates of tolling revenues.<sup>5</sup>

**Transportation Research Bureau of the National Academies: “[Estimating Toll Road Demand and Revenue: A Synthesis of Highway Practice](#).”**

Like the Standard & Poor's reports, this study found that traffic forecasts for toll roads systematically overestimate actual traffic volumes:<sup>6</sup>

[I]ndustry experience in tolling forecasts and the associated recoverable benefits historically have been quite varied, *in that demand (and the accompanying revenues) has ranged from frequently overestimated to occasionally underestimated*. The resultant variations have had significant impacts on both the actual revenue streams and on the facility's debt structuring and obligations. [Emphasis added.]

*US tolling forecasts have ranged from frequently overestimated to occasionally underestimated.*

The report identifies many toll roads built in the United States after 1986 that have underperformed their projections, along with a few toll roads whose traffic exceeded forecasts. For their entire sample, actual first year traffic volumes fell short of projections by 41 percent. For the subsample of toll roads with continuous 5-year data, toll roads remained 30% below forecasts in year 5. (See Table 1 of the report, appended to this review as Attachment A.) In addition, the report found that in developed corridors where drivers frequently had access to toll-free alternatives, toll roads underperformed planners' projections by an average of 40 to 49 percent—suggesting that transportation planners frequently underestimate the lure of non-tolled alternatives, especially when drivers face high toll rates.

Peter Næss, et al., “[Do Road Planners Produce More ‘Honest Numbers’ Than Rail Planners? An Analysis of Accuracy in Road-traffic Forecasts in Cities versus Peripheral Regions](#),” *Transport Reviews*, Vol. 26, No. 5, 537-555, September 2006.

This study looked predominantly at European roads, but included 14 US toll roads in its sample. Quoting from the report:

Among these [US toll] roads, there is a gross overestimation of traffic, with lower traffic than predicted for 13 of the 14 roads. On average, the traffic is 42% lower than forecasted.<sup>7</sup>

**The Denver Post, series: “The Truth Be Tolloed.” (Parts [1](#), [2](#), [3](#), and [related article](#).)**

This series of investigative reports looked at toll road financing throughout the US, finding evidence that toll road forecasts commonly overestimate actual revenues:<sup>8</sup>

As Colorado, other states and federal officials increasingly look to toll roads to spur growth or clear clogged highways, a review of 23 new turnpikes nationwide shows that *a clear majority are failing to meet revenue projections to justify their costs*. [Emphasis added.]

The Post focused, in part, on potential conflicts of interest—suggesting, for example, that transportation officials used inflated traffic projections to negotiate favorable bond ratings, which can be crucial to financing expensive projects. But intimations of deception aside, the numbers speak for themselves: many recently constructed toll roads simply have not met their projected revenues, often leaving taxpayers with additional, unanticipated costs.

**Washington Department of Transportation, [Toll Revenue Projections: Synthesis of Issues](#).**

This review covers many of the same sources and evidence identified above, including a review of eight states with inaccurate toll road estimates—some of which were underestimates, but most of which were overestimates. Most significantly, though, WSDOT’s review uncovered no evidence to contradict the findings of systematic upward bias in tolling revenue estimates.<sup>9</sup>

## Relevant Local Experience

There are only two tolled facilities operating fully within the state of Washington: the Tacoma Narrows Bridge, and the High-Occupancy/Toll (HOT) Lanes on SR-167.

- ◆ **Tacoma Narrows Bridge.** Officials projected that traffic volumes on the Tacoma Narrows Bridge would fall by 10–15 percent once the state began collecting a \$2.75 electronic toll on eastbound traffic in 2007. Instead, [traffic volumes remained relatively steady](#), perhaps buoyed by reduced travel times after the opening of the new bridge span.<sup>10</sup> However, since the second fiscal quarter of 2010, the bridge has generally under-performed projections—with the shortfalls increasing as gasoline prices rose.<sup>11</sup>

- ◆ **SR 167 HOT Lanes.** In contrast to the Narrows Bridge, state transportation officials projected that 5,000 vehicles each day would opt to pay a fee to use the SR 167 HOT lanes, with dynamic tolls expected to be set between \$1.50 and \$2.00 to keep traffic moving.<sup>12</sup> But as of April of 2010, two years after the HOT lanes were opened, only about 2,200 cars per day paid to use the lanes, with tolls averaging just 88 cents.<sup>13</sup> This actually represented a substantial and steady improvement over the first year's results, when tolls averaged 96 cents per vehicle and traffic never exceeded an average of 1,800 vehicles per day.<sup>14</sup> Of course, the early period of the HOT lanes coincided with high gas prices, followed by a rapid economic decline that reduced traffic volumes throughout the state. Regardless, by the end of the second year of operation, the number of cars paying to use the HOT lane remained 55 percent below forecasts. Indeed, even though traffic on the SR 167 HOT lanes has been lower than projected, traffic throughput and speeds increased after the HOT lane experiment began.
- ◆ **Columbia River Crossing on I-5.** After several years of operation as a free bridge, the Columbia River Crossing on I-5 was tolled during the early 1960s. After a \$0.20 toll was imposed in 1960 (\$1.50 in today's dollars), traffic volumes fell by 14 percent in a single year, despite the lack of a convenient toll-free alternative for drivers who wished to cross the Columbia.<sup>15</sup>

*After a 20 cent toll was imposed on the I-5 bridge across the Columbia in 1960, traffic volumes fell by 14 percent in a single year.*

## Summary and Analysis

Both the published literature and local experience with traffic and revenue forecasts for toll roads suggests several conclusions:

### **Toll road traffic and revenue tend to fall short of official projections.**

In study after study, from the US and beyond, the findings are the same: transportation officials tend to overestimate how much traffic will use tolled facilities, and how much revenue can be generated from tolls. Just as importantly, traffic and revenue projections for tolled road facilities are highly error prone. There appears to be no consistent or reliable method for predicting whether a particular toll road forecast will miss the mark.

Washington's own experience with tolling highlights the problem. After tolling began on the eastbound Tacoma Narrows Bridge, traffic remained steady, rather than falling as had been expected. But for SR 167, fewer drivers than predicted have chosen to pay to enter the HOT lanes. Three years after the lanes were opened, the HOT lane toll revenues still don't even pay for the lane's operating costs.

**Toll-free alternatives increase traffic diversion.**

Perhaps the greatest difference between the Tacoma Narrows Bridge (which had more traffic than expected) and the SR 167 HOT lanes (which had less) is the availability of convenient, toll-free alternative routes. If eastbound drivers wish to avoid the \$2.75 toll on the Tacoma Narrows Bridge, they must travel at least an hour out of their way, wasting more than \$2.75 of gas in the process. In contrast, drivers who wish to avoid the SR-167 HOT lane toll have a free alternative literally in the adjacent lane, and fewer drivers than expected have proven willing to pay for the time savings of the HOT lane. The relative performance of these two tolled facilities is consistent with research findings showing that convenient access to toll-free alternative routes can induce substantial toll avoidance, causing traffic volumes on toll roads to fall short of forecasts.

Arguably, Washington's SR 520, the I-5 Columbia River Crossing, and the SR-99 deep bore tunnel have more in common with SR 167 than with the Tacoma Narrows Bridge. For the deep bore tunnel, drivers who wish to avoid tolls will have many toll-free alternatives—including I-5 and city streets—readily available. Indeed, state forecasters already believe that tolls could divert more than half of the traffic away from the deep bore tunnel.<sup>16</sup> Likewise, if nearby alternatives to Columbia River Crossing and SR 520 remain toll free, the risks of traffic diversion increase—potentially affecting the reliability of toll forecasts.

**Conclusion**

None of the literature reviewed suggests that tolling is inherently a bad idea. On the contrary, tolling can be an important source of revenue, and a powerful tool for managing limited road space and relieving congestion.

Still, the evidence is clear: official forecasts frequently overestimate actual traffic and revenue from tolled roads. And forecasts are most likely to overestimate revenue in jurisdictions with limited experience with tolling, and where drivers have toll-free alternatives.

The fiscal consequences of toll revenue shortfalls can be troubling. If toll revenues for the SR 520 bridge, the Alaskan Way Viaduct, or the Columbia River Crossing fall short of expectations, it is not clear how the state departments of transportation will pay for the projects. Raising toll rates on those facilities may not raise additional revenue, but could simply divert more cars to parallel, toll-free routes. If traffic and tolling revenues don't meet forecasts, the shortfalls can strain state transportation budgets—forcing the state to reprogram money from other projects in other parts of the state to pay off bonds that had been backed by future toll revenues.

Because of the fiscal consequences, members of the public would be wise to take a cautious and skeptical view of official tolling revenue forecasts. Likewise, state transportation officials should carefully consider the long-term fiscal consequences of toll revenue shortfalls, particularly on facilities where drivers can select alternative, toll-free routes.

**Attachment 1:** Table 1 from *Estimating Toll Road Demand and Revenue: A Synthesis of Highway Practice*, Transportation Research Board of the National Academies, 2006.

TABLE 1  
ACTUAL REVENUE AS PERCENTAGE OF PROJECTED RESULTS OF OPERATION

Authority/Facility	Year of Opening	Year 1	Year 2	Year 3	Year 4	Year 5
Florida's Turnpike Enterprise/Sawgrass Expressway (6)	1986	17.8%	23.4%	32.0%	37.1%	38.4%
North Texas Tollway Authority/Dallas North Tollway (6)	1986, 1987	73.9%	<b>91.3%</b>	<b>94.7%</b>	<b>99.3%</b>	<b>99.0%</b>
Harris County Toll Road Authority (Texas)/Hardy (6)	1988	29.2%	27.7%	23.8%	22.8%	22.3%
Harris County Toll Road Authority (Texas)/Sam Houston (6)	1988, 1990	64.9%	79.7%	81.0%	83.2%	78.0%
Illinois State Toll Highway Authority/Illinois North South Tollway (6)	1989	<b>94.7%</b>	<b>104.3%</b>	112.5%	116.9%	115.3%
Orlando-Orange Expressway Authority/Central Florida Greenway North Segment (6)	1989	<b>96.8%</b>	85.7%	81.4%	69.6%	77.1%
Orlando-Orange Expressway Authority/Central Florida Greenway South Segment (6)	1990	34.1%	36.2%	36.0%	50.0%	NA
Oklahoma Turnpike Authority/John Kilpatrick (3)	1991	18.0%	26.4%	29.3%	31.4%	34.7%
Oklahoma Turnpike Authority/Creek (3)	1992	49.0%	55.0%	56.8%	59.2%	65.5%
Mid-Bay Bridge Authority (Florida)/Choctawhatchee Bay Bridge (38,39)	1993	79.8%	<b>95.5%</b>	<b>108.9%</b>	113.2%	116.7%
Orlando-Orange Expressway Authority/Central Florida Greenway Southern Connector (6)	1993	27.5%	36.6%	NA	NA	NA
State Road and Tollway Authority (Georgia)/GA 400 (3)	1993	117.0%	133.1%	139.8%	145.8%	141.8%
Florida's Turnpike Enterprise/Veteran's Expressway (3)	1994	50.1%	52.9%	62.5%	65.0%	56.8%
Florida's Turnpike Enterprise/Seminole Expressway (3)	1994	45.6%	58.0%	70.7%	78.4%	70.1%
Transportation Corridor Agencies (California)/Foothill North (3)	1995	86.5%	<b>92.3%</b>	<b>99.3%</b>	NA <sup>1</sup>	NA <sup>1</sup>
Osceola County (Florida)/Osceola County Parkway (3)	1995	13.0%	50.7%	38.5%	40.4%	NA
Toll Road Investment Partnership (Virginia)/Dulles Greenway (3)	1995	20.1%	24.9%	23.6%	25.8%	35.4%
Transportation Corridor Agencies (California)/San Joaquin Hills (3)	1996	31.6%	47.5%	51.5%	52.9%	54.1%
North Texas Tollway Authority/George Bush Expressway (3)	1998	152.2%	<b>91.8%</b>	NA	NA	NA
Transportation Corridor Agencies (California)/Foothill Eastern (3)	1999	119.1%	79.0%	79.2%	NA <sup>1</sup>	NA <sup>1</sup>
E-470 Public Highway Authority (Colorado)/E-470 (3)	1999	61.8%	59.6%	NA	<b>95.4%</b> <sup>2</sup>	NA <sup>3</sup>
Florida's Turnpike Enterprise/Polk (3)	1999	81.0%	67.5%	NA	NA	NA
Santa Rosa Bay Bridge Authority (Florida)/Garcon Point Bridge (42,43)	1999	32.6%	54.8%	50.5%	47.1%	48.7%
Connector 2000 Association (South Carolina)/Greenville Connector (3)	2001	29.6%	NA	NA	NA	NA
Pocahontas Parkway Association (Virginia)/Pocahontas Parkway (44,45)	2002	41.6% <sup>4</sup>	40.4%	50.8%	NA	NA
Northwest Parkway Public Highway Authority (Colorado)/Northwest Parkway (46,47)	2004	60.5%	56% <sup>5</sup>	NA	NA	NA

## Endnotes

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## About the Author

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**Sightline Institute** is a not-for-profit research and communication center—a think tank—based in Seattle. Sightline’s mission is to make the Northwest a global model of sustainability—strong communities, a green economy, and a healthy environment.

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