Columbia River Crossing

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Team Baldwin – Fall 2009
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1. Introduction

The Columbia River Crossing (CRC) is a potential construction project to improve the current Interstate I-5 bridge over the Columbia River between Oregon and Washington. It is not of immediate necessity, but described as needed to address the transportation problems on I-5, and the proposed solution is a mix combination of bridge, public transit and highway solutions. If they do not move forward with a comprehensive long-term solution now, the problems will only get worse. This project will address [1]:

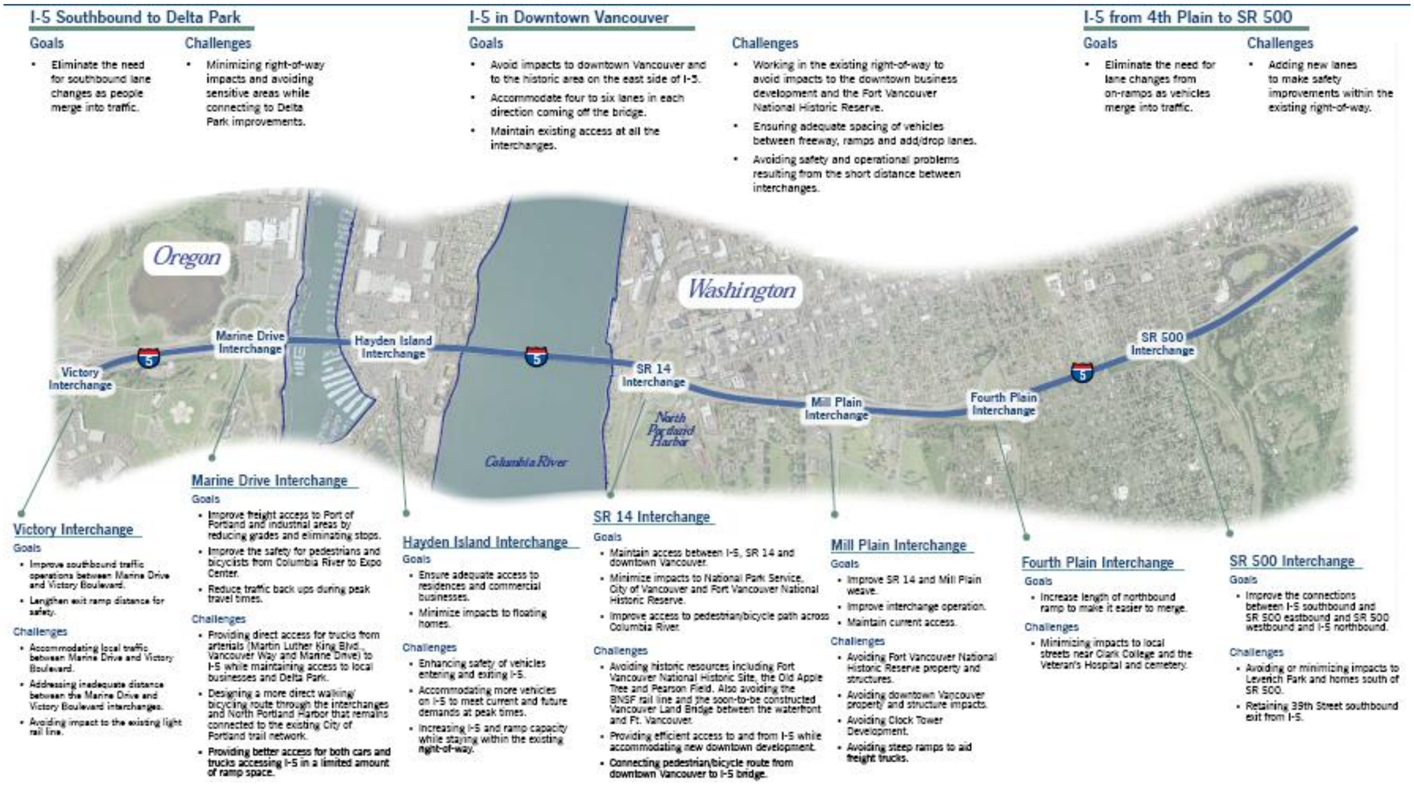
- Growing travel demand and congestion
- Impaired freight movement
- Limited public transportation operation, connectivity and reliability
- Safety and vulnerability to collisions
- Substandard pedestrian and bicycle facilities
- Seismic vulnerability

The reasons given for improvement include:

- Traffic congestion at the I-5 Bridge currently lasts six hours and is expected to increase to more than seven hours southbound and eight hours northbound by the year 2030.
- On-time freight deliveries are compromised by congestion, hampering productivity and efficiency.
- Buses traveling I-5 between Vancouver and Portland get stuck in traffic and can become less reliable.
- Safety is deteriorating.
    - About one crash occurs daily – a rate that is two times higher than similar highways in Oregon and Washington. Crashes will grow with more congestion.
    - Many collisions can be attributed to short on-and off-ramps, inadequate spaces for merging and weaving, and poor sight distances on and near the I-5 Bridge.
- A significant earthquake could cause bending, buckling or collapse of the I-5 bridge itself or lead to soil liquefaction under the bridge

2. Proposed Scope

In order to improve traffic of the bridge, it has been decided that the project should cover several miles of Interstate highway around the current bridge. There are three traffic interchanges affected in Oregon and four in Washington [2]:



Besides the proposed bridge and highway improvements, there are other types of travel related issues involved: bus transit, light rail transit, bike transit, pedestrian transit.
Given a project of such potential size and impact, much discussion and decision making needs to be done before construction begins.
Given all the variables covered by such a potentially large project, cost is a large variable. The goal of this paper is to create a cost model based on variable considered in this project.

This Paper's Scope

The scope of this article is the financial analysis of the project based on the data available publicly. This paper does not focus on the feasibility of the project or how much money is needed to finance the project. It does not discuss the schedule or the budget beyond using the numbers supplied by the organization (www.columbiarivercrossing.org) into making the financial analysis. This paper comes with a calculator which shows the cost and the cash flow over the time of construction.

Assumptions

The Columbia River Crossing project will:

- Replace the I-5 Bridge.
- Improve seven interchanges
- Extend light rail to Vancouver
- Enhance the pedestrian and bicycle path
- Be financed mostly by the Federal, state Governments
- The rest of financing will come from Tolling
- Tolling net income is 54% of the total revenue
- The time to spend the money is 2012-2017

3. History

The Columbia River Crossing Bridge I-5 is very important piece of infrastructures for both the state of Oregon and the state of Washington; in particular Portland metropolitan area and Vancouver, WA. The need for a reliable connection to handle the traffic across the Columbia River in this area was obvious and inventible and the constriction of the bridge came to place on the early of 1915. The bridge was built to replace a ferry system that was operated by Pacific Railway and became overcrowded. Construction on the bridge began in March 1915, by Light & Power Co. In 1917, the first bridge was opened that cost $1.75 million, the cost was paid by Clark County ($500,000) and Multnomah County paying ($1,250,000). [4] The first roadway was 38 ft wide and there was a 5-ft wide sidewalk. The bridge was the first automobile bridge to across the river from Oregon to Washington. A toll costing 5¢ per person was established on the bridge and it was removed after the states of Washington and Oregon purchased the bridge in by 1929. [4]

An upgrade that doubled the capacity of the bridge was done in 1958 costing $14.5 million. In 1990, upgrades to some parts of the bridge such as the expansion joints were completed and that cost $3 million. The bridge was repainted in 1999 and the cost was $17 million. In 2005 $ 10.8 million was spent on electrical upgrade. [4]

Importance of the I-5 Corridor and the Columbia River crossing

Columbia River Crossing is the only continuous north-south Interstate on the West Coast connecting the Canadian and Mexican borders, Interstate 5 (I-5) is vital to the local, regional, and national economy. The Columbia River, I-5 provides a critical connection to two major ports, deep-water shipping, up-river barging, two transcontinental rail lines, and much of the region's industrial land. Truck-hauled freight movement onto, off of, and over the I-5 Columbia River crossing is critical for these industrial centers and to the regional and national economies. The I-5 crossing provides the primary transportation link between Vancouver and Portland, and the only direct connection between the downtown areas of these cities. Residents of Vancouver and Portland drive, ride buses, bike, and walk across the I-5 bridges for work, recreation, shopping, and entertainment purposes. On average, 135,000 trips over the I-5 bridges occur each day. The I-205 crossing, about five miles east, is the only other highway crossing over the Columbia River within the metropolitan region, but it serves more as a suburban bypass.

The Purpose and Need for the I-5 Columbia River Crossing Project

One of the first and most important steps of any major project is to define why the project has been initiated, and what problem(s) it seeks to address. This serves as the basis for defining how alternatives will be developed and measured. A reasonable alternative must address the needs specified in the Purpose and Need statement for the alternative to be considered in a draft environmental impact statement (DEIS), making the purpose and need an influential statement that guides all future development of the project. The Purpose and Need statement developed by CRC Task Force and the project co-lead an agency is provided below.

The purpose of the proposed action is to improve I-5 mobility by addressing present and future travel demand and mobility needs in the Columbia River Crossing Bridge Influence Area (BIA). The BIA extends from approximately Columbia Boulevard in the south to SR 500 in Vancouver, Washington. The proposed action will achieve the following objectives:

a) Improve driving safety and traffic on the Interstate 5 crossing's bridges and associated interchanges.
b) Improve connectivity, reliability, travel times and operations in the BIA.
c) Improve freight mobility and address structural integrity..

The needs that need to be met are:

Travel demands and congestion: Travel is expected to increase by 40% in the next 20 years and so as congestion hours.

Freight Movement: I-5 is the only north to south bridge that link Canada, Oregon, Washington, California and Mexico in the West Coast. Freight size will double over the next 25 years.

Travel time is expected to increase by 90% over the next 20 years.

Limited connectivity and reliability: travel time is expected to increase substantially by 2030.

Safety and accidents: Accidents are 2.5 times higher than any other comparable freeway.

Substandard bicycle and pedestrian facilities: The bike/pedestrian lanes on the I-5 Columbia River bridges are 6 to 8 feet wide, narrower than the 10-foot standard, and are located extremely close to traffic lanes, thus impacting safety for pedestrians and bicyclists. Direct pedestrian and bicycle connectivity are poor in the BIA.

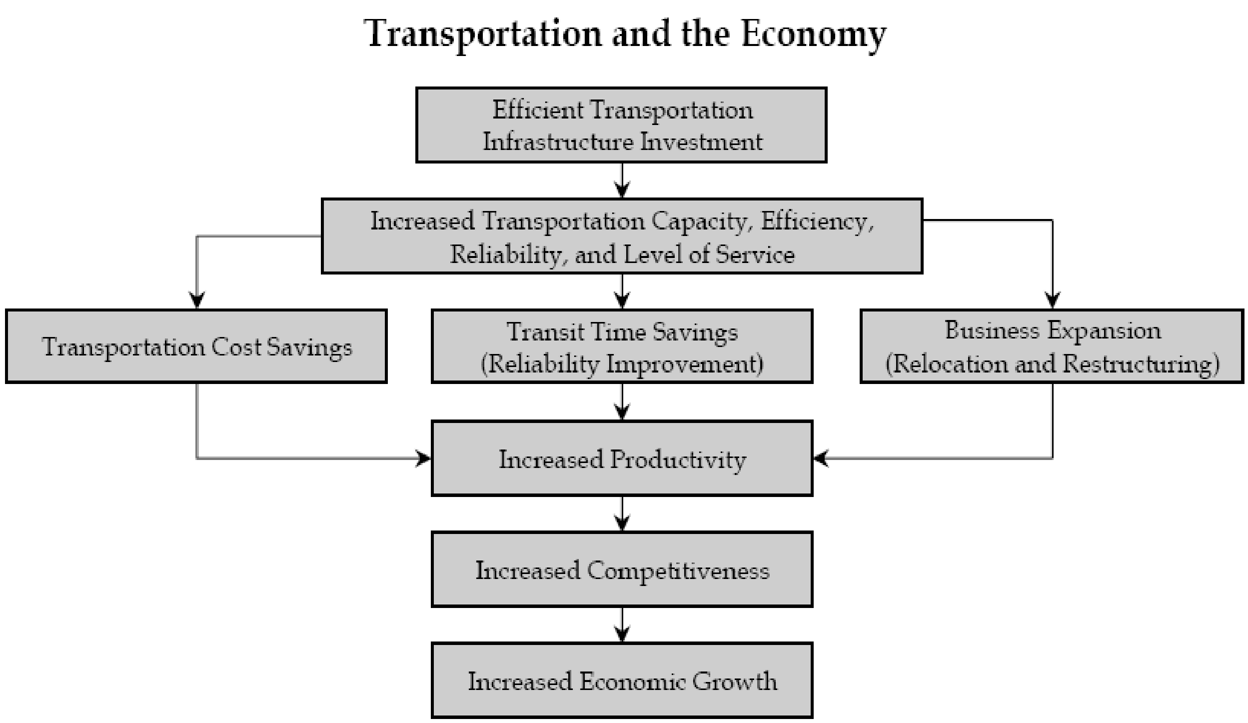
Seismic vulnerability: The existing I-5 bridges are located in a seismically active zone. They do not meet current seismic standards and are vulnerable to failure in an earthquake [5].

Economic Benefits of Investment in Transportation

The economic benefits of investment in transportation will reach many things that will rustle in economy improvement in short and long run and that such as the following **[3]**:

- Efficient transportation would reduce the cost for almost all of the industry sectors which will benefit and strengthen the economy.

- Decreasing costs of production would lower product prices that would improve sales, also investing to improve transportation would result in economy' growth that increase employment rate.
- Around 15 percent of U.S. productivity growth between 1950 and 1991 was a result of investing in roadways.
- Investing in transportation will highly improve efficiency of doing things; manufacturers, retailers and services' providers would be able to reach wider area, serving larger markets and maintaining smaller inventories and effectively yielding savings in material costs and improvements in quality.
- Reliable transportation would enable business to save time and be more efficient in just-in-time operations. [3]



http://www.i-5partnership.com/reports/RegionalEffects_r1.2.pdf

Project Timeline [6]

2002	- Clarify the problems (the bridge is old and need to be replaced)
2003	- Specify numbers of solutions, options and criteria.
2004	- Summarize downsize to the most critical solutions and options.
2005	- Grouping the ideas. - Evaluate and test performance of ideas and options.
2006	- Specify the most popular solutions to be evaluated in the version of Environmental Impact Statement (EIS).
2007	- Made a copy of EIS public to get public comment.

2008	- Consider the locally most popular alternatives and options.
2009	- Finalizing the EIS - Federal approval need to be grantee. - Some improvement to the ongoing bridge. - Plan to manage travel demand - Prepare a Sustainability plan. - Suitable kind of bridge and design. - Have suitable right rail design with related components. - Design path for bicycle and walkers. - Cost estimates and tolling options. - Suitable finance plan. - View and analysis environments.
2010	- Final Environmental Impact Statement make public. - Dissuasion of the federal record. - Starting of right of way and get needed property. - Construction plan and the early engineering start.
2011	- Came up with Final design and final plans.
2012	- Estimated start of bridge construction

[6]

Cost

The CRC organization latest estimate on the cost of the project is $3.1-$4.2 billion for the initial investment which does not include the operation or maintenance cost. The proposed financing agencies are: the federal government, state governments, and tolling.

Number of Lanes

Highways are a particularly important part of the region's transportation system because most freight moves by truck, and even freight that travels by rail, water, or air moves on the highway system at some point. Interstate 5 is the most important highway freight corridor on the West Coast, carrying the region's products to markets across the country and to nearby ports for shipment around the world.

By 2030 the number of automobiles is expected to increase by almost 30%, while the number of freight trucks is expected to increase by almost 80%. Congestion is expected to last 15 hours a day if no improvements are made and accidents are forecast to double [7].

The CRC project is analyzing the appropriate number of lanes to safely and efficiently move the very high number of auto and truck trips that are entering and exiting I-5 in a very short congested area, as well as accommodating the high overall number of trips on the Interstate itself.

What are add/drop lane?

An add/drop lane connects two or more highway interchanges. Add/drop lanes improve safety and reduce congestion by providing space for cars and trucks entering the highway to speed up before merging into traffic and to slow down after diverging out of traffic. One way to identify an add/drop lane is by the "exit only" sign posted on the highway. Lanes that connect on- and off ramps to facilitate acceleration and deceleration, weaving, merging, diverging and slow moving vehicles between two or more interchanges. They would provide better access to areas that have reduced development capacity, such as the Marine Drive corridor and Hayden Island; as well to improve safety and manage the operation of the freeway. The intent is not to add capacity, but to improve safety and match the flow of traffic to the north and south.

Congestion

By year 2030, truck freight traffic across the I-5 Bridge and in the project area is expected to increase at about twice the rate of non-truck freight traffic. Freight haulers try to avoid high periods of congestion. Consequently, a great deal of freight movement occurs in the off-peak hours.

Safety

An average of 400 crashes a year occurs along I-5 in the five-mile project area, a collision rate two times higher than similar highways in Oregon and Washington [8]. With seven closely-spaced interchanges, most highway entrances in the project area require vehicles to merge into a through-lane quickly upon entering the highway. These conditions lead to crashes. Add/drop lanes would provide drivers with more space to merge safely.

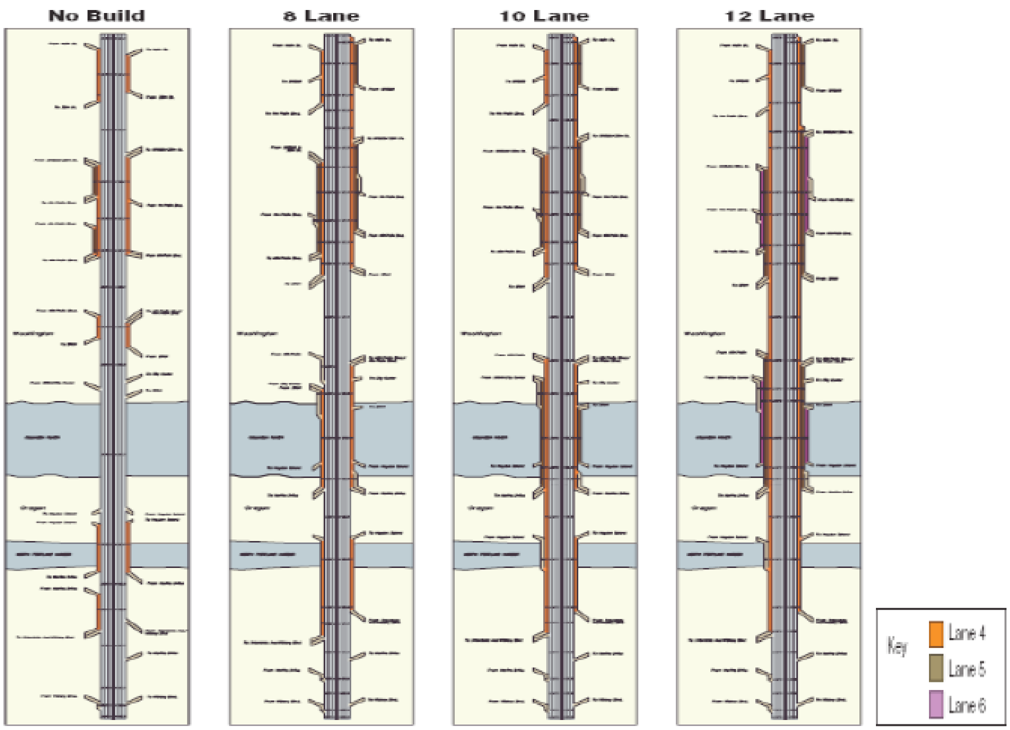
Options with fewer add/drop lanes would increase the number of "forced lane changes" along this critical highway segment. Today, almost 40% of truck collisions on this segment of highway involve sideswipes [7].

- 12% of crashes in I-5 Bridge Influence Area involved at least 1 truck
- 39% of truck crashes involved sideswipes, compared to 14% for all vehicles
- 30% of truck crashes involved injuries

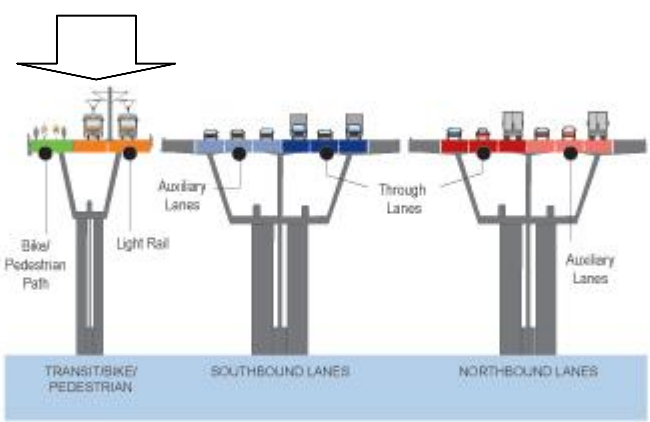
Cost

The difference in capital costs between the 10 and 12-lane options is estimated to be approximately $100 million (2008 mid-year costs). The 8-lane option would be approximately $85 million less than the 10-lane. These numbers would increase by about 35-40% when inflated to the mid-year of construction (2014) [7].

<u>Add/Drop Lane Designs [9]:</u>



Light Rail



http://www.columbiarivercrossing.org/Resources/Images/PagePictures/RepBridge_CrossSection.jpg

Light rail is a type of modern rail public transportation that mostly uses electricity and has a lower capacity and operate in a shorter distance than traditional heavy rail. [17]

Portland city has been eager to introduce and adapt new technologies such as light rail that has positive contributions and help in improve the area since the 1980s, the Portland light rail (MAX) has become big support for community and the economy. [18]

In Portland light rail was very helpful and supportive for the whole community and it is environmentally friendly. So adding or extending the light rail road to Vancouver, WA will have positive impacts on the economic growth, community and their future. [18]

Looking at economic impacts of light rail, we can refer to the Portland past experience of building the three MAX lines (Blue, Red and Yellow) that reach 44 miles with 64 stations as a economically successful project. More than $6 billion in development was accumulated along Portland light rail lines since it was build in 1978. Therefore, we can indicate that light rail option is a transportation technology that was successfully implemented and it is papule in Portland. Therefore, it will be very beneficial to extend it to Vancouver in the new project. [18]

Light rail options benefits

A population growth of one million or more is expected for the Portland and Vancouver region by 2030. This means that the Light rail will be a very efficient solution that can help to improve mobility for people who depend on transit and provide effective and reliable alternative to automobile use. Light rail will helping to relieve bad traffic and smoothen the mobility in the area across the Columbia River. Light rail will provide effective transportation service to many impotent regional destinations such as Vancouver and Portland business area and employment centers which will benefit the economy growth of the area around. Benefits of light rail options include the flowing [10]

- high frequency trips which is estimated to be 8 minutes in weekday peak time between service, and around 15 minute service during off-peak periods.[10]
- reliable travel time which is estimated to be 39 minutes for a trip between downtown Vancouver and downtown Portland, and around 29 minutes between downtown Vancouver and the Rose Quarter.[10]
- light rail car has a relatively high capacity, tow car trains can accommodate around 266 passengers.[11]
- reduce the traffic in peak time by allowing absorb around 2,100 to 2,700 passengers per peak hour in each direction and operated around 8-10 vehicles per peak hours.[11]
- Almost no delay the light rail has a reliable travel times since light rail operate on an exclusive track.
- Environmentally effective; CO2 emission average is 202 since it is using electricity to operate. (Co2; passenger miles per Diesel equivalent gallon).[16]
- Compared light rail to bus the rapid transit about 20% higher construction cost; and 35% lower annual operating costs[11]

Cost of a light rail in general:

Generally the cost of light rail construction is different from one to another depending on the nature of the project and the circumstances surrounding the area of construction. Some construction needs more tunneling and some need bridges. The cost of generally is between $15 million to $ 100 per mile.
For example, because of poor soil conditions and the need for extensive tunneling, Seattle's new light rail system cost around $179 million per mile and that was one of the most expensive light rail project in the USA.[17]

Estimated cost of light rail option on the Columbian Bridge:

The cost for building 2.9 miles of light rail track, buying 16 new light rail trains, building station, park and maintenance is estimated to be around $0.53 to $1.17 billion [12]

Also the ridership by 2030 estimated to reach about 17,000 people will cross the river using the light rail each day. [12]

Bus lane and Alternatives

The Interstate 5 corridor addresses the future travel demand and mobility needs in the Columbia River Crossing Bridge Influence Area (BIA). The BIA extends from approximately Columbia Boulevard in the south to SR 500 in the north Relative to the No-Build Alternative, the proposed action is intended to achieve the following objectives:

a) Improve travel safety and traffic operations on the Interstate 5 crossing's bridges and associated interchanges.

b) Improve connectivity, reliability, travel times and operations of public transportation modal alternatives in the BIA.

c) Improve highway freight mobility and address interstate than statewide averages for comparable facilities. Incident evaluations generally attribute these crashes to traffic congestion and weaving movements associated with closely spaced interchanges. Without breakdown lanes or shoulders, even minor traffic accidents or stalls cause severe delay or more serious accidents.

Existing bicycle and pedestrian facilities:

Substandard bicycle and pedestrian facilities: The bike/pedestrian lanes on the I-5 Columbia River bridges are 6 to 8 feet wide, narrower than the 10-foot standard, and are located extremely close to traffic lanes, thus impacting safety for pedestrians and bicyclists. Direct pedestrian and bicycle connectivity are poor in the BIA [13].

Seismic vulnerability: The existing I-5 bridges are located in a seismically active zone. They do not meet current seismic standards and are vulnerable to failure in an earthquake.

The CRC Project Addresses Six Problems on I-5

• **Congestion:** Travel demand exceeds capacity

• **Freight:** Mobility through the area is impaired

• **Public transit:** Service is limited by congestion

• **Safety** Crash rates are too high

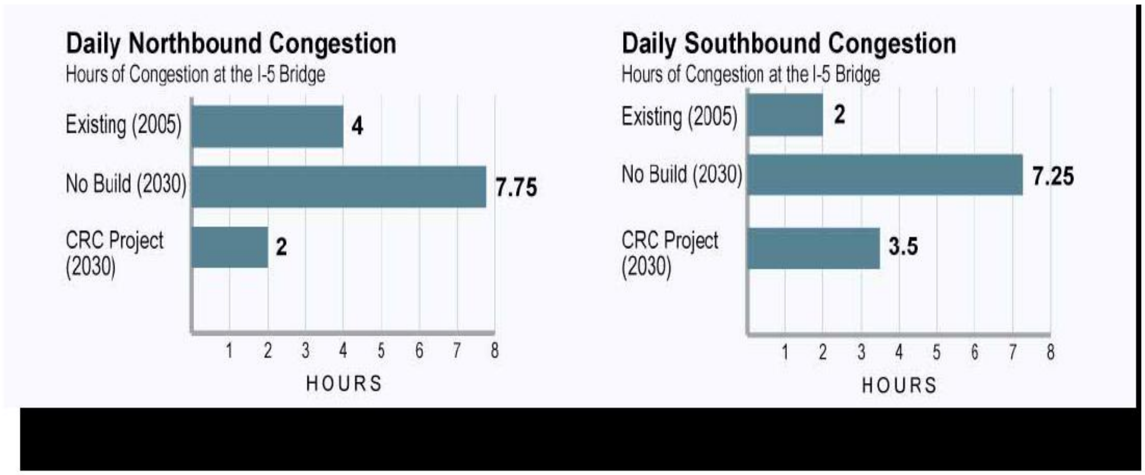
• **Bicyclists and pedestrians:** Facilities and connections are inadequate

• **Earthquake safety:** Bridges don't meet current seismic standards

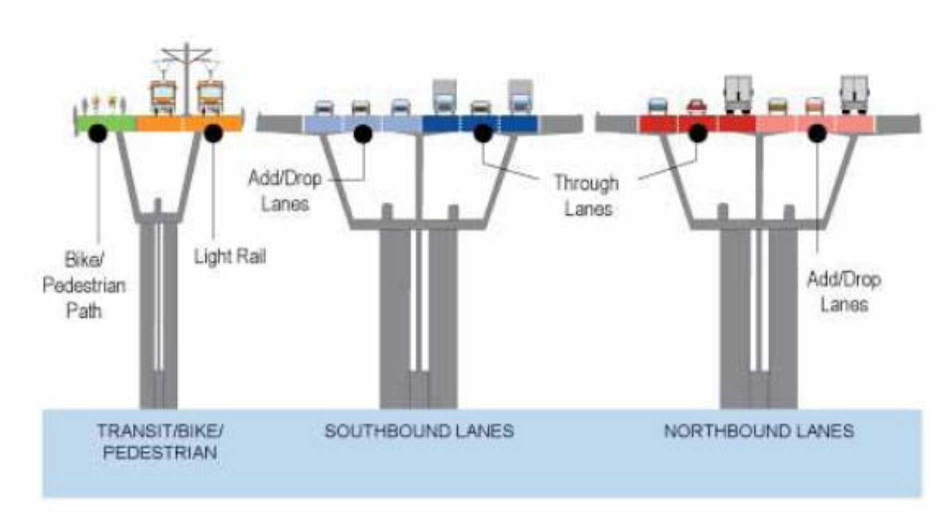
Alternatives

1. **No build**
   It serves as a baseline for comparison with other alternatives. The existing Interstate Bridge and public transit systems would remain. The only transportation system changes assumed are those identified as likely to receive funding and be constructed in the Metro and southwest Washington regional transportation plans.
2. **Replacement bridge with bus rapid transit**
   The Interstate Bridge would be replaced with new bridge structures and would have a lane for bus rapid transit and a lane for foot and bicycle traffic, potentially located on a separate structure.
3. **Replacement bridge with light rail**
   The Interstate Bridge would be replaced with new bridge structures and would have a lane for light rail and a lane for foot and bicycle traffic, potentially located on a separate structure.
4. **Supplemental bridge with bus rapid transit**
   A new bridge would be built for southbound vehicles. The new bridge also would have a lane for bus rapid transit. The existing Interstate Bridge would be re-striped for northbound traffic. Pedestrians and bicyclists would have a lane on the existing bridge'
5. **Supplemental bridge with light rail**
   A new bridge would be built for southbound vehicles. The new bridge would have a lane for light rail. The existing Interstate Bridge would be re-striped for northbound traffic. Pedestrians and bicyclists would have a lane on the existing bridge.

Picture showing the bridge useful for trucks and public transit [13]

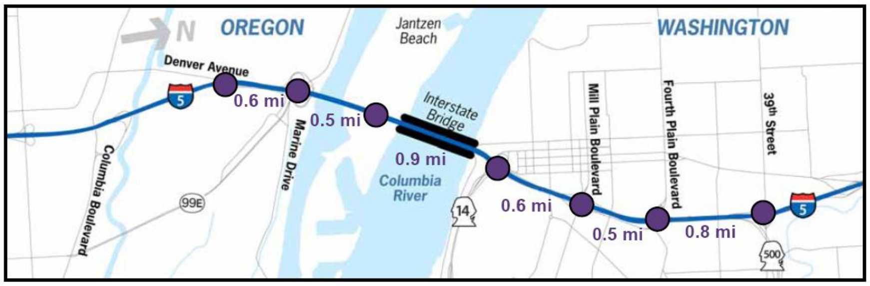


Picture showing the bridge congestion Northbound & Southbound.



Picture showing the three bridge concept

Seven Closely Spaced Interchanges



Standard Spacing: Desirable = 2 Miles
Minimum = 1 Mile

Tolling

The CRC organization emphasizes that tolling to be a major part of funding and it will be implemented to improve congestion and travel reliability. Tolling initially will be used to finance the construction of the bridge.

The major concern of tolling is if it actually introduces congestion on the I5 and I205. The CRC committee is strongly proposing the All-Electronic Tolling which eliminates the need for tolling booths but requires drivers to install a device on their vehicle windshield that automatically validate the toll charged for that vehicle. This solution, though it solves the congestion concern and removes human interaction overhead, it adds overhead of creating and maintaining an electronic infrastructure which will communicate with these sensors, send information to a credit card entity, or forces using alternative pay methods.

The amount of tolls is dependent on several factors:

1. Project design which is not finalized yet.
2. Timing of construction
3. Funding provided by Federal and State governments and local communities
4. Tolling options (tolling 1 bridge or 2 bridges)
5. Varying toll rates at different times of the day.

Toll Revenues and Fees

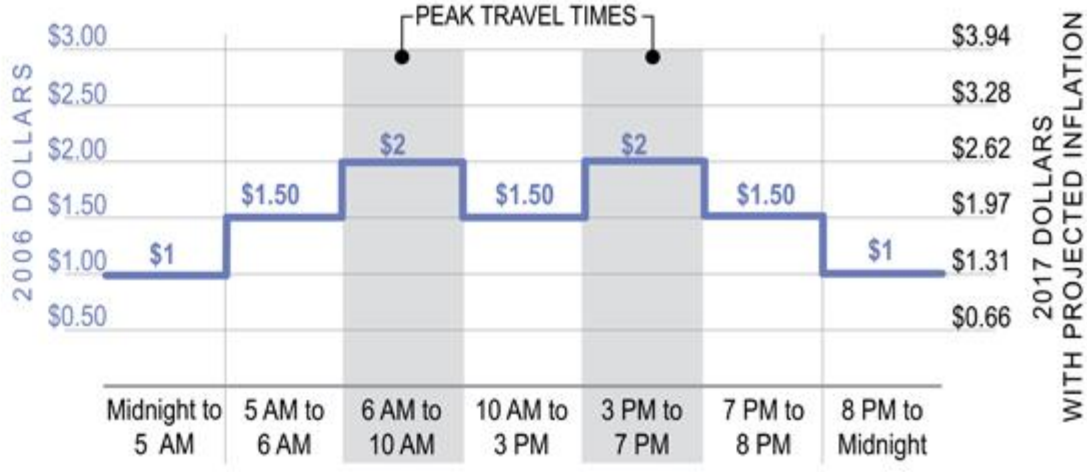
Potential Toll Revenue	91%
'Pay-by-Plate' Fee Revenue	9%
Total Potential Revenue	100%

Uses of Revenue

Credit Card Fees	3%
Toll Collection Operations and Maintenance	23%
Facility Operations and Maintenance	1%
Uncollectable Tolls	5%
Net Revenue Available for Debt Service • Debt Service (Principle & Interest Payments) 54% • Debt Service Coverage* 15%<>	69%
Total Uses of Revenue	100%

** Debt service coverage is required by investors to ensure there is sufficient cash flow to repay the debt. If revenue targets are met, the debt service coverage may be subsequently available for other uses. However, coverage funds cannot be borrowed against to increase project funding during the construction period. Debt service coverage would first be applied to fund a renovation and rehabilitation account for future work needed beyond expected operations and maintenance costs. Any remaining coverage funds could be used for other transportation uses, subject to statutory constraints.*
Source: http://tolling.columbiarivercrossing.org/Funding/Default.aspx

For the sake of this study, the authors assume a net income of 54% of the collection of the tolling fees. There are many schemes for tolling. Figure () shows an example of weekday tolling scheme.



One example [14] of many rates being studied

The CRC committee came up with 6 possible scenarios of tolling:

1. Toll I-5 Bridge only with variable rates as in the figure above with lower than Base Draft EIS Peak Period Toll
2. Toll I-5 Bridge and I-205 Bridge with variable rates tolls lower than Base Draft EIS peak period toll
3. Toll I-5 Bridge only with a fixed rate toll
4. Toll I-5 Bridge only with variable rate and additional price points
5. Toll I-5 Bridge only variable tolls 50% higher rates than Base Draft EIS
6. Toll I-5 and I-205 bridges with variable toll rate. I-5 would have a base toll with lower peak period toll on I-205.

The main point behind these different scenarios is to make sure the tolling will contribute the right share of the funding. There are other tolling scenarios where a car is charged by axle but it is beyond the scope of this paper to go into them in detail. More information exists on the CRC website. Appendix C illustrates the expected revenue from tolling.

It is predicted that tolling will not only generate funding for the construction; it will also change habits of drivers. It is expected that a considerable number of drivers will change their travel time to avoid high tolls, do more car pooling to share the cost of the toll, stop driving and use the bus or light rail, or even bike or walk. See Appendix B to see the effect of different tolling scenarios on drivers' habits.

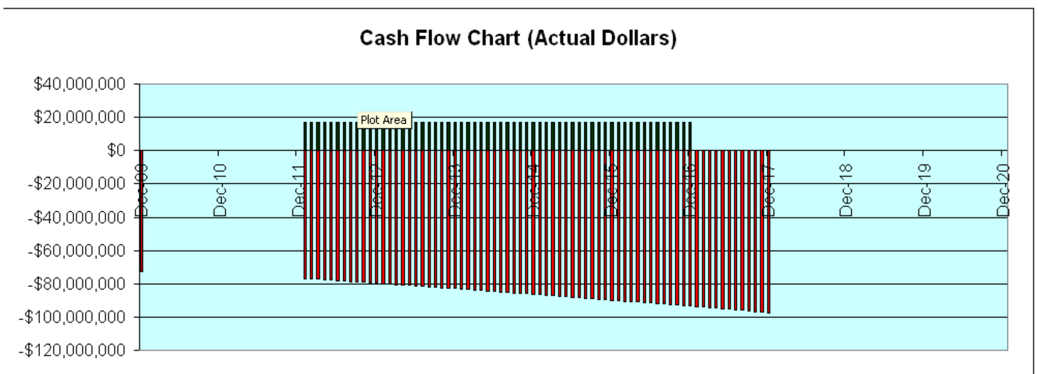
With Tolling, one would think there should be congestions. To eliminate congestion caused by tolling the CRC proposes investing in an electronic tolling system where drivers can buy prepaid cards which they can hang on their dashboard. Sensors on the freeway will read these prepaid cards and automatically deduct from the account. There is also a proposal with cameras reading the license plate and a server would issue a bill and send to the owner of the vehicle. [15]

The Model

See Appendix A for calculator views.

The calculator we created in Microsoft Excel is designed to deal with popular project options discussed above. By inputting options such as: number of lanes, light rail option, bus lane option, construction dates, tolling options, tolling dates, and inflation rate; the calculator shows the time value of money in a graphic format as well as being able to show the time value of money for a desired inflation rate over time, such as shown in this example:

Inflation Rate 4.00% per year

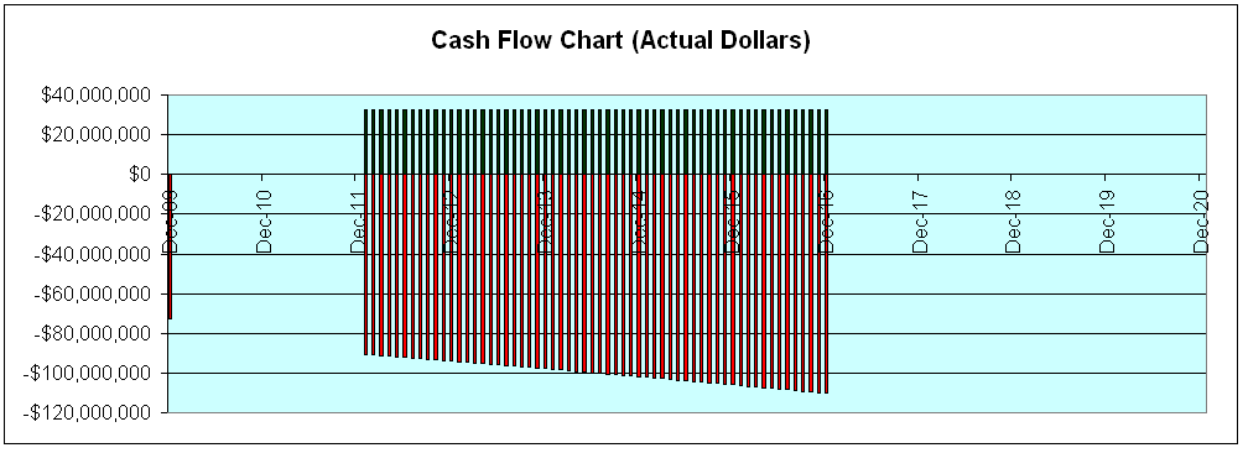


Total Project Cost minus Revenue in terms of dollars at Jan-2009 equals: $4,066,846,226

The calculator we created is a quick way for someone interested in the project to review the impact of the option on the cost/revenue of the project as well as be able to understand those costs as a function of value of money over time.

Analysis

By putting the current “best assumption” data gathered in this research into the calculator:
Construction – 2012 to 2017, 10-lane bridge, with light rail, no bus lane,
Tolling – both bridges, during construction (2012 to 2017), $3 per vehicle
With an inflation rate of 4% per year, the total cost of the project is:



Total Project Cost minus Revenue in terms of dollars at Jan-2009 equals: $3,247,588,045

For the construction options shown above to be paid off by tolling during the construction the toll would have to be $9.25. There would be huge ramifications of making people pay $9.25 per crossing. The shock of a toll that high would have unpredictable affects on use of the bridge and economic impact on the region, therefore the research done on this project does not cover the option of charging people that much.

This means that the toll, at least if in place during the construction of the bridge only, would not be expected to cover the full cost of bridge construction.

The calculator shows that at a continuous toll rate of $3 (not raising toll for inflation, and all assumptions same as above), the toll would have to be in place until 2032 in order for the toll to pay for the full construction of the bridge.

There are many options that the calculator is capable of covering and we encourage the reader to try different options for the CRC and see how it affects the financial analysis of the project.

Conclusion

The Columbia River Crossing project is a government project in which the benefits and the cost are the same. The benefit cost ration is 1. In this paper, the authors created a spread sheet showing cost over time over 5 years of construction starting year 2012 assuming most of the funding is provided by government agencies and supplemented by tolling. The user of the model can enter the options such as number of lanes, timing of construction, tolling scenarios, inflation rate, and will get a cash flow diagram over the time of construction. The model also calculates amount of funding produced by different tolling scenarios.

This paper does not address in detail every possible scenario of construction or the material cost. It has rather used data supplied by the Columbia River Crossing. There is no denial that the data and the conclusions supplied by the CRC are accurate based on other national public projects (and especially bridges).

Finally, the areas of improvement for this research could be adding more functionality to the model such as calculating the future value in real and actual dollars.

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<http://trimet.org/about/history/maxoverview.htm>

Appendix A

The gray cells are variables that can be edited by user. The graph updates automatically based on values of gray cells. Cells with a red triangle in the top right corner show a description of the cell value when the cursor is held over them.

Columbia River Crossing Spending Calculator

Number of vehicle lanes: 10
Light Rail Option: 1
Bus lane Options: 1

Cost of lanes $3,914,720,000 (Dec, 2009 dollars)
Light rail cost $1,000,000,000 (Dec, 2009 dollars)
Bus lane option $132,966,506 (Dec, 2009 dollars)

Cost so Far: $72,800,000 (Dec, 2009 dollars)

Total Construction Cost: $5,072,866,822 (Dec, 2009 dollars)

Start of Construction: Jan-2012
End of Construction: Jan-2018
Duration of construction= 72 months

Average Daily Traffic Volumes		
I-5 Bridge	I-205 Bridge	Total River Crossings
190,000	190,000	380,000

	Northbound	Southbound
Midnight to 5 AM	$3.00	$3.00
5 AM to 6 AM	$3.00	$3.00
6 AM to 10 AM	$3.00	$3.00
10 AM to 3 PM	$3.00	$3.00
3 PM to 7 PM	$3.00	$3.00
7 PM to 8 PM	$3.00	$3.00
8 PM to midnight	$3.00	$3.00

Date of Toll Dollars Jan-2012

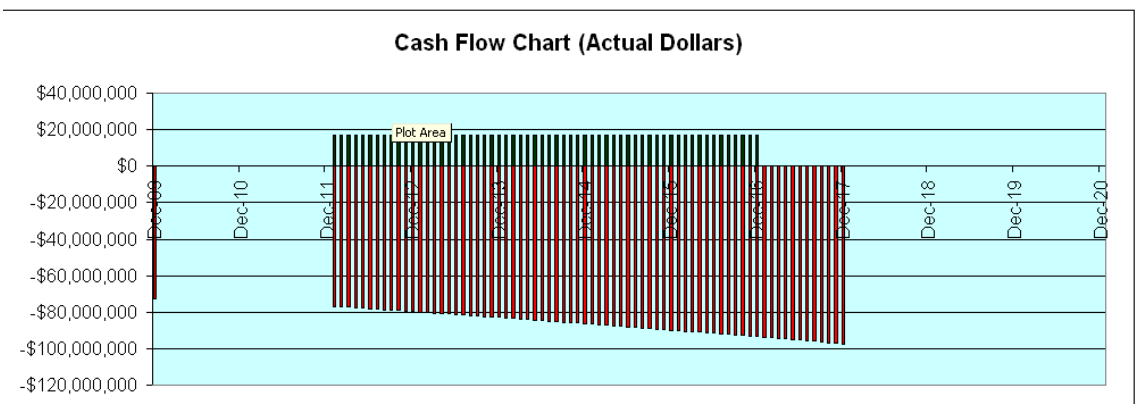
Options
Toll I5 Bridge: 0
Toll I205 Bridge: 1

Total Monthly Revenue $17,100,000

Start of Toll Option: Jan-2012
End of Toll Option: Jan-2017
Tolling Duration 60 months

Total Accumulated Revenue at end of tolling $1,026,000,000
Total Tolling Value at start of Tolling Date $928,514,078

Inflation Rate 4.00% **per year**



Total Project Cost minus Revenue in terms of dollars at Jan-2009 **equals: $4,066,846,226**

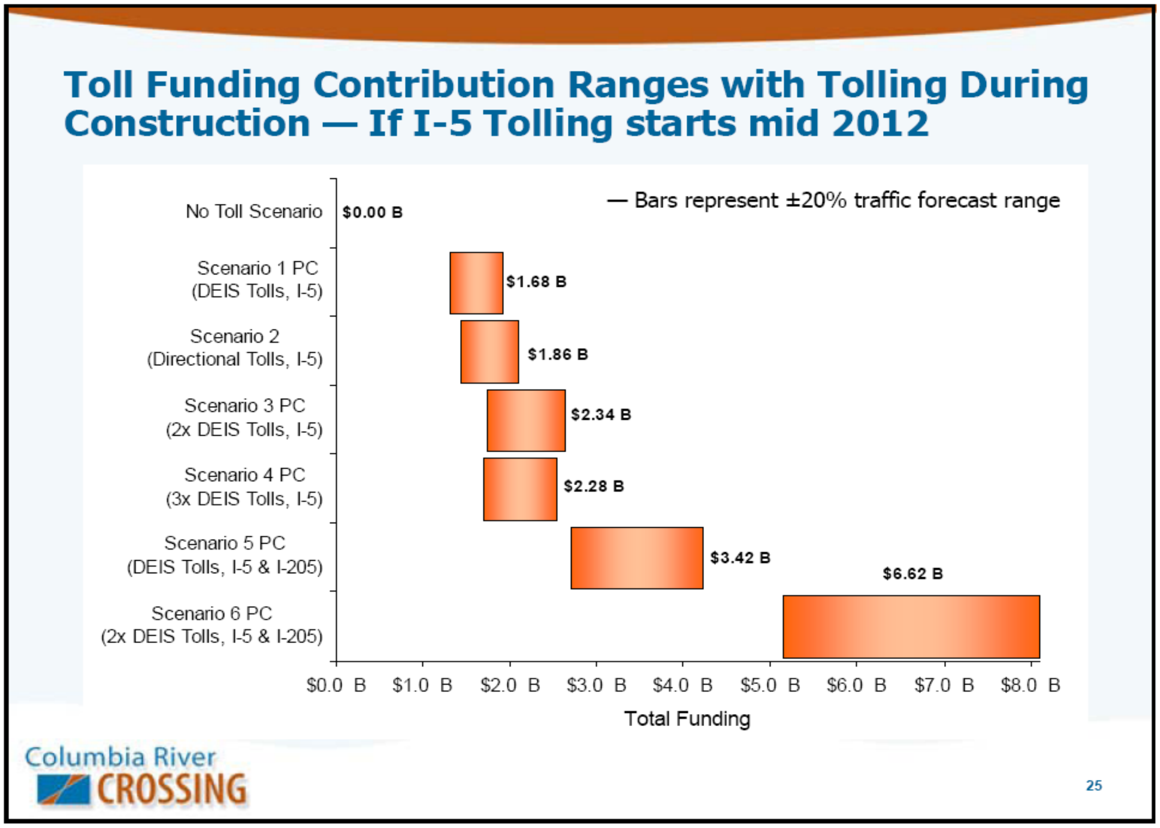
Appendix B

Tolling Scenarios

		No Tolls	Tolling I-5					Tolling I-5 and I-205	
		Studied for Comparison Purposes	Scenario 1 DEIS Variable Toll: Toll Struction from Draft EIS	Scenario 2 Directional Variable Toll rates differ by Direction		Scenario 3 DEIS Variable Toll	Scenario 4 3xDEIS Variable Toll	Scenario 5 DEIS Variable Toll on Both Bridges: Draft EIS tolls on both bridges .	Scenario 6 2xDEIS Variable Toll on Both Bridges: Double the Draft EIS tolls on both bridges .
Total Yearly Revenue Per Scenario		Raises $0	Raises ~$1.3B	Raises ~1.5 $B		Raises ~$2B	Raises ~$1.9B	Raises ~$2.9 billion	Raises ~$6.1 billion
			One Way Tolls	One Way Tolls		One Way Tolls	One Way Tolls	Round Trip Tolls	Round Trip Tolls
			Both Directions	Northboud	Southbound	Both Directions	Both Directions	Southbound	Southbound
2006 Dollars	Midnight to 5 AM		$1.00	$1.00	$1.00	$2.00	$3.00	$2.00	$4.00
	5 AM to 6 AM		$1.50	$1.50	$1.75	$3.00	$4.50	$3.00	$6.00
	6 AM to 10 AM		$2.00	$1.75	$3.00	$4.00	$6.00	$4.00	$8.00
	10 AM to 3 PM		$1.50	$1.50	$1.50	$3.00	$4.50	$3.00	$6.00
	3 PM to 7 PM		$2.00	$3.00	$1.75	$4.00	$6.00	$4.00	$8.00
	7 PM to 8 PM		$1.50	$1.75	$1.50	$3.00	$4.50	$3.00	$6.00
	8 PM to midnight		$1.00	$1.00	$1.00	$2.00	$3.00	$2.00	$4.00
2017 Dollars	Midnight to 5 AM		$1.31	$1.31	$1.31	$2.62	$3.94	$2.62	$5.25
	5 AM to 6 AM		$1.97	$1.97	$2.30	$3.94	$5.90	$3.94	$7.87
	6 AM to 10 AM		$2.62	$2.30	$3.94	$5.25	$7.87	$5.25	$10.50
	10 AM to 3 PM		$1.97	$1.97	$1.97	$3.94	$5.90	$3.94	$7.87
	3 PM to 7 PM		$2.62	$3.94	$2.30	$5.25	$7.87	$5.25	$10.50
	7 PM to 8 PM		$1.97	$2.30	$1.97	$3.94	$5.90	$3.94	$7.87
	8 PM to midnight		$1.31	$1.31	$1.31	$2.62	$3.94	$2.62	$5.25

Source: http://tolling.columbiarivercrossing.org/

Appendix C: Projected Revenue from Tolling



Source: Source: http://tolling.columbiarivercrossing.org/