Thurston Regional Planning Council

UPDATED TELEWORK/COMPRESSED WORK WEEK AND ONLINE SHOPPING AND SERVICE ASSUMPTIONS

FOR THURSTON REGIONAL PLANNING COUNCIL 2045 TRAVEL DEMAND MODELS
April 2021

1. BACKGROUND

This document provides documentation on TRPC's transportation model assumptions for telework/compressed work week participation, and online shopping and services. The purpose of the update is to:

- Develop updated assumptions for telework/compressed work week for the 2045-time horizon, anticipating that a "new normal" will be achieved after recovery from the COVID-19 pandemic on the acceptance and desire to telework.
- Develop updated assumptions for online shopping and services.
- Tie the model results to "real life" changes due to COVID-19

While it is difficult to predict the future, the COVID-19 pandemic, and associated change in travel behavior has given us additional data to test how TRPC's travel demand models in the EMME and Dynameq platforms can mimic resulting changes in travel patterns.

The updated assumptions will be used in the ongoing I-5 Planning and Environmental Linkages Study that is looking at a range of mid- and long-term improvements to increase mobility on the I-5 corridor from Tumwater to Mounts Road. They will also be used in various studies that utilize TRPC's travel demand models.

2. PREVIOUS ASSUMPTION

The model assumption used previously was that 25 percent of both government and service workers would telework or work from home at least one day a week by 2045. This resulted in an overall trip reduction of 0.5 percent. There were no assumptions for changes to online shopping or online access to services.

3. VARIABLES AND ALTERNATIVES

The study team put together a range of alternatives to see if the models could better capture the effects of telework and compressed work schedules and online shopping and services on trip reduction. The alternatives ranged from the previous assumption, a 5 percent reduction for telework/compressed work weeks, to a full-COVID shutdown alternative, as outlined in Table A1. The goal was to try to mimic both full-COVID shutdown and Phase 2/3 recovery, and a post-recovery scenario.

Telework and Compressed Work Week Assumptions

A range of telework and compressed work week assumptions were tested to gauge the sensitivity of the model (Alternatives 2-4). Telework/compressed work week participation is often collected on surveys in two parts, what percent of the work force, and how often. Table 1 shows the relationship of those two factors and the percent reduction factor applied in the travel demand models.

Table 1: Relationship of percent of work force and frequency to reduction factor

What Percent of Work Force?	How Often?	Applied as Percent reduction to workers
25% of workers telework or have a compressed work week	1 day a week	5% reduction
25% of workers telework or have a compressed work week	3 day a week	15% reduction
50% of workers telework or have a compressed work week	3 day a week	30% reduction
66% of workers telework or have a compressed work week	3 day a week	40% reduction
80% of workers telework or have a compressed work week	3 day a week	48% reduction
80% of workers telework or have a compressed work week	5 days a week	80% reduction
90% or workers telework or have a compressed work week	5 days a week	90% reduction

Trips Associated with Commute Trips
Trip making characteristics from the TRPC household travel survey show that that reducing the number of home to work trips would also lead to reduction in other types of trips, such as home to shopping or home to other (stops on the way to and from work), or non-home based trips (trips from work to eat or do errands) trips (see Figures 1 and 2). Recognizing that reductions in commute trips also had an impact on associated trips, the study team adjusted these trips as indicated by data from TRPC's household travel survey. TRPC's Household Travel shows that during the day, on average, for every work trip there are 0.65 non-home based trips generated:

- 21% are work related
- 9% are school related
- 16% are shopping related
- 54% are related to other purposes

Online Shopping and Access to Services
The COVID-19 Pandemic has also led to an increase in online shopping and access to online services such as medical appointments or obtaining building permits or renewing driver's licenses. A series of alternatives were developed to test the sensitivity of the models to these changes.

The model alternatives incorporate the changes by decreasing home-based shopping and home-based other trip attractions.

Remote Learning
The COVID-19 Pandemic also led to a replacement of in-school learning to online learning. Two alternatives were developed to reflect those conditions by reducing home-based school and home-based college trips.

Figure 1: Example travel day without telework. Each leg is a trip in the travel demand model

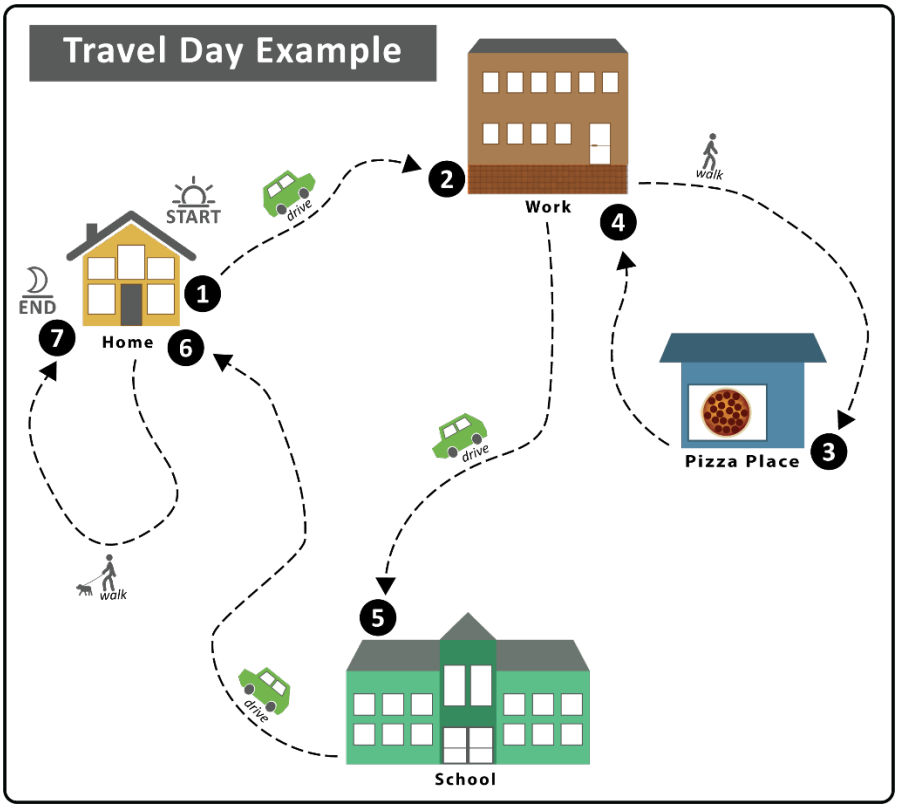
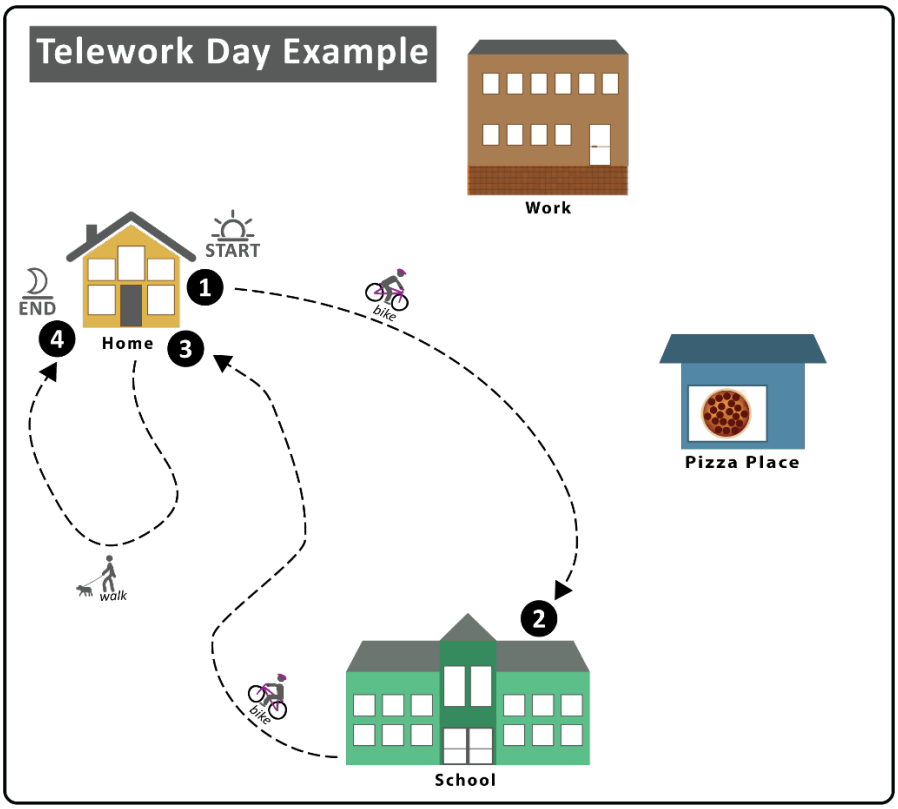


Figure 2: Example travel day with telework. Each leg is a trip in the travel demand model



4. CALIBRATION TO COVID-19 TRAVEL PATTERNS

Overall Reductions

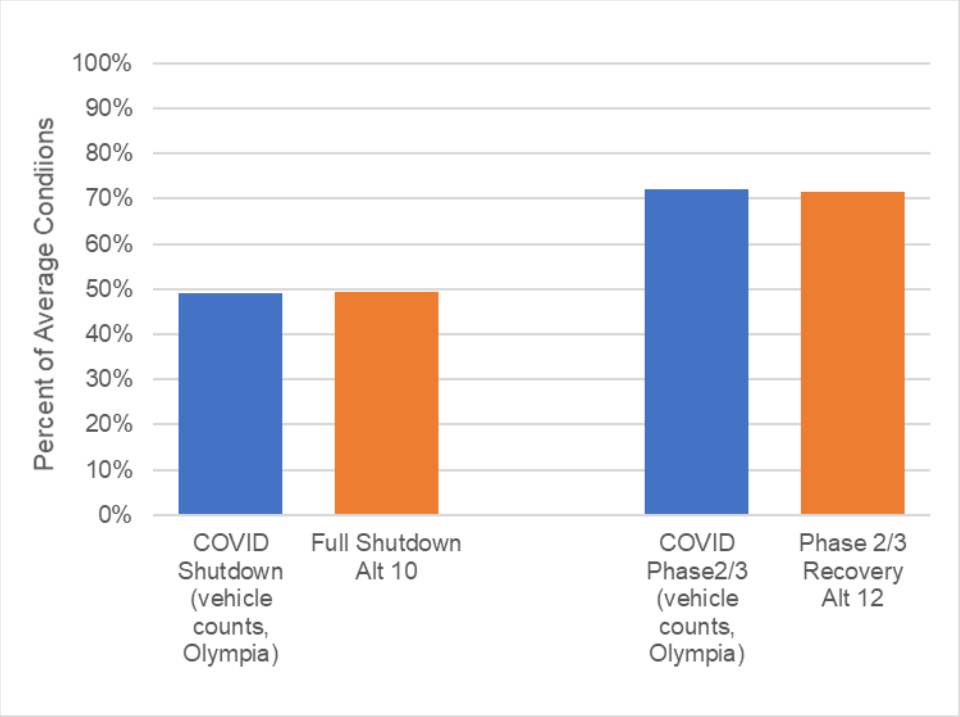
Figure 3 shows two model alternatives that were built to mimic COVID Full Shutdown and Phase 2/3 Recovery conditions.

Transportation models are traditionally calibrated/validated to traffic counts. Traffic counts taken during the changing travel patterns resulting from the COVID-19 Pandemic and subsequent stay at home orders and recovery plans, provided the study team data for additional model calibration/validation. As the focus of this effort was to develop 2045 Model Assumptions, all differences between normal conditions and COVID-19 traffic patterns are reported as percentages, either percent reductions, or percent of normal conditions.

As the first screening, the study team compared percent reduction in model total daily trips to traffic counts. Both were compared to “normal” conditions:

- Normal model conditions 2045 Land use with no additional telework or compressed work week assumptions measured in total daily trips (all modes) for the entire model (Thurston County, Lewis County, Grays Harbor County, and parts of Mason and Pierce Counties)
- Normal traffic count conditions were average weekday volumes for the respective month for either 2019, collected by the City of Olympia for the city extents. City data were used rather than Interstate 5 data because they were felt to better represent total daily trips as generated by the model, as Interstate trips tend to have a lot of through trips.

Figure 3. Percent of trips for each alterative compared to base conditions



COVID Phase 2/3 Recovery Scenario
During COVID full shutdown conditions (April 2020), traffic volumes dropped across the region, ranging from a 37 percent to 58 reduction, with an average of 49 percent. There was no noticeable difference between reductions on state freeways and local roads.

In comparison, by September 2020, as things opened up and the region was in Phase 2/3 recovery, there was a marked difference between traffic reductions between state freeways and local roads. On US 101 and I-5, reductions averaged around 13 percent, while on local Olympia roads, the reductions averaged 28 percent.

September 2020 is the most recent period counts were available. The COVID Phase 2/3 scenario (Alternative 12) was assigned to the transportation model network to see if the model reflected the reductions in the correct locations. Figures 6 and 7 and Table 3 show the results.

Some of the key components of this scenario include:
For Thurston, Pierce, and Lewis Counties

- 80% reduction in government job commute trips due to telework and compressed work weeks
- 25% reduction in service job commute trips due to telework and compressed work weeks, and shut down of services
- Reduction in trips related to commute trips (based on household survey relationships)
- 100% reduction in college and school trips due to remote learning and associated reduction in teachers and staff
- 15% reduction in retail (shopping) trips due to restrictions and increased online shopping and an associated reduction in work commute trips for retail employees
- 65% reduction in trips to government locations to receive government services
- 25% reduction in trips to non-government services

These reductions include both telework and remote learning, and related trips, as well as an increase in on-line shopping and on-line access to services such as medical appointments, as well as a reduction in shopping, eating out, or accessing services due to the pandemic.

For Grays Harbor and Mason Counties, reductions were less aggressive (cut by 80 percent) for trips related to telework/compressed work week and accessing government and general services. This was a reflection that Thurston County was the seat of State government and continued to implement telework more robustly than adjacent counties during Phase 2/3 recovery.

Time of Day
The model reports data for the afternoon (PM) peak period. The I-5 and US 101 traffic counts were available hourly, and the data indicates very little difference in the time of day pattern in September 2020, as compared to September 2019/2018.

Figure 4: Northbound I-5 September Mid-Week Average Hourly Volumes

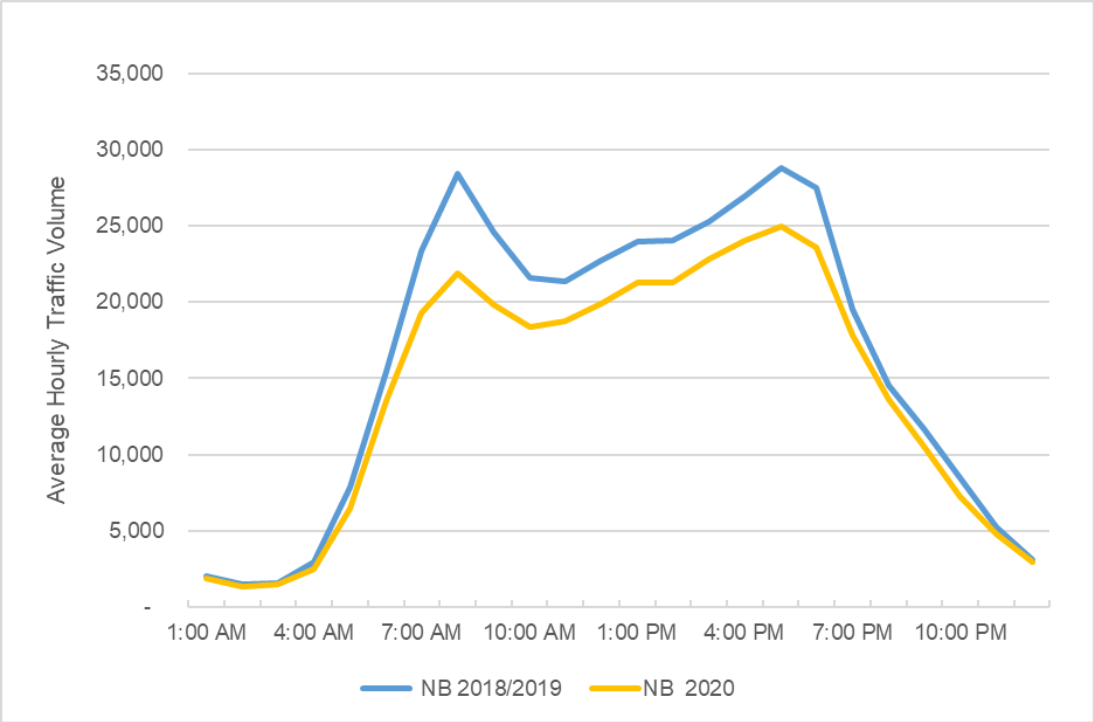


Figure 5: Southbound I-5 September Mid-Week Average Hourly Volumes

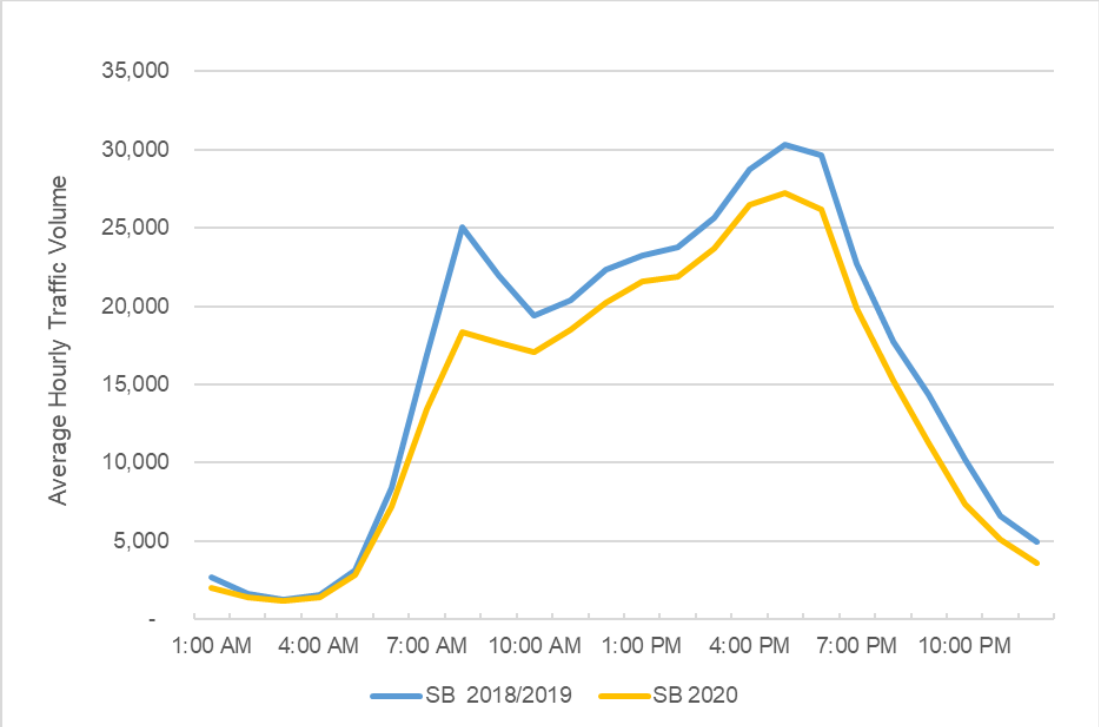


Figure 6: COVID Phase 2/3 Recovery conditions – reductions in traffic counts compared to model volumes (Alternative 12) for I-5 and US 101

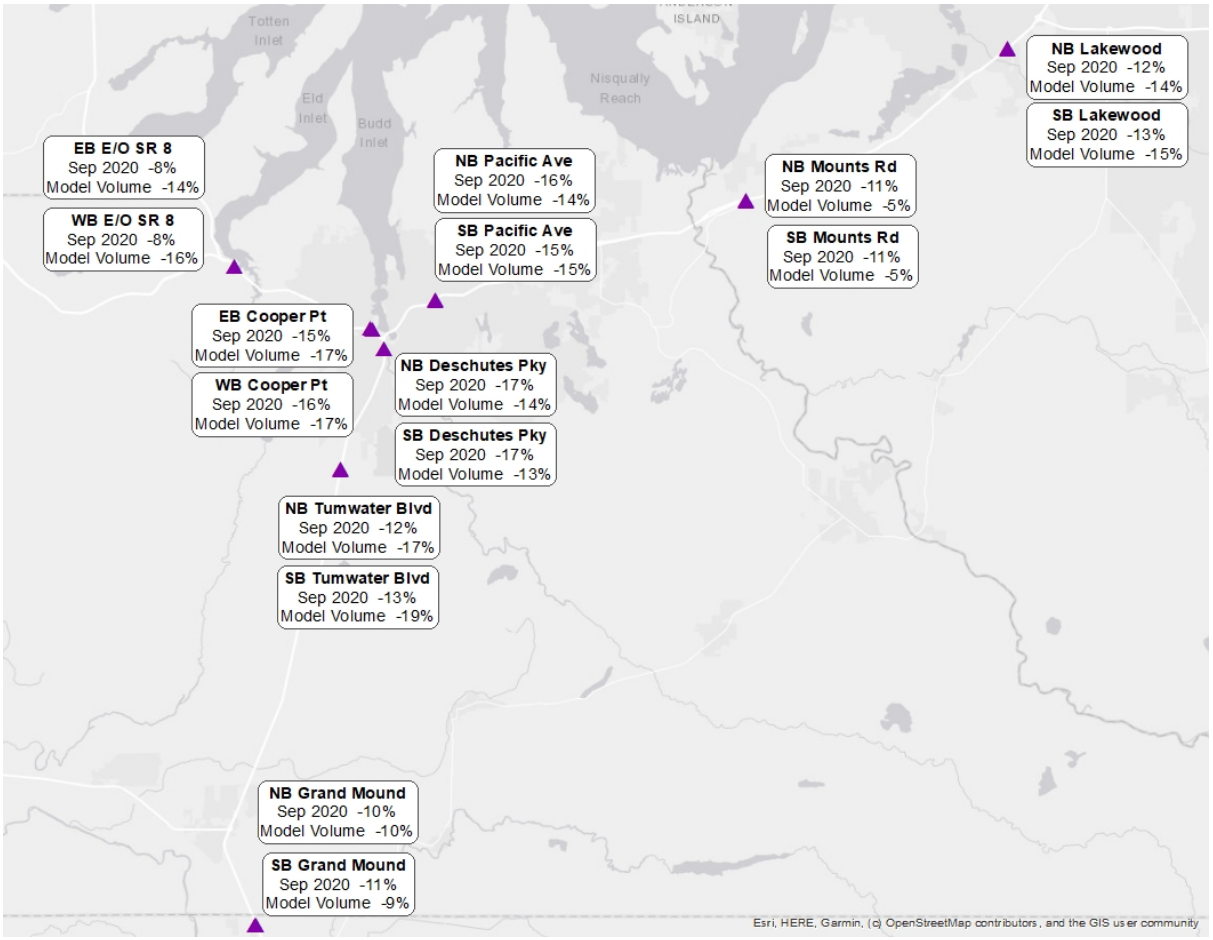
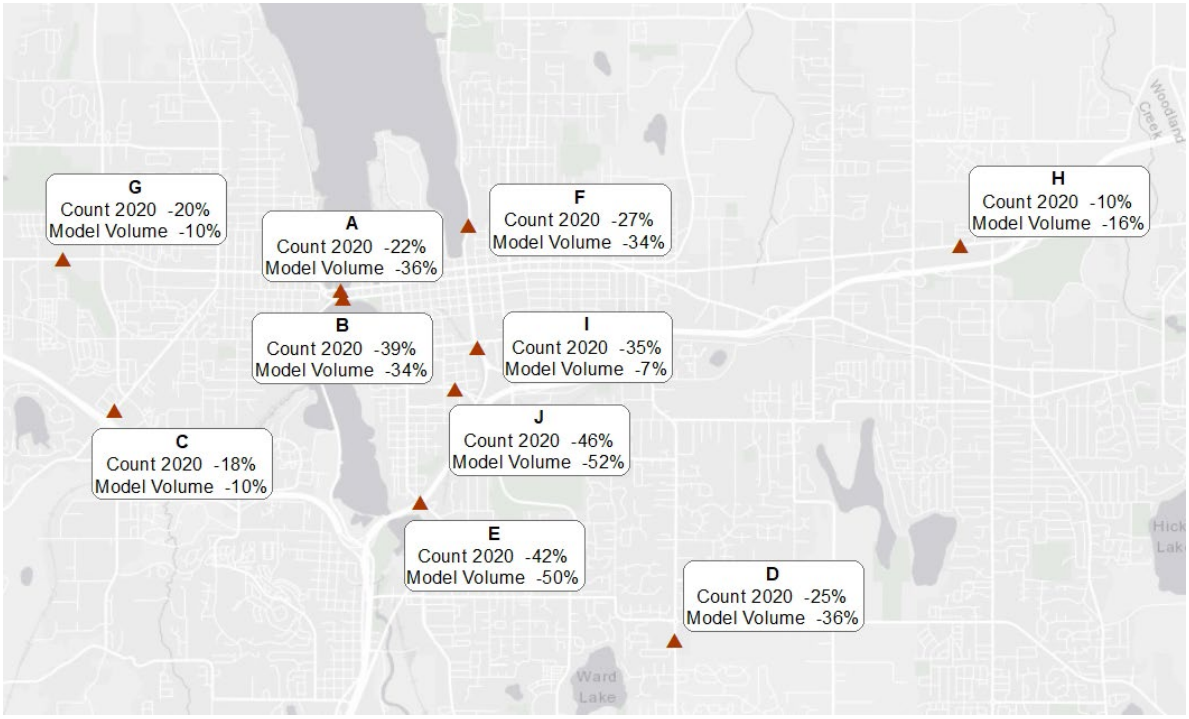


Figure 7: COVID Phase 2/3 Recovery conditions – reductions in traffic counts compared to model volumes (Alternative 12) for local roads



MAP KEY	
ID	**Location**
A	4th Ave Bridge
B	5th Ave Bridge
C	Black Lake Blvd north of US 101
D	Boulevard Rd south of Log Cabin Rd
E	Capitol Blvd @ I-5 Overpass
F	East Bay Dr north of Glass Ave
G	Harrison Ave east of Yauger Way
H	Martin Way east of Sleater-Kinney Rd
I	Plum St South of Union Ave
J	14th east of Jefferson Ave

Table 3: COVID Phase 2/3 Recovery conditions – reductions in traffic counts compared to model volumes (Alternative 12)

Interstate 5 and US 101		**Reduction in Traffic Count**	**Model Reduction**
US 101 @ east of SR 8	EB	-8%	-14%
	WB	-8%	-16%
US 101 @ Cooper Point Road	WB	-15%	-17%
	EB	-16%	-17%
I - 5 @ Grand Mound	NB	-10%	-10%
	SB	-11%	-9%
I - 5 @ Tumwater Boulevard	NB	-12%	-17%
	SB	-13%	-19%
I - 5 @ Deschutes Parkway	NB	-17%	-14%
	SB	-17%	-13%
I - 5 @ Pacific Avenue	NB	-16%	-14%
	SB	-15%	-15%
I - 5 @ Mounts Road	NB	-11%	-5%
	SB	-11%	-5%
I - 5 @ Lakewood (SR 512)	NB	-12%	-14%
	SB	-13%	-15%
I-5 and US 101 Average		**-13%**	**-13%**
City of Olympia			
4th Avenue Bridge		-22%	-36%
5th Avenue Bridge		-39%	-34%
Black Lake Boulevard north of SR-101		-18%	-10%
Boulevard Road south of Log Cabin Road		-25%	-36%
Capitol Boulevard at I-5 Overpass		-42%	-50%
East Bay Drive north of Glass Avenue		-27%	-34%
Harrison Avenue east of Yauger Way		-20%	-10%
Martin Way east of Sleater-Kinney Road		-10%	-16%
Plum Street south of Union Avenue		-35%	-7%
Jefferson and 14th Avenue		-46%	-52%
Olympia Average		**-28%**	**-29%**
Overall Average		**-19%**	**-19%**

Summary

Overall, the model reflects traffic counts quite well. One of the exceptions was the Plum Street (south of Union Avenue) location, where the traffic counts showed a much greater reduction than the model. In the 2045 Average Conditions model, the Plum Street onramp onto southbound I-5 was showing a great deal of delay, which was not in Alternative 12, mainly due to traffic volumes coming from the State Capitol Campus being greatly reduced for that alternative. The change in delay at this location led to a re-distribution of travel patterns, leading to more traffic on Plum Street than anticipated.

5. RECOMMENDATION FOR 2045 TELEWORK/COMPRESSED WORK WEEK SCENARIO

Alternative 13 was developed by modifying the assumptions in Alternative 12 (Phase 2/3 COVID-19 Recovery scenario) to reflect a return to a “new normal.” It represents an overall 9 percent reduction in total trips, compared to 2045 Assumptions without additional telework or compressed work week reductions. For comparison, the original model assumption resulted in less than one percent reduction.

This alternative leads to an overall:

- 25% increase in trips compared to Base 2018 conditions
- 7% increase in trips compared to Base 2030 conditions

Some of the key components of this scenario include:

For Thurston, Pierce, and Lewis Counties

- 40% reduction in government job commute trips due to telework and compressed work weeks. As a comparison, in a survey of Washington State employees (fall 2020), a commute reduction rate of 54% was indicated (See Appendix C). No comparable surveys have been conducted for federal or local employees.
- 15% reduction in service job commute trips due to telework and compressed work weeks, and shut down of services
- Reduction in trips related to commute trips (based on household survey relationships)
- No reduction in college and school trips due to remote learning and associated reduction in teachers and staff, the assumption being that local schools, colleges, and universities will return to in-person teaching.
- 10% reduction in retail (shopping) trips due to restrictions and increased online shopping and an associated reduction in work commute trips for retail employees
- 20% reduction in trips to government locations to receive government services
- 10% reduction in trips to non-government services

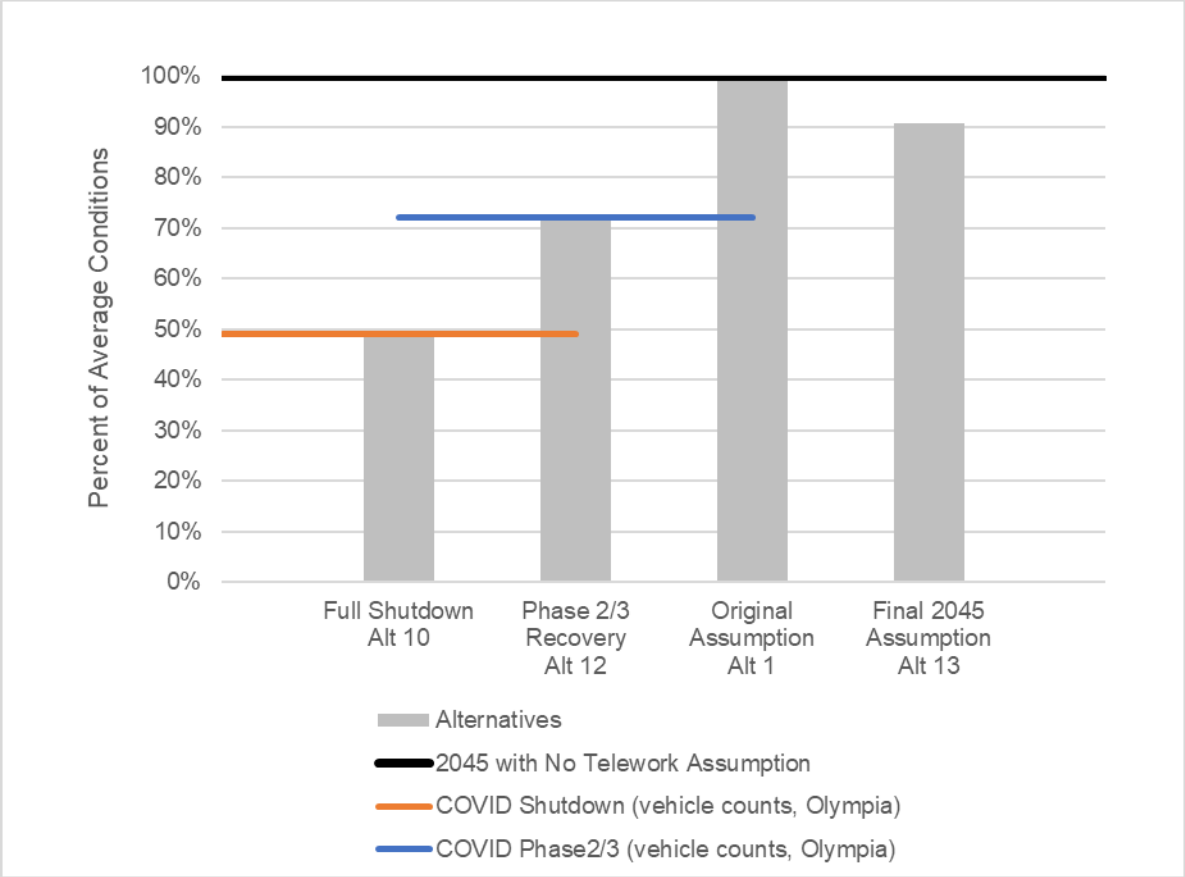
The final 2045 assumptions compared to the Phase 2/3 Recovery Scenario and the original 2045 Assumptions were as follows.

Table 4: Comparison of assumptions for various scenarios

	Alternative 1 Funded Base Original 2045 Percent reduction*	**Alternative 13** Final 2045 Assumptions "Post COVID New Normal" Percent reduction*	**Alternative 12** COVID Phase 2/3 Recovery Scenario Percent reduction*
1) Government Telework Rates (excluding education)	5%	40%	80%
2) Other telework eligible type of jobs telework rates	5%	15%	25%
3) Shopping trends unrelated to work trips, such as online shopping	None	10%	15%
4) Online access to government services	None	20%	65%
5) Online access to other services (medical, etc.)	None	10%	25%
6) Online school	None	0%	100%
7) Online college (higher education)	None	0%	100%
Overall Reduction in Trips	**0.05%**	**9%**	**29%**

*Reductions are compared to 2045 baseline conditions with no telework/compressed work week reductions.

Figure 8: Overall trip reductions for the various scenarios



APPENDIX A: SCENARIO DETAILS

Several variables were used in developing the alternatives, including:

- The percent of workers teleworking or having a compressed work week schedule
- The number of times a week they telework or do not work due to a compressed work week schedule
- The percent of shopping and access to services that shifted from in-person to online, and an associated reduction in employment
- The type of employment classification (landuse/jobs)
  - Government
  - Service
  - Retail
- The trip purpose
  - Home based work (HBW)
  - Home based college (HBCol)
  - Home based shopping (HBShp)
  - Home based other (HBO)
  - Non-home based (NHB)
  - Home based school (HBSch)

Table A1: Alternatives and Purpose

Alternative	Brief Description	Purpose
1	Existing assumption	
2-3	Staff estimate reduced alternatives	Developed to test sensitivity of initial telework assumptions
4	Initial Staff Estimate: Estimate from WSDOT and TRPC Commute Trip Reduction staff	Starting point
5-9 and 11	Estimate between initial staff estimate and COVID Full Shutdown scenario (10)	More aggressive scenarios developed
10	COVID – Full shutdown	To calibrate against full shut-down reductions
12	COVID – Phase 2/3 Conditions	To calibrate against Phase 2/3 traffic reductions
13	Final Scenario	Recommended 2045 Scenario (based on a combination of alternatives)

Table A2. Trip Reduction Assumptions - Percent by Employment Classification

Trip Purpose	Funded Base Alt 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8	Alternative 9*
Home based work (HBW)	5%Govt 5%Service	15%Govt 5%Service	30%Govt 5%Service	48%Govt 5%Service	48%Govt 15%Service	48%Govt 25%Service	48%Govt 48%Service	48%Govt 25%Service	48%Govt 25%Service
Home based college (HBCol)	0%	0%	0%	0%	0%	0%	0%	0%	0%
Home based shopping (HBShp)	0%	0%	0%	0%	15%Retail	25%Retail	25%Retail	25%Retail	25%Retail
Home based other (HBO)	0%	0%	0%	0%	15%Govt 15%Service	25%Govt 25%Service	48%Govt 48%Service	48%Govt 38%Service	48%Govt 38%Service
Non-home based (NHB)	0%	0%	0%	0%	18%	18%	30%	23%	23%
Home based school (HBSch)	0%	0%	0%	0%	0%	0%	0%	0%	0%

Trip Purpose	Alternative 10	Alternative 11	Alternative 12*	Alternative 13*
Home based work (HBW)	90%Govt 70%Service	48%Govt 15%Service	80%Govt 25%Service	40%Govt 15%Service
Home based college (HBCol)	100%	0%	100%	0%
Home based shopping (HBShp)	40%Retail	15%Retail	15%Retail	10%Retail
Home based other (HBO)	90%Govt 70%Service	48%Govt 15%Service	65%Govt 25%Service	20%Govt 10%Service
Non-home based (NHB)	42%	18%	20%	10%
Home based school (HBSch)	100%	0%	100%	0%

Note: * Grays Harbor County, Mason County - HBW 20% of Thurston County and HBO 20% of Thurston County.

Table A3: Trip Reduction by Purpose

Trip Purpose	2045 Trips	Funded Base Alt 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9*	Alt. 10	Alt 11	Alt. 12*	Alt. 13*
HBW	724,778	20,543	31,599	48,184	68,085	113,182	153,248	222,313	153,248	130,142	346,954	113,182	170,614	106,517
HBCol	54,672	0	0	0	0	0	0	0	0	0	54,672	0	54,672	0
HBShp	391,156	0	0	0	0	57,416	97,789	97,789	97,789	97,789	156,462	57,416	57,416	38,314
HBO	1,288,645	0	0	0	0	138,717	231,194	421,223	356,225	319,307	621,560	204,992	263,785	93,333
NHB	1,352,470	0	0	0	0	182,174	247,861	407,573	313,440	284,214	566,376	216,949	276,914	130,434
HBSch	372,178	0	0	0	0	0	0	0	0	0	372,178	0	372,178	0
Total	4,183,899	20,543	31,599	48,184	68,085	491,489	730,093	1,148,898	920,702	831,453	2,118,202	592,539	1,195,579	372,178
% Total		0%	1%	1%	2%	12%	17%	27%	22%	20%	51%	14%	29%	9%

Note: * Grays Harbor County, Mason County - HBW 20% of Thurston County and HBO 20% of Thurston County.
Trips are daily person trips, all modes.

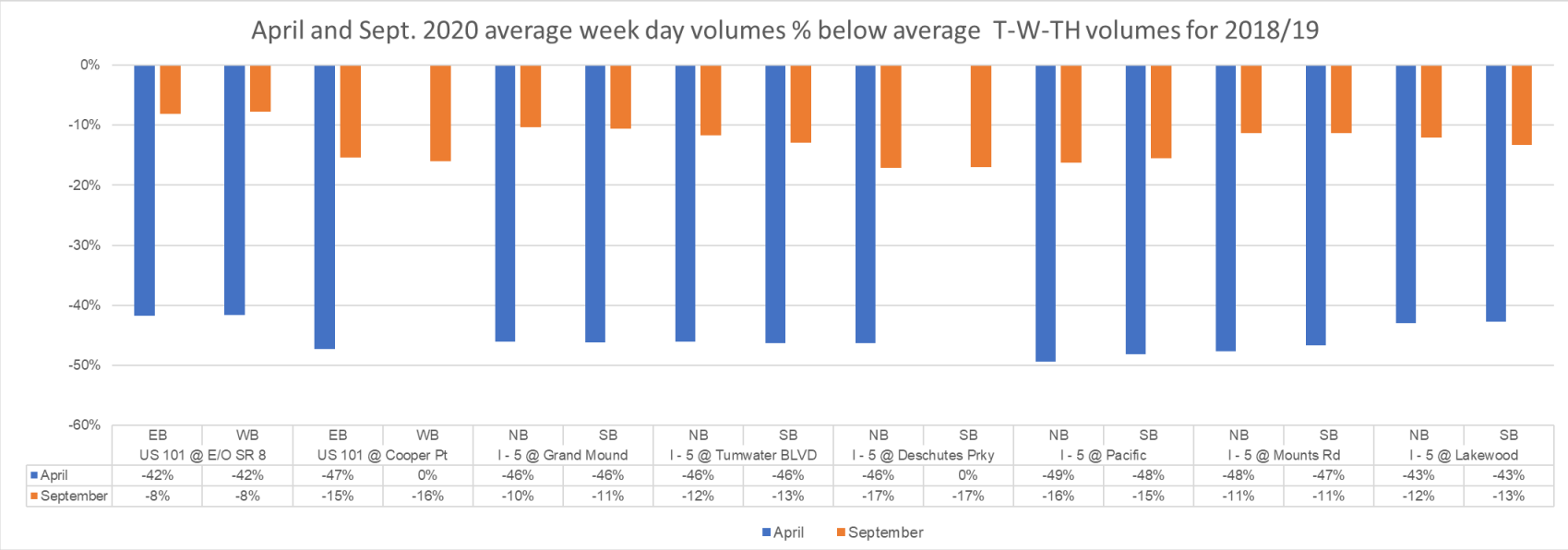
APPENDIX B: TRAFFIC COUNTS

The study team collected traffic counts from the Washington State Department of Transportation's online portal, the City of Olympia, and Thurston County, to see what the reduction in traffic was for April (COVID-19 Shut down) and September 2020 (COVID Phase 2/3) compared to the previous year.

I-5 and US 101 locations

- Average mid-week volumes - 2020 volumes % below average average mid-week volumes for 2018/19
- 2020 % below 2018/19 AVG
- Data Source: WSDOT Traffic GeoPortal, permanent traffic recorder data (PTR)
- https://www.wsdot.wa.gov/data/tools/geoportal/?config=traffic

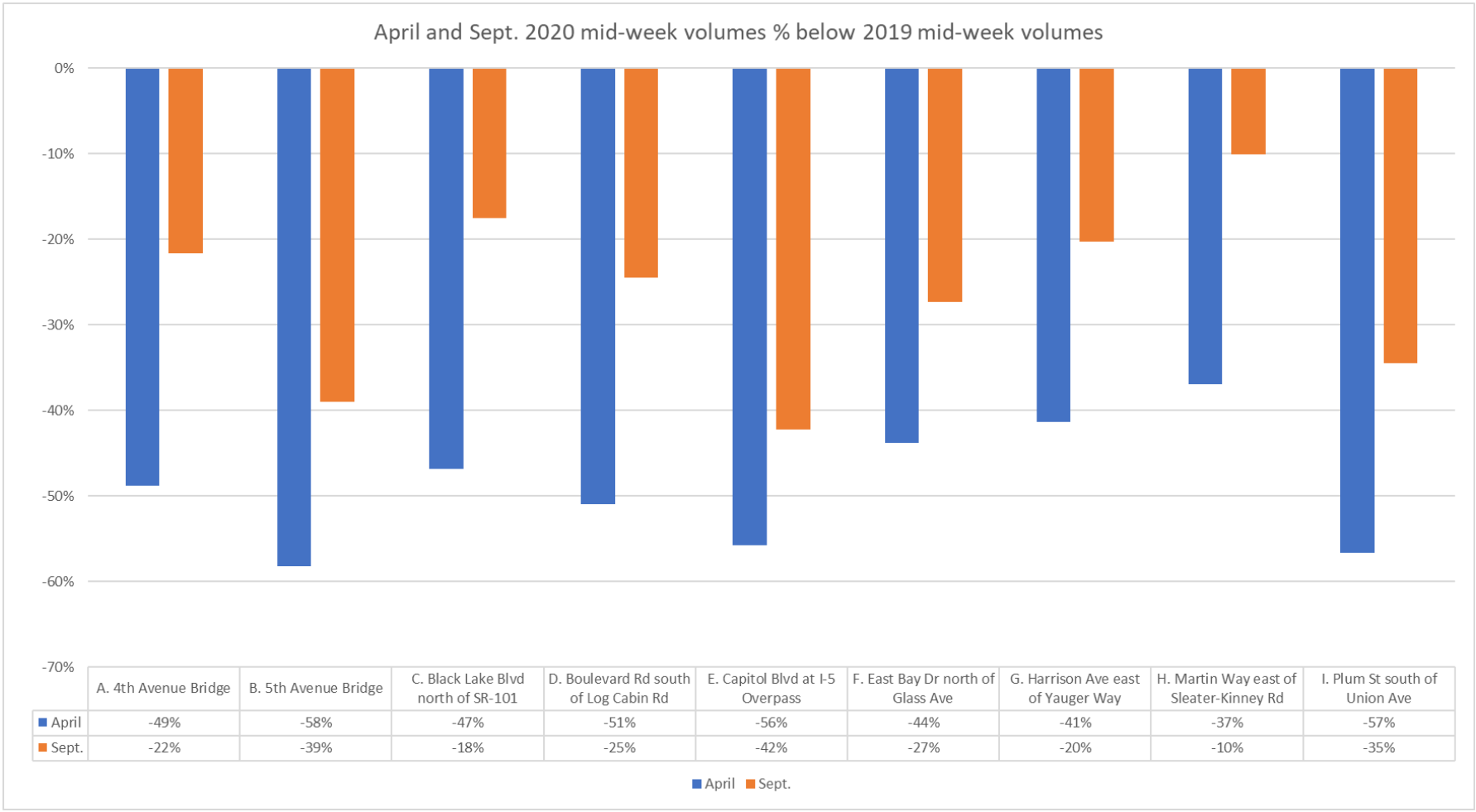
Figure B1: Reduction in I-5 and US 101 traffic counts compared to previous years



	EB US 101 @ E/O SR 8	WB US 101 @ E/O SR 8	EB US 101 @ Cooper Pt	WB US 101 @ Cooper Pt	NB I - 5 @ Grand Mound	SB I - 5 @ Grand Mound	NB I - 5 @ Tumwater BLVD	SB I - 5 @ Tumwater BLVD	NB I - 5 @ Deschutes Prky	SB I - 5 @ Deschutes Prky	NB I - 5 @ Pacific	SB I - 5 @ Pacific	NB I - 5 @ Mounts Rd	SB I - 5 @ Mounts Rd	NB I - 5 @ Lakewood	SB I - 5 @ Lakewood
April	-42%	-42%	-47%	0%	-46%	-46%	-46%	-46%	-46%	0%	-49%	-48%	-48%	-47%	-43%	-43%
September	-8%	-8%	-15%	-16%	-10%	-11%	-12%	-13%	-17%	-17%	-16%	-15%	-11%	-11%	-12%	-13%

City of Olympia Traffic Data - Average Daily Traffic (Average of three (3) midweek days)

Figure B2: Reduction in City of Olympia traffic counts compared to previous years



	A. 4th Avenue Bridge	B. 5th Avenue Bridge	C. Black Lake Blvd north of SR-101	D. Boulevard Rd south of Log Cabin Rd	E. Capitol Blvd at I-5 Overpass	F. East Bay Dr north of Glass Ave	G. Harrison Ave east of Yauger Way	H. Martin Way east of Sleater-Kinney Rd	I. Plum St south of Union Ave
April	-49%	-58%	-47%	-51%	-56%	-44%	-41%	-37%	-57%
Sept.	-22%	-39%	-18%	-25%	-42%	-27%	-20%	-10%	-35%

Thurston County daily traffic counts (one day).

Caution use Thurston County data sparingly as traffic counts are collected as needed for specific project, locations and time of year may not coincide

Figure B3: Reduction in Thurston County traffic counts compared to previous years

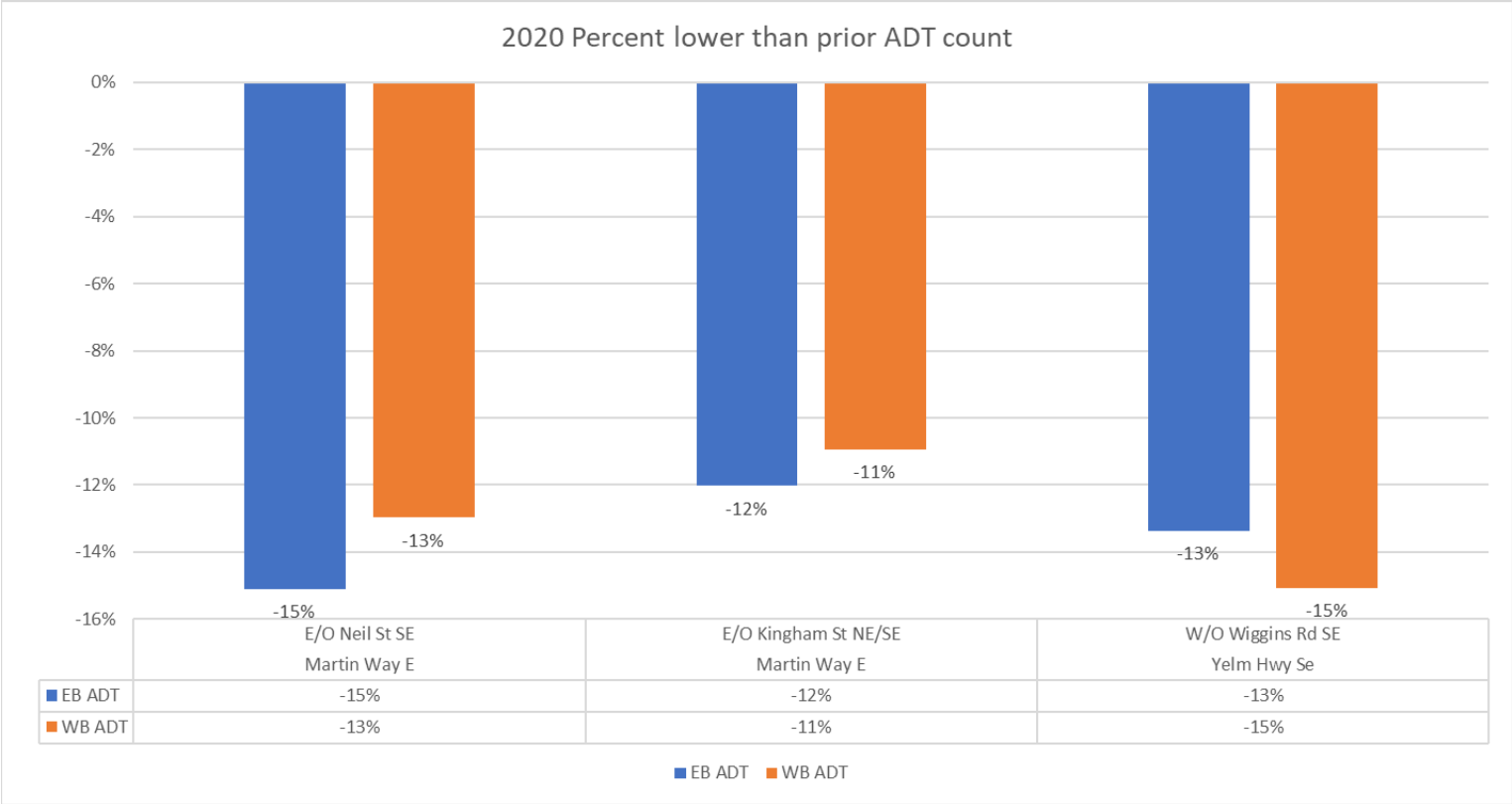


Table 3A. Reduction in traffic counts, 2020 compared to 2018/2019 averages. Average weekday conditions

		January	February	March	April	May	June	July	August	September
Interstate 5 and US 101										
US 101 @ east of SR 8	EB	-4%	12%	-20%	-42%	-27%	-14%	-8%	-8%	-8%
	WB	-2%	13%	-20%	-42%	-26%	-13%	-8%	-8%	-8%
US 101 @ Cooper Point Road	WB	-4%	8%	-24%	-47%	-35%	-21%	-13%	-14%	-15%
	EB	-5%	7%	-24%	n/a	-36%	-20%	-12%	-13%	-16%
I - 5 @ Grand Mound	NB	0%	10%	-24%	-46%	-30%	-21%	-13%	-13%	-10%
	SB	-1%	11%	-26%	-46%	-31%	-20%	-14%	-13%	-11%
I - 5 @ Tumwater Boulevard	NB	-2%	9%	-24%	-46%	-31%	-21%	-14%	-14%	-12%
	SB	0%	10%	-24%	-46%	-31%	-21%	-14%	-15%	-13%
I - 5 @ Deschutes Parkway	NB	-3%	8%	-23%	-46%	-32%	-23%	-16%	-18%	-17%
	SB	-4%	7%	-23%	n/a	n/a	-22%	-15%	-18%	-17%
I - 5 @ Pacific Avenue	NB	-3%	8%	-25%	-49%	-35%	-23%	-15%	-17%	-16%
	SB	-3%	8%	-25%	-48%	-34%	-20%	-12%	-14%	-15%
I - 5 @ Mounts Road	NB	-3%	9%	-26%	-48%	-30%	-18%	-13%	-13%	-11%
	SB	-3%	12%	-23%	-47%	-30%	-18%	-13%	-13%	-11%
I - 5 @ Lakewood (SR 512)	NB	-4%	9%	-23%	-43%	-28%	-18%	-11%	-12%	-12%
	SB	-5%	7%	-23%	-43%	-26%	-16%	-11%	-11%	-13%
I-5 and US 101 Average		**-3%**	**10%**	**-24%**	**-46%**	**-31%**	**-20%**	**-13%**	**-14%**	**-13%**
City of Olympia										
4th Avenue Bridge		-2%	-3%	-3%	-49%	-40%	-31%	-23%	-19%	-22%
5th Avenue Bridge		0%	-4%	-3%	-58%	-52%	-42%	-34%	-31%	-39%
Black Lake Boulevard north of SR-101		-2%	-8%	2%	-47%	-41%	-23%	-16%	-11%	-18%
Boulevard Road south of Log Cabin Road		-7%	2%	2%	-51%	-40%	-31%	-23%	-17%	-25%
Capitol Boulevard at I-5 Overpass		-1%	3%	-1%	-56%	-44%	-32%	-34%	-33%	-42%
East Bay Drive north of Glass Avenue		-4%	-2%	0%	-44%	-39%	-20%	-14%	-13%	-27%
Harrison Avenue east of Yauger Way		-2%	-4%	1%	-41%	-33%	-22%	-17%	-13%	-20%
Martin Way east of Sleater-Kinney Road		1%	-4%	-2%	-37%	-31%	-16%	-14%	-8%	-10%
Plum Street south of Union Avenue		-6%	-5%	10%	-57%	-50%	-38%	-33%	-29%	-35%
Jefferson Avenue and 14th Avenue		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-46%
Olympia Average		**-3%**	**-3%**	**1%**	**-49%**	**-41%**	**-28%**	**-23%**	**-19%**	**-28%**
Average		**-3%**	**5%**	**-15%**	**-47%**	**-35%**	**-23%**	**-16%**	**-16%**	**-19%**

APPENDIX C: RESULTS OF OCTOBER 2020 WASHINGTON STATE EMPLOYEE ENGAGEMENT SURVEY

Table C1: Results of State Employee Engagement Survey telework question

When the workplace is safe (such as low case counts, vaccine) to reopen for employees, I would be interested in teleworking:	Number of Respondees	Conversion factor per week	Telework days per week
100% every week	12,976	1.0	12,976
3-4 days a week	11,153	0.7	7,807
1-2 days a week	7,951	0.3	2,385
Less than one day a week	1,198	0.0	0
Not telework at all	2,376	0.0	0
N/A doesn't apply to my position	7,259	0.0	0
Total	**42,913**		**23,168**
Overall Rate			**54%**