

SR 520 BRIDGE

Investment Grade Traffic and Revenue Study Update



SR 520 Bridge and the Eastside plus West Approach Bridge Project

February 16, 2017

Photographs Courtesy of WSDOT



**CDM
Smith**



**Washington State
Department of Transportation**

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Executive Summary

The Washington State Department of Transportation (WSDOT) has utilized toll financing as part of a broader package to finance the implementation of the SR 520 Bridge Replacement and HOV Program. WSDOT began tolling the bridge in December 2011, prior to the construction of the replacement floating bridge which opened in April 2016. The U.S. Department of Transportation's Transportation Infrastructure Finance and Innovation Act (TIFIA) program provided financial support to the SR 520 Program via a direct loan in October 2012.

In order to satisfy TIFIA requirements and meet current and future bond requirements, the SR 520 Bridge Investment Grade Traffic and Revenue Study (T&R Study) was updated to address changes in project scope, additional actual tolling experience, changes in toll rates, updated construction schedules, and revisions to the underlying economic forecasting. Revised transactions and gross revenue forecasts were developed for FY 2017 through FY 2056.

Project Description

The SR 520 corridor stretches nearly 13 miles between I-5 in Seattle to the west and SR 202 to the east, crossing I-405 at about the halfway point, and serving various Eastside communities, including Bellevue, Kirkland, and Redmond. The new floating bridge opened to traffic in April 2016. Tolls are collected on land east of the bridge via all electronic tolling.

The SR 520 Bridge Replacement and HOV Program includes the portion of the corridor between I-5 and I-405 and is comprised of five major components:

- Pontoon Construction - complete
- Eastside Transit and HOV Project - complete
- Floating Bridge and Landings (FB&L) Project – functionally complete
- West Approach Bridge North (WABN) – under construction
- I-5 to Lake Washington (“Rest of the West”), including the West Approach Bridge South, new Portage Bay Bridge, and second Montlake Boulevard bascule bridge across the Montlake Cut – expected construction start is FY 2018.

The \$4.56 billion in SR 520 funding authorized by the Legislature pays for: a new, safer, six-lane floating bridge, with a cross-lake bicycle and pedestrian path; 77 bridge pontoons built at facilities in Grays Harbor and Tacoma; the corridor's Eastside transit and HOV improvements between Lake Washington and I-405; the north (westbound) half of a new west approach bridge connecting Seattle to the new floating bridge (WABN); a replacement West Approach Bridge South for eastbound traffic connecting Seattle to the new floating bridge; a second Montlake Boulevard bascule bridge over the Montlake Cut; a new, six-lane Portage Bay Bridge; an extension of a regional bicycle and pedestrian path from Montlake to I-5; and mitigation of the program's environmental impacts.

Figure ES-1 shows the assumed lane configurations for this study with three phases discussed below.

FY 2017 through FY 2021 – Current Configuration with Main Bridge Span Replaced

For purposes of this study, the configuration assumed from FY 2017 through FY 2021 consists of:

- I-5 to west end of main bridge span: two general-purpose lanes in each direction.
- Lake Washington: New six-lane main span opened in April 2016 with two general-purpose and one inside transit/HOV 3+ lane in each direction, from west end of main span, across Lake Washington to the eastern shore. Tolls are collected on the eastern shore of Lake Washington.
- East side of Lake Washington to I-405: Three lanes in each direction including two general-purpose lanes and one inside transit/high occupancy vehicle lane with a 3+ occupancy requirement (HOV3+)

FY 2022 through FY 2025 – West Approach Bridge North and South

For purposes of this study, the configuration assumed from FY 2022 through FY 2025 consists of:

- I-5 to Montlake Boulevard: no changes from current (FY 2017-2021) configuration.
- Montlake Boulevard to west end of new floating bridge: new West Approach Bridge North (WABN) connector and new West Approach Bridge South (WABS) connector resulting in three lanes in each direction (two general-purpose and one inside transit/HOV 3+ lane in each direction). The WABS connector is a new element since the 2014 study, which was added after the 2015 State Legislature approved funding for SR 520's planned improvements from I-5 to Lake Washington – the "Rest of the West."
- Lake Washington: no changes from current (FY 2017-2021) configuration.

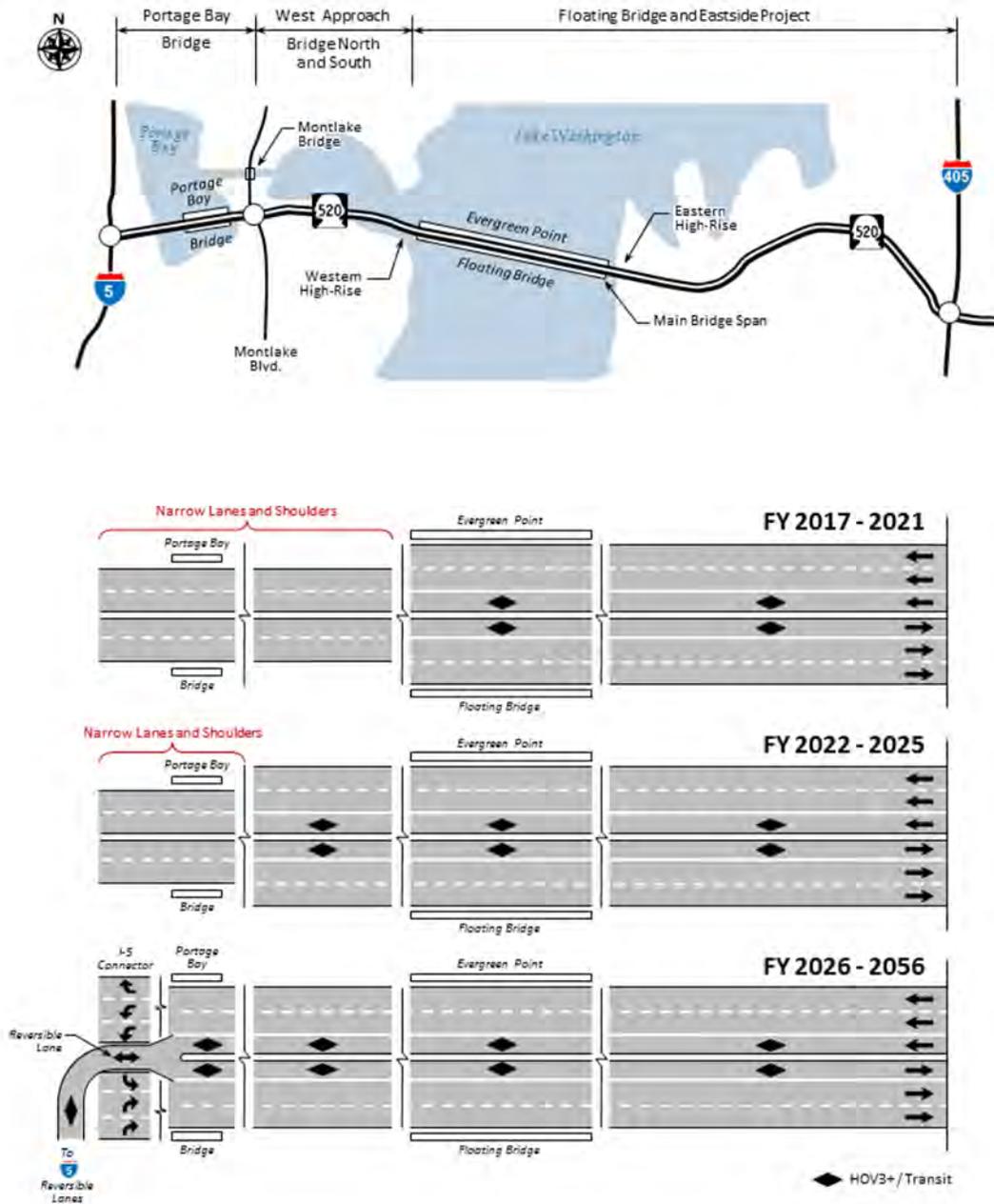
FY 2026 through FY 2056 – Portage Bay Bridge Replaced

For purposes of this study, the configuration assumed from FY 2026 forward consists of:¹

- I-5 to Montlake Boulevard: new Portage Bay Bridge resulting in three lanes in each direction (two general-purpose and one inside transit/HOV 3+ lane in each direction) plus a one-lane transit/HOV3+ reversible direct connector between SR 520 and the I-5 reversible express lanes operating in the direction of the I-5 reversible lanes. The Portage Bay Bridge replacement is a new element since the 2014 study, which was added after the 2015 State Legislature approved funding for SR 520's planned improvements from I-5 to Lake Washington – the "Rest of the West."
- Montlake Boulevard to west end of new floating bridge: no changes from FY 2022-2025 configuration.
- Lake Washington: no changes from current (FY 2017-2021) configuration.

¹ The network configuration and phasing assumptions are as of June 30, 2016 and subject to change.

Figure ES-1: Assumed SR 520 Lane Configuration



Traffic and Revenue Forecasting History

CDM Smith conducted the initial investment grade study for SR 520, completed in late summer 2011. This study developed annual gross revenue estimates from the assumed start of tolling (January 1, 2012) through 2056. The study was conducted at a level of detail sufficient for use in support of project financing and resulted in the September 2011 Investment Grade traffic and revenue forecast.² The estimates were prepared based on a study work program which included:

- **Traffic count data collection** – including review of WSDOT annual traffic reports, as well as independent traffic count data collection.
- **Travel pattern surveys** – Mail-back surveys were sent to SR 520 users in the fall of 2009. The survey requested information on origin and destination travel, trip frequency, travel time of day, trip purpose, vehicle occupancy, vehicle class, and SR 520 entrance and exit points.
- **Travel time surveys** – Travel time surveys were performed along SR 520 and on important routes that could be potential alternatives.
- **Stated preference surveys** – Stated preference surveys were conducted in the fall of 2009 to measure the responses of current bridge users to tolling of SR 520. The results were used to develop a travel choice model which was used to forecast future travel behavior under tolled conditions including values of time, trip suppression, and mode shift.
- **Independent corridor growth analysis** – An independent review was conducted to update the Puget Sound Regional Council (PSRC) data. This review utilized independent regional forecasts which account for the major recession and overall economic downturn, data on economic and real estate activity, and a review of area development plans as the basis for revised population and employment forecasts for the region.
- **Tolling analysis model development** – The model development process included compiling and converting the PSRC regional travel model data sets to the toll forecast model. The model was calibrated to match existing observed conditions based on traffic counts and speeds. Once calibrated, the traffic assignment model was developed, incorporating tolling algorithms with the assignment process. CDM Smith also incorporated the results of the travel patterns surveys, the stated preference survey, independent corridor growth review, and travel time surveys.
- **Traffic and revenue analysis** – CDM Smith utilized the tolling analysis model to analyze several preliminary toll structures, as requested by WSDOT. The final investment grade traffic and revenue scenario was based on the FY 2012 adopted tolling structure and the future year tolling structure in the financing plan reviewed by the Washington State Transportation Commission (WSTC).
- **Sensitivity tests** – Several sensitivity tests were performed to determine the revenue impacts associated with variations in the following parameters and assumptions: regional growth, values of time, account-based participation rate, motor fuel cost, trip suppression and mode shift, and possible tolling of the I-90 bridge.

² The report containing the September 2011 traffic and revenue forecast was dated August 29, 2011. It was prepared in conjunction with other financing reports that are collectively referred to as the September 2011 forecast.

Tolling started on the SR 520 bridge on December 29, 2011. In September 2012, CDM Smith provided an updated forecast based on tolling experience over the first six months of 2012, a revised socio-economic basis, and revised project construction schedule. The resulting updated revenue forecast differed only modestly from the September 2011 forecast.

In late 2012 and early 2013, CDM Smith provided analysis of a series of alternative toll rate scenarios requested by the Washington State Transportation Commission (WSTC). A traffic and revenue forecast was produced for the nickel rounding alternative ultimately adopted by WSTC in May 2013. In this alternative, toll rates for account-based (*Good To Go!*) and Pay By Mail transactions in FY 2014 through FY 2016 were rounded to the nearest \$0.05, resulting in slight forecast changes through FY 2016. (Toll rates from FY 2017 onward were rounded to the nearest \$0.05 in the original 2011 study and continued to be so in the later studies.)

In October 2013, CDM Smith provided a revised forecast based on detailed information on tolling experience from January 1, 2012 to December 31, 2012, preliminary tolling experience from January 1, 2013 to June 30, 2013, revised closure schedule, assumed toll rate schedule, and revised economic forecasts prepared in July 2013. The updated traffic and gross toll revenue forecast was documented in the April 4, 2014 investment grade study update.³

In November 2014, CDM Smith provided a revised forecast based on detailed information on tolling experience through December 31, 2013, preliminary tolling experience from January 1, 2014 to June 30, 2014, slightly revised bridge configuration with the addition of the West Approach Bridge North connection from the Montlake interchange to the western high-rise and reconfiguration of the existing west approach bridge, revised closure schedule, assumed toll rate schedule, and revised economic forecasts completed in October 2014. The updated traffic and gross toll revenue forecast was documented in the January 29, 2015 investment grade study update.⁴

CDM Smith issued a revised investment grade forecast report on April 22, 2016. The revised forecast was prepared in conjunction with other financing reports that are collectively referred to as the November 2015 forecast. The November 2015 forecast accounted for detailed information for tolling experience from January 1, 2012 to December 31, 2014, preliminary tolling experience for the period July 2015 through February 2016, revised bridge configuration assumptions, revised closure schedule, assumed toll rate schedule, and October 2015 revised economic forecast,

Review of Tolling Performance

For purposes of generating this November 2016 SR 520 forecast, CDM Smith analyzed traffic and tolling performance data provided by WSDOT covering January 2015 through June 2016. These results of actual tolling experience provided valuable information to help evaluate and adjust the traffic and revenue estimates.

The traffic performance review examined the traffic impacts as a result of tolling; the focus was on comparing how traffic conditions, including travel times, have evolved from January 2015 through June 2016. Figure ES-2 shows the actual traffic volumes and the forecast traffic based on the 2011

³ The forecast presented in the April 2014 report was generated and reviewed in the summer and fall of 2013. It was prepared in conjunction with other financing reports that are collectively referred to as the October 2013 forecast.

⁴ The forecast documented in the January 2015 report was prepared in conjunction with other financing reports that are collectively referred to as the November 2014 forecast.

Investment Grade study (referred to as the September 2011 forecast) and the November 2015 forecast. Note that on this figure, the annual average daily traffic includes all traffic (non-revenue vehicles, overnight traffic, and weekend traffic) and is adjusted to exclude weekend closures due to construction.

As illustrated by Figure ES-2, the overall average daily traffic on SR 520 dropped by about 36 percent when tolling began from 93,100 in 2011 to 59,500 in the first six months of 2012. The September 2011 forecast had anticipated a drop of about 44 percent. The average daily traffic increased to 61,800 vehicles in FY 2013, 62,500 in FY 2014, 66,500 in FY 2015, and 69,500 in FY 2016. The November 2015 forecast had anticipated a traffic volume of 66,700 for FY 2016.

The tolling performance review covers the following elements: transactions, gross toll revenue potential, method of payment, average weekday and weekend day transactions, and vehicle classification. When applicable, the performance data (actuals) for FY 2016 are compared to the prior IG forecasts prepared by CDM Smith (September 2011 and November 2015 forecasts) in the information that follows.

Figure ES-2: Impacts of Tolling on Traffic

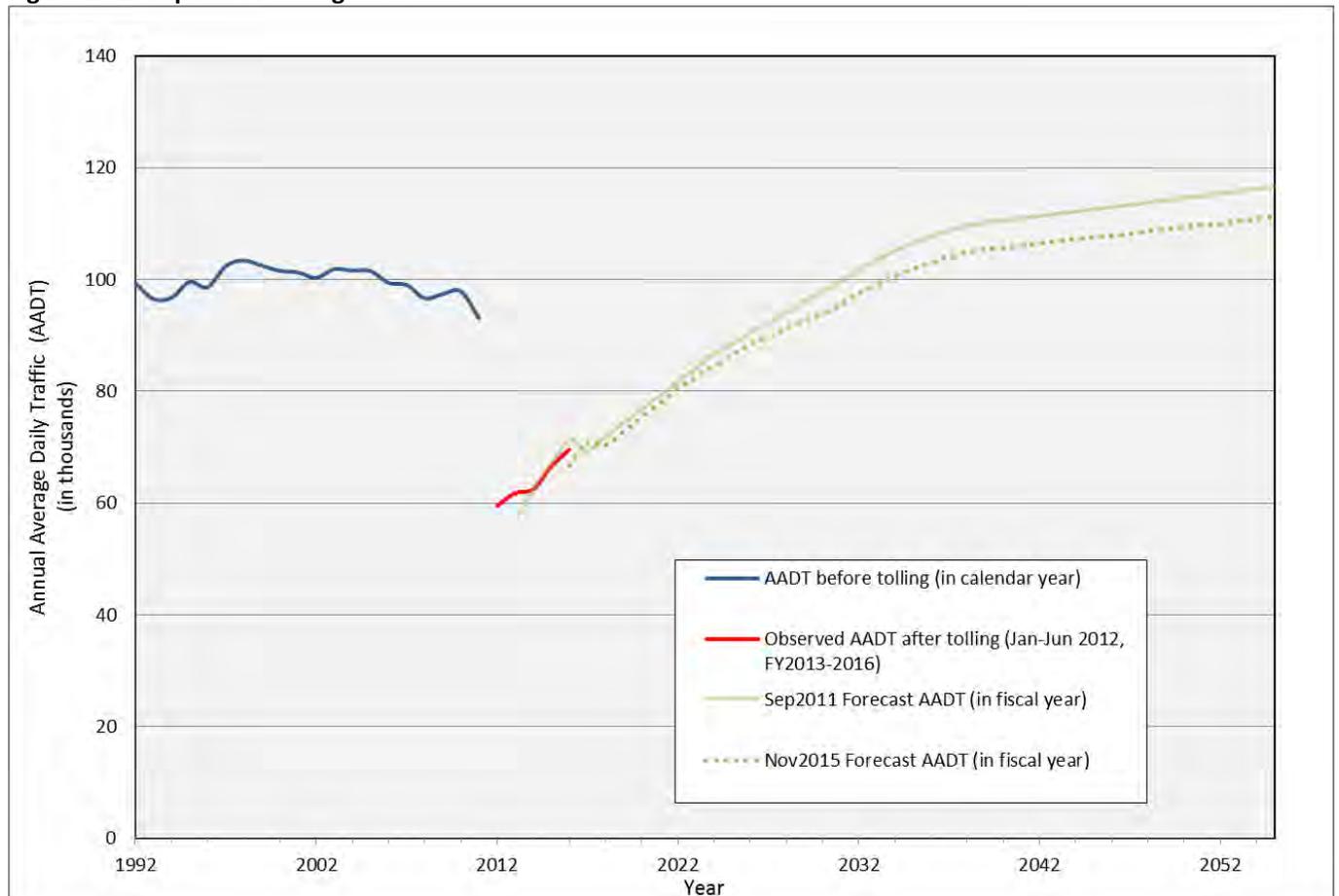


Table ES-1 presents the difference between total annual forecast transactions and actual results. Overall, the actual transactions in FY 2016 were 3.1 percent below the September 2011 forecast, and exceeded the November 2015 forecast by 1.4 percent.

Table ES-1: FY 2016 Transactions vs. Forecasts

| Transactions | Sep2011 Forecast ¹ | Nov2015 Forecast ² | Actuals ^{3,4} | Variance vs 2011 Forecast | Variance vs 2015 Forecast |
|-------------------|----------------------------------|----------------------------------|------------------------|---------------------------------|---------------------------------|
| Jul 2015-Dec 2015 | 11,905,342 | 11,276,000 | 11,537,725 | -3.1% | 2.3% |
| Jan 2016-Jun 2016 | 12,054,658 | 11,610,000 | 11,679,275 | -3.1% | 0.6% |
| FY 2016 | 23,960,000 | 22,886,000 | 23,217,000 | -3.1% | 1.4% |

1. Based on CDM Smith September 2011 forecast

2. Based on CDM Smith November 2015 forecast

3. For CY 2015, actuals are based on WSDOT toll transaction data provided to CDM Smith on 6/3/16

4. For CY 2016, actuals are based on WSDOT monthly lane equipment data adjusted by CDM Smith

Table ES-2 presents the difference between total annual forecast gross toll revenue potential and actual results available for FY 2016. The revenue potential reflects the toll rate increase implemented on July 1, 2015. Overall, the actual revenue potential was about 8.7 percent lower than the September 2011 forecast and exceeded the November 2015 forecast by 0.4 percent.

Table ES-2: FY 2016 Gross Toll Revenue Potential vs. Forecasts

| Gross Toll Revenue Potential | Sep2011 Forecast ¹ | Nov2015 Forecast ² | Actuals ^{3,4} | Variance vs 2011 Forecast | Variance vs 2015 Forecast |
|---------------------------------|----------------------------------|----------------------------------|------------------------|---------------------------------|---------------------------------|
| Jul 2015-Dec 2015 | \$40,704,743 | \$36,684,000 | \$37,134,440 | -8.8% | 1.2% |
| Jan 2016-Jun 2016 | \$41,215,257 | \$37,808,000 | \$37,667,234 | -8.6% | -0.4% |
| FY 2016 | \$81,920,000 | \$74,492,000 | \$74,801,674 | -8.7% | 0.4% |

1. Based on CDM Smith September 2011 forecast

2. Based on CDM Smith November 2015 forecast

3. For CY 2015, actuals are based on WSDOT toll transaction data provided to CDM Smith on 6/3/16

4. For CY 2016, actuals are based on preliminary financial reporting system results and adjustments

Economic Growth Analysis

The CDM Smith team developed independent economic forecasts of population and employment based on estimates of current socioeconomic variables and forecasts of future socioeconomic activity. These forecasts were updated in October 2016 by CDM Smith team member Community Attributes Inc. (CAI) to reflect newly available economic performance estimates, current regional economic forecasts, projected development in Seattle and Eastside King County communities, and current market conditions such as office occupancy rates and housing unit absorption trends.

The team produced base year traffic analysis zone (TAZ) estimates for 2015 drawing from current data published by State and regional government agencies and data providers. Forecasts include employment and population forecasts for 2016, 2017, 2018, 2020, 2030 and 2040, driven by data and published forecasts.

For comparative purposes, the updated economic forecasts are compared to forecasts used in the previous November 2015 SR 520 traffic and revenue forecast. Base year (2015) employment exceeded the prior economic forecast values, resulting in a revised base. However, the revised employment forecast has a lower annual growth rates for 2016-2020 for King County compared with the prior forecast (1.0 percent vs. 1.2 percent in the prior forecast); the 2020-2030 and 2030-2040 employment

forecast growth rates are slightly higher, with respectively 1.0 percent and 1.1 percent annual growth compared with 0.9 percent growth in the prior forecast.

Forecast population for King County is slightly higher overall, though this in part owes to a higher base year population for year 2015 compared with a forecast population for year 2015 in the prior economic forecast. Near-term (2016-2020) growth as well as later-term (2020-2030 and 2030-2040) growth are expected to be the same as in the prior forecast.

For the four main cities in the SR 520 corridor (Seattle, Bellevue, Kirkland, and Redmond), overall employment and population are higher in the revised forecast compared to the prior forecast. For employment, the forecast increase varies between 1.7 percent in 2016 and 3.3 percent in 2040. For population, the forecast increase varies between 1.1 percent in 2016 and 1.6 percent in 2040.

When incorporated into the revised traffic and revenue forecast, the slightly higher population and employment forecast in outer years result in increased transactions and gross revenue.

Tolling Operations

Tolling commenced on the existing SR 520 bridge on December 29, 2011. Overall, the toll rates assumed in the 2011 study before the start of tolling were implemented. Since tolling began, the Washington State Transportation Commission (WSTC) has raised tolls approximately 2.5 percent on July 1, 2012, July 1, 2013, July 1, 2014 and July 1, 2015, consistent with the original 2011 study assumptions. The last toll rate increase of approximately 5 percent was implemented on July 1, 2016 (FY 2017) based on the toll rate schedule adopted by WSTC in May 2016.

The existing (FY 2017) toll rates are as follows:

- The maximum *Good To Go!* toll rate for 2-axle vehicles is \$4.10 on weekdays and \$2.50 on weekends in FY 2017. The toll rates have been rounded to the nearest \$0.05
- In FY 2017, Pay By Mail customers pay exactly \$2.00 above the *Good To Go!* toll rates for 2-axle vehicles.
- Tolls for multi-axle vehicles (those with more than two axles on the ground) are determined by multiplying the number of axles by the per axle toll rate for two-axle vehicles using the same payment method and rounded to the nearest \$0.05. The maximum rate is the six-axle rate, regardless of additional axles.

Future toll rates and policies assumed in this study are consistent with the latest toll rate schedule formally adopted by WSTC in May 2016. The assumed toll rates for FY 2018 and beyond are as follows:

- Weekday *Good To Go!* account-based tolls will increase approximately 5.2 percent on average from FY 2017 to FY 2018 (i.e. on July 1, 2017).
- Weekend *Good To Go!* account-based tolls will increase approximately 6.2 percent on average from FY 2017 to FY 2018.
- The maximum *Good To Go!* toll rate for 2-axle vehicles will be \$4.30 on weekdays and \$2.65 on weekends.

- Pay By Mail customers will pay exactly \$2.00 above the *Good To Go!* toll rates for 2-axle vehicles.
- All toll rates will continue to be rounded to the nearest \$0.05.
- No toll rate escalation is assumed after FY 2018.
- Tolls will be charged during all 24 hours starting in FY 2018. The night time (11:00 pm – 5:00 am) account-based toll rate for 2-axle vehicles is \$1.25 on both weekdays and weekend days.
- Tolls for multi-axle vehicles will be set to axle factors based on the per axle rate for two-axle vehicles for the same payment type. The maximum rate is the six-axle rate, regardless of additional axles.

Toll Model Update

As part of the 2011 study, CDM Smith developed a tolling analysis model specific to the SR 520 corridor. A detailed description of the model structure and primary input is provided in the 2011 IG report. Specific toll model and forecasting revisions incorporated in the revised forecast include:

- **Model trip table calibration** – The SR 520 toll model trip tables were calibrated to toll transactions derived from the toll performance analysis and to traffic volumes on SR 520, I-90, SR 522, I-5, and I-405 for the November 2015 forecast. Additional calibration was not necessary for the November 2016 forecast.
- **Growth performance review** – Short-term traffic and revenue revised forecasts (FY 2017 and FY 2018) were partly informed by actual results for FY 2015 and FY 2016, as well as recent growth patterns revealed by the tolling performance review. Average weekday and average weekend transactions for FY 2017 and FY 2018 were adjusted accordingly.
- **Time of day profile** – Updated information on distribution of transactions by hour by direction on an average weekday were incorporated into the model.
- **Roadway configuration** – Changes in roadway configuration assumptions related to the SR 520 West Side improvements, and an updated completion date for the I-90 Two-Way Transit & HOV Operations project had been introduced in the November 2015 forecast. No changes were necessary for the 2016 update.
- **Socioeconomic growth** – The revised socioeconomic growth review was incorporated into the new forecast.
- **Gas price forecast change** – Compared to the gas price forecast used in the November 2015 forecast, the new forecast assumes the same forecast since current WSDOT state forecasts of the long term growth rate of gas prices is similar.
- **Proportion of payment** – The shares of *Good To Go!* account-based transactions (weekday, weekend, and overall) have been revised based on the performance review.
- **Payment type refinements** – The hourly account-based proportions for both cars and trucks had been updated in the November 2015 forecast.

- **Truck proportions** – Based on the performance review, no changes to the proportions of trucks (weekday, weekend, and overall) were necessary
- **SR 520 closures due to construction** – Planned closure assumptions have been revised to account for progress on SR 520 reconstruction work and affects only FY 2017.
- **I-90 closures due to construction** – Planned closures on I-90 routinely increase traffic on SR 520 and a conservative assumption for increased traffic and revenue is included in the new forecast for FY 2017.

Summary of Assumptions

A summary of the assumptions used for the updated forecast is shown in Table ES-3.⁵

⁵ The forecast presented in this report was prepared in conjunction with other financing reports that are collectively referred to as the November 2016 forecast.

Table ES-3: November 2016 Traffic and Gross Revenue Forecast Assumptions

| General Assumptions |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Improvements in the Puget Sound Regional Council's current regional transportation plan, <i>Transportation 2040</i> , will be implemented as planned. No new competitive toll-free facilities or additional capacity will be constructed during the projection period other than those assumed in the plan. |
| The percentage of payment types will be consistent with the ranges assumed for this study. The percentage of potential bridge users in the <i>Good To Go!</i> account-based program is assumed to increase from 84% in FY 2017 to 87% in FY 2031. |
| Economic growth in the project study area will occur as forecasted herein based in part on the 2013 PSRC Land Use Baseline Forecast from the Puget Sound Regional Council, Conway Pedersen 2016 forecasts, and the independent socioeconomic sub-consultant Community Attributes. |
| The facility will continue to be well maintained, efficiently operated, effectively signed, and promoted to encourage maximum usage. |
| Inflation will average 2.5% annually over the forecast horizon. This figure is based on historic CPI up to 2016. While current inflation forecasts are somewhat lower for the state overall (2.3% long term), the greater Seattle region and the SR 520 primary market corridor are growing at a significant pace implying the assumption of 2.5% inflation throughout the SR 520 forecasts should be kept. |
| Motor fuel will remain in adequate supply and no national or regional emergency will arise that would abnormally restrict the use of motor vehicles. The per gallon price for passenger car gasoline is assumed to be \$2.80 per gallon in FY 2016, \$2.94 in FY 2017, \$4.40 in FY 2024, and \$5.37 in FY 2031, resulting in a long term annual growth assumption of 4.4%. These values are consistent with TRFC's June 2016 long term forecast of gas price. |
| The value of time for work trips ranges from \$9.60 per hour for the lowest income group to \$22.80 per hour for the highest income group. The value of time for non-work passenger car trips is \$13.80 per hour. Truck trip value of time reaches \$36.00 per hour for heavy trucks. All values are in 2010 dollars. |
| SR 520 Corridor Lane Configuration |
| FY 2017 through FY 2021: New floating bridge with two wider general-purpose lanes in each direction, one inside HOV/transit lane in each direction, and wider shoulders in each direction. West of the replacement span, SR 520 will remain in its current two-lane per direction configuration. |
| FY 2022 through FY 2025: Two wider general-purpose lanes in each direction, one inside HOV/transit lane in each direction, and wider shoulders in each direction on replacement span. New west approach bridge north and south connections from the western high rise to Montlake Blvd. interchange such that three standard-width lanes and full shoulders are provided between the floating span and Montlake Blvd. West of Montlake Blvd., SR 520 will remain in its current two-lane per direction configuration. |
| FY 2026 and onward: On replacement span, west approach bridge north and south connections, and new Portage Bay bridge between I-5 and the Montlake Blvd, roadway configuration includes two wider general-purpose lanes in each direction, one inside HOV/transit lane in each direction, and wider shoulders in each direction. Also includes a one-lane transit/HOV3+ reversible direct connector between SR 520 and the I-5 reversible express lanes operating in the direction of the I-5 reversible lanes. |
| SR 520 Configuration East of Bridge to I-405, FY 2016 and onward: Two general-purpose lanes in each direction and one inside HOV/transit lane in each direction (with three person occupancy requirement HOV3+). |

(table continued)

Table ES-3: November 2016 Traffic and Gross Revenue Forecast Assumptions (Continued)

| Construction Closures | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Weekend closures of SR 520 from the Montlake Interchange to I-405 including the tolled section will occur an equivalent of 4 days in FY 2017, 12 days in FY 2018, 17 days in FY 2019, 16 days in FY 2020, 17 days in FY 2021, and 13 days in FY 2022. Since night time (11pm - 5am) tolling is assumed from FY 2018 forward, weekday night time closures from FY 2018 forward are also considered. Weekday night time closures will occur an equivalent of 22.5 nights in FY 2018, 29.5 nights in FY 2019, 29 nights in FY 2020, 29.5 nights in FY 2021, and 23 nights in FY 2022. | |
| Construction of the new Portage Bay bridge will start in FY 2020 and will require closures of SR 520 between I-5 and the Montlake interchange. During these closures, traffic will still be allowed on the tolled section between the Montlake interchange and I-405. Portage Bay bridge weekend closures will occur an equivalent of 7 days in FY 2020, 10 days in FY 2021, 10 days in FY 2022, 5 days in FY 2023, 3 days in FY 2024, 3 days in FY 2025, and 7 days in FY 2026. Weekday night time closures will occur an equivalent of 12 nights in FY 2020, 17.5 nights in FY 2021, 17.5 nights in FY 2022, 15 nights in FY 2023, 10 nights in FY 2024, 10 nights in FY 2025, and 12 nights in FY 2026. | |
| Toll Collection | |
| Starting in January 2016, tolls are collected on land east of the bridge. | |
| Toll rates will be the same for either direction on the bridge. | |
| The toll collection is all electronic; there will be no manual toll collection. | |
| FY 2017: no night time tolling (11pm - 5am). FY 2018 and beyond: tolls will be charged during all 24 hours. | |
| Toll Rates | |
| FY 2017 | |
| | The maximum <i>Good To Go!</i> toll rate for 2-axle vehicles is \$4.10 on weekdays, and \$2.50 on weekends in FY 2017 as adopted by the Washington State Transportation Commission. The toll rates have been rounded to the nearest \$0.05 |
| | In FY 2017, Pay By Mail customers pay exactly \$2.00 above the <i>Good To Go!</i> toll rates. The Pay By Mail rates are rounded to the nearest \$0.05. |
| | Tolls for multi-axle vehicles (three or more axles) are set to the axle multiple of the per-axle rates for two-axle vehicles using the same payment method. |
| FY 2018 and beyond | |
| | The maximum <i>Good To Go!</i> toll rate for 2-axle vehicles is \$4.30 on weekdays, and \$2.65 on weekends in FY 2018 and beyond. |
| | In FY 2018 and beyond, Pay By Mail customers pay exactly \$2.00 above the <i>Good To Go!</i> toll rates. |
| | Weekday <i>Good To Go!</i> account-based tolls will increase approximately 5.2% on average from FY 2017 to FY 2018 (i.e. on July 1, 2017). |
| | Weekend <i>Good To Go!</i> account-based tolls will increase approximately 6.2% from FY 2017 to FY 2018 (i.e. on July 1, 2017). |
| | All toll rates will be rounded to the nearest \$0.05. |
| | Night time tolling (11pm - 5am) will be introduced starting in FY 2018. The night time account-based toll rate for 2-axle vehicles is \$1.25 on both weekdays and weekend days |
| | Tolls for multi-axle vehicles (three or more axles) will be set to the axle multiple of the per-axle rates for two-axle vehicles using the same payment method. |
| | No toll rate escalation is assumed after FY 2018. |
| Toll Exemptions | |
| | Toll exemptions currently in place (public/private buses, registered vanpools, State Police vehicles, bridge maintenance vehicles, emergency vehicles, tow trucks while responding to SR 520 calls, and vehicles owned and maintained by a foreign government) are continued. |
| | Carpools pay the same toll as single occupant vehicles (SOVs). |

Updated Transactions and Gross Toll Revenue Potential

Taking into account the tolling experience to date, revised independent economic forecast, and revised bridge configuration assumptions including closures, updated baseline estimates of toll transactions and gross toll revenue potential were developed for FY 2017 through FY 2056, shown in Table ES-4.

Initially, annual growth in transactions and revenue is expected to generally follow recent trends. In FY 2018, the growth rate of transactions is lower than revenue primarily due to the 5% toll increase even though the beginning of night time tolling (from 11:00 pm to 5:00 am) brings additional transactions. After FY 2018, toll rates are assumed not to change, which makes the real value of the toll decline due to inflation. From FY 2019 through 2036, average transactions are expected to grow at a rate varying between approximately 1 and 6 percent annually, while revenue growth rates vary between approximately 1 and 5 percent. Strong growth in FY 2022 and FY 2023 can be attributed to much fewer assumed closures and the opening of three operational lanes in each direction to the Montlake interchange. Throughout the remainder of the forecast horizon, the growth rates of both transactions and revenue declines to well below 1 percent annually.

Figure ES-3 shows the comparison of the September 2011, November 2015, and November 2016 forecasts over the entire study period. In the short term (FY 2017 through FY 2025), transactions are down in the November 2016 forecast compared to the November 2015 forecast. The change is about 2 percent in FY 2017, and about 1 percent in FY 2018 through FY 2025. This trend is mainly due to the re-benchmarking to match FY 2016 actuals, as well as reduced short term growth rates for weekday traffic based on recent trends. In the long term, transactions are up by about 0.4 percent in FY 2026 and thereafter in the November 2016 forecast compared to the November 2015 forecast, primarily due to the slightly higher socioeconomic forecast.

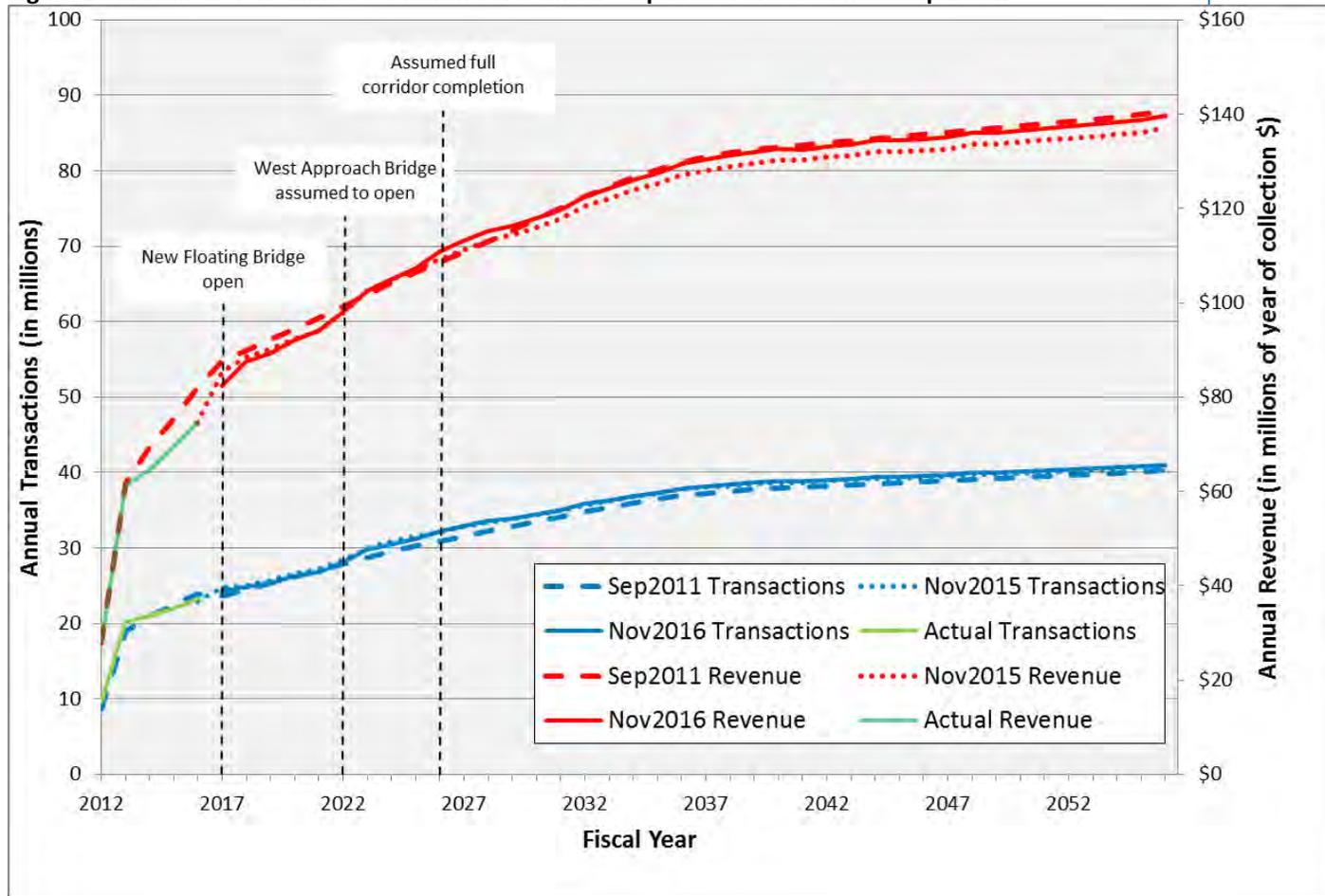
For revenue, the changes between forecasts are more pronounced than transactions. In the short term, the forecasted revenue is down or stable in the new forecast. In FY 2017, the November 2016 forecast is down by 3.6 percent compared to the previous forecast, due lower number of transactions as well as refined hourly profiles better aligned with recent observations leading to a lower share of traffic during peak hours. Revenue is down by 1 percent or less between FY 2018 and FY 2022 compared to the November 2015 forecast, before being nearly unchanged in FY 2023 through FY 2025. For FY 2026 and beyond, the forecasted gross toll revenue potential is slightly higher than the November 2015 forecast, with changes of about 1.6 to 1.8 percent, due to higher number of transactions and reduced share of account-based transactions.

When comparing to the September 2011 forecast, annual transactions are up for all years except FY 2021. From FY 2019 through FY 2022, the “rest of the west” closures bring the transactions forecast down overall and close to the September 2011 forecast. From FY 2023 onward, the variance on annual transactions starts at about 3 to 4 percent and over time decreases to about 2 percent in the later forecast years. Annual revenue is usually down compared to the September 2011 forecast except for the period between FY 2023 and FY 2030, which has higher revenue in the revised forecast compared to the original forecast. This is mostly due to higher forecasted transactions during this period. With the exception of FY 2017 which shows an annual gross revenue reduced by 6 percent, the variance on annual gross revenue never exceeds plus or minus 3 percent. Long range variance from FY 2031 onward is less than one percent lower than the September 2011 forecast.

Table ES-4: SR 520 Annual Transactions and Gross Revenue -- November 2016 Baseline Forecast

| Fiscal Year | Transactions (millions) | Annual Growth | Gross Toll Revenue Potential (millions of year of collection \$) | Annual Growth |
|-------------|-------------------------|---------------|------------------------------------------------------------------|---------------|
| 2017 | 24.190 | -- | \$82.371 | -- |
| 2018 | 24.806 | 2.5% | 87.589 | 6.3% |
| 2019 | 25.398 | 2.4% | 89.443 | 2.1% |
| 2020 | 26.230 | 3.3% | 92.146 | 3.0% |
| 2021 | 26.872 | 2.4% | 94.050 | 2.1% |
| 2022 | 28.075 | 4.5% | 97.875 | 4.1% |
| 2023 | 29.727 | 5.9% | 102.568 | 4.8% |
| 2024 | 30.521 | 2.7% | 104.966 | 2.3% |
| 2025 | 31.187 | 2.2% | 107.224 | 2.2% |
| 2026 | 32.222 | 3.3% | 110.950 | 3.5% |
| 2027 | 32.930 | 2.2% | 113.094 | 1.9% |
| 2028 | 33.559 | 1.9% | 115.145 | 1.8% |
| 2029 | 33.939 | 1.1% | 116.234 | 0.9% |
| 2030 | 34.463 | 1.5% | 117.907 | 1.4% |
| 2031 | 35.029 | 1.6% | 119.792 | 1.6% |
| 2032 | 35.826 | 2.3% | 122.511 | 2.3% |
| 2033 | 36.340 | 1.4% | 124.219 | 1.4% |
| 2034 | 36.899 | 1.5% | 126.103 | 1.5% |
| 2035 | 37.347 | 1.2% | 127.531 | 1.1% |
| 2036 | 37.887 | 1.4% | 129.366 | 1.4% |
| 2037 | 38.165 | 0.7% | 130.342 | 0.8% |
| 2038 | 38.443 | 0.7% | 131.263 | 0.7% |
| 2039 | 38.647 | 0.5% | 131.931 | 0.5% |
| 2040 | 38.851 | 0.5% | 132.542 | 0.5% |
| 2041 | 38.861 | 0.0% | 132.521 | 0.0% |
| 2042 | 39.037 | 0.5% | 133.170 | 0.5% |
| 2043 | 39.167 | 0.3% | 133.587 | 0.3% |
| 2044 | 39.420 | 0.6% | 134.443 | 0.6% |
| 2045 | 39.430 | 0.0% | 134.424 | 0.0% |
| 2046 | 39.517 | 0.2% | 134.607 | 0.1% |
| 2047 | 39.649 | 0.3% | 135.028 | 0.3% |
| 2048 | 39.952 | 0.8% | 136.134 | 0.8% |
| 2049 | 39.962 | 0.0% | 136.115 | 0.0% |
| 2050 | 40.096 | 0.3% | 136.541 | 0.3% |
| 2051 | 40.231 | 0.3% | 136.969 | 0.3% |
| 2052 | 40.397 | 0.4% | 137.364 | 0.3% |
| 2053 | 40.501 | 0.3% | 137.828 | 0.3% |
| 2054 | 40.637 | 0.3% | 138.261 | 0.3% |
| 2055 | 40.774 | 0.3% | 138.694 | 0.3% |
| 2056 | 41.037 | 0.6% | 139.584 | 0.6% |

Figure ES-3: Transactions and Gross Revenue Potential – Updated Forecast and Comparison



Sensitivity Tests

In order to evaluate the impact of possible changes in input parameters and their effect on transactions and revenue, several sensitivity tests were performed, involving variations in the following parameters and assumptions:

- Toll rate sensitivity
- Regional growth
- Account-based participation rate

Toll Rate Sensitivity

A range of toll rates from \$2.00 to \$9.00 during peak hours and from \$2.00 to \$5.00 during the midday was modeled using the tolling analysis model for FY 2018. These toll rates are expressed in year of collection dollars (FY 2018). For each toll rate, the corresponding revenue was computed to develop toll sensitivity curves for AM peak, midday, and PM peak periods.

The FY 2018 selected peak period toll rate of \$4.30 is estimated to generate 87 and 84 percent of the maximum revenue during the AM and PM peak periods, respectively. During the off-peak (midday)

period in FY 2018, the selected toll rate of \$2.70 is estimated to generate 93 percent of the maximum revenue.

Regional Growth

Using the downside economic forecast developed by CAI as part of the November 2015 forecast, the tolling analysis model was run to determine transactions and gross toll revenue potential under lower economic growth conditions. For FY 2018, under an approximately 2 and 3 percent economic downside scenario for population and employment respectively, transactions and revenue are expected to be about 3 percent lower. For FY 2022, under an approximately 4 and 5 percent economic downside scenario for population and employment respectively, transactions and revenue are expected to be about 6 percent lower. For FY 2031, under an approximately 9 percent economic downside scenario for population and employment, transactions and revenue are expected to be about 10 percent lower.

Account-based Participation Rate

This test examined the difference in transactions and revenue for account-based participation rates differing from those assumed in the baseline scenario. The overall transaction *Good To Go!* share for the baseline scenario is 84 percent in FY 2018, 85 percent in FY 2022, and 87 percent in FY 2031. In the sensitivity test, these rates were raised to 87 percent in FY 2018, 90 percent in FY 2022, and 92 percent in FY 2031.

The higher account-based participation rate results in transactions increasing by 1.0 percent in FY 2018, 1.2 percent in FY 2022, and 0.6 percent in FY 2031. Under this scenario, gross toll revenue potential would be expected to decline by 0.5 percent in FY 2018, by 1.4 percent in FY 2022, and by 2.6 percent in FY 2031.

Chapter 1

Introduction

The Washington State Department of Transportation (WSDOT) has utilized toll financing as part of a broader package to finance the implementation of the SR 520 Bridge Replacement and HOV Program. WSDOT began tolling the bridge in December 2011, prior to the construction of the replacement floating bridge which opened in April 2016. The U.S. Department of Transportation's Transportation Infrastructure Finance and Innovation Act (TIFIA) program provided financial support to the SR 520 Program via a direct loan in October 2012.

In order to satisfy TIFIA requirements and meet current and future bond requirements, the SR 520 Bridge Investment Grade Traffic and Revenue Study (T&R Study) was updated to address changes in project scope, additional actual tolling experience, changes in toll rates, updated construction schedules, and revisions to the underlying economic forecasting. Revised transactions and gross revenue forecasts were developed for FY 2017 through FY 2056.

Project Description

The SR 520 corridor stretches nearly 13 miles between I-5 in Seattle to the west and SR 202 to the east, crossing I-405 at about the halfway point, and serving various Eastside communities, including Bellevue, Kirkland, and Redmond. Figure 1-1 shows the corridor location. The new floating bridge opened to traffic in April 2016. Tolls are collected on land east of the bridge via all electronic tolling.

The SR 520 Bridge Replacement and HOV Program includes the portion of the corridor between I-5 and I-405 and is comprised of five major components:

- Pontoon Construction - complete
- Eastside Transit and HOV Project - complete
- Floating Bridge and Landings (FB&L) Project – functionally complete
- West Approach Bridge North (WABN) – under construction
- I-5 to Lake Washington (“Rest of the West”), including the West Approach Bridge South, new Portage Bay Bridge, and second Montlake Boulevard bascule bridge across the Montlake Cut.

The \$4.56 billion in SR 520 funding authorized by the Legislature pays for: a new, safer, six-lane floating bridge, with a cross-lake bicycle and pedestrian path; 77 bridge pontoons built at facilities in Grays Harbor and Tacoma; the corridor's Eastside transit and HOV improvements between Lake Washington and I-405; the north (westbound) half of a new west approach bridge connecting Seattle to the new floating bridge (WABN); a replacement West Approach Bridge South for eastbound traffic connecting Seattle to the new floating bridge; a second Montlake Boulevard bascule bridge over the Montlake Cut; a new, six-lane Portage Bay Bridge; an extension of a regional bicycle and pedestrian path from Montlake to I-5; and mitigation of the program's environmental impacts.

Figure 1-1: SR 520 Corridor Location

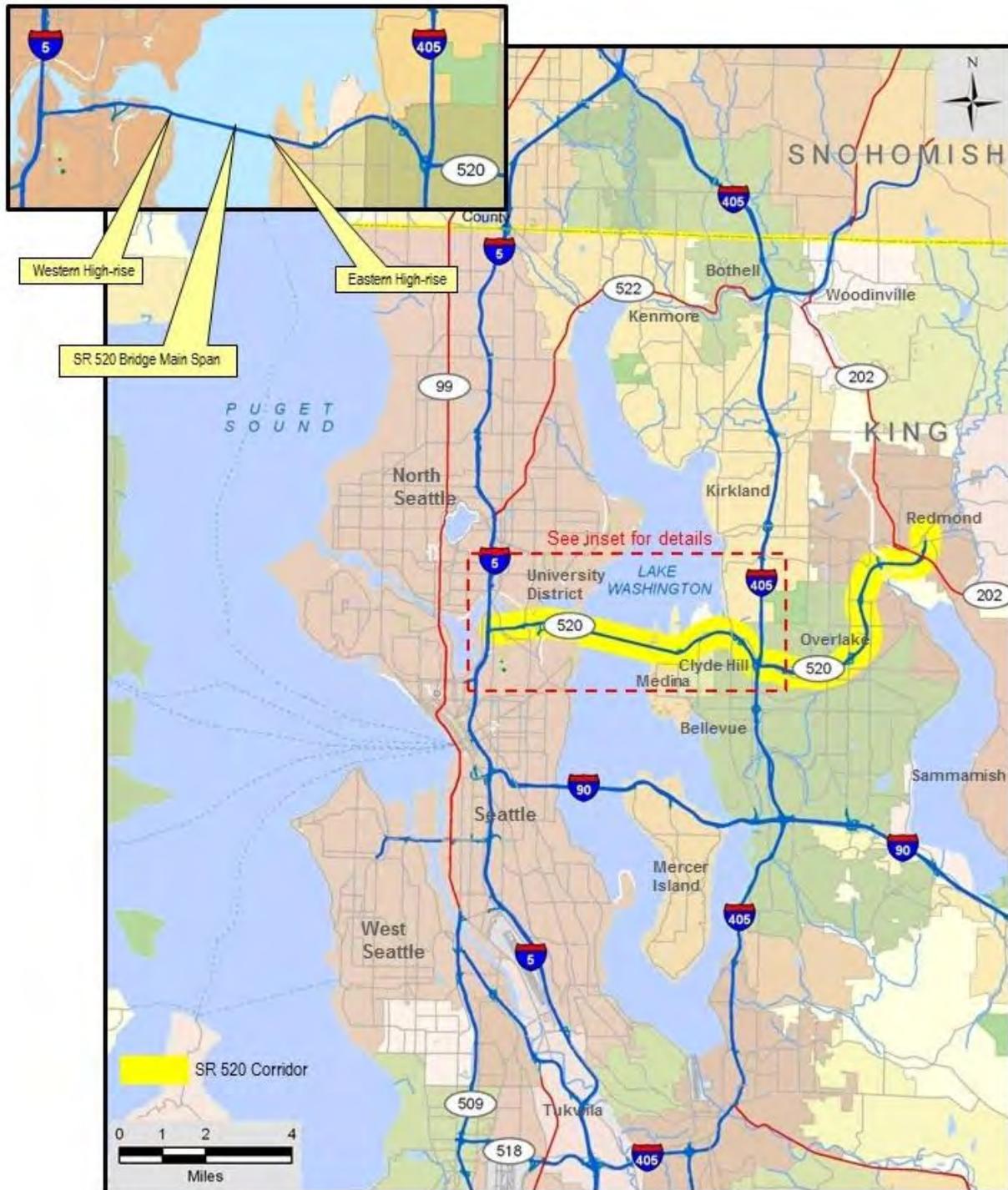


Figure 1-2 shows the assumed lane configurations for this study with three phases that are discussed below.

FY 2017 through FY 2021 – Current Configuration with Main Bridge Span Replaced

For purposes of this study, the configuration assumed from FY 2017 through FY 2021 consists of:

- I-5 to west end of main bridge span: two general-purpose lanes in each direction.
- Lake Washington: New six-lane main span opened in April 2016 with two general-purpose and one inside transit/HOV 3+ lane in each direction, from west end of main span, across Lake Washington to the eastern shore. Tolls are collected on the eastern shore of Lake Washington.
- East side of Lake Washington to I-405: Three lanes in each direction including two general-purpose lanes and one inside transit/high occupancy vehicle lane with a 3+ occupancy requirement (HOV3+)

FY 2022 through FY 2025 – West Approach Bridge North and South

For purposes of this study, the configuration assumed from FY 2022 through FY 2025 consists of:

- I-5 to Montlake Boulevard: no changes from current (FY 2017-2021) configuration.
- Montlake Boulevard to west end of new floating bridge: new West Approach Bridge North (WABN) connector and new West Approach Bridge South (WABS) connector resulting in three lanes in each direction (two general-purpose and one inside transit/HOV 3+ lane in each direction). The WABS connector is a new element since the 2014 study, which was added after the 2015 State Legislature approved funding for SR 520's planned improvements from I-5 to Lake Washington – the "Rest of the West."
- Lake Washington: no changes from current (FY 2017-2021) configuration.

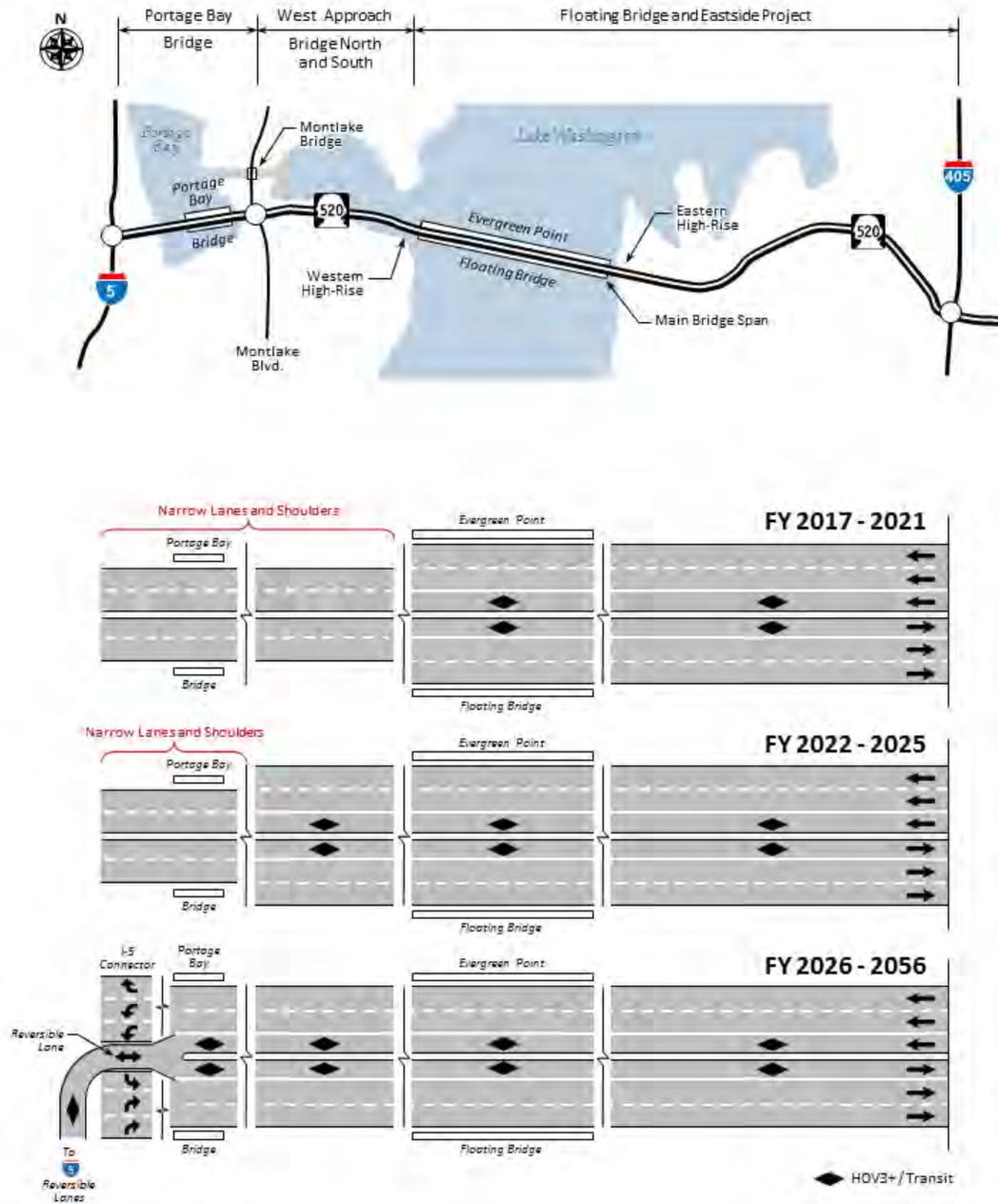
FY 2026 through FY 2056 – Portage Bay Bridge Replaced

For purposes of this study, the configuration assumed from FY 2026 forward consists of:⁶

- I-5 to Montlake Boulevard: new Portage Bay Bridge resulting in three lanes in each direction (two general-purpose and one inside transit/HOV 3+ lane in each direction) plus a one-lane transit/HOV3+ reversible direct connector between SR 520 and the I-5 reversible express lanes operating in the direction of the I-5 reversible lanes. The Portage Bay Bridge replacement is a new element since the 2014 study, which was added after the 2015 State Legislature approved funding for SR 520's planned improvements from I-5 to Lake Washington – the "Rest of the West."
- Montlake Boulevard to west end of new floating bridge: no changes from FY 2022-2025 configuration.
- Lake Washington: no changes from current (FY 2017-2021) configuration.

⁶ The network configuration and phasing assumptions are as of June 30, 2016 and subject to change.

Figure 1-2: Assumed SR 520 Lane Configuration



Bond Financing Context

Several different debt instruments are being used to finance the SR 520 Corridor program. A combination of triple pledge bonds (backed by toll revenue, fuel tax, and the full faith and credit of the State), Federal Highway Grant Anticipation Revenue (GARVEE) bonds, and a loan from the Transportation Infrastructure Finance and Innovation Act (TIFIA) are being used to finance the program.

To date, five bonds have been issued under the two master bond resolutions that govern the municipal financing provided to the project, including: (1) triple pledge bonds in October 2011; (2) GARVEE bonds in June 2012; (3) TIFIA bond in the form of a draw down loan in October 2012; (4) GARVEE bonds in September 2013; and (5) triple pledge bonds in September 2016.

Traffic and Revenue Forecasting History

CDM Smith conducted the initial investment grade study for SR 520, completed in late summer 2011. This study developed annual gross revenue estimates from the assumed start of tolling (January 1, 2012) through 2056. The study was conducted at a level of detail sufficient for use in support of project financing and resulted in the September 2011 Investment Grade traffic and revenue forecast.⁷ The estimates were prepared based on a study work program which included:

- **Traffic count data collection** – including review of WSDOT annual traffic reports, as well as independent traffic count data collection.
- **Travel pattern surveys** – Mail-back surveys were sent to SR 520 users in the fall of 2009. The survey requested information on origin and destination travel, trip frequency, travel time of day, trip purpose, vehicle occupancy, vehicle class, and SR 520 entrance and exit points.
- **Travel time surveys** – Travel time surveys were performed along SR 520 and on important routes that could be potential alternatives.
- **Stated preference surveys** – Stated preference surveys were conducted in the fall of 2009 to measure the responses of current bridge users to tolling of SR 520. The results were used to develop a travel choice model which was used to forecast future travel behavior under tolled conditions including values of time, trip suppression, and mode shift.
- **Independent corridor growth analysis** – An independent review was conducted to update the Puget Sound Regional Council (PSRC) data. This review utilized independent regional forecasts which account for the major recession and overall economic downturn, data on economic and real estate activity, and a review of area development plans as the basis for revised population and employment forecasts for the region.
- **Tolling analysis model development** – The model development process included compiling and converting the PSRC regional travel model data sets to the toll forecast model. The model was calibrated to match existing observed conditions based on traffic counts and speeds. Once calibrated, the traffic assignment model was developed, incorporating tolling algorithms with

⁷ The report containing the September 2011 traffic and revenue forecast was dated August 29, 2011. It was prepared in conjunction with other financing reports that are collectively referred to as the September 2011 forecast.

the assignment process. CDM Smith also incorporated the results of the travel patterns surveys, the stated preference survey, independent corridor growth review, and travel time surveys.

- **Traffic and revenue analysis** – CDM Smith utilized the tolling analysis model to analyze several preliminary toll structures, as requested by WSDOT. The final investment grade traffic and revenue scenario was based on the FY 2012 adopted tolling structure and the future year tolling structure in the financing plan reviewed by the Washington State Transportation Commission (WSTC).
- **Sensitivity tests** – Several sensitivity tests were performed to determine the revenue impacts associated with variations in the following parameters and assumptions: regional growth, values of time, account-based participation rate, motor fuel cost, trip suppression and mode shift, and possible tolling of the I-90 bridge.

Tolling started on the SR 520 bridge on December 29, 2011. In September 2012, CDM Smith provided an updated forecast based on tolling experience over the first six months of 2012, a revised socio-economic basis, and revised project construction schedule. The resulting updated revenue forecast differed only modestly from the September 2011 forecast.

In late 2012 and early 2013, CDM Smith provided analysis of a series of alternative toll rate scenarios requested by the Washington State Transportation Commission (WSTC). A traffic and revenue forecast was produced for the nickel rounding alternative ultimately adopted by WSTC in May 2013. In this alternative, toll rates for account-based (*Good To Go!*) and Pay By Mail transactions in FY 2014 through FY 2016 were rounded to the nearest \$0.05 resulting in slight forecast changes through FY 2016. (Toll rates from FY 2017 onward were rounded to the nearest \$0.05 in the original 2011 study and continued to be so in the later studies.)

In October 2013, CDM Smith provided a revised forecast based on detailed information on tolling experience from January 1, 2012 to December 31, 2012, preliminary tolling experience from January 1, 2013 to June 30, 2013, revised closure schedule, assumed toll rate schedule, and revised economic forecasts prepared in July 2013. The updated traffic and gross toll revenue forecast was documented in the April 4, 2014 investment grade study update.⁸

In November 2014, CDM Smith provided a revised forecast based on detailed information on tolling experience through December 31, 2013, preliminary tolling experience from January 1, 2014 to June 30, 2014, slightly revised bridge configuration with the addition of the West Approach Bridge North connection from the Montlake interchange to the western high-rise and reconfiguration of the existing west approach bridge, revised closure schedule, assumed toll rate schedule, and revised economic forecasts completed in October 2014. The updated traffic and gross toll revenue forecast was documented in the January 29, 2015 investment grade study update.⁹

CDM Smith issued a revised investment grade forecast report on April 22, 2016. The revised forecast was prepared in conjunction with other financing reports that are collectively referred to as the November 2015 forecast. The November 2015 forecast accounted for detailed information for tolling

⁸ The forecast presented in the April 2014 report was generated and reviewed in the summer and fall of 2013. It was prepared in conjunction with other financing reports that are collectively referred to as the October 2013 forecast.

⁹ The forecast documented in the January 2015 report was prepared in conjunction with other financing reports that are collectively referred to as the November 2014 forecast.

experience from January 1, 2012 to December 31, 2014, preliminary tolling experience for the period July 2015 through February 2016, revised bridge configuration assumptions, revised closure schedule, assumed toll rate schedule, and October 2015 revised economic forecast,

Traffic and Revenue Study Approach

The primary tasks leading to the development of this report and the revised forecast are summarized in this section. The approach essentially followed the same process as the prior forecast updates. These tasks are described in detail in subsequent chapters of the report.

Review of Tolling Performance

CDM Smith analyzed data provided by WSDOT to examine the traffic, transactions, and tolling performance of the SR 520 bridge between January 2015 and June 2016 (18-month period). The results of actual tolling experience provide valuable information to help evaluate and adjust the transactions and revenue forecast.

The traffic performance review examines the traffic impacts as a result of tolling; the focus is on comparing how traffic conditions, including travel times, have evolved from January 2015 through June 2016.

The tolling performance review covers the following elements: transactions; gross toll revenue potential; method of payment; average weekday and weekend day transactions; and vehicle classification. When applicable, the performance data (actuals) for FY 2016 are compared to the most recent investment grade (IG) forecast prepared by CDM Smith (November 2015 forecast).

Economic Growth Analysis

The CDM Smith team developed independent economic forecasts of population and employment based on estimates of current socioeconomic variables and forecasts of future socioeconomic activity. These forecasts were updated in October 2016 by CDM Smith team member Community Attributes Inc. (CAI) to reflect newly available economic performance estimates, current regional economic forecasts, projected development in Seattle and Eastside King County communities, and current market conditions such as office occupancy rates and housing unit absorption trends.

The team produced base year traffic analysis zone (TAZ) estimates for 2015 drawing from current data published by State and regional government agencies and data providers. Forecasts include employment and population forecasts for 2016, 2017, 2018, 2020, 2030 and 2040, driven by data and published forecasts. The revised forecast by CDM Smith incorporates the revised socioeconomic growth review performed by CAI.

For comparative purposes, the updated economic forecasts are compared to forecasts used in the previous November 2015 SR 520 traffic and revenue forecast.

Tolling Operations

Tolling commenced on the existing SR 520 bridge on December 29, 2011. Overall, the toll rates assumed in the 2011 study before the start of tolling were implemented. The Washington State Transportation Commission (WSTC) has since raised the tolls approximately 2.5 percent on July 1, 2012, July 1, 2013, July 1, 2014 and July 1, 2015, consistent with the original 2011 study assumptions. The last toll rate increase of approximately 5 percent was implemented on July 1, 2016 (FY 2017) based on the toll rate schedule adopted by WSTC in May 2016.

The existing (FY 2017) toll rates are as follows:

- The maximum *Good To Go!* toll rate for 2-axle vehicles is \$4.10 on weekdays and \$2.50 on weekends in FY 2017. The toll rates have been rounded to the nearest \$0.05
- In FY 2017, Pay By Mail customers pay exactly \$2.00 above the *Good To Go!* toll rates for 2-axle vehicles.
- Tolls for multi-axle vehicles (those with more than two axles on the ground) are determined by multiplying the number of axles by the per axle toll rate for two-axle vehicles using the same payment method and rounded to the nearest \$0.05. The maximum rate is the six-axle rate, regardless of additional axles.

Future toll rates and policies assumed in this study are consistent with the latest toll rate schedule formally adopted by WSTC in May 2016. The assumed toll rates for FY 2018 and beyond are as follows:

- Weekday *Good To Go!* account-based tolls will increase approximately 5.2 percent on average from FY 2017 to FY 2018 (i.e. on July 1, 2017).
- Weekend *Good To Go!* account-based tolls will increase approximately 6.2 percent on average from FY 2017 to FY 2018.
- The maximum *Good To Go!* toll rate for 2-axle vehicles will be \$4.30 on weekdays and \$2.65 on weekends.
- Pay By Mail customers will pay exactly \$2.00 above the *Good To Go!* toll rates for 2-axle vehicles.
- All toll rates will continue to be rounded to the nearest \$0.05.
- No toll rate escalation is assumed after FY 2018.
- Tolls will be charged during all 24 hours starting in FY 2018. The night time (11:00 pm – 5:00 am) account-based toll rate for 2-axle vehicles is \$1.25 on both weekdays and weekend days.
- Tolls for multi-axle vehicles will be set to axle factors based on the per axle rate for two-axle vehicles for the same payment type. The maximum rate is the six-axle rate, regardless of additional axles.

Toll Model Update

As part of the 2011 study, CDM Smith developed a tolling analysis model specific to the SR 520 corridor. A detailed description of the model structure and primary input is provided in the 2011 IG report. Specific toll model and forecasting revisions incorporated in the revised forecast include:

- **Model trip table calibration** – The SR 520 toll model trip tables were calibrated to toll transactions derived from the toll performance analysis and to traffic volumes on SR 520, I-90, SR 522, I-5, and I-405 for the November 2015 forecast. Additional calibration was not necessary for the November 2016 forecast.
- **Growth performance review** – Short-term traffic and revenue revised forecasts (FY 2017 and FY 2018) were partly informed by actual results for FY 2015 and FY 2016, as well as recent

growth patterns revealed by the tolling performance review. Average weekday and average weekend transactions for FY 2017 and FY 2018 were adjusted accordingly.

- **Time of day profile** – Updated information on distribution of transactions by hour by direction on an average weekday were incorporated into the model.
- **Roadway configuration** – Changes in roadway configuration assumptions related to the SR 520 West Side improvements, and an updated completion date for the I-90 Two-Way Transit & HOV Operations project had been introduced in the November 2015 forecast. No changes were necessary for the 2016 update.
- **Socioeconomic growth** – The revised socioeconomic growth review was incorporated into the new forecast.
- **Gas price forecast change** – Compared to the gas price forecast used in the November 2015 forecast, the new forecast assumes the same forecast since current WSDOT state forecasts of the long term growth rate of gas prices is similar.
- **Proportion of payment** – The shares of *Good To Go!* account-based transactions (weekday, weekend, and overall) have been revised based on the performance review.
- **Payment type refinements** – The hourly account-based proportions for both cars and trucks had been updated in the November 2015 forecast.
- **Truck proportions** – Based on the performance review, no changes to the proportions of trucks (weekday, weekend, and overall) were necessary
- **SR 520 closures due to construction** – Planned closure assumptions have been revised to account for progress on SR 520 reconstruction work and affects only FY 2017.
- **I-90 closures due to construction** – Planned closures on I-90 routinely increase weekend traffic on SR 520 and a conservative assumption for increased traffic and revenue is included in the new forecast for FY 2017.
- **Toll rate and toll policy assumptions** – The Washington State Transportation Commission has changed toll rate and policy assumptions since 2011 including: changing FY 2017 and FY 2018 toll rate increases to approximately 5 percent each, removing the assumption of free 3+ carpool travel from FY 2017 onward, and increasing the Pay By Mail differential to \$2.00 starting in FY 2017.

Transactions and Revenue Analysis

The revised tolling analysis model developed for the November 2015 forecast was used as a basis for new transaction and gross revenue forecasts. The model output for weekdays for key analysis years FY 2017, FY 2018, FY 2021, FY 2022, FY 2024, FY 2025, FY 2026, and FY 2031 was post processed taking into account recent experience to date on SR 520 and future planned improvements. The selection of model analysis years was determined primarily based on changes in roadway lane configurations.

The weekday results for years between model years were determined by interpolation. The model results were then annualized taking into account weekend traffic and toll rates. The process generated a baseline transaction and gross revenue forecast from FY 2017 to FY 2056.

Sensitivity Tests

In order to evaluate the impact of possible changes in input parameters and their effect on transactions and revenue, several sensitivity tests were performed, involving variations in the following parameters and assumptions:

- Toll rate sensitivity
- Regional growth
- Account-based participation rate

Report Structure

The remainder of this report is organized as follows:

- Chapter 2 presents a review of traffic and tolling performance including comparisons to the November 2015 forecast.
- Chapter 3 covers the economic growth analysis and revised economic forecast. It includes comparisons to the 2015 study economic forecast.
- Chapter 4 discusses the assumptions related to toll structure and toll rates including vehicle classes and toll exemptions, methods of payment, and estimated market shares by payment type.
- Chapter 5 presents the traffic and revenue forecasting approach. It includes an overview of the tolling analysis model, a description of the revisions made to the model and forecasting process, and a summary of major forecasting assumptions.
- Chapter 6 includes the results of traffic and gross revenue analysis in the form of estimated annual transactions and gross toll revenue potential stream for the period from FY 2017 through FY 2056.¹⁰
- Chapter 7 contains the results of sensitivity testing of key model parameters and assumptions.

¹⁰ The forecast presented in this report was prepared in conjunction with other financing reports that are collectively referred to as the November 2016 forecast.

Chapter 2

Review of Tolling Performance

CDM Smith analyzed data provided by WSDOT to examine the SR 520 traffic and tolling performance between January 2015 and June 2016. The results of actual tolling experience provide valuable information to refine the traffic and revenue forecast.

This chapter provides a general overview of the traffic and toll performance reviews performed by CDM Smith as part of this investment grade (IG) study update. The traffic performance review examines the traffic impacts as a result of tolling; the focus is on comparing how traffic conditions, including travel times, have evolved from January 2015 through June 2016. The tolling performance review covers the following elements: transactions; gross toll revenue potential; method of payment; average weekday and weekend day transactions; vehicle classification; SR 520 and I-90 bridge closures; and transactions by home zip code. When applicable, the performance data (actuals) for FY 2016 are compared to the prior IG forecast prepared by CDM Smith (November 2015 forecast).

The results presented here are based on transaction resolution as of April 2016, the latest dataset available at the time the report was prepared. Consequently, the results presented may show some variation versus official values reported previously. Also, not all of the transactions had reached final resolution¹¹ by the time of this analysis; therefore, additional adjustments to transactions and revenue are likely over time, as more transactions reach final resolution. In particular, the analysis of tolling experience since January 2016 has been adjusted based on experience with resolved transactions in 2014. **The analysis in this assessment was prepared to help inform the update of the SR 520 forecast and does not represent a change in officially reported values.**

Traffic Impacts as a Result of Tolling

Traffic data provided by WSDOT were used to review traffic variations on SR 520 prior to and after tolling started.

Traffic Volumes

Figure 2-1 shows the observed traffic volumes and the November 2015 forecast traffic. Note that on this figure, the annual average daily traffic includes all traffic (non-revenue vehicles, overnight traffic, and weekend traffic) and is adjusted to exclude weekend bridge closures due to construction on SR 520 and I-90. As illustrated by Figure 2-1, the overall average daily traffic on SR 520 dropped by about 36 percent when tolling began from 93,100 in 2011 to 59,500 in the first six months of 2012. The September 2011 forecast had anticipated a drop of about 44 percent. The average daily traffic increased to 61,800 in FY 2013, 62,500 vehicles in FY 2014, 66,500 vehicles in FY 2015, and 69,500 in FY 2016. The November 2015 forecast had anticipated a traffic volume of 66,700 vehicles for FY 2016.

¹¹ A transaction is considered resolved when it has reached final disposition.

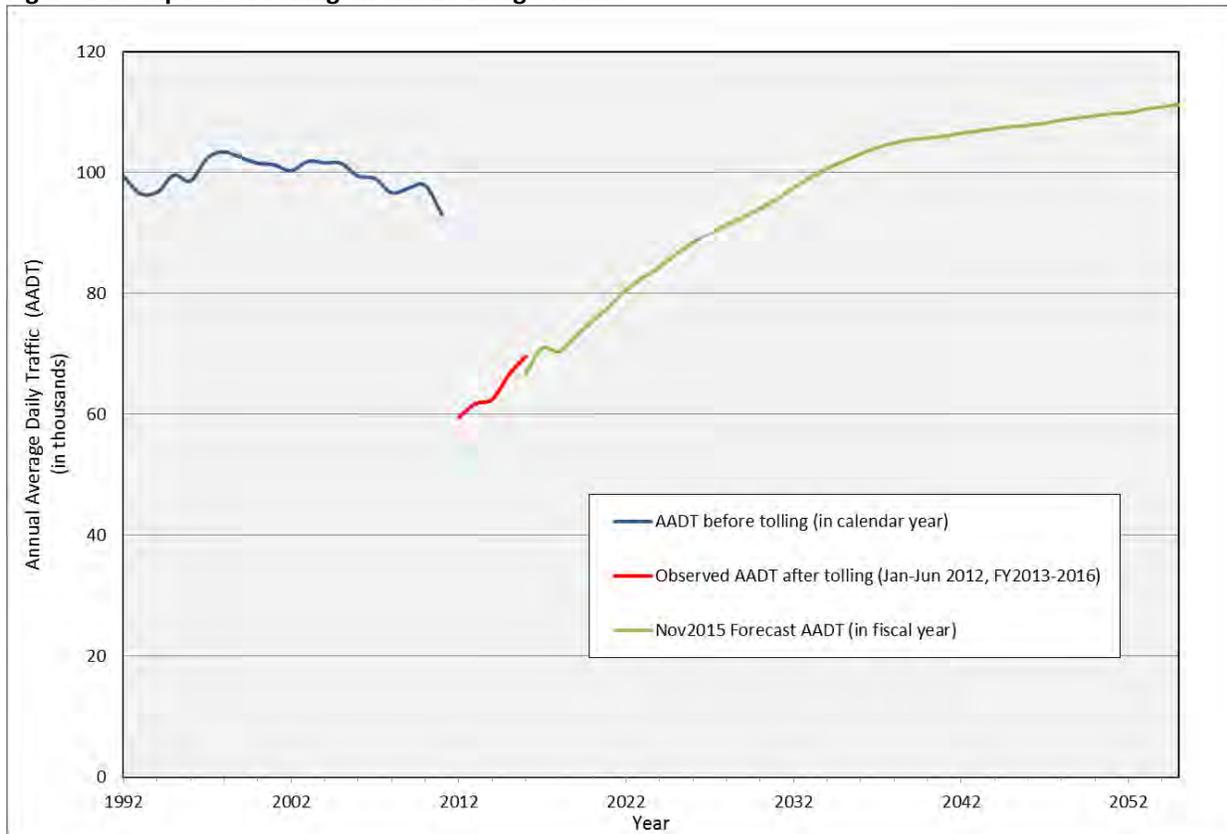
Figure 2-1: Impacts of Tolling on SR 520 Bridge Traffic

Table 2-1 shows the average weekday traffic volumes on SR 520 and I-90 by fiscal year since tolling started. Weekday data shows the average weekday traffic volume on SR 520 increased by 4.8 percent in January-June 2013 compared to the same period in 2012. The average weekday traffic on SR 520 increased by 1.2 percent in FY 2014 (compared to FY 2013), by 5.9 percent in FY 2015, and by 4.0 percent in FY 2016. The average weekday traffic volume on the SR 520 bridge was 76,800 vehicles in FY 2016 compared to 73,900 vehicles in FY 2015.

I-90 is the main alternative route across Lake Washington. I-90 average weekday traffic increased by 2.4 percent in January-June 2013 compared to the same period in 2012. The average weekday traffic increased by 2.3 percent in FY 2014, decreased by 0.6 percent in FY 2015, and decreased by 0.4 percent in FY 2016. The average weekday traffic volume on the I-90 bridge was 157,700 vehicles in FY 2016 compared to 158,300 vehicles in FY 2015.

The average weekday cross lake traffic (combining SR 520 and I-90 traffic volumes) increased by 3.1 percent in January-June 2013 compared to the same period in 2012. The upward trend continued but slowed in FY 2014 (2.0 percent increase), FY 2015 (1.4 percent increase) and FY 2016 (1.8 percent increase).

Table 2-1: Average Weekday Traffic – Comparison of SR 520 and I-90 Cross-lake Travel

| | FY 2012 | FY 2013 | FY 2014 | FY 2015 | FY 2016 |
|-----------------------------------------|------------------------------|---------------------------|----------------|----------------|----------------|
| SR 520^(1,2) | | | | | |
| July | | 67,354 | 69,652 | 75,061 | 80,250 |
| August | | 70,345 | 70,415 | 73,241 | 77,419 |
| September | | 69,182 | 69,702 | 73,827 | 76,422 |
| October | | 68,681 | 69,413 | 73,403 | 76,925 |
| November | | 66,696 | 68,558 | 71,230 | 73,729 |
| December | | 64,426 | 65,495 | 69,639 | 72,400 |
| January | 58,835 ⁽³⁾ | 66,450 | 68,415 | 71,650 | 74,885 |
| February | 65,461 | 70,239 | 67,379 | 71,964 | 74,722 |
| March | 67,672 | 73,735 | 69,651 | 74,722 | 76,347 |
| April | 66,321 | 67,166 | 70,927 | 74,883 | 75,919 |
| May | 69,875 | 71,557 | 73,718 | 77,924 | 79,774 |
| June | 71,118 | 71,384 | 73,725 | 78,610 | 82,376 |
| Annual Average | 66,832⁽⁴⁾ | 68,938 | 69,767 | 73,869 | 76,799 |
| Annual % Change | | 4.8%⁽⁵⁾ | 1.2% | 5.9% | 4.0% |
| I-90^(1,2) | | | | | |
| July | | 154,823 | 164,342 | 155,305 | 161,843 |
| August | | 158,094 | 162,766 | 162,190 | 160,811 |
| September | | 151,469 | 161,093 | 159,482 | 159,477 |
| October | | 153,143 | 159,847 | 158,583 | 158,353 |
| November | | 149,314 | 154,683 | 152,901 | 152,320 |
| December | | 146,471 | 149,855 | 151,043 | 146,114 |
| January | 146,655 ⁽³⁾ | 152,302 | 154,493 | 155,128 | 152,630 |
| February | 154,936 | 155,154 | 154,379 | 156,735 | 155,316 |
| March | 155,698 | 158,797 | 158,947 | 160,402 | 159,400 |
| April | 156,352 | 159,225 | 159,482 | 159,725 | 160,394 |
| May | 156,965 | 162,949 | 164,253 | 163,097 | 159,610 |
| June | 159,038 | 165,609 | 166,060 | 164,966 | 165,597 |
| Annual Average | 155,230⁽⁴⁾ | 155,674 | 159,235 | 158,328 | 157,715 |
| Annual % Change | | 2.4%⁽⁵⁾ | 2.3% | -0.6% | -0.4% |
| Total Cross-lake^(1,2) | | | | | |
| July | | 222,177 | 233,994 | 230,366 | 242,093 |
| August | | 228,439 | 233,181 | 235,431 | 238,231 |
| September | | 220,651 | 230,795 | 233,308 | 235,899 |
| October | | 221,824 | 229,260 | 231,986 | 235,278 |
| November | | 216,010 | 223,241 | 224,132 | 226,049 |
| December | | 210,898 | 215,351 | 220,682 | 218,514 |
| January | 205,490 ⁽³⁾ | 218,752 | 222,908 | 226,779 | 227,516 |
| February | 220,397 | 225,392 | 221,757 | 228,700 | 230,039 |
| March | 223,370 | 232,532 | 228,598 | 235,124 | 235,747 |
| April | 222,673 | 226,391 | 230,410 | 234,608 | 236,313 |
| May | 226,840 | 234,505 | 237,972 | 241,021 | 239,384 |
| June | 230,157 | 236,993 | 239,785 | 243,576 | 247,972 |
| Annual Average | 222,062⁽⁴⁾ | 224,612 | 229,002 | 232,197 | 236,315 |
| Annual % Change | | 3.1%⁽⁵⁾ | 2.0% | 1.4% | 1.8% |

Notes:

1. All major holidays falling on weekdays were removed
2. Data includes all traffic crossing the bridges. For SR 520, it includes non-revenue and overnight vehicles
3. January 2012 snow storm days were removed
4. For FY 2012, annual average value is for Jan-Jun 2012
5. For FY 2013, the annual percent change is calculated for Jan-Jun period

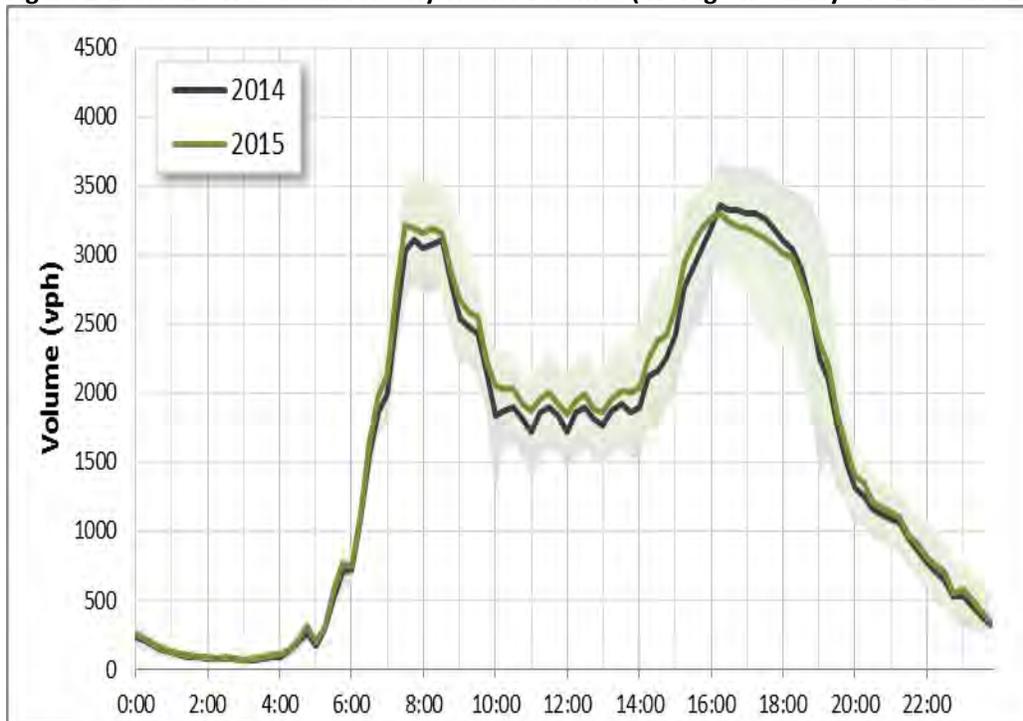
Source: WSDOT data and CDM Smith analysis

Hourly Traffic Variations on Weekdays

Figures 2-2 and 2-3 show hourly variations of average weekday traffic volumes on SR 520 in 2015 and 2014, respectively for the westbound and eastbound direction. The figures show 2015 and 2014 annual averages, as well as typical range (10th to 90th percentiles) in both 2014 and 2015. It can be observed that in the westbound direction, 2015 average hourly volumes were slightly higher than 2014 values during the AM peak period and midday off-peak period. However, during the PM peak period (4:00 pm to 6:00 pm), 2015 average weekday traffic in the westbound direction was lower than in 2014 most likely due to increased congestion conditions. In the eastbound direction, 2015 average hourly volumes were up between 7:00 am and 9:00 pm.

Similarly, Figures 2-4 and 2-5 show hourly variations of average weekday traffic volumes on I-90 in 2015 and 2014 respectively for the westbound and eastbound direction. Again, the figures show 2015 and 2014 annual averages, as well as typical range (10th to 90th percentiles). For both directions of I-90, the 2015 hourly traffic profile was nearly identical to the 2014 profile.

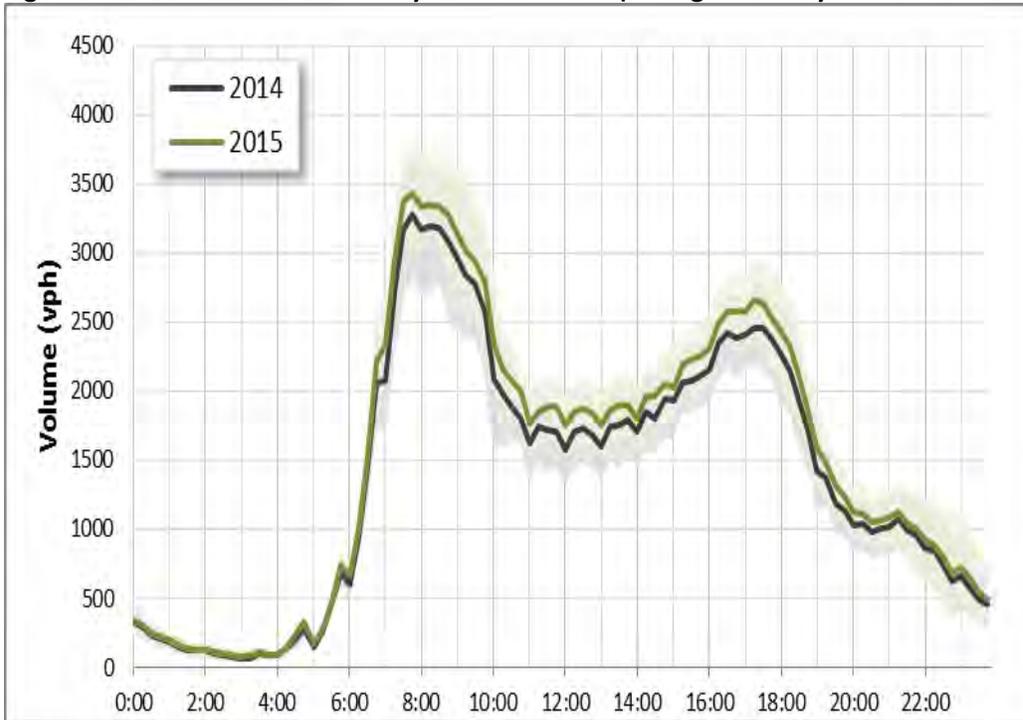
Figure 2-2: SR 520 Westbound Hourly Traffic Volumes (average weekday CYs 2015 and 2014)



Note: Shaded areas indicate the range of average travel times over the calendar year

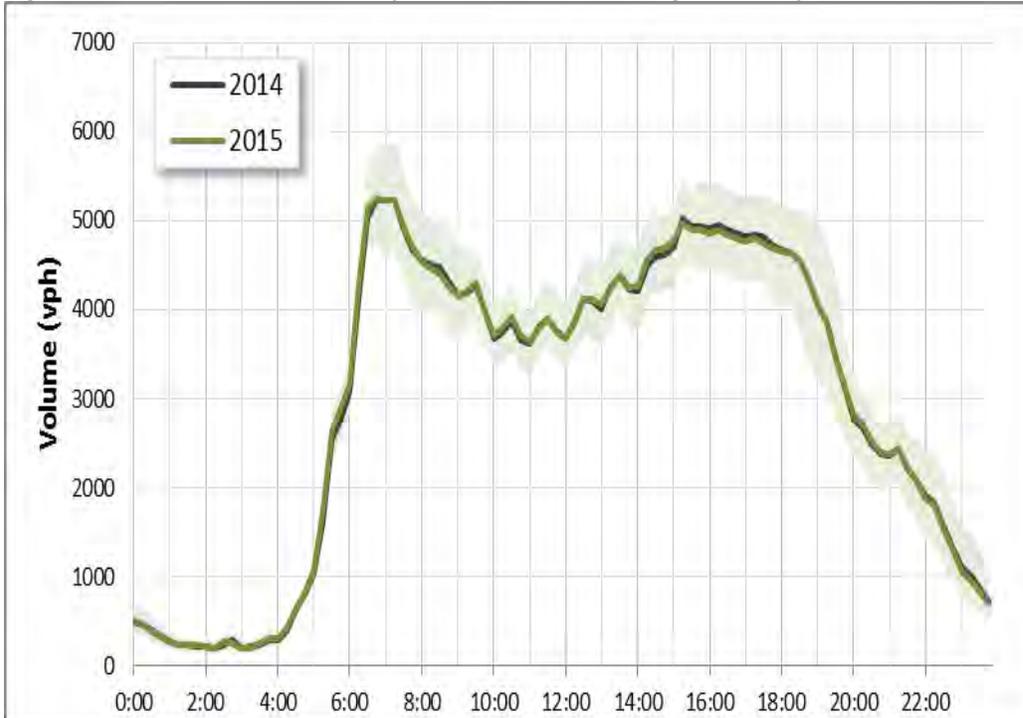
Source: WSDOT

Figure 2-3: SR 520 Eastbound Hourly Traffic Volumes (average weekday CYs 2015 and 2014)

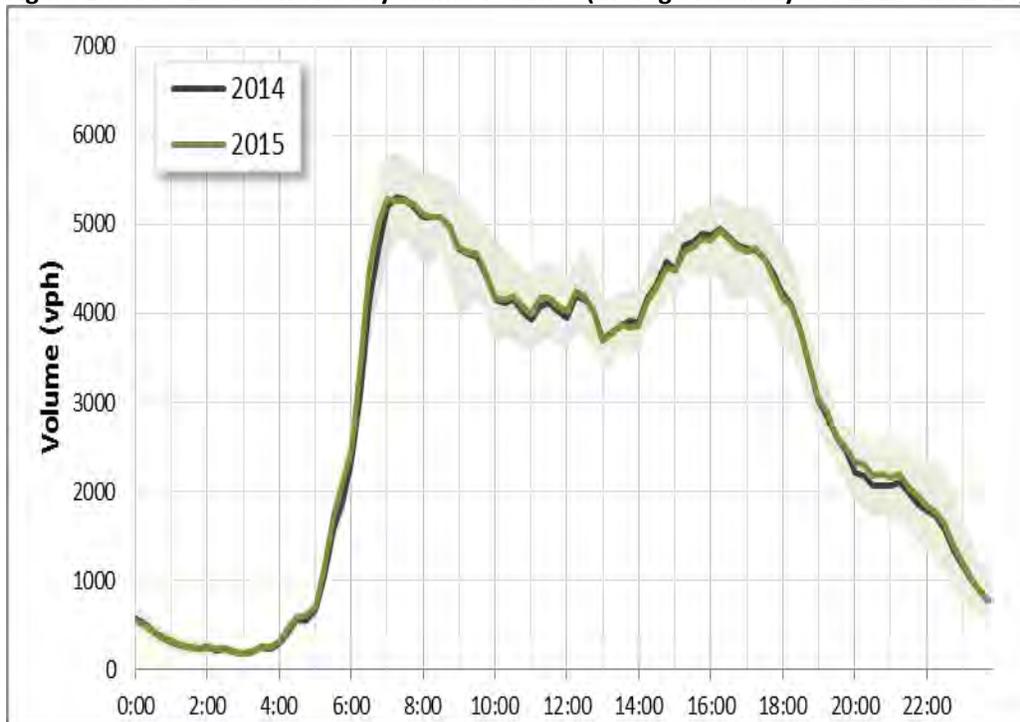


Note: Shaded areas indicate the range of average travel times over the calendar year
 Source: WSDOT

Figure 2-4: I-90 Westbound Hourly Traffic Volumes (average weekday CYs 2015 and 2014)



Note: Shaded areas indicate the range of average travel times over the calendar year
 Source: WSDOT

Figure 2-5: I-90 Eastbound Hourly Traffic Volumes (average weekday CYs 2015 and 2014)

Note: Shaded areas indicate the range of average travel times over the calendar year

Source: WSDOT

Travel Times

One source of travel time information available for review came from WSDOT. Table 2-2 illustrates the average weekday travel time difference (value and percentage) between calendar years 2015 and 2014, and between January-June 2016 vs. January-June 2015 for three routes across Lake Washington, for the AM and PM peak periods.

On SR 520, the average travel times during peak periods in 2015 have generally increased in the westbound direction by about 3 percent, and only slightly increased in the eastbound direction. In January-June 2016, travel times increased significantly during the AM peak period, while PM peak travel times decreased in both directions compared to the same period in 2015.

On I-90, the average travel times during peak periods in 2015 have generally increased in the westbound direction by about 4 percent, and slightly decreased (by about 1-2 percent) in the eastbound direction. In 2016, I-90 has generally experienced an increase in average travel time westbound in the AM peak period, averaging about 13 percent; during the PM peak period, average weekday travel times on I-90 have decreased by about 6 percent in the westbound direction, and increased by about 5 percent in the eastbound direction.

On SR 522, the most important changes in average travel times have been observed in the westbound direction during the PM peak, with increases of 6 percent in 2015 and 7 percent in 2016. There is considerable variation in month-to-month travel time changes, likely due to effects of adverse weather, traffic signal operations, traffic collisions, construction, and traffic patterns.

Table 2-2: Changes in Average Weekday Peak Period Travel Times (in minutes and percent change)

| Calendar Years | | Redmond/Seattle via SR 520 | | Issaquah/Seattle via I-90 | | Woodinville/Seattle via SR 522 | |
|------------------------|----------|----------------------------|--------|---------------------------|-------|--------------------------------|-------|
| | | WB | EB | WB | EB | WB | EB |
| AM Peak 7am-9am | | | | | | | |
| 2015 vs. 2014 | minutes | 0.5 | 0.1 | 1.0 | -0.2 | -0.4 | 0.7 |
| | % change | (+3%) | (+1%) | (+4%) | (-1%) | (-1%) | (+3%) |
| 2016 vs. 2015* | minutes | 2.4 | 1.8 | 3.4 | 0.2 | -0.4 | -0.2 |
| | % change | (+13%) | (+11%) | (+13%) | (+1%) | (-1%) | (-1%) |
| PM Peak 3pm-6pm | | | | | | | |
| 2015 vs. 2014 | minutes | 0.9 | 0.1 | 1.3 | -0.3 | 3.0 | 0.9 |
| | % change | (+3%) | (0%) | (+4%) | (-2%) | (+6%) | (+2%) |
| 2016 vs. 2015* | minutes | -2.0 | -0.7 | -2.0 | 1.0 | 3.9 | -0.3 |
| | % change | (-6%) | (-3%) | (-6%) | (+5%) | (+7%) | (-1%) |

*Based on January through June data
Source: WSDOT data and CDM Smith analysis

Toll Transactions and Gross Toll Revenue Potential

The primary tolling data available for review from WSDOT are reports from transactions processed by the Customer Service Center (CSC). The dataset provided to CDM Smith on June 3, 2016 contains toll transaction information broken down by date, hour, class and type of toll transaction. The breakout of *Good To Go!* (GTG) account-based vs. Pay By Mail (PBM) proportions reflects the transaction payment type as each transaction proceeds from lane equipment through processing within the CSC. The dataset reflects any adjustments that occur such as a license plate read transaction later changed to Pay By Plate. The data is generally thought to be at a level appropriate to derive the actual gross toll revenue potential comparable to CDM Smith's forecasts.

For January 2016 through June 2016, the CSC dataset was not available.¹² Instead, the actual transactions were estimated based on WSDOT's data from the toll lane equipment system as reported in the Monthly Trips Reports (MTR). The MTR provides an aggregated summary of toll transactions. Transactions are subsequently processed and reconciled with toll accounts by the CSC. In order to provide a more reliable comparison with the forecast transactions and revenue, the number of transactions from the lane equipment system was adjusted based on the experience gained from analyzing the CY 2014 CSC dataset and MTRs. Available information on the number of duplicate transactions was used to adjust the MTR results downward. The second adjustment focused on estimating and removing the likely amount of non-revenue transactions. Then, the number of post-CSC process transactions was estimated by applying a factor derived from the comparison of pre- and post-CSC processing results. The resulting "estimated actual" number of monthly transactions is what is considered the best estimate at the date this report was produced; the values will be revised as more information becomes available and as the transactions are resolved.

¹² To get an accurate estimate of transaction resolution, prior analysis has indicated the CSC data pull for a given period cannot start until 90 days after the end of the analysis period to give most of the transactions time to reach final status. Also, the analysis of the CSC data set takes many weeks after this 90 day period. In order to meet the timeframe for delivery of this forecast, it was necessary to estimate the CY 2016 results as described in the text above.

Transactions

Table 2-3 shows the actual number of transactions by month for the period from January 2012 through June 2016. Overall, transactions increased by 3.7 percent in FY 2014, by 5.1 percent in FY 2015, and by 5.4 percent in FY 2016.

Table 2-3: Monthly Actual Transactions

| Actual Transactions | FY 2012 ¹ | FY 2013 ¹ | % Change | FY 2014 ¹ | % Change | FY 2015 ¹ | % Change | FY 2016 ^{2,3} | % Change |
|---------------------|----------------------|----------------------|----------|----------------------|-------------|----------------------|-------------|------------------------|-------------|
| July | | 1,634,862 | | 1,714,340 | 4.9% | 1,845,510 | 7.7% | 2,047,488 | 10.9% |
| August | | 1,748,279 | | 1,843,593 | 5.5% | 1,785,013 | -3.2% | 1,931,941 | 8.2% |
| September | | 1,605,673 | | 1,672,627 | 4.2% | 1,796,980 | 7.4% | 1,901,386 | 5.8% |
| October | | 1,780,703 | | 1,891,073 | 6.2% | 1,853,706 | -2.0% | 2,053,773 | 10.8% |
| November | | 1,595,208 | | 1,698,416 | 6.5% | 1,632,066 | -3.9% | 1,749,637 | 7.2% |
| December | 101,620 | 1,627,330 | | 1,692,471 | 4.0% | 1,804,291 | 6.6% | 1,853,500 | 2.7% |
| January | 1,275,306 | 1,697,451 | 33.1% | 1,782,226 | 5.0% | 1,804,665 | 1.3% | 1,901,672 | 5.4% |
| February | 1,505,263 | 1,537,817 | 2.2% | 1,555,759 | 1.2% | 1,714,604 | 10.2% | 1,849,759 | 7.9% |
| March | 1,667,299 | 1,794,438 | 7.6% | 1,871,405 | 4.3% | 1,949,255 | 4.2% | 2,046,140 | 5.0% |
| April | 1,579,205 | 1,651,778 | 4.6% | 1,848,497 | 11.9% | 1,940,953 | 5.0% | 1,667,332 | -14.1% |
| May | 1,800,544 | 1,843,724 | 2.4% | 1,816,370 | -1.5% | 2,021,484 | 11.3% | 2,075,349 | 2.7% |
| June | 1,679,936 | 1,703,339 | 1.4% | 1,572,796 | -7.7% | 1,871,243 | 19.0% | 2,139,023 | 14.3% |
| Annual Total | 9,609,173 | 20,220,601 | | 20,959,574 | 3.7% | 22,019,770 | 5.1% | 23,217,000 | 5.4% |

1. For data through June 2015, actuals are based on WSDOT reported toll traffic and revenue

2. For July-December 2015, actuals are based on WSDOT toll transaction data provided to CDM Smith on 6/3/16

3. For CY 2016, actuals are based on WSDOT monthly lane equipment data and adjustments by CDM Smith

Table 2-4 presents the difference between total annual forecast transactions and actual results available. Overall, the actual transactions exceeded the forecast by 1.4 percent in FY 2016.

Table 2-4: FY 2016 Transactions vs. Forecast

| Transactions | Forecast ¹ | Actuals ^{2,3} | Variance |
|-------------------|-----------------------|------------------------|-------------|
| Jul 2015-Dec 2015 | 11,276,000 | 11,537,725 | 2.3% |
| Jan 2016-Jun 2016 | 11,610,000 | 11,679,275 | 0.6% |
| FY 2016 | 22,886,000 | 23,217,000 | 1.4% |

1. Based on CDM Smith November 2015 forecast

2. For Jul-Dec 2015, actuals are based on WSDOT toll transaction data provided to CDM Smith on 6/3/16

3. For CY 2016, actuals are based on WSDOT monthly lane equipment data and adjustments by CDM Smith

Gross Toll Revenue Potential

For purposes of this analysis, the gross toll revenue potential is defined as the revenue that would be collected if every vehicle crossing the bridge paid exactly the published toll rate based on time of crossing, vehicle class, payment method, and applicable exemptions. The gross toll revenue potential does not include any fee revenue (including pay by plate fees), short term account discounts, Notice of Civil Penalty fines, nor any amounts attributed to non-revenue vehicles.

Table 2-5 shows the actual gross toll revenue potential by month for the period from January 2012 through June 2016. Overall, the gross toll revenue potential increased by 5.4 percent in FY 2014, by 7.4 percent in FY 2015, and by 7.8 percent in FY 2016.

Table 2-5: Monthly Actual Gross Toll Revenue Potential

| Actual Gross Toll Revenue Potential | FY 2012 ¹ | FY 2013 ¹ | % Change | FY 2014 ¹ | % Change | FY 2015 ¹ | % Change | FY 2016 ^{1,2} | % Change |
|-------------------------------------|----------------------|----------------------|----------|----------------------|-------------|----------------------|-------------|------------------------|-------------|
| July | | \$4,976,772 | | \$5,359,491 | 7.7% | \$5,911,195 | 10.3% | \$6,617,330 | 11.9% |
| August | | 5,398,814 | | 5,693,623 | 5.5% | 5,682,554 | -0.2% | 6,245,899 | 9.9% |
| September | | 4,836,775 | | 5,149,693 | 6.5% | 5,695,356 | 10.6% | 6,140,916 | 7.8% |
| October | | 5,459,692 | | 5,827,248 | 6.7% | 5,937,936 | 1.9% | 6,572,689 | 10.7% |
| November | | 4,853,751 | | 5,138,744 | 5.9% | 5,084,915 | -1.0% | 5,618,227 | 10.5% |
| December | \$325,281 | 4,797,087 | | 5,108,936 | 6.5% | 5,630,420 | 10.2% | 5,939,381 | 5.5% |
| January | 3,753,917 | 5,138,969 | 36.9% | 5,458,848 | 6.2% | 5,624,088 | 3.0% | 6,038,102 | 7.4% |
| February | 4,462,654 | 4,686,538 | 5.0% | 4,821,340 | 2.9% | 5,361,470 | 11.2% | 5,963,796 | 11.2% |
| March | 4,887,942 | 5,364,149 | 9.7% | 5,726,176 | 6.7% | 6,123,337 | 6.9% | 6,631,687 | 8.3% |
| April | 4,596,628 | 5,075,045 | 10.4% | 5,683,192 | 12.0% | 6,103,275 | 7.4% | 5,519,736 | -9.6% |
| May | 5,172,209 | 5,574,437 | 7.8% | 5,598,529 | 0.4% | 6,218,715 | 11.1% | 6,622,872 | 6.5% |
| June | 4,857,006 | 5,139,682 | 5.8% | 5,023,328 | -2.3% | 6,009,948 | 19.6% | 6,891,041 | 14.7% |
| Annual Total | \$28,055,637 | \$61,301,711 | | \$64,589,147 | 5.4% | \$69,383,209 | 7.4% | \$74,801,674 | 7.8% |

1. Actuals through December 2015 are based on WSDOT toll revenue data.

2. Actuals starting in January 2016 are based on preliminary financial reporting system results and adjustments.

Table 2-6 presents the difference between total annual forecast revenue potential and actual results available. The revenue potential reflects the toll rate increase implemented on July 1, 2015. Overall, the actual gross toll revenue potential for FY 2016 exceeded the forecast by 0.4 percent.

Table 2-6: FY 2016 Gross Toll Revenue Potential vs. Forecast

| Gross Toll Revenue Potential | Forecast ¹ | Actuals ² | Variance |
|------------------------------|-----------------------|----------------------|-------------|
| Jul 2015-Dec 2015 | \$36,684,000 | \$37,134,440 | 1.2% |
| Jan 2016-Jun 2016 | \$37,808,000 | \$37,667,234 | -0.4% |
| FY 2016 | \$74,492,000 | \$74,801,674 | 0.4% |

1. Based on CDM Smith November 2015 forecast

2. Actuals through December 2015 are based on WSDOT toll revenue data. Actuals starting in January 2016 are based on preliminary financial reporting system results and adjustments.

Payment Share

Table 2-7 presents the breakdown of CY 2015 transactions and gross toll revenue potential by payment type, based on the CSC-processed transactions. In this table, the Pay By Mail category includes transactions in-process, billed, and paid. The unbillable category includes unreadable transponder/license plate, inability to identify owner, and dismissals for business rules. NOCP (Notice of Civil Penalty) toll refers to all transactions that have gone to the NOCP process, whether the bills have been paid or not.

The proportion of *Good To Go!* (i.e., account-based) transactions was 83.9 percent for calendar year 2015, with 63.3 percent of the transactions using a transponder and 20.6 percent using the Pay By Plate payment option. The share of Pay By Plate transactions increased noticeably since 2013 when they represented only about 15 percent of overall transactions.

Table 2-7: CY 2015 Actual Method of Payment

| Payment Type | Transactions | | Gross Toll Revenue Potential | |
|-----------------------------------|-------------------|---------------|------------------------------|---------------|
| | Total | Proportion | Total | Proportion |
| <i>Good To Go!</i> – Tag | 14,453,941 | 63.3% | \$42,725,404 | 58.9% |
| <i>Good To Go!</i> – Pay By Plate | 4,704,456 | 20.6% | \$13,499,902 | 18.6% |
| Pay By Mail ¹ | 2,546,124 | 11.2% | \$11,222,833 | 15.5% |
| Unbillable ² | 649,280 | 2.8% | \$2,963,157 | 4.1% |
| NOCP Tolls | 476,590 | 2.1% | \$2,108,142 | 2.9% |
| Total CY 2015 | 22,830,391 | 100.0% | \$72,519,437 | 100.0% |

1. Includes transactions in process, billed, and paid

2. Unbillable includes unreadable transponder/license plate, inability to identify owner, and business rule dismissals

Source: WSDOT toll transaction data provided to CDM Smith on 6/3/16

Note that later resolution of transactions is possible and could affect all breakout slightly.

Table 2-8 shows how the share of payment type has evolved over time. The share of *Good To Go!* transactions which had been increasing since tolling started, dropped slightly in FY 2015 from 84.5 percent to 84.0 percent, and remained unchanged at 84.0 percent in FY 2016. Among account-based transactions, Pay By Plate transactions have substantially and continuously increased, rising from 14 percent of all transactions in FY 2013 to 21 percent in FY 2016. Conversely, the share of *Good To Go!* transponder transactions has generally decreased over time. In terms of actual number of transactions, transponder transactions have increased by approximately 320,000 in FY 2016, Pay By Plate transactions have increased by approximately 685,000, and Pay By Mail transactions have increased by about 205,000.

Table 2-8: Trends in Actual Method of Payment

| Share of Transactions ^{1,2} | <i>Good To Go!</i> | | | PBM ³ |
|--------------------------------------|--------------------|--------------|-----------------|------------------|
| | Transponder | PBP | All <i>GTG!</i> | |
| Jan-Jun 2012 ⁴ | 71.6% | 11.2% | 82.7% | 17.3% |
| FY 2012 | 71.6% | 11.2% | 82.7% | 17.3% |
| Jul-Dec 2013 | 69.7% | 13.1% | 82.8% | 17.2% |
| Jan-Jun 2013 | 69.7% | 14.8% | 84.6% | 15.4% |
| FY 2013 | 69.7% | 14.0% | 83.7% | 16.3% |
| Jul-Dec 2013 | 67.9% | 16.0% | 83.9% | 16.1% |
| Jan-Jun 2014 | 67.7% | 17.4% | 85.1% | 14.9% |
| FY 2014 | 67.8% | 16.7% | 84.5% | 15.5% |
| Jul-Dec 2014 | 65.6% | 18.1% | 83.7% | 16.3% |
| Jan-Jun 2015 | 64.2% | 20.2% | 84.4% | 15.6% |
| FY 2015 | 64.9% | 19.1% | 84.0% | 16.0% |
| Jul-Dec 2015 | 62.4% | 21.0% | 83.5% | 16.5% |
| Jan-Jun 2016 | 63.3% | 21.2% | 84.5% | 15.5% |
| FY 2016 | 62.9% | 21.1% | 84.0% | 16.0% |

1. For CYs 2012 through 2015, values are based on WSDOT toll transaction data provided to CDM Smith

2. For CY 2016, values are based on preliminary financial reporting system results and adjustments

3. For consistency with the SR 520 forecast methodology, all leakage is attributed to PBM.

Note that later resolution of transactions is possible and could affect above breakout slightly.

Average Weekday and Weekend Day Transactions

Table 2-9 shows a comparison of observed average weekday and average weekend day transactions to the forecast for FY 2016. Adjustments were made to account for bridge closure weekends on SR 520 and I-90, and major holidays (when WSDOT charged weekend toll rates) to provide comparable data. For FY 2016, weekday transactions were 0.5 percent below forecasts, while weekend transactions were 3.8 percent above forecasts.

Table 2-9: FY 2016 Average Weekday and Average Weekend Transactions vs. Forecast

| Average Daily Transactions | Forecast ¹ | Actuals ^{2,3} | Variance |
|---------------------------------|-----------------------|------------------------|--------------|
| Weekdays | | | |
| Jul 2015-Dec 2015 | 71,870 | 72,001 | 0.2% |
| Jan 2016-Jun 2016 | 74,330 | 73,535 | -1.1% |
| FY 2016 | 73,100 | 72,755 | -0.5% |
| Weekend Days⁴ | | | |
| Jul 2015-Dec 2015 | 41,045 | 42,540 | 3.6% |
| Jan 2016-Jun 2016 | 42,757 | 44,540 | 4.2% |
| FY 2016 | 41,887 | 43,463 | 3.8% |

1. Forecast based on CDM Smith November 2015 forecast

2. For CY 2015, actuals are based on WSDOT toll transaction data provided to CDM Smith on 6/3/16

3. For CY 2016, actuals are based on WSDOT monthly lane equipment data and adjustments by CDM Smith

4. Weekend bridge closure days were removed; includes holidays on weekdays (weekend rates)

Table 2-10 shows how the average weekday and weekend transactions have evolved over time. Average weekday transactions have continuously increased since tolling started, with annual increases of 2.9 percent in FY 2013, 3.4 percent in FY 2014, 4.1 percent in FY 2015, and 3.7 percent in FY 2016. Average weekend transactions have followed a similar increasing pattern than weekday transactions, although the growth rates have been lower in FYs 2014-2015, and higher in FY 2016. Average weekend transactions have increased by 3.3 percent in FY 2013, by 3.0 percent in FY 2014, by 3.6 percent in FY 2015, and by 6.8 percent in FY 2016.

Table 2-10: Trends in Actual Average Weekday and Average Weekend Transactions

| Average Daily Transactions | Weekday | Weekend |
|----------------------------|----------------------------------|----------------------------------|
| Jan-Jun 2012 | 63,303 | 36,920 |
| FY 2012 | 63,303 | 36,920 |
| Jul-Dec 2012 | 64,616 | 37,469 |
| Jan-Jun 2013 | 65,715 | 38,802 |
| FY 2013 | 65,165 <i>(+ 2.9%)</i> | 38,142 <i>(+ 3.3%)</i> |
| Jul-Dec 2013 | 66,294 | 38,485 |
| Jan-Jun 2014 | 68,479 | 40,285 |
| FY 2014 | 67,382 <i>(+ 3.4%)</i> | 39,289 <i>(+ 3.0%)</i> |
| Jul-Dec 2014 | 69,106 | 39,574 |
| Jan-Jun 2015 | 71,165 | 42,021 |
| FY 2015 | 70,131 <i>(+ 4.1%)</i> | 40,708 <i>(+ 3.6%)</i> |
| Jul-Dec 2015 | 72,001 | 42,540 |
| Jan-Jun 2016 ¹ | 73,535 | 44,540 |
| FY 2016¹ | 72,755 <i>(+ 3.7%)</i> | 43,463 <i>(+ 6.8%)</i> |

1. Based on preliminary data

Transactions by Time Period

Observed transactions by time period for average weekdays in CY 2015 were examined and compared to forecasts. The time periods used in this analysis correspond to the time periods of the toll rates (which are different on weekdays and weekends).

Table 2-11 shows the number of actual transactions per weekday toll period, the payment method proportion, and the share of transactions by time period (observed versus assumed in the November 2015 forecast). On weekdays, the share of *Good To Go!* transactions tends to be higher during the morning commute peak period, with a ratio of 90 percent or more between 6:00 am and 9:00 am. The share of weekday transactions by toll period in CY 2015 has followed the IG forecast amounts very closely.

Similarly, Table 2-12 shows the number of actual transactions per weekend toll period, the payment method proportion, and the share of transactions by time period (observed versus assumed in the November 2015 forecast). On weekends, the payment method proportion remains fairly stable throughout the day. A high share of transactions occurs during the midday and afternoon periods. Again, the share of weekend transactions by toll period in CY 2015 has followed the IG forecast amounts very closely.

Table 2-11: CY 2015 Average Weekday Toll Period Transactions and Payment Shares

| Toll Period | Actual Transactions | Good To Go! ¹ (% of Txns) | Pay By Mail ² (% of Txns) | CY 2015 Observed % of Day ³ | 2015 IG Forecast % of Day ⁴ |
|--------------|---------------------|-----------------------------------------|-----------------------------------------|-------------------------------------------|-------------------------------------------|
| 05:00-05:59 | 877 | 88% | 12% | 1% | 1% |
| 06:00-06:59 | 2,687 | 90% | 10% | 4% | 4% |
| 07:00-08:59 | 12,178 | 90% | 10% | 17% | 17% |
| 09:00-09:59 | 5,468 | 88% | 12% | 8% | 8% |
| 10:00-13:59 | 15,480 | 82% | 18% | 21% | 21% |
| 14:00-14:59 | 4,202 | 82% | 18% | 6% | 6% |
| 15:00-17:59 | 16,349 | 85% | 15% | 23% | 23% |
| 18:00-18:59 | 4,982 | 86% | 14% | 7% | 7% |
| 19:00-20:59 | 5,753 | 84% | 16% | 8% | 8% |
| 21:00-22:59 | 3,608 | 82% | 18% | 5% | 5% |
| Total | 71,584 | 85% | 15% | 100% | 100% |

1. Includes Pay By Plate and transponders

2. Includes NOCP Toll and leakage

3. Observed proportion of CY 2015 transactions by time period

4. Proportion of transactions by time period for FY 2015 in the November 2015 forecast

Source: WSDOT toll transaction data provided to CDM Smith on 6/3/16

Note that later resolution of transactions is possible and could affect above breakout slightly.

Table 2-12: CY 2015 Average Weekend Toll Period Transactions and Payment Shares

| Toll Period | Transactions ¹ | Good To Go! ² (% of Txns) | Pay By Mail ³ (% of Txns) | CY 2015 Observed % of Day ⁴ | 2015 IG Forecast % of Day ⁵ |
|--------------|---------------------------|-----------------------------------------|-----------------------------------------|-------------------------------------------|-------------------------------------------|
| 05:00-07:59 | 1,635 | 81% | 19% | 4% | 4% |
| 08:00-10:59 | 6,616 | 81% | 19% | 16% | 16% |
| 11:00-17:59 | 23,275 | 78% | 22% | 55% | 55% |
| 18:00-20:59 | 7,217 | 78% | 22% | 17% | 17% |
| 21:00-22:59 | 3,550 | 78% | 22% | 8% | 8% |
| Total | 42,293 | 78% | 22% | 100% | 100% |

1. Weekend bridge closure days were removed, holidays are included

2. Includes transponder and Pay By Plate

3. Includes NOCP Toll and leakage

4. Observed proportion of CY 2015 transactions by time period

5. Proportion of transactions by time period for FY 2015 in the November 2015 forecast

Source: WSDOT toll transaction data provided to CDM Smith on 6/3/16

Note that later resolution of transactions is possible and could affect above breakout slightly.

Vehicle Classification

Table 2-13 indicates how the FY 2016 observed proportion of trucks compared to the forecast, in terms of share of transactions and share of gross toll revenue potential.

The table shows that the actual truck percentages were very close to the November 2015 forecast, both in terms of share of transactions and share of gross toll revenue potential.

Table 2-13: FY 2016 Truck Percentages – Actuals vs. Forecast

| Trucks | Forecast ¹ | Actuals ^{2,3} |
|-----------------------------------------------------|-----------------------|------------------------|
| Truck Share of Transactions⁴ | | |
| Jul 2015-Dec 2015 | 0.7% | 0.7% |
| Jan 2016-Jun 2016 | 0.7% | 0.7% |
| FY 2016 | 0.7% | 0.7% |
| Truck Share of Potential Revenue⁴ | | |
| Jul 2015-Dec 2015 | 1.4% | 1.4% |
| Jan 2016-Jun 2016 | 1.4% | 1.4% |
| FY 2016 | 1.4% | 1.4% |

1. Forecast based on November 2015 forecast

2. For CY 2015, actuals are based on WSDOT toll transaction data provided to CDM Smith on 6/3/16

3. For CY 2016, actuals are based on WSDOT monthly lane equipment data and adjustments by CDM Smith

4. Trucks defined as three or more axles

Table 2-14 shows how the truck share of transactions and the truck share of gross toll revenue potential have evolved over time. The proportion of trucks among toll transactions started at a very low level (around 1.0 percent) and decreased by the beginning of CY 2013, but has been stable since. The contribution of trucks to overall gross revenue follows the same pattern.

Table 2-14: Trends in Actual Truck Shares

| Trucks | Truck Share of Transactions | Truck Share of Revenue |
|----------------------------|-----------------------------|------------------------|
| Jan-Jun 2012 | 1.0% | 2.2% |
| FY 2012 | 1.0% | 2.2% |
| Jul-Dec 2012 | 1.0% | 1.9% |
| Jan-Jun 2013 | 0.7% | 1.5% |
| FY 2013 | 0.8% | 1.7% |
| Jul-Dec 2013 | 0.7% | 1.3% |
| Jan-Jun 2014 | 0.6% | 1.2% |
| FY 2014 | 0.6% | 1.3% |
| Jul-Dec 2014 | 0.6% | 1.3% |
| Jan-Jun 2015 | 0.6% | 1.3% |
| FY 2015 | 0.6% | 1.3% |
| Jul-Dec 2015 | 0.7% | 1.4% |
| Jan-Jun 2016 ¹ | 0.7% | 1.4% |
| FY 2016¹ | 0.7% | 1.4% |

1. Based on preliminary data

SR 520 and I-90 Bridge Closures

The number of closure days for the SR 520 bridge is calculated based on whether or not both directions are closed and the closure time frame during the tolling period. For instance, a day with the bridge closed in one direction only is counted as half-day, and a day with full closure during half of the tolling period is also counted as half-day. The traffic and revenue forecast (November 2015 forecast) had assumed 10.4 closure days on SR 520 in FY 2016. In reality, 9.8 closure days occurred in FY 2016

(0.6 days less than expected). This helped raise total actual transactions by approximately 25,000 and gross toll revenue potential by approximately \$60,000.

In addition, the I-90 bridge also experienced lane closures related to construction of the I-90 Two-Way Transit and HOV Operations project. When the I-90 bridge is partially closed, traffic on SR 520 is significantly higher than usual. These I-90 closures were not accounted for in the November 2015 forecast. During FY 2016, partial closures of I-90 happened for a total of nineteen (19) weekend days. An analysis by CDM Smith determined that I-90 closures added an estimated 214,000 toll transactions and about \$570,000 to the gross toll revenue potential in FY 2016.

Transactions by Home Zip Code

WSDOT provided a summary of SR 520 toll transactions that occurred in CY 2015, with information about the Zip code of the drivers using the facility. The *Good To Go!* Zip codes are based upon their *Good To Go!* account registration in the system. The PBM customer Zip codes are from their vehicle registration. The transactions are summarized by *Good To Go!* and Pay By Mail categories.

The results are summarized in Table 2-15. As expected, a vast majority of users reside in Seattle, Bellevue, Kirkland, and Redmond. Together, these four cities represent 66 percent of drivers. Only about 5 percent of drivers do not reside in the state of Washington. The travel shed geography is defined as the set of zip codes where the majority of toll transactions originate from, based on toll collection data and vehicle registration. In 2015, the most concentrated sources for originating vehicles crossing the SR 520 bridge were in areas of Seattle (downtown, Green Lake, the University District, South Lake Union, and eastern sections of North Seattle), Bellevue, Kirkland, Redmond, and Sammamish (Figure 2-6).

Table 2-15: Summary of CY 2015 Transactions by Home Area

| CY 2015 | <i>Good To Go!</i> Transactions | Pay By Mail Transactions | Total Transactions | Transaction Percentage |
|--------------------|------------------------------------|-----------------------------|-----------------------|---------------------------|
| Bellevue | 2,657,524 | 205,294 | 2,862,818 | 12.6% |
| East King County | 2,526,748 | 352,214 | 2,878,962 | 12.6% |
| Kirkland | 2,080,516 | 175,760 | 2,256,276 | 9.9% |
| Kitsap County | 59,398 | 18,185 | 77,583 | 0.3% |
| Redmond | 1,493,190 | 117,860 | 1,611,050 | 7.1% |
| Seattle North | 3,426,831 | 343,921 | 3,770,752 | 16.6% |
| Seattle South | 4,018,983 | 440,969 | 4,459,952 | 19.6% |
| South King County | 176,286 | 75,801 | 252,087 | 1.1% |
| Rest of Washington | 2,470,665 | 976,152 | 3,446,817 | 15.1% |
| Oregon | 29,053 | 74,429 | 103,482 | 0.5% |
| California | 45,556 | 63,488 | 109,044 | 0.5% |
| Rest of the US | 535,240 | 416,285 | 951,525 | 4.2% |
| Canada | 660 | 177 | 837 | 0.0% |
| Outside US and CAN | 1,367 | 267 | 1,634 | 0.0% |
| Total | 19,522,017 | 3,260,802 | 22,782,819 | 100.0% |

Note: Entries that had no county, state, or city information were removed.

Source: WSDOT and CDM Smith analysis

Chapter 3

Economic Growth Analysis

Economic growth is an important factor in evaluating the expected revenue from a toll facility. CDM Smith retained Community Attributes Inc. (CAI) to provide an updated independent economic forecast. CAI had provided the economic forecasts used in the original (2011) traffic and revenue investment grade forecast as well as the subsequent updates.

Future levels of population and employment in the bridge market area are important because they are an indication of cross-lake travel demand as well as a determinant of highway congestion levels influencing the attractiveness of alternatives to the SR 520 bridge. The CDM Smith team developed independent forecasts of population and employment based on estimates of current socioeconomic variables and forecasts of future socioeconomic activity. The forecasts were developed for the Seattle metropolitan planning region which includes King, Snohomish, Pierce, and Kitsap counties. These forecasts were updated in May 2016 to reflect current economic conditions, updated regional forecasts, projected development in Seattle and Eastside King County communities, and current market conditions, such as office occupancy rates and housing unit absorption trends.

The updated socioeconomic forecasts are compared to previous forecasts used in the November 2015 traffic and revenue forecast.

Methodology

CAI provided updated socioeconomic forecasts for use in the revised toll revenue forecast. The update benefited from newly released population and employment data from Washington State Office of Financial Management (OFM), the Puget Sound Regional Council (PSRC), and the U.S. Bureau of Labor Statistics.

The analysis followed methods similar to those used for the November 2015 forecast. The approach included reviewing current estimates and forecasts of socioeconomic measures for the overall region and employment sectors, and sub-regional differences in estimated population and employment growth. From this, a Baseline Scenario for regional growth was developed covering the Central Puget Sound Region. Then, utilizing this baseline information along with other adjustments, such as estimates of new building growth absorption, detailed estimates and forecasts at a finer geographic scale were developed. This finer geographic scale was compatible with the main regional travel demand model from PSRC and the tolling analysis model developed for this study.

The methodology leveraged existing regional and national resources, along with primary data gathered expressly for this analysis, such as real estate development pipeline and market data.

Initial population and household counts were determined from 2015 data from the Washington State Office of Financial Management (OFM). Yearly growth rates at the (Traffic Analysis Zone) TAZ level were calculated from the 2013 PSRC model results, and were used to adjust the local area forecasts for each time step. These values were adjusted using control totals at the county level, calculated using growth rates from Conway Pedersen market projections. The Conway Pedersen forecast from 2016 through 2026, released in February 2016, was the driver of population projections for the period between 2016 and 2020.

Base year employment estimates were drawn from 2014 TAZ-level employment totals by macro sector provided by the PSRC, and then scaled to 2015 using county-based sectoral growth rates. Projections of employment by macro-sector were based on TAZ level estimates derived from the 2013 PSRC model results, controlled by county-level control totals estimated from Conway Pedersen projections. The Conway Pedersen forecast from March 2016 provided sector-level detail for the four-county region, as well as total employment by county through 2024.

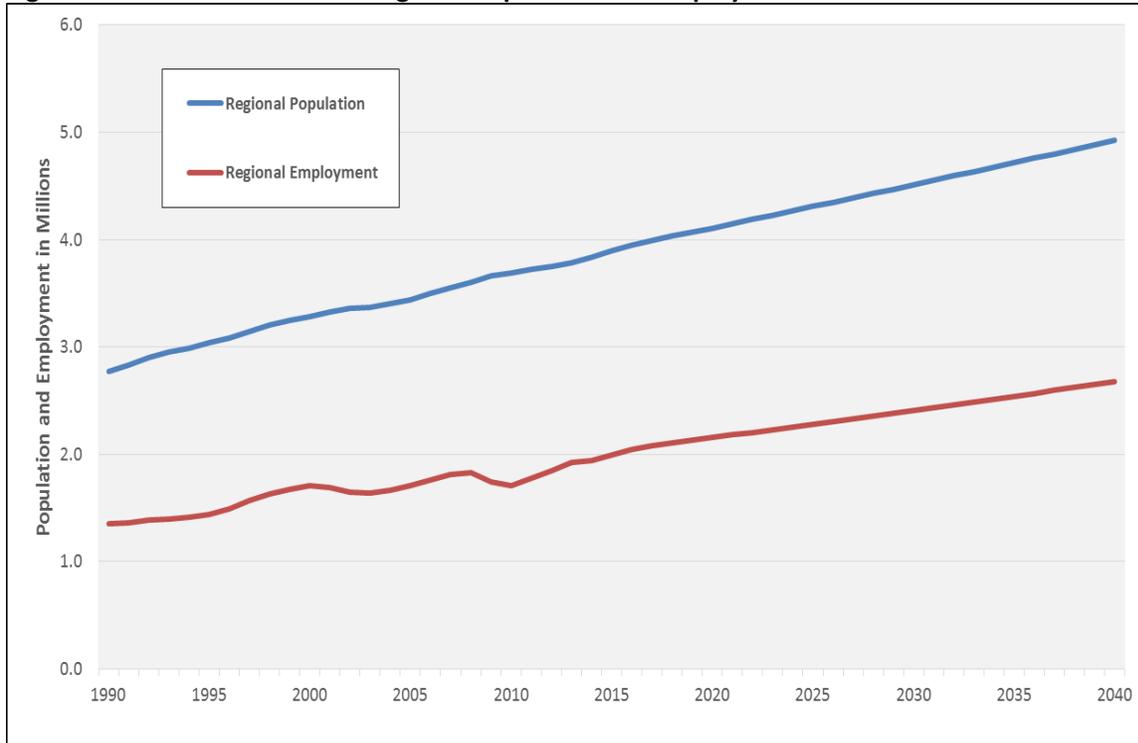
These base estimates were adjusted by a projected development pipeline. This consists of identified commercial, industrial, and multi-family residential projects that are currently under construction or planned for development in the study area. Project details were drawn from CoStar, municipal permitting data, county assessment data, and published pipeline data from local sources.

Regional Population and Employment Baseline Forecasts

Baseline population in the Central Puget Sound Region is expected to grow steadily from 3.7 million people in 2010 to 4.9 million by 2040, a compounded annual growth rate of 1.0 percent. Annual regional population growth is anticipated to be 1.5 percent from 2014 through 2016, then to decrease to 1.0 percent through 2020. Beyond 2020, the annual population growth rate is anticipated to be 0.9 percent through 2040. Figure 3-1 shows the population actuals and forecast, and Figure 3-2 shows the corresponding average annual changes.

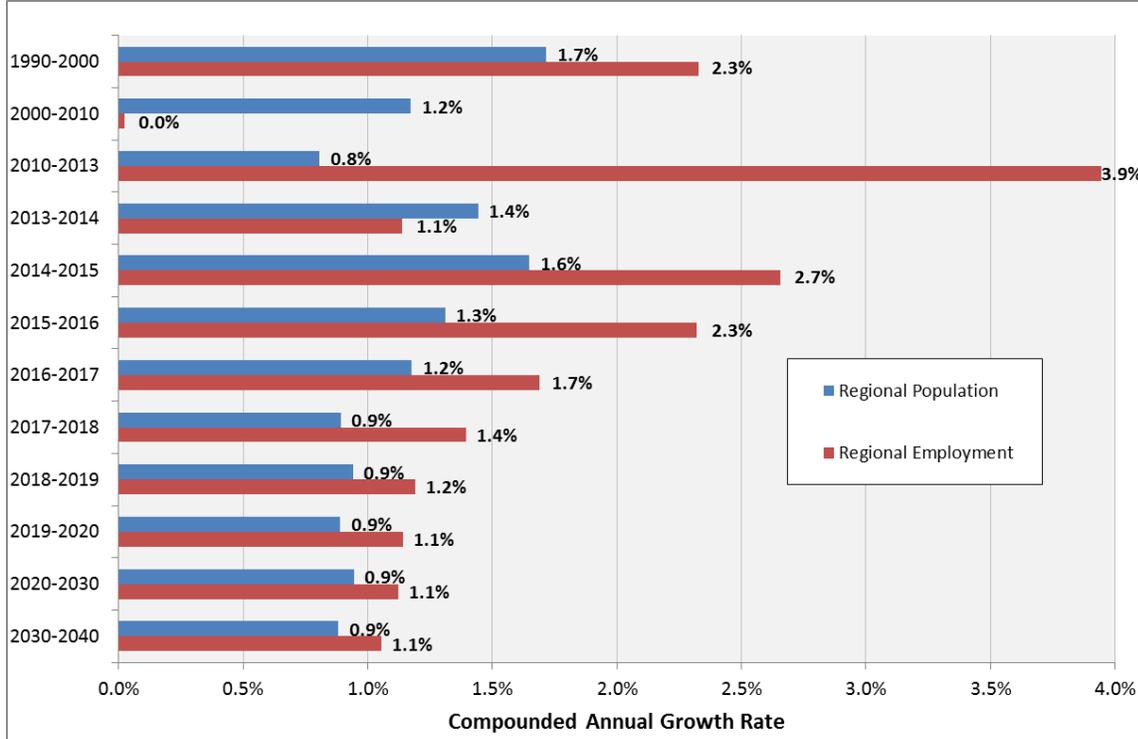
Regional employment is expected to grow from 1.7 million jobs in 2010 to 2.7 million in 2040, a compounded annual growth rate of 1.5 percent. Annual regional employment growth is anticipated to be 2.5 percent from 2014 through 2016, then decline to 1.4 percent from 2016 to 2020. Beyond 2020, the annual employment growth rate is anticipated to be 1.1 percent through 2040. Figure 3-1 shows the employment actuals and forecast, and Figure 3-2 shows the corresponding average annual changes (CAGR - compounded annual growth rate).

Figure 3-1: 1990-2040 Baseline Regional Population and Employment



Source: Conway Pedersen Economics, Community Attributes Inc., 2016

Figure 3-2: 1990-2040 CAGR of Baseline Regional Population and Employment



Source: Conway Pedersen Economics, Community Attributes Inc., 2016

Traffic Analysis Zone (TAZ) Level Analysis

The unit of analysis and projection in this study are Traffic Analysis Zones (TAZ). TAZ sizes range from a fraction of a square mile to several square miles based on the development density. Forecasts by TAZ are developed by allocation of the countywide forecasts. The allocations utilize core information from PSRC and data analyzed regarding real estate conditions (occupancy rates), development pipeline projections provided by private vendors and municipalities along the corridor, and economic events reported in local media such as Amazon.com-related construction in South Lake Union and development plans for the Bel-Red Road area in Bellevue.

An important difference compared with earlier studies is PSRC's adoption in 2013 of a new method for allocating its macroeconomic forecast by TAZ. The PSRC 2016 forecast (as well as the 2015 PSRC forecast) utilizes a capacity-constraint model for estimating TAZ-level distributions. The UrbanSim model uses parcel data to determine where projected growth may occur, bringing a higher degree of precision over previous PSRC TAZ-level estimates.

The near term projections were mainly driven by the Conway Pederson forecast through 2024. Average annual growth rates were calculated from this forecast and applied on a county-wide basis to baseline data. To arrive at TAZ level estimates, PSRC TAZ level distributions were applied to the Conway Pedersen county control totals. Growth forecasts by economic sector were integrated with real-estate development pipeline and absorption calculations and pertinent local economic news. Beyond 2020, trend line analysis was employed based on historic and Conway Pedersen forecast estimates to derive 2030 and 2040 estimates.

Near-Term Forecasts in Areas of Interest

Growth within the Central Puget Sound Region is not expected to be uniform, and the baseline forecast shows variations among the cities and neighborhoods that make up the area. Table 3-1 shows the near-term population and employment forecast by subareas, focusing on King County and the cities of Seattle, Bellevue, Kirkland, and Redmond.

King County population is expected to grow at a slightly slower pace than the region during the 2014 to 2020 period, and to account for 48 percent of the regional population growth. The annual population growth in Seattle is forecasted to be 2.0 percent. On the Eastside, annual growth rates are expected to be 1.1 percent in Kirkland, 1.5 percent in Bellevue, and 1.6 percent in Redmond. Overall, the cities of Seattle, Bellevue, Kirkland, and Redmond are expected to account for 79 percent of the increase in King County population over the 2014-2020 period.

King County is expected to slightly outpace regional employment growth over the 2014 to 2020 period, and to account for 66 percent of the regional employment growth. The annual employment growth in Seattle is forecasted to be 3.2 percent; on the Eastside, annual growth rates are expected to be 1.8 percent in Kirkland, 2.3 percent in Redmond, and 2.9 percent in Bellevue. Overall, the cities of Seattle, Bellevue, Kirkland, and Redmond are expected to generate more jobs than the County as a whole over the period 2014 to 2020, meaning that the rest of the county is expected to experience a net decline in employment.

Table 3-1: Near-term Population and Employment Forecasts in Areas of Interest

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2020 | 2014-2020 CAGR ¹ |
|--------------------------|------------------|------------------|------------------|------------------|------------------|------------------|--------------------------------|
| Population | | | | | | | |
| Four Major Cities | 890,700 | 915,400 | 937,100 | 959,500 | 971,500 | 991,800 | 1.8% |
| <i>Seattle</i> | <i>640,300</i> | <i>662,100</i> | <i>679,100</i> | <i>698,100</i> | <i>706,500</i> | <i>719,200</i> | <i>2.0%</i> |
| <i>Bellevue</i> | <i>130,400</i> | <i>131,000</i> | <i>133,600</i> | <i>135,400</i> | <i>137,400</i> | <i>142,300</i> | <i>1.5%</i> |
| <i>Kirkland</i> | <i>52,600</i> | <i>53,100</i> | <i>53,600</i> | <i>54,200</i> | <i>54,800</i> | <i>56,200</i> | <i>1.1%</i> |
| <i>Redmond</i> | <i>67,400</i> | <i>69,200</i> | <i>70,800</i> | <i>71,800</i> | <i>72,800</i> | <i>74,100</i> | <i>1.6%</i> |
| King County | 2,017,200 | 2,052,700 | 2,073,700 | 2,094,900 | 2,110,800 | 2,145,800 | 1.0% |
| Region | 3,835,500 | 3,898,700 | 3,949,800 | 3,996,300 | 4,031,900 | 4,106,000 | 1.1% |
| Employment | | | | | | | |
| Four Major Cities | 782,600 | 815,700 | 846,600 | 874,500 | 897,600 | 933,900 | 3.0% |
| <i>Seattle</i> | <i>532,700</i> | <i>555,200</i> | <i>577,300</i> | <i>597,900</i> | <i>614,900</i> | <i>643,800</i> | <i>3.2%</i> |
| <i>Bellevue</i> | <i>122,900</i> | <i>127,000</i> | <i>131,200</i> | <i>135,500</i> | <i>140,000</i> | <i>145,800</i> | <i>2.9%</i> |
| <i>Kirkland</i> | <i>36,200</i> | <i>37,100</i> | <i>37,700</i> | <i>39,000</i> | <i>40,000</i> | <i>40,300</i> | <i>1.8%</i> |
| <i>Redmond</i> | <i>90,800</i> | <i>96,400</i> | <i>100,400</i> | <i>102,100</i> | <i>102,700</i> | <i>104,000</i> | <i>2.3%</i> |
| King County | 1,252,700 | 1,291,600 | 1,323,700 | 1,345,600 | 1,361,400 | 1,379,300 | 1.6% |
| Region | 1,941,000 | 1,992,500 | 2,037,400 | 2,071,200 | 2,097,600 | 2,134,400 | 1.6% |

1. Compounded annual growth rate

Source: Community Attributes Inc., 2016

Comparison with November 2015 Socioeconomic Forecasts

Comparison of the region and King County compound annual growth rates with the 2015 forecast are presented in Tables 3-2 and 3-4, respectively for population and employment. Comparison of the subarea forecasts with the 2015 forecasts are presented in Tables 3-3 and 3-5, respectively for population and employment. In both population and employment forecasts, differences with the prior forecast can be explained primarily by three important changes:

1. The new forecasts include an adjustment in the 2015 base year estimate compared with previous forecasts. For employment, 2014 actuals are also adjusted compared to what was used in the previous forecast.
2. Updates to the PSRC's UrbanSim model for TAZ-based allocations, which are reflected in the latest PSRC forecasts by TAZ
3. New developments, either underway or planned have shifted more growth to Seattle over the forecast period, especially in the Central Business District. These new projects in Seattle's CBD, which includes South Lake Union, largely reflect real estate demand and growth from Amazon and other tenants in this area.

Tables 3-2 and 3-3 show the November 2015 and revised population forecast for the SR 520 corridor. Overall, when compared to the prior economic forecast, the short-term (2014-2016) population forecasts are adjusted upwards for King County and for the region as a whole reflecting current strong growth. Beyond 2016, the population growth rates remain virtually unchanged for the region and for King County.

Within King County, the total population forecast among the four major cities along the SR 520 corridor (Seattle, Kirkland, Bellevue, and Redmond) has been adjusted slightly upwards, primarily driven by more growth expected in Redmond and in Seattle. Projections for Bellevue and Kirkland have been reduced from the 2015 forecast.

Table 3-2: Comparison of Compound Annual Growth Rates for Population

| Population CAGR | 2014-2016 | 2016-2020 | 2020-2030 | 2030-2040 |
|-----------------------|-----------|-----------|-----------|-----------|
| Region | | | | |
| 2016 Updated Forecast | 1.5% | 1.0% | 0.9% | 0.9% |
| 2015 Forecast | 1.2% | 1.0% | 1.0% | 0.9% |
| King County | | | | |
| 2016 Updated Forecast | 1.4% | 0.9% | 0.9% | 0.8% |
| 2015 Forecast | 1.0% | 0.9% | 0.9% | 0.8% |

Source: Community Attributes Inc., 2016

Table 3-3: Population Forecast – Comparison with November 2015 Forecast

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2020 | 2030 | 2040 |
|------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 2016 Updated Forecast | | | | | | | | |
| Four Major Cities | 890,700 | 915,400 | 937,100 | 959,500 | 971,500 | 991,800 | 1,073,300 | 1,143,700 |
| <i>Seattle</i> | 640,300 | 662,100 | 679,100 | 698,100 | 706,500 | 719,200 | 764,000 | 807,100 |
| <i>Bellevue</i> | 130,400 | 131,000 | 133,600 | 135,400 | 137,400 | 142,300 | 166,800 | 175,800 |
| <i>Kirkland</i> | 52,600 | 53,100 | 53,600 | 54,200 | 54,800 | 56,200 | 59,000 | 63,500 |
| <i>Redmond</i> | 67,400 | 69,200 | 70,800 | 71,800 | 72,800 | 74,100 | 83,500 | 97,300 |
| King County | 2,017,200 | 2,052,700 | 2,073,700 | 2,094,900 | 2,110,800 | 2,145,800 | 2,349,100 | 2,554,500 |
| Region | 3,835,500 | 3,898,700 | 3,949,800 | 3,996,300 | 4,031,900 | 4,106,000 | 4,511,000 | 4,924,700 |
| 2015 Forecast | | | | | | | | |
| Four Major Cities | 890,700 | 906,300 | 927,200 | 946,400 | 958,600 | 977,800 | 1,059,400 | 1,125,700 |
| <i>Seattle</i> | 640,300 | 651,400 | 667,700 | 683,900 | 692,600 | 704,200 | 747,800 | 789,700 |
| <i>Bellevue</i> | 130,400 | 133,000 | 136,000 | 137,600 | 139,900 | 144,900 | 171,100 | 180,100 |
| <i>Kirkland</i> | 52,600 | 53,500 | 53,900 | 54,500 | 55,100 | 56,600 | 59,500 | 64,100 |
| <i>Redmond</i> | 67,400 | 68,400 | 69,600 | 70,400 | 71,000 | 72,100 | 81,000 | 91,800 |
| King County | 2,017,200 | 2,035,900 | 2,056,200 | 2,073,900 | 2,091,300 | 2,127,400 | 2,331,900 | 2,533,600 |
| Region | 3,835,500 | 3,880,300 | 3,931,300 | 3,971,500 | 4,010,800 | 4,093,300 | 4,531,700 | 4,969,700 |
| Absolute Difference | | | | | | | | |
| Four Major Cities | - | 9,100 | 9,900 | 13,100 | 12,900 | 14,000 | 13,900 | 18,000 |
| <i>Seattle</i> | - | 10,700 | 11,400 | 14,200 | 13,900 | 15,000 | 16,200 | 17,400 |
| <i>Bellevue</i> | - | (2,000) | (2,400) | (2,200) | (2,500) | (2,600) | (4,300) | (4,300) |
| <i>Kirkland</i> | - | (400) | (300) | (300) | (300) | (400) | (500) | (600) |
| <i>Redmond</i> | - | 800 | 1,200 | 1,400 | 1,800 | 2,000 | 2,500 | 5,500 |
| King County | - | 16,800 | 17,500 | 21,000 | 19,500 | 18,400 | 17,200 | 20,900 |
| Region | - | 18,400 | 18,500 | 24,800 | 21,100 | 12,700 | (20,700) | (45,000) |
| Percentage Difference | | | | | | | | |
| Four Major Cities | 0.0% | 1.0% | 1.1% | 1.4% | 1.3% | 1.4% | 1.3% | 1.6% |
| <i>Seattle</i> | 0.0% | 1.6% | 1.7% | 2.1% | 2.0% | 2.1% | 2.2% | 2.2% |
| <i>Bellevue</i> | 0.0% | -1.5% | -1.8% | -1.6% | -1.8% | -1.8% | -2.5% | -2.4% |
| <i>Kirkland</i> | 0.0% | -0.7% | -0.6% | -0.6% | -0.5% | -0.7% | -0.8% | -0.9% |
| <i>Redmond</i> | 0.0% | 1.2% | 1.7% | 2.0% | 2.5% | 2.8% | 3.1% | 6.0% |
| King County | 0.0% | 0.8% | 0.9% | 1.0% | 0.9% | 0.9% | 0.7% | 0.8% |
| Region | 0.0% | 0.5% | 0.5% | 0.6% | 0.5% | 0.3% | -0.5% | -0.9% |

Source: Community Attributes Inc., 2016

Tables 3-4 and 3-5 show the November 2015 and revised employment forecast for the SR 520 corridor. For employment, the regional and King County annual growth rates were adjusted upwards by +0.6 percent in the immediate short term reflecting current strong growth. Starting in 2016, regional and King County employment growth rates are very similar to the November 2015 forecast.

On a subarea basis, the total employment forecast among the four major cities along the SR 520 corridor (Seattle, Kirkland, Bellevue, and Redmond) has been adjusted upwards, primarily driven by more jobs expected in Seattle and in Bellevue. Projections for Redmond and Kirkland employment have also increased from the 2015 forecast, although more moderately.

Table 3-4: Comparison of Compound Annual Growth Rates for Employment

| Employment CAGR | 2014-2016 | 2016-2020 | 2020-2030 | 2030-2040 |
|-----------------------|-----------|-----------|-----------|-----------|
| Region | | | | |
| 2016 Updated Forecast | 2.5% | 1.2% | 1.1% | 1.1% |
| 2015 Forecast | 1.9% | 1.2% | 1.0% | 0.9% |
| King County | | | | |
| 2016 Updated Forecast | 2.8% | 1.0% | 1.0% | 1.1% |
| 2015 Forecast | 2.2% | 1.2% | 0.9% | 0.9% |

Source: Community Attributes Inc., 2016

Table 3-5: Employment Forecast – Comparison with November 2015 Forecast

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2020 | 2030 | 2040 |
|------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| 2016 Updated Forecast | | | | | | | | |
| Four Major Cities | 782,600 | 815,700 | 846,600 | 874,500 | 897,600 | 933,900 | 1,029,500 | 1,131,400 |
| Seattle | 532,700 | 555,200 | 577,300 | 597,900 | 614,900 | 643,800 | 705,000 | 745,400 |
| Bellevue | 122,900 | 127,000 | 131,200 | 135,500 | 140,000 | 145,800 | 170,700 | 195,600 |
| Kirkland | 36,200 | 37,100 | 37,700 | 39,000 | 40,000 | 40,300 | 44,300 | 54,700 |
| Redmond | 90,800 | 96,400 | 100,400 | 102,100 | 102,700 | 104,000 | 109,500 | 135,700 |
| King County | 1,252,700 | 1,291,600 | 1,323,700 | 1,345,600 | 1,361,400 | 1,379,300 | 1,526,100 | 1,694,200 |
| Region | 1,941,000 | 1,992,500 | 2,037,400 | 2,071,200 | 2,097,600 | 2,134,400 | 2,377,700 | 2,642,100 |
| 2015 Forecast | | | | | | | | |
| Four Major Cities | 782,000 | 809,400 | 832,300 | 855,900 | 877,800 | 919,200 | 1,007,100 | 1,095,000 |
| Seattle | 535,300 | 554,400 | 570,000 | 586,700 | 602,500 | 637,300 | 693,300 | 723,700 |
| Bellevue | 121,200 | 124,800 | 128,400 | 132,400 | 136,800 | 140,700 | 163,600 | 185,400 |
| Kirkland | 35,700 | 36,500 | 36,800 | 38,100 | 39,100 | 40,100 | 43,700 | 54,500 |
| Redmond | 89,800 | 93,700 | 97,100 | 98,700 | 99,400 | 101,100 | 106,500 | 131,400 |
| King County | 1,250,800 | 1,283,700 | 1,305,500 | 1,323,800 | 1,340,100 | 1,371,000 | 1,503,100 | 1,652,100 |
| Region | 1,942,800 | 1,984,700 | 2,016,800 | 2,044,100 | 2,068,600 | 2,115,000 | 2,327,400 | 2,555,400 |
| Absolute Difference | | | | | | | | |
| Four Major Cities | 600 | 6,300 | 14,300 | 18,600 | 19,800 | 14,700 | 22,400 | 36,400 |
| Seattle | (2,600) | 800 | 7,300 | 11,200 | 12,400 | 6,500 | 11,700 | 21,700 |
| Bellevue | 1,700 | 2,200 | 2,800 | 3,100 | 3,200 | 5,100 | 7,100 | 10,200 |
| Kirkland | 500 | 600 | 900 | 900 | 900 | 200 | 600 | 200 |
| Redmond | 1,000 | 2,700 | 3,300 | 3,400 | 3,300 | 2,900 | 3,000 | 4,300 |
| King County | 1,900 | 7,900 | 18,200 | 21,800 | 21,300 | 8,300 | 23,000 | 42,100 |
| Region | (1,800) | 7,800 | 20,600 | 27,100 | 29,000 | 19,400 | 50,300 | 86,700 |
| Percentage Difference | | | | | | | | |
| Four Major Cities | 0.1% | 0.8% | 1.7% | 2.2% | 2.3% | 1.6% | 2.2% | 3.3% |
| Seattle | -0.5% | 0.1% | 1.3% | 1.9% | 2.1% | 1.0% | 1.7% | 3.0% |
| Bellevue | 1.4% | 1.8% | 2.2% | 2.3% | 2.3% | 3.6% | 4.3% | 5.5% |
| Kirkland | 1.4% | 1.6% | 2.4% | 2.4% | 2.3% | 0.5% | 1.4% | 0.4% |
| Redmond | 1.1% | 2.9% | 3.4% | 3.4% | 3.3% | 2.9% | 2.8% | 3.3% |
| King County | 0.2% | 0.6% | 1.4% | 1.6% | 1.6% | 0.6% | 1.5% | 2.5% |
| Region | -0.1% | 0.4% | 1.0% | 1.3% | 1.4% | 0.9% | 2.2% | 3.4% |

Source: Community Attributes Inc., 2016

The results of the CAI 2016 baseline scenario for the entire region are summarized in Tables 3-6 and 3-7, and shown graphically in Figures 3-3 and 3-4. These tables and figures also include the CAI 2015 baseline forecast, as well as the latest PSRC-based forecast as an additional comparison. The PSRC forecast used for comparisons is from 2014, but adjusted to a derived forecast, i.e., using the updated actuals and CAGRs for subsequent forecast years.

Table 3-6: Comparison of Regional Population Forecasts

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2020 | 2030 | 2040 |
|-----------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Regional Population (millions) | | | | | | | | |
| PSRC 2014 | 3.84 | 3.90 | 3.95 | 4.00 | 4.04 | 4.12 | 4.46 | 4.84 |
| Baseline Scenario (CAI 2015) | 3.84 | 3.88 | 3.93 | 3.97 | 4.01 | 4.09 | 4.53 | 4.97 |
| Baseline Scenario (CAI 2016) | 3.84 | 3.90 | 3.95 | 4.00 | 4.03 | 4.11 | 4.51 | 4.92 |
| Percentage Difference from CAI 2016 Baseline | | | | | | | | |
| PSRC 2014 | 0.0% | 0.0% | 0.1% | 0.0% | 0.2% | 0.3% | -1.1% | -1.6% |
| Baseline Scenario (CAI 2015) | 0.0% | -0.5% | -0.5% | -0.6% | -0.5% | -0.3% | 0.5% | 0.9% |

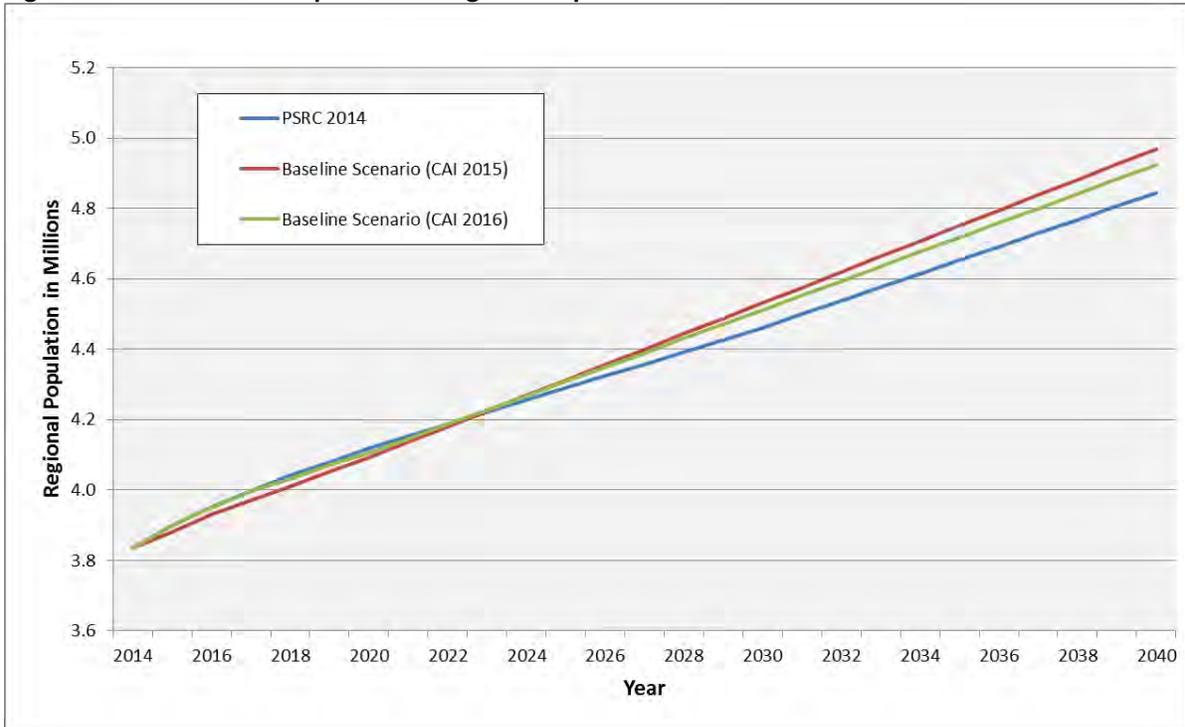
Source: Community Attributes Inc., 2016

Table 3-7: Comparison of Regional Employment Forecasts

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2020 | 2030 | 2040 |
|-----------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Regional Employment (millions) | | | | | | | | |
| PSRC 2014 | 1.94 | 1.99 | 2.02 | 2.04 | 2.06 | 2.10 | 2.30 | 2.75 |
| Baseline Scenario (CAI 2015) | 1.94 | 1.98 | 2.02 | 2.04 | 2.07 | 2.12 | 2.33 | 2.56 |
| Baseline Scenario (CAI 2016) | 1.94 | 1.99 | 2.04 | 2.07 | 2.10 | 2.13 | 2.38 | 2.64 |
| Percentage Difference from CAI 2016 Baseline | | | | | | | | |
| PSRC 2014 | 0.0% | 0.0% | -0.9% | -1.4% | -1.6% | -1.7% | -3.3% | 4.2% |
| Baseline Scenario (CAI 2015) | 0.1% | -0.4% | -1.0% | -1.3% | -1.4% | -0.9% | -2.1% | -3.3% |

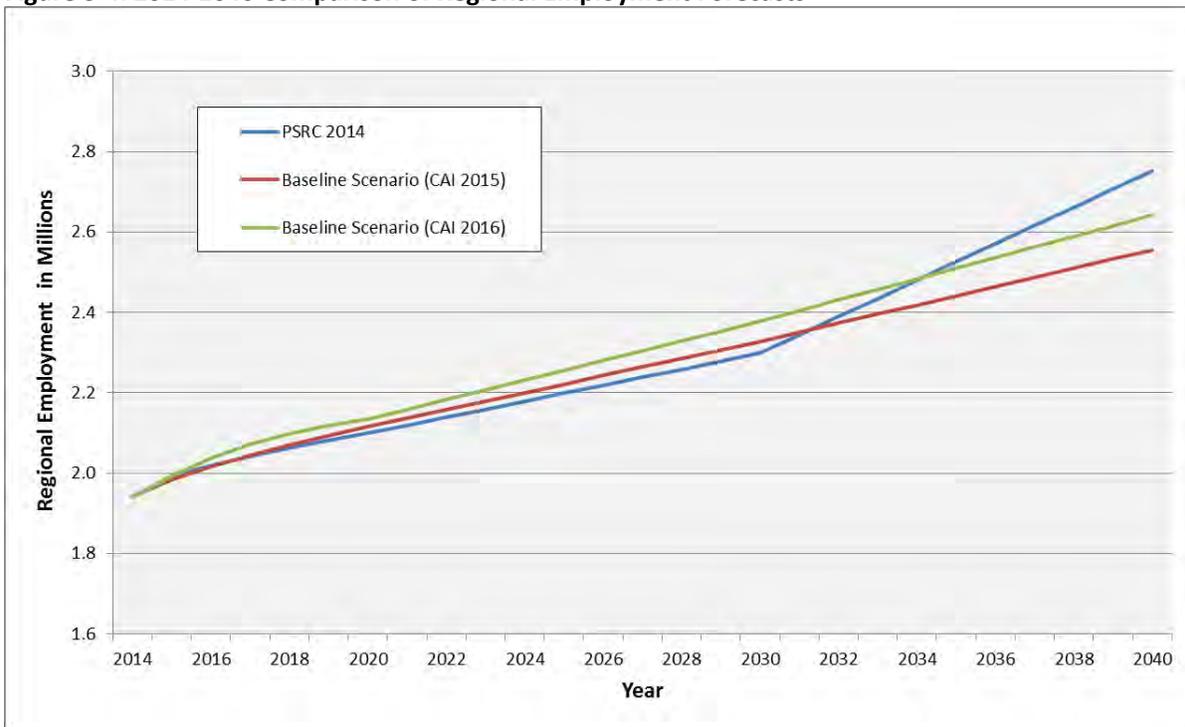
Source: Community Attributes Inc., 2016

Figure 3-3: 2014-2040 Comparison of Regional Population Forecasts



Source: Community Attributes Inc., 2016

Figure 3-4: 2014-2040 Comparison of Regional Employment Forecasts



Source: Community Attributes Inc., 2016

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Chapter 4

Tolling Operations

Tolling on the SR 520 bridge commenced on December 29, 2011 in advance of the construction of the replacement bridge. Tolls continued to be collected during construction and will be collected on the replacement bridge span. This report assumes tolling continues through FY 2056.

WSDOT has chosen to implement a variably-priced, cashless tolling system on the SR 520 bridge. The all-electronic approach allows vehicles to travel through the corridor at highway speeds without stopping to pay the toll, while minimizing right-of-way requirements, and allowing faster construction and installation compared to conventional toll plazas. From December 2011 through January 2016, tolls were being collected at the east high-rise section of the SR 520 bridge via all electronic tolling. After January 2016, tolls are collected on land east of the bridge via all electronic tolling.

Toll rates vary by time of day and day of week (weekday versus weekend day) with higher tolls during peak demand periods. The variable pricing allows for better management of traffic operations on the facility during peak periods.

Two payment types are available: account-based (pre-paid) and Pay By Mail (post-paid). Account-based toll payment, branded as “*Good To Go!*” provides two options – via transponder or registered license plate. The first option requires motorists to establish a prepaid account and obtain a *Good To Go!* transponder. The second option requires motorists to establish a prepaid account and register their vehicle license plate, known as Pay By Plate. The other payment type, Pay By Mail, also provides two options – through customer-initiated payments and following receipt of an invoice in the mail. Different costs of toll collection are associated with each payment type including processing costs and revenue losses.

In the November 2015 forecast, estimated payment proportions for potential bridge users was 84.6 percent *Good To Go!* account-based for FY 2016. Actual results for FY 2016 show 84.0 percent *Good To Go!* account-based. (See Table 2-8: Trends in Actual Method of Payment, for details.)

On the SR 520 floating bridge, a weekday toll schedule applies to all weekdays, and a separate weekend toll schedule applies to both weekend days. Major holidays¹³ that fall on weekdays use the weekend toll schedule.

Currently, tolls are not collected during the overnight period defined as 11:00 pm to 5:00 am; however, from FY 2018 onwards, it is assumed tolls will be collected over the entire day.

Vehicles are tolled according to vehicle classes by number of axles. The toll rates for multiple-axle vehicles (three or more axels) are generally based on the axle multiple of the appropriate two-axle vehicle per axle base toll rate for primary payment types: account-based *Good To Go!* and Pay By Mail.

¹³ New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day per WAC rule 468-270-071.

A variety of toll exemptions have been implemented on the SR 520 bridge, and are assumed to continue throughout the forecast horizon. Some are implemented State policy while others are by agreement between the State and Federal Highway Administration. These exemptions include:

- Agency-owned and branded transit vehicles
- Privately-owned transit vehicles which operate on a fixed route and regular schedule
- Agency-sanctioned vanpools
- State Police vehicles
- Bridge maintenance vehicles
- Emergency vehicles
- Tow trucks while responding to SR 520 calls
- Vehicles owned or operated by a foreign government

All passenger car vehicles including carpools with two, three, or more occupants are currently tolled and are assumed to continue to be tolled in the future.

The original toll schedule plan assumed in the 2011 T&R study has been implemented with the addition of \$0.05 rounding starting in FY 2014. In accordance with this plan, the Washington State Transportation Commission (WSTC) has raised the tolls approximately 2.5 percent on July 1, 2012 (FY 2013), July 1, 2013 (FY 2014), July 1, 2014 (FY 2015), and July 1, 2015 (FY 2016), consistent with the September 2011 traffic and revenue forecast assumptions. The last toll rate increase of approximately 5 percent was implemented on July 1, 2016 (FY 2017) based on the toll rate schedule adopted by WSTC in May 2016. Since FY 2014, all toll rates have been rounded to \$0.05.

The existing (FY 2017) toll rates for two-axle vehicles are shown in Tables 4-1 and 4-2, respectively for weekdays and weekends, and are summarized below:

- The maximum *Good To Go!* toll rate for 2-axle vehicles is \$4.10 on weekdays and \$2.50 on weekends in FY 2017.
- In FY 2017, Pay By Mail customers pay exactly \$2.00 above the *Good To Go!* toll rates for 2-axle vehicles.
- Tolls for multi-axle vehicles (those with more than two axles on the ground) are determined by multiplying the number of axles by the per axle toll rate for two-axle vehicles using the same payment method and rounded to the nearest \$0.05. The maximum rate is the six-axle rate, regardless of additional axles.

Future toll rates and policies assumed in this study are consistent with the latest toll rate schedule formally adopted by WSTC in May 2016. The assumed toll rates for FY 2018 and beyond for two-axle vehicles are shown in Tables 4-1 and 4-2, respectively for weekdays and weekends:

- Weekday *Good To Go!* account-based tolls will increase approximately 5.2 percent on average from FY 2017 to FY 2018 (i.e. on July 1, 2017).

- Weekend *Good To Go!* account-based tolls will increase approximately 6.2 percent on average from FY 2017 to FY 2018.
- The maximum *Good To Go!* toll rate for 2-axle vehicles will be \$4.30 on weekdays and \$2.65 on weekends.
- Pay By Mail customers will pay exactly \$2.00 above the *Good To Go!* toll rates for 2-axle vehicles.
- All toll rates will continue to be rounded to the nearest \$0.05.
- No toll rate escalation is assumed after FY 2018.
- Tolls will be charged during all 24 hours starting in FY 2018. The night time (11:00 pm – 5:00 am) account-based toll rate for 2-axle vehicles is \$1.25 on both weekdays and weekend days.
- Tolls for multi-axle vehicles will be set to axle factors based on the per axle rate for two-axle vehicles for the same payment type. The maximum rate is the six-axle rate, regardless of additional axles.

Table 4-1: Weekday Two-Axle Vehicle Toll Rates

| Fiscal Year | 10 AM- 11 PM- | | | | | | | | | | | |
|-----------------------------------------------------|---------------|--------|--------|--------|---------|--------|--------|--------|--------|--------|---------|--------|
| | 12-5 AM | 5-6 AM | 6-7 AM | 7-9 AM | 9-10 AM | 2 PM | 2-3 PM | 3-6 PM | 6-7 PM | 7-9 PM | 9-11 PM | 12 AM |
| <i>Good To Go!</i> Weekday 2-Axle Toll Rates | | | | | | | | | | | | |
| 2017 | | \$1.90 | \$3.25 | \$4.10 | \$3.25 | \$2.55 | \$3.25 | \$4.10 | \$3.25 | \$2.55 | \$1.90 | |
| 2018+ | \$1.25 | \$2.00 | \$3.40 | \$4.30 | \$3.40 | \$2.70 | \$3.40 | \$4.30 | \$3.40 | \$2.70 | \$2.00 | \$1.25 |
| Pay By Mail Weekday 2-Axle Toll Rates | | | | | | | | | | | | |
| 2017 | | \$3.90 | \$5.25 | \$6.10 | \$5.25 | \$4.55 | \$5.25 | \$6.10 | \$5.25 | \$4.55 | \$3.90 | |
| 2018+ | \$3.25 | \$4.00 | \$5.40 | \$6.30 | \$5.40 | \$4.70 | \$5.40 | \$6.30 | \$5.40 | \$4.70 | \$4.00 | \$3.25 |

Note: Toll rates in year of expenditure dollars

Table 4-2: Weekend Two-Axle Vehicle Toll Rates

| Fiscal Year | 11 AM- 11 PM- | | | | | | |
|-----------------------------------------------------|---------------|--------|---------|--------|--------|---------|--------|
| | 12-5 AM | 5-8 AM | 8-11 AM | 6 PM | 6-9 PM | 9-11 PM | 12 AM |
| <i>Good To Go!</i> Weekend 2-Axle Toll Rates | | | | | | | |
| 2017 | | \$1.30 | \$1.95 | \$2.50 | \$1.95 | \$1.30 | |
| 2018+ | \$1.25 | \$1.40 | \$2.05 | \$2.65 | \$2.05 | \$1.40 | \$1.25 |
| Pay By Mail Weekend 2-Axle Toll Rates | | | | | | | |
| 2017 | | \$3.30 | \$3.95 | \$4.50 | \$3.95 | \$3.30 | |
| 2018+ | \$3.25 | \$3.40 | \$4.05 | \$4.65 | \$4.05 | \$3.40 | \$3.25 |

Note: Toll rates in year of expenditure dollars

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Chapter 5

Traffic and Revenue Approach

This chapter presents an overview of the modeling and forecasting approach. The revised forecast utilized the travel demand toll model and model processing tools developed for the September 2011 forecast, but incorporated new information to account for key changes. This chapter starts with an overview of the tolling analysis model used in the September 2011 forecast, then describes the changes made to the model and associated post processing tools.

Overview of September 2011 Tolling Analysis Model

The September 2011 SR 520 tolling analysis model was built from the Puget Sound Regional Council (PSRC) travel demand model. The PSRC files contain highway and transit networks, data on land-use and socioeconomic forecasts, and trip tables representing vehicle trips. These files formed the basis of the tolling analysis model. CDM Smith used a number of studies and surveys specific to the SR 520 corridor to build and update the modeling tools.

Traffic data was obtained from WSDOT's traffic count stations for the years 2008 through 2010. In addition, CDM Smith conducted vehicle occupancy and truck classification studies in November 2009. This data was used in the calibration stage of the tolling analysis model. Travel time and speed data were collected using Global Positioning System (GPS) equipped vehicles in November 2009 and were also used for model calibration.

A travel pattern survey, conducted by CDM Smith in September 2009 and including 6,400 participants, was a major effort to understand the travel patterns of the SR 520 bridge users. Information obtained from this survey was used to refine the original trip tables. The results showed the strong use of the SR 520 bridge for commuting in both directions across Lake Washington. The survey results indicated:

- AM peak (6:00 to 9:00 am) travel and PM peak (3:00 to 6:00 pm) travel each accounted for approximately 18 percent of total trips; midday trips accounted for approximately 36 percent of total trips
- Trip purpose results showed 85 percent of AM peak and 62 percent of PM peak trips are for work commuting; midday trips were dominated by company business, personal business/medical trips, and people going to jobs with later start times
- About half of all peak trips were made five times a week
- West end origins and destinations were almost all in Seattle, while east end origins and destinations were dominated by Bellevue, Redmond, and Kirkland.

The CDM Smith team conducted a stated preference survey in November 2009 to help assess current bridge users' willingness to pay tolls. This is measured in value of time, which is the monetary value an individual places on saving a certain increment of travel time. The survey also provided data to estimate changes in travel behavior in response to tolls. Changes in travel behavior include combining or forgoing trips, choosing a different destination, shifting to alternative modes including transit, and/or changes in the time of travel. Value of time results from the 2009 stated preference survey

were demonstrably lower than value of time results from a similar stated preference survey of SR 520 users in 2003. The survey results also revealed respondents have a relatively high median household income of about \$125,000. While the range of values from the 2009 survey fell within the average range for the region estimated from other sources, the higher income of travelers in this corridor suggested that the value of time estimates should be higher than the regional average. Accordingly, analytical methods were used to re-benchmark value of time estimates to bring them into alignment with average hourly wages.

An independent review of economic growth forecasts was conducted by local economic forecasting consultant Community Attributes Inc. who included impacts of the then recent recession on short and long-term growth forecasts for the region as a whole. The most recent population, employment, and economic activity data was used for this purpose, primarily from 2009 and the first half of 2010. Regional independent population and employment forecasts were applied to updated PSRC regional distributions to model zone areas and the results were further augmented by up to date development pipeline information. The resulting model zone socioeconomic forecasts were used to adjust the tolling analysis model trip tables.

The PSRC highway networks were updated to include the fields necessary to perform toll diversion calculations and also to better represent traffic movements on SR 520 and I-90 bridges. Model modifications were made to allow accounting for possible suppression of trips or shifting to non-automobile modes due to tolling. Since variable rate tolling was planned, the model was split into hourly toll periods from the larger peak and off peak periods.

After the updates of trip tables and highway networks using the data and surveys were completed, CDM Smith developed a tolling analysis model for studying the SR 520 bridge. Prior to tolling analysis, the model was calibrated using 2010 hourly traffic counts and travel time data under toll-free operation. The model was then used to develop projected SR 520 transactions and gross toll revenue potential from FY 2012 through FY 2056, known as the September 2011 forecast.

Regional Transportation Projects

The September 2011 model assumed that a number of regional highway and transit projects would be completed. The November 2016 forecast is based on similar modeling assumptions. Table 5-1 provides a list of relevant major regional transportation projects, with an indication of completion date as currently anticipated. While no significant changes in planned major projects have occurred, minor recent revisions include: the East Link light rail extension to Bellevue has been pushed back to 2023 (original expected completion date was 2020-21); the I-90 reversible lane project completion date has been pushed back to mid-2017; the newly funded I-405 Renton to Bellevue widening and Express Toll Lanes project has been added; completed projects including the SR 520 Eastside expansion/HOV project, the I-405 Bellevue to Lynnwood widening and Express Toll Lanes project, and the SR 522 Business Access and Transit Lanes project have been removed from this list.

Table 5-1: Summary of Major Regional Transportation Projects

| Route | Expected Completion ¹ | Project Description |
|-----------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-90 | Mid 2017 | Addition of an HOV2+ lane in each direction on the outer roadway across Lake Washington. Closure of the reversible center roadway once the outer roadway is reconfigured. (Center roadway will be used for East Link Light Rail.) |
| I-405 | Summer 2019 | I-405/SR 167 Interchange Direct Connector: builds a new flyover ramp connecting the High Occupancy Toll lanes on SR 167 to the carpool lanes on I-405. Funded in the 2015 Connecting Washington transportation package. |
| East Link | Targeted 2023 | Sound Transit East Link Light Rail Extension - Extension of Link Light Rail from downtown Seattle at International District Station, on I-90 corridor east to Bellevue Way, then north to Downtown Bellevue, and then east to current Overlake Transit Center (Redmond Technology Center Station) with possible later extension to Downtown Redmond. |
| I-405 | 2024 | Renton to Bellevue Widening and Express Toll Lanes project: adds one northbound and southbound lane on I-405 between SR 169 in Renton and NE 6th Street in downtown Bellevue. Recently funded in the 2015 Connecting Washington transportation package. These new lanes will be paired with the existing carpool lane to create a two-lane express toll lane system. |
| Gateway | 2031 | Completes the SR 509 and SR 167 connections to I-5 to improve mobility and connectivity in the Puget Sound region; adds more capacity to I-5 through express toll lanes, reducing congestion and travel times between Seattle and Tacoma. |

1. Expected completion date as of November 2016

Adjustments Made to Toll Modeling and Traffic and Gross Revenue Forecasting

The revised forecast utilized the travel demand toll model and model processing tools developed for the September 2011 forecast but incorporated new information to account for key changes¹⁴. This section focuses on the changes made to the September 2011 tolling analysis model and associated post processing tools. The revised model is referred to as the November 2016 model.

The travel demand toll model, which covers average weekday travel, includes the following model years: FY 2016, FY 2017, FY 2018, FY 2021, FY 2022, FY 2024, FY 2025, FY 2026, and FY 2031. The results for years between model years are determined by interpolation.

The observed data did not indicate a need to update the values and distribution of value of time and trip diversion methodology. Consequently, these parameters and methodology as applied in the

¹⁴ Prior to beginning the November 2016 forecast update, CDM Smith revisited the assumption of using the PSRC model obtained for the September 2011 forecast with key PSRC and WSDOT staff. The conclusion was that the PSRC model used to develop the CDM Smith toll model was still the latest available PSRC model basis and that the re-benchmarking, calibration, and modifications to the toll model by CDM Smith for past and current forecast processes would be sufficient to bring the toll model up to date.

September 2011 study were not modified for the current study. The September 2011 study used trip suppression and mode shift parameters and methodologies to estimate the impact of adding tolling to the bridge. The current study, as noted below, includes a model trip table calibration process that accounts for post-tolling experience. This calibration process replaces the suppression and mode shift due to tolling methodologies used in the September 2011 study.

For the current study, key elements of the travel demand toll model and post-processing tools were reviewed to examine whether or not changes were required, including:

- Roadway configuration
- Socioeconomic forecasts
- Model trip table calibration
- Toll performance review
 - Average weekday transactions
 - Average weekday hourly transaction profiles
 - Average weekend transactions
- Gas price forecast
- Future toll rates
- Proportion of payment type
- Toll vehicle classification
- Planned SR 520 closures due to construction
- Partial lane closures on I-90 due to construction.

Each of these elements is successively discussed in this chapter.

Roadway Configuration

The model network assumptions were generally kept the same as the September 2011 and November 2015 studies. A few important changes in the roadway configuration assumptions had been made for the November 2015 forecast based on then recent project developments, and these changes remained valid for the November 2016 revised forecast. The network configuration changes are related to the SR 520 West Side improvements,

In June 2015, the Washington State legislature passed the Connecting Washington transportation funding package, which includes \$1.6 B in new funding to complete construction of the West Side of the SR 520 corridor between FY 2018 and FY 2026. In planning for this newly funded section, WSDOT has identified updated preliminary roadway configurations that are reflected in the model network assumptions. The roadway configuration assumed along the SR 520 corridor in the new forecast is discussed in Chapter 1 and shown graphically in Figure 1-2.

Between Montlake Boulevard and the west end of the main SR 520 floating bridge span, the assumed configuration is as follows:

- FY 2017 through FY 2021: current configuration with two general-purpose lanes in each direction. In FY 2018, it is assumed the traffic in this section will be moved to the new West Approach Bridge North (WABN), but capacity will not change.
- FY 2022 and beyond: new WABN and new West Approach Bridge South (WABS) resulting in three lanes in each direction (two general-purpose and one inside transit/HOV 3+ lane in each direction).

Between I-5 and Montlake Boulevard, the assumed configuration is as follows:

- FY 2017 through FY 2025: current configuration with two general-purpose lanes in each direction.
- FY 2026 and beyond: new Portage Bay Bridge resulting in three lanes in each direction (two general-purpose and one inside transit/HOV 3+ lane in each direction) plus a one lane transit/HOV3+ reversible direct connector between SR 520 and the I-5 reversible express lanes operating in the direction of the I-5 reversible lanes.

The main impact of this roadway configuration is continuation of the four lane capacity constriction between Montlake Boulevard and the western high rise through FY 2021.

Socioeconomic Forecasts

A revised socioeconomic forecast was prepared in October 2016, as discussed in Chapter 3: Economic Growth Analysis. Base year (2015) employment exceeded the prior economic forecast values, resulting in a revised base. However, the revised employment forecast has a lower annual growth rates for 2016-2020 for King County compared with the prior forecast; the 2020-2030 and 2030-2040 employment forecast growth rates are slightly higher, with respectively 1.0 percent and 1.1 percent annual growth compared with 0.9 percent growth in the prior forecast.

Forecast population for King County is slightly higher overall, though this in part owes to a higher base year population for year 2015 compared with a forecast population for year 2015 in the prior economic forecast. Near-term (2016-2020) growth as well as later-term (2020-2030 and 2030-2040) growth are expected to be the same as in the prior forecast.

For the four main cities in the SR 520 corridor (Seattle, Bellevue, Kirkland, and Redmond), overall employment and population are higher in the revised forecast compared to the prior forecast. For employment, the forecast increase varies between 1.7 percent in 2016 and 3.3 percent in 2040. For population, the forecast increase varies between 1.1 percent in 2016 and 1.6 percent in 2040.

When incorporated into the revised traffic and revenue forecast, the slightly higher population and employment forecast in outer years result in increased transactions and gross revenue.

Model Trip Table Calibration

The 2015 study included an extensive effort to calibrate the FY 2015 trip tables, based on the revised socioeconomic data and latest traffic counts. The trip tables for FY 2015 had been adjusted to better match traffic volumes on SR 520, I-90, SR 522, I-5, and I-405. The improved model calibration on I-90 and other competing routes led to a better representation of traffic volumes on SR 520, particularly

during peak periods. Once the FY 2015 trip tables were calibrated, they served as the new base year trip tables. The difference between the original and calibrated base year trip tables for each origin-destination movement was used to adjust future year model trip tables to account for the FY 2015 calibration.

For the 2016 forecast update, it was decided that a full model calibration was not necessary given that the model trip tables had recently been adjusted. Instead, the effort focused on re-benchmarking the new base year (FY 2016) traffic and revenue using the most recent traffic and toll performance data, as described below.

Toll Performance Review

As described in Chapter 2, traffic and revenue results including split between account-based and Pay By Mail transactions were available for FY 2015 and preliminary information was available for FY 2016. Actuals were used to benchmark the base year (FY 2016) forecast. Also, recent trends in weekday and weekend transaction growth rates, hourly profiles of weekday transactions, and payment shares between account-based and Pay By Mail were used to adjust the FY 2016 model.

Average Weekday Transactions

The toll performance review showed that FY 2016 weekday toll transactions were about 0.5 percent lower than anticipated in the November 2015 forecast (72,755 compared to 73,100). As a result, the average weekday traffic for the base year model (FY 2016) was adjusted down by 0.5 percent in the November 2016 forecast, as shown in Table 5-2.

Average weekday transactions grew by 4.1 percent in FY 2015 and 3.7 percent in FY 2016, lower than what was expected in prior forecasts. Also, the analysis of the latest performance data showed that the opening of the new floating bridge span in April 2016 did not generate a significant increase in average weekday transactions. As a result of these observations, the growth rate for FY 2017 average weekday transactions was adjusted downward in the revised forecast. The FY 2018 growth rate is expected to be somewhat higher than FY 2017 primarily due to the introduction of night time tolling (11:00 p.m. to 5:00 a.m.). The average annual growth rate from FY 2018 to FY 2021 was left unchanged compared to the prior forecast.

Table 5-2: Average Weekday Transactions - Actuals and Short Term Forecast

| FY | Weekday Transactions | | | Annual Weekday Growth | | |
|-------------|----------------------|-------------------|---------------|-----------------------|-------------------|-------------|
| | Nov2015 Forec. | Nov2016 Forec. | Actuals | Nov2015 Forec. | Nov2016 Forec. | Actuals |
| 2012 | -- | -- | 63,303 | -- | -- | -- |
| 2013 | -- | -- | 65,165 | -- | -- | 2.9% |
| 2014 | -- | -- | 67,382 | -- | -- | 3.4% |
| 2015 | -- | -- | 70,131 | -- | -- | 4.1% |
| 2016 | 73,100 | 72,755 | 72,755 | 4.2% | 3.7% | 3.7% |
| 2017 | 78,427 | 75,483 | -- | 7.3% | 3.7% | -- |
| 2018 | 80,830 | 78,880 | -- | 3.1% | 4.5% | -- |
| 2021 | 89,380 | 87,228 | -- | 3.4% | 3.4% | -- |

These adjustments when combined led to lower average weekday traffic in the short term: 3.8 percent lower than in the previous forecast for FY 2017, and 2.4 percent lower for FY 2018 and FY 2021.

Average Weekday Hourly Transaction Profiles

The toll performance review provided updated information on distribution of transactions by hour on an average weekday. The base year (FY 2016) as well as forecast weekday transaction profiles were adjusted to better reflect the observed hourly distribution of transactions and the incremental capacity enhancements along the corridor as future phases of the rest of the West improvements are being completed.

The November 2015 forecast used toll model outputs to inform the hourly profiles. The FY 2017 model year output included significant growth both from background traffic as well as estimated capacity increases from the new floating span. However, review of actual data showed these estimated increases were unlikely to happen. Figure 5-1 illustrates the changes made to the FY 2017 hourly weekday profile in the revised forecast. Two sets of observed data were used to help inform the forecast revisions: FY 2016 hourly distribution of average weekday traffic volumes on SR 520 as measured by loop detectors; and initial data for FY 2017 to date combining transactions reported from lane equipment for July and August 2016, and loop detector data for July 2016 through mid-September 2016. Based on these observed data, the hourly profile of FY 2017 forecast transactions was adjusted. Most notably, transactions occurring during the midday period were raised to a level better aligned with recent observations; and transactions occurring during the AM and PM peak periods were lowered compared to the previous forecast.

A similar pattern was followed for FY 2018, as shown in Figure 5-2. The revised forecast profile for FY 2018 raises transactions during midday period to a level more consistent with recent observations and also better aligned with the revised forecast profile for FY 2017. The revised FY 2018 profile also lowers transactions during the AM and PM peak periods to a level closer to recent observations and consistent with the revised forecast profile for FY 2017.

Figure 5-3 illustrates the changes made to the FY 2021 hourly weekday profile in the revised forecast. Note that for FY 2021, the assumed roadway configuration between Montlake Boulevard and the west end of the main bridge span is the same as the current configuration with two general-purpose lanes in each direction. The revised forecast profile for FY 2021 raises transactions during AM peak and midday periods, and lowers transactions during PM peak period to a level closer to recent observations and revised forecast profiles for FY 2017 and FY 2018.

In addition to adjusting the two-way hourly transaction profiles, specific profiles for the eastbound and westbound directions were also refined to better align with recent counts, observed traffic conditions during peak periods, and future incremental capacity enhancements along the corridor.

In general, these adjustments in hourly weekday profiles result in lower share of transactions occurring during the PM peak period compared to the previous forecast, leading to a decrease in gross revenue for FY 2017. However, in later years, the AM peak period and midday growth overcome the PM peak period reductions, leading to an increase in gross revenue for FY 2021 through FY 2056.

Figure 5-1: FY 2017 Weekday Hourly Traffic/Transaction Profiles

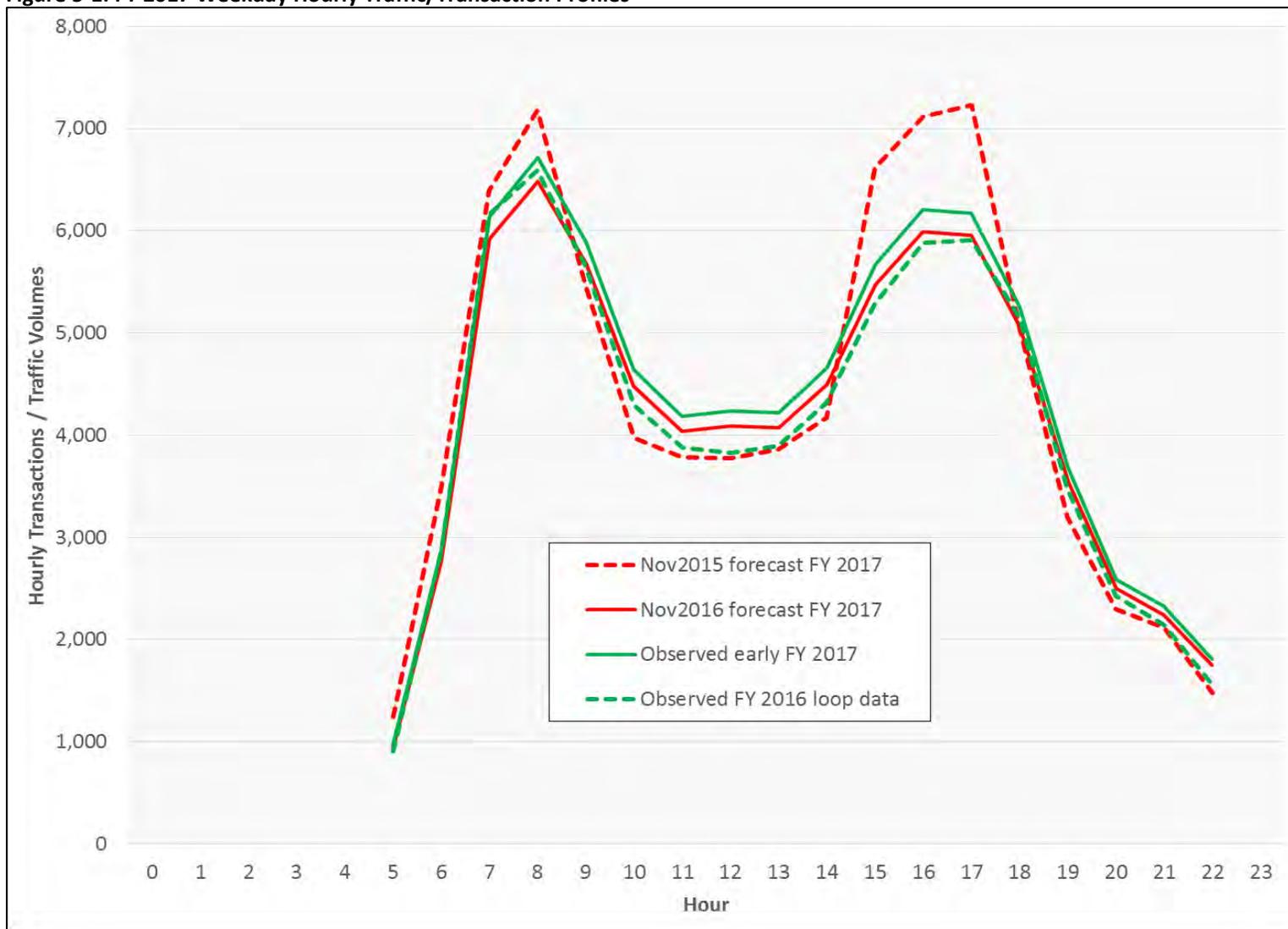


Figure 5-2: FY 2018 Weekday Hourly Transaction Profiles

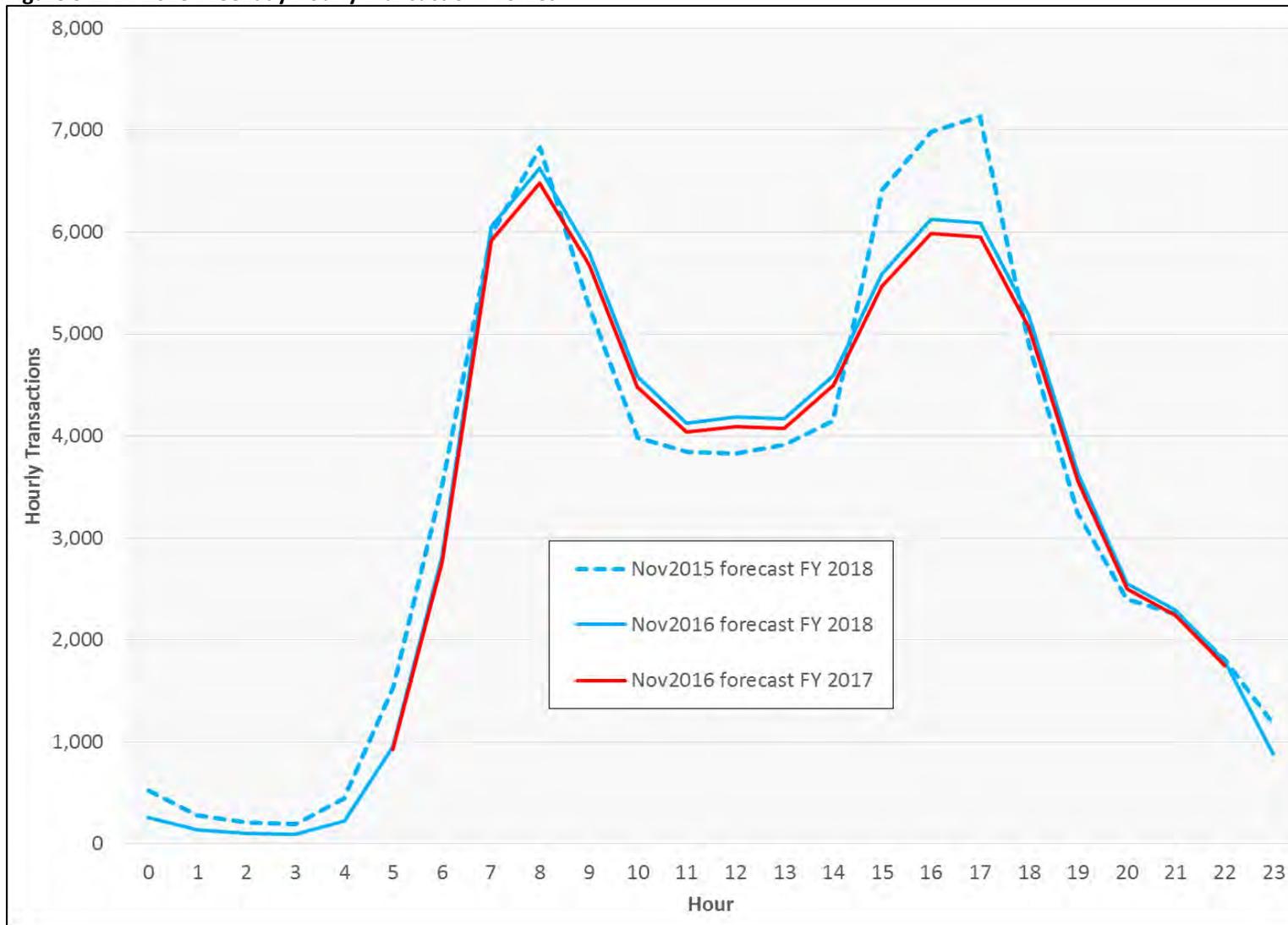
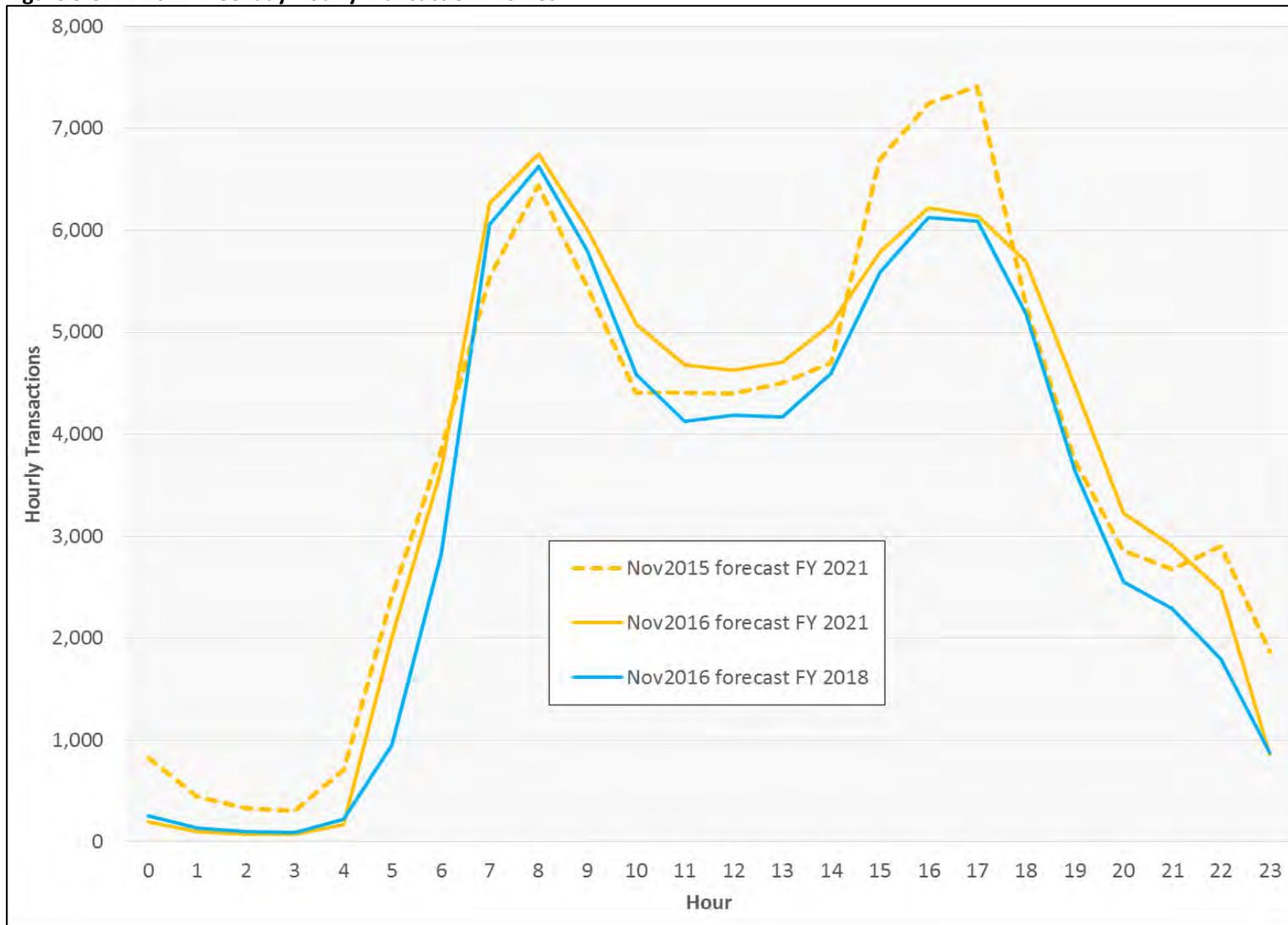


Figure 5-3: FY 2021 Weekday Hourly Transaction Profiles



Average Weekend Transactions

Average observed weekend transactions include holidays on weekdays (weekend rates) and exclude weekend days with closures of SR 520 or I-90 during tolling period. The toll performance review showed that FY 2016 average weekend toll transactions were about 3.8 percent higher than anticipated in the November 2015 forecast (43,463 compared to 41,887). This is likely due to the rapid population growth in the region. As a result, the average weekend traffic for the base year model (FY 2016) was adjusted up by 3.8 percent in the November 2016 forecast, as shown in Table 5-3.

Table 5-3: Average Weekend Transactions - Actuals and Short Term Forecast

| FY | Weekend Transactions | | | Annual Weekend Growth | | |
|-------------|----------------------|-------------------|---------------|-----------------------|-------------------|-------------|
| | Nov2015 Forec. | Nov2016 Forec. | Actuals | Nov2015 Forec. | Nov2016 Forec. | Actuals |
| 2012 | -- | -- | 36,920 | -- | -- | -- |
| 2013 | -- | -- | 38,142 | -- | -- | 3.3% |
| 2014 | -- | -- | 39,289 | -- | -- | 3.0% |
| 2015 | -- | -- | 40,708 | -- | -- | 3.6% |
| 2016 | 41,887 | 43,463 | 43,463 | 2.9% | 6.8% | 6.8% |
| 2017 | 43,662 | 45,190 | -- | 4.2% | 4.0% | -- |
| 2018 | 46,444 | 48,816 | -- | 6.4% | 8.0% | -- |
| 2021 | 51,042 | 53,616 | -- | 3.2% | 3.2% | -- |

Average weekend transactions grew by 6.8 percent in FY 2016, but historically the growth rates were closer to 3.3 percent. The analysis of the latest performance data showed that the opening of the new floating bridge span in April 2016 did not generate a significant increase in average weekend transactions. As a result of these observations, it was decided to keep the FY 2017 growth rate almost unchanged compared to the previous forecast, which still results in higher transactions due to the significantly higher FY 2016 base value. The FY 2018 growth rate is expected to be higher than FY 2017 primarily due to the introduction of night time tolling (11:00 pm to 5:00 am). The average annual growth rate from FY 2018 to FY 2021 was left unchanged compared to the prior forecast.

These adjustments, when combined, led to higher average weekend traffic in the short term: 3.5 percent higher than in the previous forecast for FY 2017, 5.1 percent higher for FY 2018, and 5.0 percent higher for FY 2021. The consequential increase in annual gross revenue is much smaller at approximately 0.20 percent, due to the small share of weekend traffic vs. weekdays, and the lower weekend toll rates.

The weekend traffic hourly profiles are not generated from a model since no tolling model exists for weekend. Instead, the hourly profiles are based on observed transactions with adjustments for expected future capacity. Using updated observed count and lane-level transaction data including data since the new floating span opened, the weekend hourly profiles were adjusted with the result having more estimated transactions during the midday peak and fewer during the evening and night, resulting in a slight annual revenue increase from FY 2018 onward.

Gas Price Forecast

The per gallon price for passenger car gasoline is assumed to be \$2.80 per gallon in FY 2016, \$2.94 in FY 2017, \$4.40 in FY 2024, and \$5.37 in FY 2031, resulting in a long term annual growth assumption

of 4.4 percent from FY 2016 to FY 2031. These values are similar to the State's Transportation Revenue Forecast Council's June 2016 long term gas price forecast.

Future Toll Rates

As discussed in Chapter 4, future toll rates and policies assumed in this revised forecast are consistent with the latest toll rate schedule adopted by the Washington State Transportation Commission (WSTC) in May 2016, and reflected in the final November 2015 forecast. SR 520 toll rates are assumed to increase by approximately 5 percent in FY 2018. Night time tolling (from 11:00 pm to 5:00 am) is assumed to start in FY 2018. No future toll rate change is assumed after FY 2018.

The November 2016 forecast assumes Pay By Mail customers would pay \$2.00 above the *Good To Go!* toll rates for 2-axle vehicles. This change was a policy decision by the WSTC in May 2016 and implemented for FY 2017. Note that this increment is factored by the number of axles since tolls for multi-axle vehicles are determined by multiplying the number of axles by the per axle toll rate for two-axle vehicles.

Similar to the November 2015 forecast, The November 2016 forecast assumes a toll policy that 3+ carpools must pay tolls throughout the forecast horizon.

Proportion of Payment Type

Table 5-4 shows the *Good To Go!* (account-based) payment shares assumed in the November 2015 forecast, the actual value for FY 2012 through 2016, and the revised payment type proportions used in the new forecast. Review of preliminary FY 2016 performance results showed average account-based share to be about 84.0 percent, about 0.6 percent lower than assumed in the November 2015 forecast. As a result, the new forecast has overall lower *Good To Go!* shares, as shown in Table 5-4, with the decrease being around minus 0.5 percent compared to the prior forecast. The effect is an increase in Pay By Mail share throughout the forecast horizon, resulting in a small annual gross revenue increase due to higher Pay By Mail toll rates.

Table 5-4: *Good To Go!* Transaction Account-based Share

| Fiscal Year | Nov2015 Forecast | Nov2016 Forecast | Actual* |
|-------------|------------------|------------------|----------|
| 2012 | -- | -- | 82.7% |
| 2013 | -- | -- | 83.7% |
| 2014 | -- | -- | 84.5% |
| 2015 | -- | -- | 84.0% |
| 2016 | 84.6% | -- | 84.0% ** |
| 2017 | 84.6% | 84.0% | -- |
| 2024 | 86.0% | 85.5% | -- |
| 2031 | 87.6% | 87.2% | -- |

* For consistency with the SR 520 forecast methodology, all leakage is attributed to PBM

** July-December 2015 actual, January-June 2016 preliminary data

Nov2015 – Investment Grade Forecast November 2015

Nov2016 – Investment Grade Forecast November 2016

Toll Vehicle Classification

The performance data indicated that the actual share of trucks (defined as vehicles with 3 or more axles) in FY 2016 was consistent with what was assumed in the November 2015 forecast. As a result, no changes were made to the new annual average forecast for share of trucks as shown in Table 5-5 below.

Table 5-5: Proportion of Trucks

| Fiscal Year | Nov2015 Forecast | Nov2016 Forecast | Actual |
|-------------|------------------|------------------|--------|
| 2012 | -- | -- | 1.0% |
| 2013 | -- | -- | 0.8% |
| 2014 | -- | -- | 0.6% |
| 2015 | -- | -- | 0.6% |
| 2016 | 0.7% | -- | 0.7% * |
| 2017 | 0.7% | 0.7% | -- |
| 2024 | 1.0% | 1.0% | -- |
| 2031 | 1.2% | 1.2% | -- |

* July-December 2015 actual, January-June 2016 preliminary data

Nov2015 – Investment Grade Forecast November 2015

Nov2016 – Investment Grade Forecast November 2016

Toll rates on SR 520 vary by vehicle class and number of axles: two, three, four, five, and six or more axles. The tolling analysis model categorizes vehicles as passenger cars/light trucks (two axles), medium trucks (three and four axles), and heavy trucks (five axles or more). Representative toll rates for medium and heavy trucks are provided to the model by applying a factor derived from actual truck axle class distributions (called truck toll rate multiplier) to the two-axle toll rates. The revised forecast uses the same truck toll rate multipliers as the November 2015 forecast.

Planned SR 520 Closures

Weekend day and weekday night closures of the SR 520 main toll span will be required and are reflected in Table 5-6. Note that the closure assumptions reflect WSDOT's preliminary estimations of the number of closures needed at the time the forecast was prepared; these closure assumptions will very likely be revised in future forecast updates. The only change compared to the November 2015 forecast is that four weekend days of closures are now forecasted in FY 2017 whereas the prior forecast had assumed only two.

Construction of the new Portage Bay Bridge and I-5 transit and HOV3+ direct connector improvements are currently assumed to occur between FY 2020 and FY 2026. During these closures, traffic will be allowed to use the floating bridge between the Montlake interchange and I-405. Only the section of SR 520 west of the Montlake interchange will be closed. Weekend and weekday night closures of the Portage Bay bridge are shown separately in Table 5-6 (see Portage Bay Bridge columns). Note that the closure assumptions reflect WSDOT's preliminary estimations of the number of closures needed at the time the forecast was prepared; these closure assumptions will likely be revised in future forecast updates. The Portage Bay Bridge closure assumptions did not change in the new forecast.

Table 5-6: SR 520 Program Construction Closures

| Fiscal Year | November 2016 Forecast | | | | Actuals | |
|-------------|------------------------|---------------|--------------------|---------------|-------------|---------------|
| | SR 520 Main Span | | Portage Bay Bridge | | SR 520 | |
| | Weekend Day | Weekday Night | Weekend Day | Weekday Night | Weekend Day | Weekday Night |
| 2012 | -- | NA | -- | NA | 10.0 | NA |
| 2013 | -- | NA | -- | NA | 14.2 | NA |
| 2014 | -- | NA | -- | NA | 13.8 | NA |
| 2015 | -- | NA | -- | NA | 13.1 | NA |
| 2016 | -- | NA | -- | NA | 9.8 | NA |
| 2017 | 4.0 * | NA | -- | -- | -- | -- |
| 2018 | 12.0 | 22.5 | -- | -- | -- | -- |
| 2019 | 17.0 | 29.5 | -- | -- | -- | -- |
| 2020 | 16.0 | 29.0 | 7.0 | 12.0 | -- | -- |
| 2021 | 17.0 | 29.5 | 10.0 | 17.5 | -- | -- |
| 2022 | 13.0 | 23.0 | 10.0 | 17.5 | -- | -- |
| 2023 | -- | -- | 5.0 | 15.0 | -- | -- |
| 2024 | -- | -- | 3.0 | 10.0 | -- | -- |
| 2025 | -- | -- | 3.0 | 10.0 | -- | -- |
| 2026 | -- | -- | 7.0 | 12.0 | -- | -- |

* November 2015 forecast had assumed 2.0 weekend days for FY 2017

Partial Lane Closures on I-90 due to Construction

The November 2016 forecast specifically incorporates the expected impact of partial closures on I-90 due to construction in FY 2017. Based on the experience gained from studying the impact of I-90 closures in FY 2016, there is now enough information to estimate their impact. It is expected that lane closures on I-90 will occur during a total of 9 weekends (18 weekend days) in FY 2017; however, to be conservative, only 75 percent of these planned closures are assumed in the forecast. Overall, the expected impact on gross revenue for FY 2017 is estimated to be about \$0.4 million,

Summary of Assumptions

A summary of the assumptions used for the revised forecast is shown in Table 5-7.

Table 5-7: November 2016 Traffic and Gross Revenue Forecast Assumptions

| General Assumptions |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Improvements in the Puget Sound Regional Council's current regional transportation plan, <i>Transportation 2040</i> , will be implemented as planned. No new competitive toll-free facilities or additional capacity will be constructed during the projection period other than those assumed in the plan. |
| The percentage of payment types will be consistent with the ranges assumed for this study. The percentage of potential bridge users in the <i>Good To Go!</i> account-based program is assumed to increase from 84% in FY 2017 to 87% in FY 2031. |
| Economic growth in the project study area will occur as forecasted herein based in part on the 2013 PSRC Land Use Baseline Forecast from the Puget Sound Regional Council, Conway Pedersen 2016 forecasts, and the independent socioeconomic sub-consultant Community Attributes. |
| The facility will continue to be well maintained, efficiently operated, effectively signed, and promoted to encourage maximum usage. |
| Inflation will average 2.5% annually over the forecast horizon. This figure is based on historic CPI up to 2016. While current inflation forecasts are somewhat lower for the state overall (2.3% long term), the greater Seattle region and the SR 520 primary market corridor are growing at a significant pace implying the assumption of 2.5% inflation throughout the SR 520 forecasts should be kept. |
| Motor fuel will remain in adequate supply and no national or regional emergency will arise that would abnormally restrict the use of motor vehicles. The per gallon price for passenger car gasoline is assumed to be \$2.80 per gallon in FY 2016, \$2.94 in FY 2017, \$4.40 in FY 2024, and \$5.37 in FY 2031, resulting in a long term annual growth assumption of 4.4%. These values are consistent with TRFC's June 2016 long term forecast of gas price. |
| The value of time for work trips ranges from \$9.60 per hour for the lowest income group to \$22.80 per hour for the highest income group. The value of time for non-work passenger car trips is \$13.80 per hour. Truck trip value of time reaches \$36.00 per hour for heavy trucks. All values are in 2010 dollars. |
| SR 520 Corridor Lane Configuration |
| FY 2017 through FY 2021: New floating bridge with two wider general-purpose lanes in each direction, one inside HOV/transit lane in each direction, and wider shoulders in each direction. West of the replacement span, SR 520 will remain in its current two-lane per direction configuration. |
| FY 2022 through FY 2025: Two wider general-purpose lanes in each direction, one inside HOV/transit lane in each direction, and wider shoulders in each direction on replacement span. New west approach bridge north and south connections from the western high rise to Montlake Blvd. interchange such that three standard-width lanes and full shoulders are provided between the floating span and Montlake Blvd. West of Montlake Blvd., SR 520 will remain in its current two-lane per direction configuration. |
| FY 2026 and onward: On replacement span, west approach bridge north and south connections, and new Portage Bay bridge between I-5 and the Montlake Blvd, roadway configuration includes two wider general-purpose lanes in each direction, one inside HOV/transit lane in each direction, and wider shoulders in each direction. Also includes a one-lane transit/HOV3+ reversible direct connector between SR 520 and the I-5 reversible express lanes operating in the direction of the I-5 reversible lanes. |
| SR 520 Configuration East of Bridge to I-405, FY 2016 and onward: Two general-purpose lanes in each direction and one inside HOV/transit lane in each direction (with three person occupancy requirement HOV3+). |

(table continued)

Table 5-7: November 2016 Traffic and Gross Revenue Forecast Assumptions (Continued)

| Construction Closures | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Weekend closures of SR 520 from the Montlake Interchange to I-405 including the tolled section will occur an equivalent of 4 days in FY 2017, 12 days in FY 2018, 17 days in FY 2019, 16 days in FY 2020, 17 days in FY 2021, and 13 days in FY 2022. Since night time (11pm - 5am) tolling is assumed from FY 2018 forward, weekday night time closures from FY 2018 forward are also considered. Weekday night time closures will occur an equivalent of 22.5 nights in FY 2018, 29.5 nights in FY 2019, 29 nights in FY 2020, 29.5 nights in FY 2021, and 23 nights in FY 2022. | |
| Construction of the new Portage Bay bridge will start in FY 2020 and will require closures of SR 520 between I-5 and the Montlake interchange. During these closures, traffic will still be allowed on the tolled section between the Montlake interchange and I-405. Portage Bay bridge weekend closures will occur an equivalent of 7 days in FY 2020, 10 days in FY 2021, 10 days in FY 2022, 5 days in FY 2023, 3 days in FY 2024, 3 days in FY 2025, and 7 days in FY 2026. Weekday night time closures will occur an equivalent of 12 nights in FY 2020, 17.5 nights in FY 2021, 17.5 nights in FY 2022, 15 nights in FY 2023, 10 nights in FY 2024, 10 nights in FY 2025, and 12 nights in FY 2026. | |
| Toll Collection | |
| Starting in January 2016, tolls are collected on land east of the bridge. | |
| Toll rates will be the same for either direction on the bridge. | |
| The toll collection is all electronic; there will be no manual toll collection. | |
| FY 2017: no night time tolling (11pm - 5am). FY 2018 and beyond: tolls will be charged during all 24 hours. | |
| Toll Rates | |
| FY 2017 | |
| | The maximum <i>Good To Go!</i> toll rate for 2-axle vehicles is \$4.10 on weekdays, and \$2.50 on weekends in FY 2017 as adopted by the Washington State Transportation Commission. The toll rates have been rounded to the nearest \$0.05 |
| | In FY 2017, Pay By Mail customers pay exactly \$2.00 above the <i>Good To Go!</i> toll rates. The Pay By Mail rates are rounded to the nearest \$0.05. |
| | Tolls for multi-axle vehicles (three or more axles) are set to the axle multiple of the per-axle rates for two-axle vehicles using the same payment method. |
| FY 2018 and beyond | |
| | The maximum <i>Good To Go!</i> toll rate for 2-axle vehicles is \$4.30 on weekdays, and \$2.65 on weekends in FY 2018 and beyond. |
| | In FY 2018 and beyond, Pay By Mail customers pay exactly \$2.00 above the <i>Good To Go!</i> toll rates. |
| | Weekday <i>Good To Go!</i> account-based tolls will increase approximately 5.2% on average from FY 2017 to FY 2018 (i.e. on July 1, 2017). |
| | Weekend <i>Good To Go!</i> account-based tolls will increase approximately 6.2% from FY 2017 to FY 2018 (i.e. on July 1, 2017). |
| | All toll rates will be rounded to the nearest \$0.05. |
| | Night time tolling (11pm - 5am) will be introduced starting in FY 2018. The night time account-based toll rate for 2-axle vehicles is \$1.25 on both weekdays and weekend days |
| | Tolls for multi-axle vehicles (three or more axles) will be set to the axle multiple of the per-axle rates for two-axle vehicles using the same payment method. |
| | No toll rate escalation is assumed after FY 2018. |
| Toll Exemptions | |
| | Toll exemptions currently in place (public/private buses, registered vanpools, State Police vehicles, bridge maintenance vehicles, emergency vehicles, tow trucks while responding to SR 520 calls, and vehicles owned and maintained by a foreign government) are continued. |
| | Carpools pay the same toll as single occupant vehicles (SOVs). |

Chapter 6

Updated Transactions and Gross Toll Revenue Potential

This chapter provides the results of the updated estimates of transactions and gross toll revenue potential for the revised baseline forecast. Taking into account the tolling experience to date, revised independent economic forecasts, and revised bridge configuration assumptions including closures, the methodology outlined in Chapter 5 was used to generate FY 2017 through FY 2056 transaction and gross toll revenue potential forecasts. This update is referred to as the November 2016 forecast.

Table 6-1 shows the SR 520 annual transactions and gross toll revenue potential updated forecast. Initially, annual growth in transactions and revenue is expected to generally follow recent trends. In FY 2018, the growth rate of transactions is lower than revenue primarily due to the 5% toll increase even though the beginning of night time tolling (from 11:00 pm to 5:00 am) brings additional transactions. After FY 2018, toll rates are assumed not to change, which makes the real value of the toll decline due to inflation. From FY 2019 through 2036, average transactions are expected to grow at a rate varying between approximately 1 and 6 percent annually, while revenue growth rates vary between approximately 1 and 5 percent. Strong growth in FY 2022 and FY 2023 can be attributed to much fewer assumed closures and the opening of three operational lanes in each direction to the Montlake interchange. Throughout the remainder of the forecast horizon, the growth rates of both transactions and revenue declines to well below 1 percent annually.

Table 6-2 shows the revised forecast compared to the November 2015 forecast for the entire study period; the same information is shown graphically on Figure 6-1. In the short term (FY 2017 through FY 2025), transactions are down in the November 2016 forecast compared to the November 2015 forecast. The change is about 2 percent in FY 2017, and about 1 percent in FY 2018 through FY 2025. This trend is mainly due to the re-benchmarking to match FY 2016 actuals, as well as reduced short term growth rates for weekday traffic based on recent trends. In the long term, transactions are up by about 0.4 percent in FY 2026 and thereafter in the November 2016 forecast compared to the November 2015 forecast, primarily due to the slightly higher socioeconomic forecast.

For revenue, the changes between forecasts are more pronounced than transactions. In the short term, the forecasted revenue is down or stable in the new forecast. In FY 2017, the November 2016 forecast is down by 3.6 percent compared to the previous forecast, due lower number of transactions as well as refined hourly profiles better aligned with recent observations leading to a lower share of traffic during peak hours. Revenue is down by 1 percent or less between FY 2018 and FY 2022 compared to the November 2015 forecast, before being nearly unchanged in FY 2023 through FY 2025. For FY 2026 and beyond, the forecasted gross toll revenue potential is slightly higher than the November 2015 forecast, with changes of about 1.6 to 1.8 percent, due to higher number of transactions and reduced share of account-based transactions.

Table 6-1: SR 520 Transactions and Gross Toll Revenue Potential – November 2016 Forecast

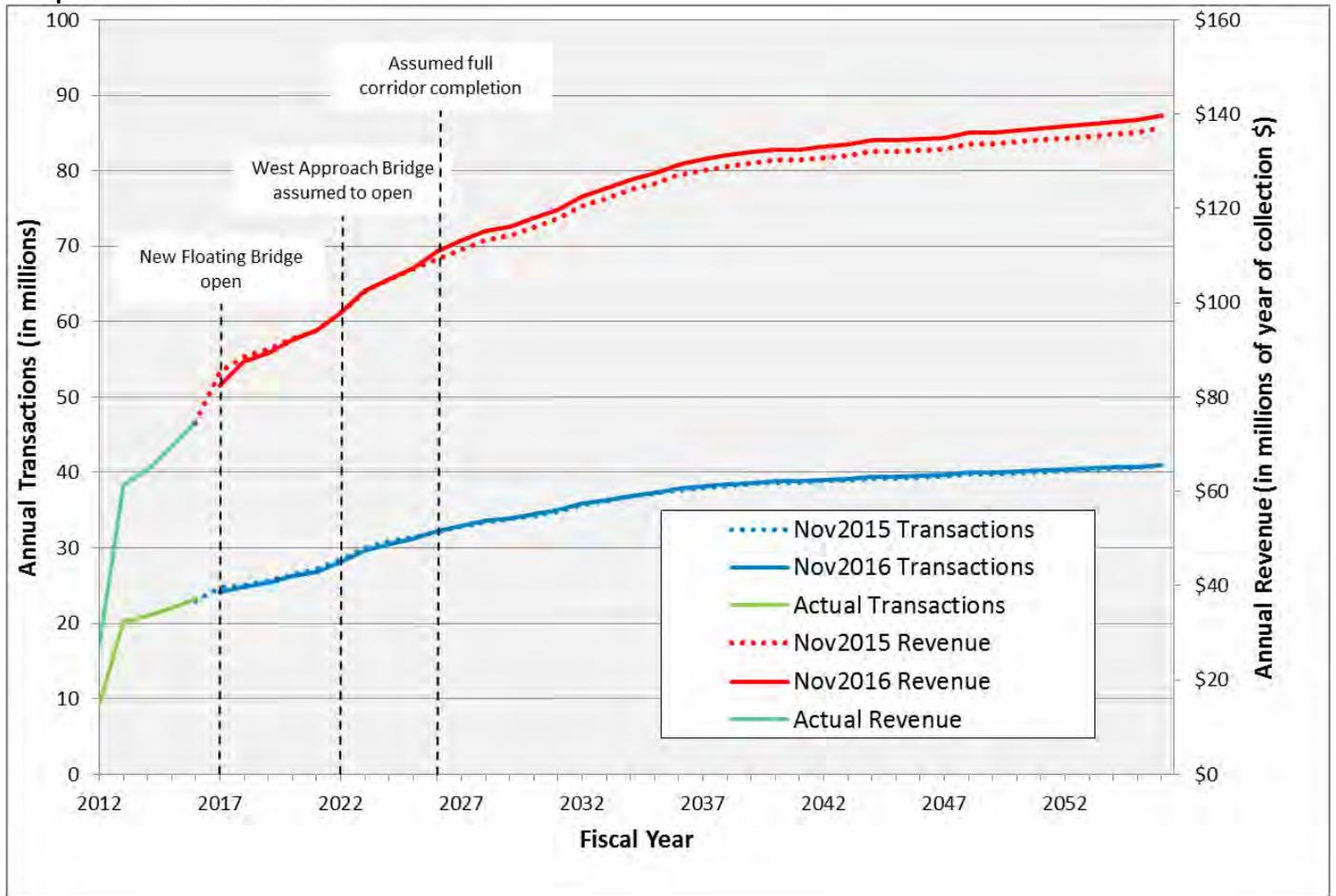
| Fiscal Year | Transactions (millions) | Annual Growth | Gross Toll Revenue Potential (millions of year of collection \$) | Annual Growth |
|-------------|-------------------------|---------------|------------------------------------------------------------------|---------------|
| 2017 | 24.190 | -- | \$82.371 | -- |
| 2018 | 24.806 | 2.5% | 87.589 | 6.3% |
| 2019 | 25.398 | 2.4% | 89.443 | 2.1% |
| 2020 | 26.230 | 3.3% | 92.146 | 3.0% |
| 2021 | 26.872 | 2.4% | 94.050 | 2.1% |
| 2022 | 28.075 | 4.5% | 97.875 | 4.1% |
| 2023 | 29.727 | 5.9% | 102.568 | 4.8% |
| 2024 | 30.521 | 2.7% | 104.966 | 2.3% |
| 2025 | 31.187 | 2.2% | 107.224 | 2.2% |
| 2026 | 32.222 | 3.3% | 110.950 | 3.5% |
| 2027 | 32.930 | 2.2% | 113.094 | 1.9% |
| 2028 | 33.559 | 1.9% | 115.145 | 1.8% |
| 2029 | 33.939 | 1.1% | 116.234 | 0.9% |
| 2030 | 34.463 | 1.5% | 117.907 | 1.4% |
| 2031 | 35.029 | 1.6% | 119.792 | 1.6% |
| 2032 | 35.826 | 2.3% | 122.511 | 2.3% |
| 2033 | 36.340 | 1.4% | 124.219 | 1.4% |
| 2034 | 36.899 | 1.5% | 126.103 | 1.5% |
| 2035 | 37.347 | 1.2% | 127.531 | 1.1% |
| 2036 | 37.887 | 1.4% | 129.366 | 1.4% |
| 2037 | 38.165 | 0.7% | 130.342 | 0.8% |
| 2038 | 38.443 | 0.7% | 131.263 | 0.7% |
| 2039 | 38.647 | 0.5% | 131.931 | 0.5% |
| 2040 | 38.851 | 0.5% | 132.542 | 0.5% |
| 2041 | 38.861 | 0.0% | 132.521 | 0.0% |
| 2042 | 39.037 | 0.5% | 133.170 | 0.5% |
| 2043 | 39.167 | 0.3% | 133.587 | 0.3% |
| 2044 | 39.420 | 0.6% | 134.443 | 0.6% |
| 2045 | 39.430 | 0.0% | 134.424 | 0.0% |
| 2046 | 39.517 | 0.2% | 134.607 | 0.1% |
| 2047 | 39.649 | 0.3% | 135.028 | 0.3% |
| 2048 | 39.952 | 0.8% | 136.134 | 0.8% |
| 2049 | 39.962 | 0.0% | 136.115 | 0.0% |
| 2050 | 40.096 | 0.3% | 136.541 | 0.3% |
| 2051 | 40.231 | 0.3% | 136.969 | 0.3% |
| 2052 | 40.397 | 0.4% | 137.364 | 0.3% |
| 2053 | 40.501 | 0.3% | 137.828 | 0.3% |
| 2054 | 40.637 | 0.3% | 138.261 | 0.3% |
| 2055 | 40.774 | 0.3% | 138.694 | 0.3% |
| 2056 | 41.037 | 0.6% | 139.584 | 0.6% |

Table 6-2: SR 520 Transactions and Gross Toll Revenue Potential – November 2016 Forecast and Comparison with November 2015 Forecast

| Fiscal Year | Transactions (millions) | | | Gross Toll Revenue Potential (millions of year of collection \$) | | |
|-------------|-------------------------|-------------------|--------|------------------------------------------------------------------|-------------------|--------|
| | November 2015 (1) | November 2016 (2) | Change | November 2015 (1) | November 2016 (2) | Change |
| 2017 | 24.715 | 24.190 | -2.1% | \$85.459 | \$82.371 | -3.6% |
| 2018 | 25.065 | 24.806 | -1.0% | 88.517 | 87.589 | -1.0% |
| 2019 | 25.679 | 25.398 | -1.1% | 90.090 | 89.443 | -0.7% |
| 2020 | 26.531 | 26.230 | -1.1% | 92.503 | 92.146 | -0.4% |
| 2021 | 27.187 | 26.872 | -1.2% | 94.098 | 94.050 | -0.1% |
| 2022 | 28.390 | 28.075 | -1.1% | 97.949 | 97.875 | -0.1% |
| 2023 | 30.012 | 29.727 | -0.9% | 102.527 | 102.568 | 0.0% |
| 2024 | 30.803 | 30.521 | -0.9% | 104.913 | 104.966 | 0.1% |
| 2025 | 31.483 | 31.187 | -0.9% | 107.173 | 107.224 | 0.0% |
| 2026 | 32.101 | 32.222 | 0.4% | 109.223 | 110.950 | 1.6% |
| 2027 | 32.798 | 32.930 | 0.4% | 111.286 | 113.094 | 1.6% |
| 2028 | 33.424 | 33.559 | 0.4% | 113.278 | 115.145 | 1.6% |
| 2029 | 33.797 | 33.939 | 0.4% | 114.309 | 116.234 | 1.7% |
| 2030 | 34.318 | 34.463 | 0.4% | 115.926 | 117.907 | 1.7% |
| 2031 | 34.884 | 35.029 | 0.4% | 117.764 | 119.792 | 1.7% |
| 2032 | 35.679 | 35.826 | 0.4% | 120.434 | 122.511 | 1.7% |
| 2033 | 36.189 | 36.340 | 0.4% | 122.103 | 124.219 | 1.7% |
| 2034 | 36.746 | 36.899 | 0.4% | 123.951 | 126.103 | 1.7% |
| 2035 | 37.188 | 37.347 | 0.4% | 125.336 | 127.531 | 1.8% |
| 2036 | 37.725 | 37.887 | 0.4% | 127.138 | 129.366 | 1.8% |
| 2037 | 38.005 | 38.165 | 0.4% | 128.100 | 130.342 | 1.8% |
| 2038 | 38.281 | 38.443 | 0.4% | 128.999 | 131.263 | 1.8% |
| 2039 | 38.484 | 38.647 | 0.4% | 129.649 | 131.931 | 1.8% |
| 2040 | 38.683 | 38.851 | 0.4% | 130.235 | 132.542 | 1.8% |
| 2041 | 38.691 | 38.861 | 0.4% | 130.206 | 132.521 | 1.8% |
| 2042 | 38.870 | 39.037 | 0.4% | 130.850 | 133.170 | 1.8% |
| 2043 | 39.000 | 39.167 | 0.4% | 131.253 | 133.587 | 1.8% |
| 2044 | 39.252 | 39.420 | 0.4% | 132.092 | 134.443 | 1.8% |
| 2045 | 39.260 | 39.430 | 0.4% | 132.063 | 134.424 | 1.8% |
| 2046 | 39.341 | 39.517 | 0.4% | 132.224 | 134.607 | 1.8% |
| 2047 | 39.473 | 39.649 | 0.4% | 132.632 | 135.028 | 1.8% |
| 2048 | 39.779 | 39.952 | 0.4% | 133.728 | 136.134 | 1.8% |
| 2049 | 39.788 | 39.962 | 0.4% | 133.700 | 136.115 | 1.8% |
| 2050 | 39.921 | 40.096 | 0.4% | 134.112 | 136.541 | 1.8% |
| 2051 | 40.054 | 40.231 | 0.4% | 134.527 | 136.969 | 1.8% |
| 2052 | 40.211 | 40.397 | 0.5% | 134.887 | 137.364 | 1.8% |
| 2053 | 40.323 | 40.501 | 0.4% | 135.359 | 137.828 | 1.8% |
| 2054 | 40.457 | 40.637 | 0.4% | 135.776 | 138.261 | 1.8% |
| 2055 | 40.593 | 40.774 | 0.4% | 136.196 | 138.694 | 1.8% |
| 2056 | 40.855 | 41.037 | 0.4% | 137.067 | 139.584 | 1.8% |

1. November 2015 Traffic and Revenue Forecast by CDM Smith
2. November 2016 Traffic and Revenue Forecast by CDM Smith.

Figure 6-1: SR 520 Transactions and Gross Toll Revenue Potential – November 2016 Forecast and Comparison with November 2015 Forecast



Chapter 7

Sensitivity Tests

This chapter includes the results of a series of tests conducted to measure the sensitivity of baseline forecasts to changes in key study assumptions. The assumptions varied in the tests are those that present risks and have a potential impact on the magnitude of the revenue estimates.

The following sensitivity tests were performed for the years indicated in conjunction with the forecast update:

- Toll rate sensitivity (FY 2018)
- Regional growth (FY 2018, FY 2022, and FY 2031)
- Account-based participation rate (FY 2018, FY 2022, and FY 2031)

Each test was performed individually. The results are not necessarily additive and do not provide an estimate of the overall impact if they were to occur simultaneously.

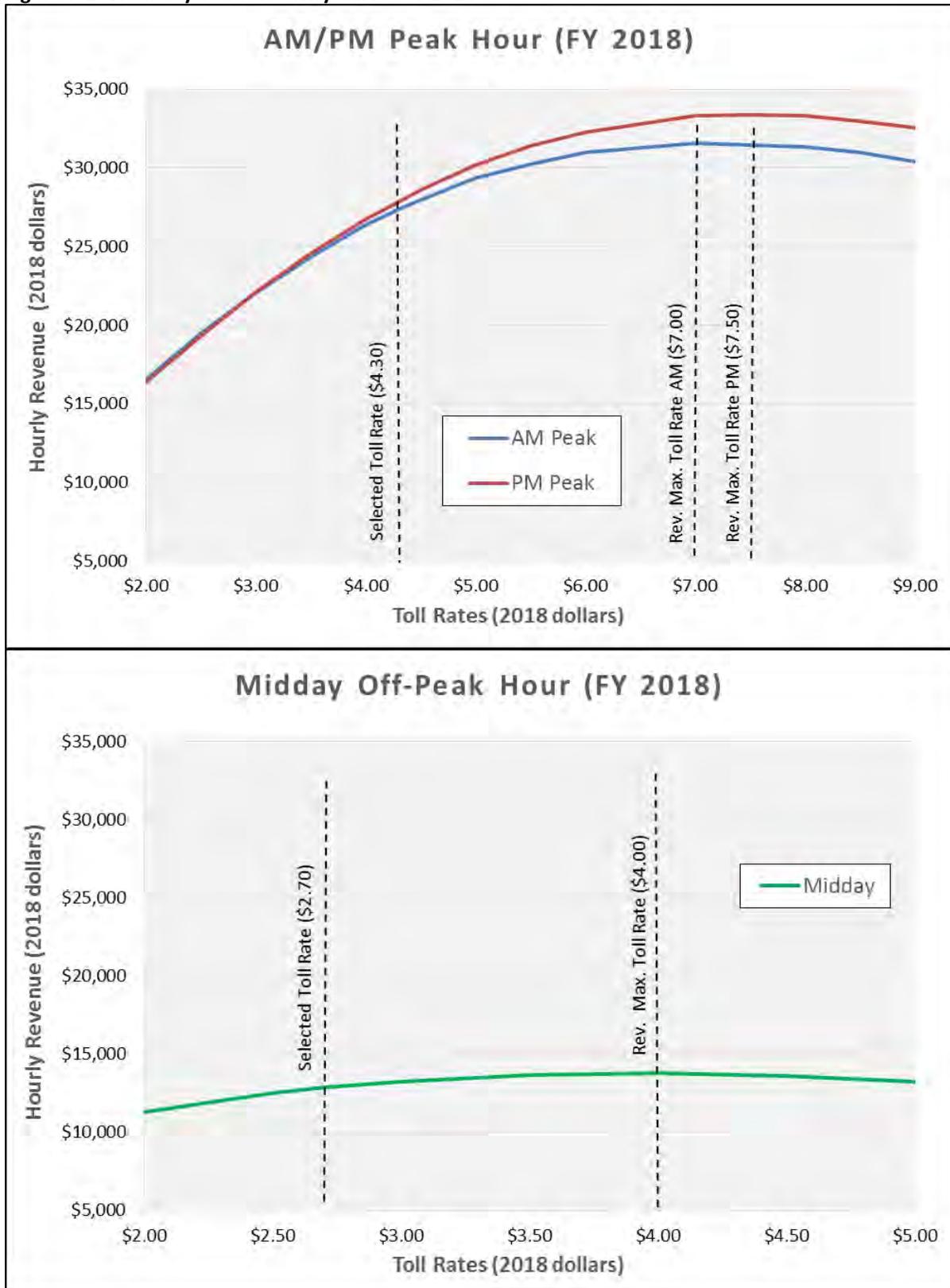
Toll Rate Sensitivity

A range of toll rates from \$2.00 to \$9.00 during peak hours and from \$2.00 to \$5.00 during the midday was modeled using the tolling analysis model for FY 2018. These toll rates are expressed in year of collection dollars (FY 2018). For each toll rate, the corresponding revenue was computed to develop toll sensitivity curves for AM peak, midday, and PM peak periods.

Figure 7-1 shows toll sensitivity curves for FY 2018. The graphs show where the selected toll rates fall on the sensitivity curves (\$4.30 for peak hours and \$2.70 for midday). Revenue maximization is obtained at toll rates corresponding to the crest of the revenue curve. As indicated on the figure, the selected toll rates are lower than the revenue maximization toll rates.

The FY 2018 selected peak period toll rate of \$4.30 is estimated to generate 87 and 84 percent of the maximum revenue during the AM and PM peak periods, respectively. During the off-peak (midday) period in FY 2018, the selected toll rate of \$2.70 is estimated to generate 93 percent of the maximum revenue.

Figure 7-1: Weekday Toll Sensitivity Curves FY 2018



Regional Growth

Using the downside economic forecast developed by CAI as part of the November 2015 forecast, the tolling analysis model was run to determine transactions and gross toll revenue potential under lower economic growth conditions. Under the downside scenario, the employment and population growth rates were generally reduced by 50 percent from the baseline socioeconomic forecast. The results are presented in Table 7-1.

For FY 2018, under the economic downside scenario, regional population and employment totals are reduced by approximately 2 and 3 percent, respectively. Transactions and revenue are expected to be about 3 percent lower.

For FY 2022, under the economic downside scenario, regional population and employment totals are reduced by approximately 4 and 5 percent, respectively. Transactions and revenue are expected to be about 6 percent lower.

For FY 2031, under the economic downside scenario, regional population and employment totals are reduced by approximately 9 percent when compared to the baseline. Transactions and revenue are expected to be about 10 percent lower.

Table 7-1: Regional Growth Sensitivity Test

| Growth Scenario | Transactions ¹ | Gross Toll Revenue Potential ² |
|----------------------------|---------------------------|-------------------------------------------|
| FY 2018³ | | |
| Baseline | 24.806 | \$87.589 |
| Downside Socioeconomic | 24.082 | \$84.969 |
| <i>Percent Difference</i> | -2.9% | -3.0% |
| FY 2022³ | | |
| Baseline | 28.075 | \$97.875 |
| Downside Socioeconomic | 26.391 | \$91.945 |
| <i>Percent Difference</i> | -6.0% | -6.1% |
| FY 2031 | | |
| Baseline | 35.029 | \$119.792 |
| Downside Socioeconomic | 31.482 | \$107.697 |
| <i>Percent Difference</i> | -10.1% | -10.1% |

1. In millions

2. In millions of year of collection dollars

3. FY 2018 and FY 2022 results incorporate impact of closures

Account-based Participation Rate

This test examined the difference in transactions and revenue if account-based participation rates were different from those assumed in the baseline scenario.

The overall output transaction *Good To Go!* share for the baseline scenario is 84 percent in FY 2018, 85 percent in FY 2022, and 87 percent in FY 2031. The account-based participation rate sensitivity test evaluated an increase to 87 percent in FY 2018, 90 percent in FY 2022, and 92 percent in FY 2031.

The results of the tests are shown in Table 7-2. The higher account-based participation rate results in transactions increasing by 1.0 percent in FY 2018, 1.2 percent in FY 2022, and 0.6 percent in FY 2031. Under this scenario, gross toll revenue potential would be expected to decline by 0.5 percent in FY 2018, by 1.4 percent in FY 2022, and by 2.6 percent in FY 2031.

Table 7-2: Account-based Participation Rate Sensitivity Test

| <i>GTG!</i> Rate Scenario | Overall <i>GTG!</i> Rate | Transactions ¹ | Gross Toll Revenue Potential ² |
|----------------------------|--------------------------|---------------------------|-------------------------------------------|
| FY 2018³ | | | |
| Baseline | 84.3% | 24.806 | \$87.589 |
| Higher <i>GTG!</i> Rate | 86.6% | 25.046 | \$87.176 |
| <i>Percent Difference</i> | | 1.0% | -0.5% |
| FY 2022³ | | | |
| Baseline | 85.3% | 28.075 | \$97.875 |
| Higher <i>GTG!</i> Rate | 89.6% | 28.406 | \$96.483 |
| <i>Percent Difference</i> | | 1.2% | -1.4% |
| FY 2031 | | | |
| Baseline | 87.2% | 35.029 | \$119.792 |
| Higher <i>GTG!</i> Rate | 92.3% | 35.223 | \$116.677 |
| <i>Percent Difference</i> | | 0.6% | -2.6% |

1. In millions

2. In millions of year of collection dollars

3. FY 2018 and FY 2022 results incorporate impact of closures

DISCLAIMER

CDM Smith used currently-accepted professional practices and procedures in the development of the traffic and revenue estimates in this report. However, as with any forecast, it should be understood that differences between forecasted and actual results may occur, as caused by events and circumstances beyond the control of the forecasters. In formulating the estimates, CDM Smith reasonably relied upon the accuracy and completeness of information provided (both written and oral) by the Washington State Department of Transportation (WSDOT). CDM Smith also relied upon the reasonable assurances of independent parties and is not aware of any material facts that would make such information misleading.

CDM Smith made qualitative judgments related to several key variables in the development and analysis of the traffic and revenue estimates that must be considered as a whole; therefore, selecting portions of any individual result without consideration of the intent of the whole may create a misleading or incomplete view of the results and the underlying methodologies used to obtain the results. CDM Smith gives no opinion as to the value or merit of partial information extracted from this report.

All estimates and projections reported herein are based on CDM Smith's experience and judgment and on a review of information obtained from multiple agencies, including WSDOT. These estimates and projections may not be indicative of actual or future values, and are therefore subject to substantial uncertainty. Future developments cannot be predicted with certainty, and may affect the estimates or projections expressed in this report, such that CDM Smith does not specifically guarantee or warrant any estimate or projection contained within this report.

While CDM Smith believes that the projections and other forward-looking statements contained within the report are based on reasonable assumptions as of the date of the report, such forward-looking statements involve risks and uncertainties that may cause actual results to differ materially from the results predicted. Therefore, following the date of this report, CDM Smith will take no responsibility or assume any obligation to advise of changes that may affect its assumptions contained within the report, as they pertain to socioeconomic and demographic forecasts, proposed residential or commercial land use development projects and/or potential improvements to the regional transportation network.

CDM Smith is not, and has not been, a municipal advisor as defined in Federal law (the Dodd Frank Bill) to WSDOT and does not owe a fiduciary duty pursuant to Section 15B of the Exchange Act to WSDOT with respect to the information and material contained in this report. CDM Smith is not recommending and has not recommended any action to WSDOT. WSDOT should discuss the information and material contained in this report with any and all internal and external advisors that it deems appropriate before acting on this information.



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