I-5 JBLM Vicinity Congestion Relief Study

Phase 2 – Multi-modal Alternatives Analysis

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Washington State Department of Transportation

LOCHNER | SCJ ALLIANCE

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ACRONYMS

AC	Active Component (part of the Camp Murray training mission)
ACP	Access Control Point (military installation gate)
ADT	Average Daily Traffic (volumes)
Amtrak	American Passenger Rail Corporation
BNSF	Burlington Northern Santa Fe (railroad)
BRAC	Base Realignment and Closure Commission
CAC	Collision Analysis Corridor
CAL	Collision Analysis Location
C/D	Collector/Distributor (road)
DOD	Department of Defense
EIS	Environmental Impact Statement
FAZ	Forecast Analysis Zones
FHWA	Federal Highway Administration
GP	General Purpose (travel lane)
GPS	Global Positioning System
HOT	High Occupancy Toll (travel lane)
HOV	High Occupancy Vehicle (travel lane)
IAL	Intersection Analysis Location
IJR	Interchange Justification Report
INRIX	Private corporation engaged in roadway operational data collection and reporting
IT	Intercity Transit
ITS	Intelligent Transportation Systems
JBLM	Joint Base Lewis McChord
LOS	Level of Service
LTB	Leadership Training Brigade (Western Army National Guard)
MP	Milepost
MVMT	Million Vehicle Miles of Travel
NCHRP	National Cooperative Highway Research Program
NCOE	Noncommissioned Officer Education System
NEPA	National Environmental Policy Act
OCS	Officer Candidate School
PSRC	Puget Sound Regional Council
ROW	Right of Way
SEPA	State Environmental Policy Act
SOV	Single Occupant Vehicle
SR	State Route
SSMCP	South Sound Military Communities Partnership
TASS	Total Army School System
TAZ	Transportation Analysis Zone
TDM	Transportation Demand Management
TIGER III	Transportation Investment Generating Economic Recovery (federal grant-funding program, third series)
TRB	Transportation Research Board
TRPC	Thurston Regional Planning Council
USAR	United States Army Reserve
WSDOT	Washington State Department of Transportation

GLOSSARY

Auxiliary Lane: Can improve safety and reduce congestion by accommodating cars and trucks entering or exiting the highway or traveling short distances between adjacent interchanges, and reduce conflicting weaving and merging movements.

Average Daily Traffic (ADT): The average number of vehicles passing a certain point on a highway, road, or street each day.

Cloverleaf Interchange: A two-level interchange where left turns are handled by physically-separated, free-flowing ramps. When viewed from the air this interchanges resemble a four-leaf clover.

Collector-Distributor (CD): A roadway that typically parallels a higher capacity and/or limited access roadway. A CD road is designed to accommodate weaving and merging activity separately from the mainline of the higher capacity road and to reduce the number of mainline entrances and exits.

Diamond Interchange: The simplest and perhaps most common type of interchange. This type of interchange has two on-ramps and two off-ramps, and forms the shape of a diamond when viewed from the air.

Diverging Diamond Interchange: This interchange configuration improves left and right turn movements by removing them from the signal operations into free or yield movements. It also reduces signal operations to two phases and provides more green time for through traffic.

Environmental Justice (EJ): Executive Order that ensures that highway projects do not disproportionately impact one segment of the population, e.g., low-income or minorities.

Environmental Justice Population: Refers collectively to the low-income and minority populations in a given area.

Latent Demand: Travel desire or demand that goes unsatisfied because there is not sufficient capacity on a roadway to accommodate it.

Level of Service (LOS): A qualitative measure of transportation system performance. LOS is most commonly used to describe roadway or intersection performance, but can also be applied to pedestrian, bicycle, transit, or other infrastructure elements. The American Association of State Highway and Transportation Officials defines the following levels of service: A= Free flow; B=Reasonably free flow; C=Stable flow; D=Approaching unstable flow; E=Unstable flow; and F=Forced or breakdown flow.

Maintenance Area: An area that has a history of not meeting air quality standards for a particular air pollutant, but is now meeting the standards and has a maintenance plan for monitoring levels of that pollutant and ensuring continued conformity to the appropriate standards.

Mode Split: The percentage of total travel in a given area by different forms of transportation, typically single-occupant vehicles, high-occupancy vehicles (two or more persons in a car), transit, walk, and bicycle.

Moving Washington: A policy-based framework used in Washington State for making transparent, cost-effective decisions about transportation infrastructure improvements.

National Environmental Policy Act (NEPA): Established in 1969, this act requires public disclosure of all environmental, social, and economic impacts for federally funded projects with significant impacts.

Non-attainment area: An area that fails to meet air quality standards for one or more pollutants.

Particulate Matter (PM): A mixture of extremely small particles or liquid droplets suspended in the air.

Peak Period: Informally known as "rush hour," this term refers to the time of the day when traffic volumes in an urban area are the highest and when travel patterns generate the most traffic, especially in a peak direction.

Section 4(f): Section 4(f) of the U.S. Department of Transportation Act (49 USC 303) concerns the use of or impacts on any significant public park, recreation area, wildlife or waterfowl refuge, or historic site by a transportation project. Section 4(f) applies to impacts caused by programs and policies undertaken by the USDOT.

Section 6(f): Section 6(f) of the Land and Water Conservation Fund Act is similar to Section 4(f) but concerns only those parks and recreational facilities that have received funding through this act. While Section 4(f) applies only to USDOT actions, Section 6(f) applies to impacts caused by programs and policies of any federal agency.

Single-Point Urban Interchange (SPUI): This interchange configuration reduces the number of signals to one location in the center of an interchange rather than two signals as is common with the diamond configuration. Left turn movements are combined at a single and more efficient intersection.

Transportation Demand Management (TDM): Measures that seek to reduce the number of vehicles using the road system, especially single-occupant vehicles, while providing alternative options to auto travel.

Throughput: The number of users being served at any time by the transportation system.

Vehicles Miles of Travel (VMT): The number of miles traveled per vehicle multiplied by the total number of vehicles.

VI. Performance Analysis of Alternative Packages

This section identifies the performance of the existing 2014 conditions and each of the alternative packages separately for 2020 and 2040 design years. The following performance statistics are summarized:

- PM Peak Hour Traffic Volumes along I-5
- PM Peak Hour Person Trips along I-5
- PM 6-hour Peak Period Person Trips By Mode along I-5
- Percent of Demand Served along I-5 in 2-hour PM Peak Period
- PM Peak Hours Speeds along I-5
- Hours of Congestion during the 6-hour PM Peak Period along I-5
- Travel Times during the 6-hour PM Peak Period along I-5

This information is derived from available data and model forecasts from the I-5 JBLM Macro Model, Meso Model, and the Transit Model. This information is used in later chapters to compare and evaluate the alternative packages.

2014 Existing Conditions

2014 data was developed to assess the existing traffic performance of I-5 and compared with data from the calibrated 2013/2014 models. Overall, this data shows that traffic volumes along I-5 through the JBLM area are at or near the capacity of I-5, traveling at slow speeds with periods of stop and go traffic. Based on the model results and due to traffic congestion and side friction caused by the vehicles entering and exiting I-5, only 89 percent of the I-5 peak hour demand can pass through the corridor; and only 96 percent of the demand can pass through during the peak two hours.

I-5 PM Peak Hour Travel Forecasts

Vehicle Trips: Based on the Meso Model data, the average PM peak hour vehicle trips along I-5 between Mounts Road and Bridgeport Way are approximately 4,750 vehicles southbound and 4,680 vehicles northbound, with about 21 percent being high-occupancy vehicle (HOV) vehicle trips and 79 percent being single occupancy vehicle (SOV) vehicle trips. Under normal traffic conditions, the average capacity along the six-lane section of I-5 between Mounts Road and Thorne Lane is approximately 5,400; whereas in the eight-lane section north of Thorne Lane, the capacity increases to approximately 7,200 vehicles in each direction. However, these capacities decrease as speed slows and congestion increases, resulting in fewer trips getting through the study area. The average traffic flow by SOV and HOV vehicles is illustrated in Figure VI-1.

Person Trips: Based on the Meso Model data, the average PM peak hour person trips along this same section of I-5 are approximately 6,620 person trips southbound and 6,480 person trips northbound, with an average of 42 percent being HOV person trips, 57 percent being SOV person trips, and about one percent being transit trips. The average person trip by SOV, HOV and transit along various segments of I-5 by direction is illustrated in Figure VI-2.

Figure VI-1: 2014 PM Peak Hour Vehicle Trips

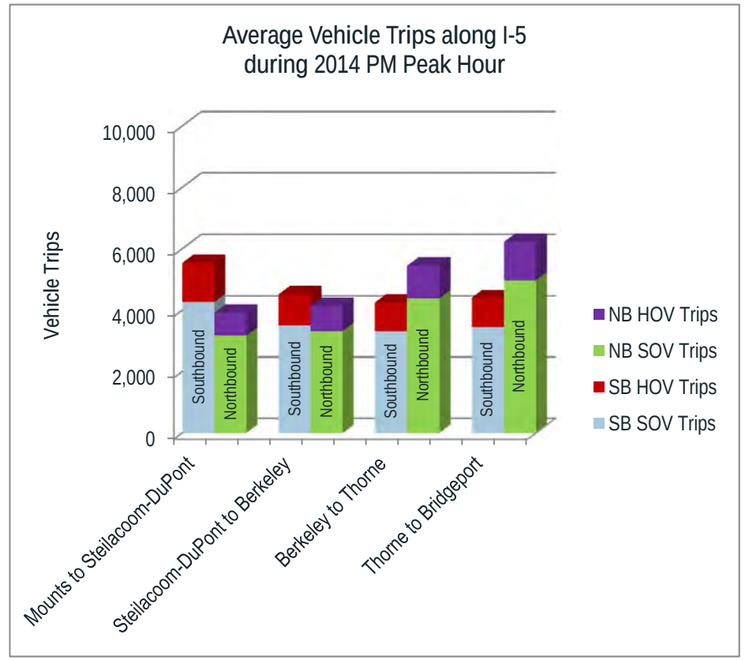
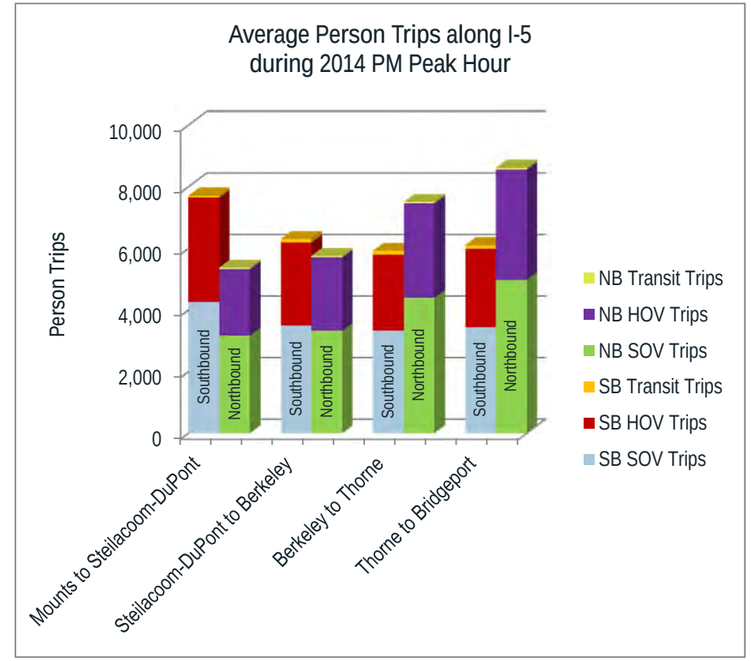


Figure VI-2: 2014 PM Peak Hour Person Trips



PM Peak Period I-5 Person Trips by Mode and Type

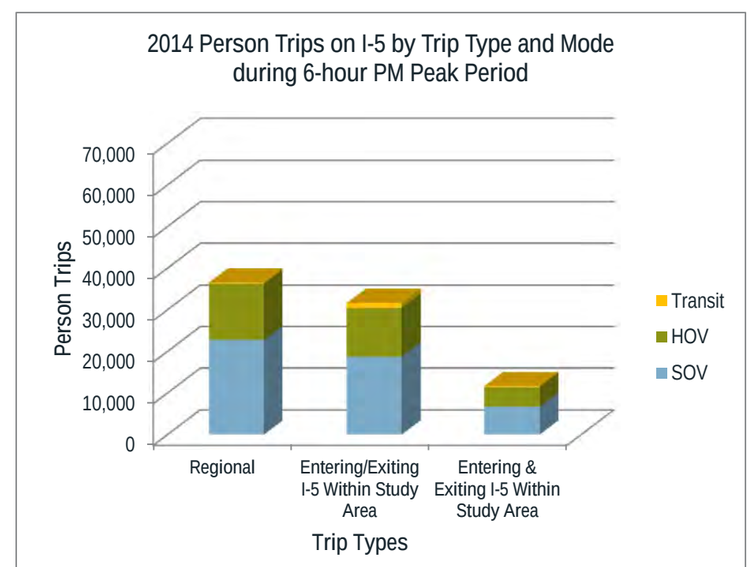
A breakdown of person trips along I-5 between Mounts Road and Bridgeport Way during the 6-hour PM peak period is illustrated in Figure VI-3. Overall, there were approximately 79,900 person trips traveling along I-5 during the 6-hour PM peak period in the study area. Of this total, about 60 percent were estimated to be SOV trips, 38 percent were estimated to be HOV trips (i.e., in carpools or vanpools), and about two percent on transit vehicles.

These trips were also broken down into three categories, with about 46 percent being classified as regional trips (i.e., trips that travelled through the study area without stopping), about 39 percent were classified as trips entering or exiting I-5 in the study area, and about 15 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-1.

Table VI-1: 2014 PM 6-hour Peak Period – Person Trips by Mode and Type

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	47%	45%	17%	46%
Entering/Exiting I-5 within Study Area	39%	39%	68%	39%
Both Entering & Exiting I-5 within Study Area	14%	16%	15%	15%

Figure VI-3: I-5 2014 PM 6-hour Peak Period Person Trips by Mode and Type



Percent of I-5 Travel Demand Served during the 2-hour PM Peak Period

Using the Meso Model, an analysis was conducted to compare the PM 2-hour person-demand for travel along I-5 in the study area with the number of person trips actually traveling in the study area. This analysis showed that approximately 95 percent of the person-demand traveling southbound could use I-5 during the 2-hour peak period; and approximately 96 percent of the person-demand traveling northbound could use I-5 during the same 2-hour PM peak period.

I-5 PM Peak Hour Travel Speeds

Travel speed is another factor used to illustrate congestion along the I-5 corridor. In WSDOT's *Highway System Plan 2007 – 2026*, 70 percent of posted speed (42 mph) is used to signify when heavy congestion, described as level of service (LOS) F, occurs.

As can be observed from Figure VI-4, several segments of I-5 experience slow travel speeds during the PM peak hour in both directions. Overall, southbound travel speeds average about 34 mph along this section of I-5; whereas the northbound travel speeds average about 42 mph.

The average speed along I-5 by direction and time of day is illustrated in Figure VI-5. This speed-time diagram shows that the slow speeds extend beyond the PM peak hour and can last for several hours during the PM peak period.

Hours of Congestion during I-5 PM Peak Period

Due to the high traffic demand and the slow speeds, the hours of congestion along I-5 extend well beyond the PM peak hour. To estimate how many hours of congestion drivers would experience along I-5, the number of hours that drivers in the various segments of I-5 would travel at slow speeds (i.e., below 70 percent of posted speed) was estimated from the Meso Model during the 6-hour PM peak period. As illustrated in Figure VI-6, congestion along I-5 in the southbound direction lasts almost three hours; whereas, in the northbound direction, congestion can last about 3.5 hours.

Using data from Figures VI-5 and VI-6, the maximum hours of congestion in the southbound direction occur in the vicinity of the Main Gate Interchange. This congestion limits the amount of traffic that can proceed south along I-5 and causes back-ups to north of Gravelly Lake Drive Interchange. Similarly, in the northbound direction, the maximum hours of congestion occur between the Berkeley Street and the Thorne Lane Interchanges, where an extra northbound lane is added. Northbound back-ups typical extend south to the vicinity of the Steilacoom-DuPont Road Interchange.

Figure VI-4: 2014 PM Peak Hour Speeds along I-5

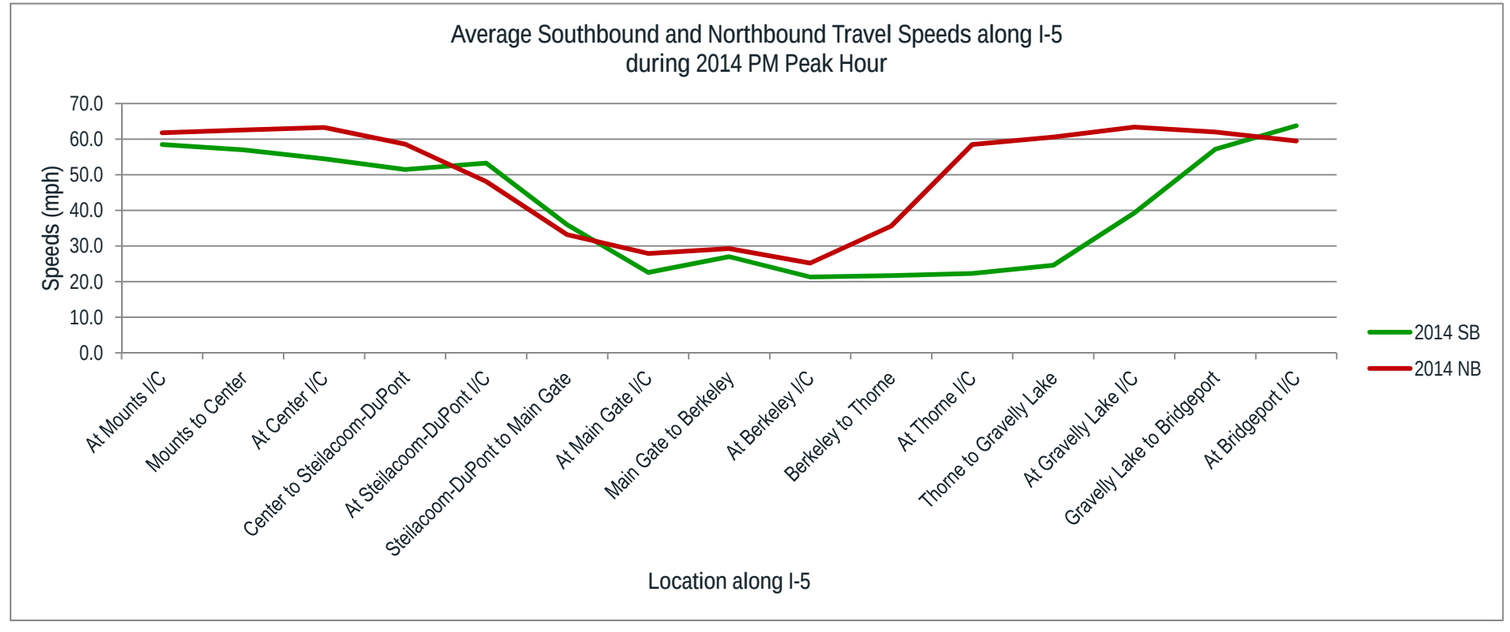


Figure VI-5: 2014 PM Peak Period Speed-Time Diagram along I-5

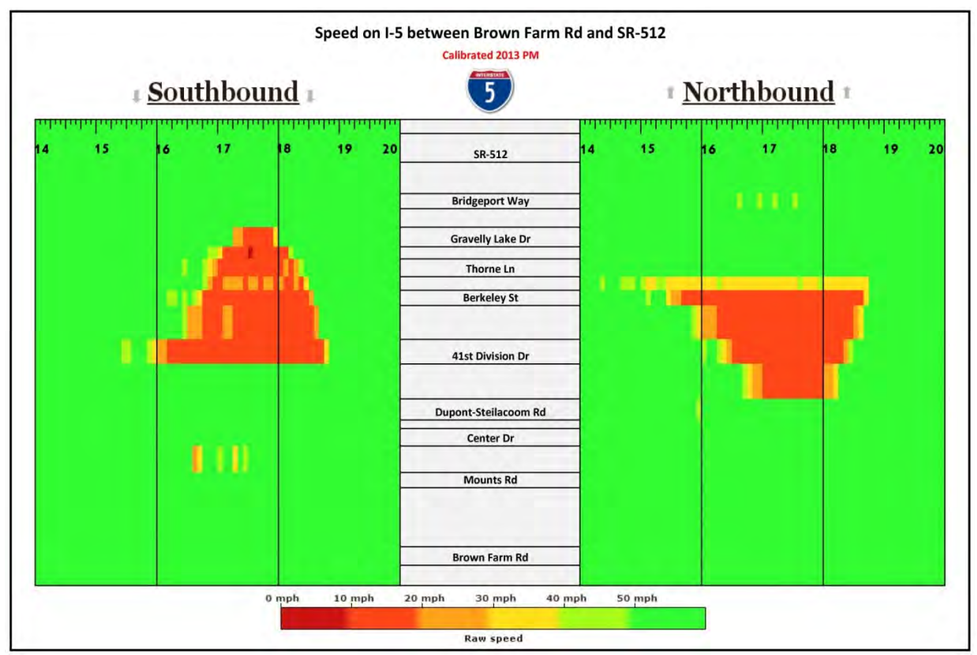
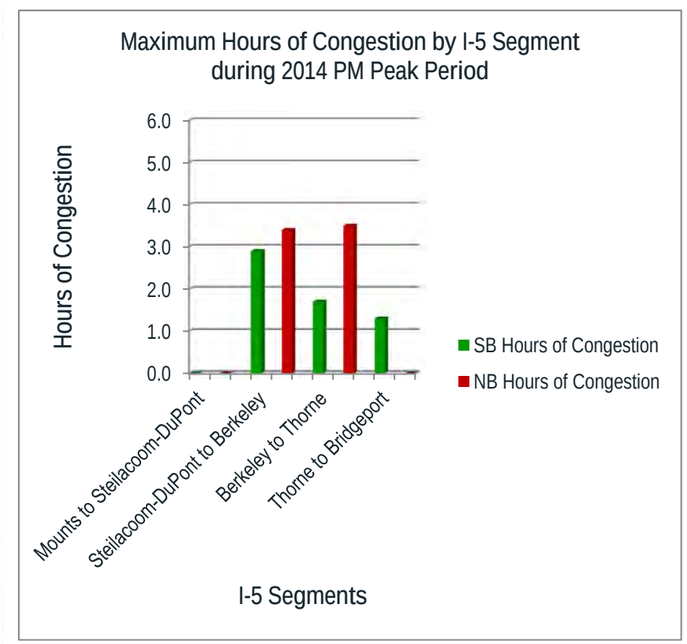


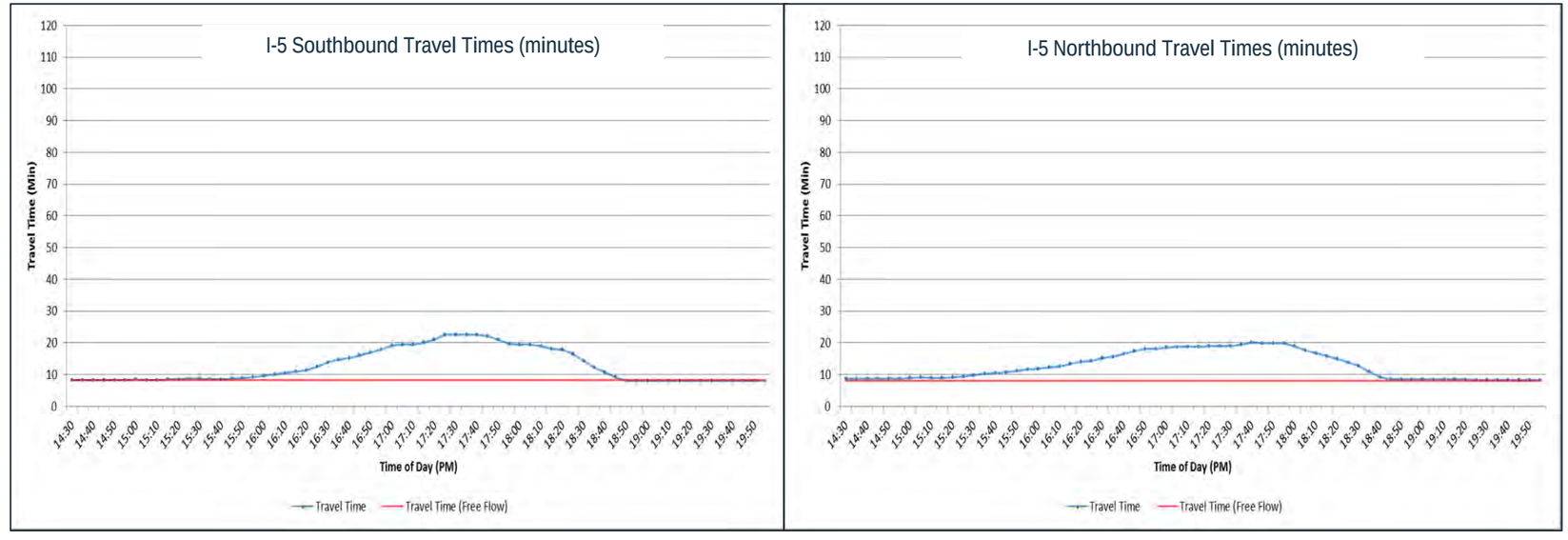
Figure VI-6: 2014 Hours of Congestion by I-5 Segments



Travel Times along I-5 during the PM Peak Period

Average travel times along I-5 between Mounts Road Interchange and the Bridgeport Way Interchanges by direction are illustrated in Figure VI-7. Travel along this 9-mile section of I-5, at the posted speed limit of 60 mph, generally takes approximately nine minutes. However, because of the large through traffic volumes and high on and off volumes at area interchanges, speeds are slowed resulting in longer travel times. In the southbound direction, the peak travel time is estimated to be about 22 minutes with a 3-hour peak period average travel time of about 14 minutes. In the northbound direction, the peak travel time is estimate at about 20 minutes with a 3-hour peak period average travel time of about 15 minutes.

Figure VI-7: Average 2014 PM Peak Period Travel Time along I-5 between Mounts Road and Bridgeport Way by Time of Day



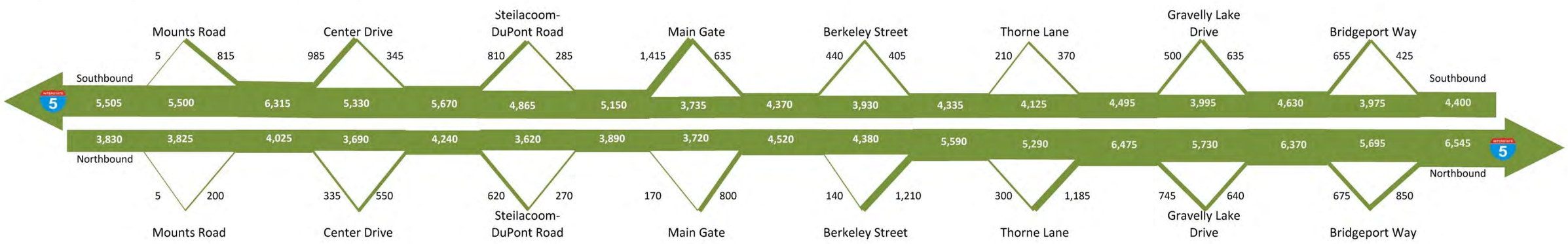
Summary of Existing I-5 Traffic Operations

The I-5 corridor through the study area is bounded on both sides by JBLM. The military facility and other geographic features limit the availability of alternative routes for drivers traveling to and through the study area. A summary of the 2014 I-5 PM peak hour traffic flow through the study area is displayed in Figure VI-8, with volumes ranging from 3,620 vph to 6,545 vph northbound and 3,735 vph to 6,315 vph southbound. With the large mainline and ramp volumes, travel speeds along I-5 can slow to less than 25 mph with some areas of stop and go traffic. These slow travel speeds reduce the overall performance of I-5 and limits that number of person trips along the I-5 corridor through the study area.

Drivers typically experience congestion and slow travel speeds along I-5 for more than three hours in both directions during the PM peak period. This congestion is caused by several factors:

- Heavy through volumes
- Reduction in through lanes at Thorne Lane Interchange
- A high volume of locally-generated trips to and from Thurston County and areas north of SR 512
- Close spacing of interchanges with high on- and off-ramp volumes, creating heavy amounts of weaving and merging
- A high volume of short trips along I-5

Figure VI-8: Average 2014 Traffic Volume along I-5 during the PM Peak Hour



Alternative P1 – No Action

No Action alternatives for 2020 and 2040 were developed to assess the performance of I-5 if no additional improvements, other than the programmed local agency TIP improvements and WSDOT's STIP improvements, were implemented by the project's opening and design years, as described in Chapter III. Overall, this data shows that travel speeds will slow, causing increased traffic congestion along I-5. These slower speeds will also constrict traffic flow and increase the number of congested hours for drivers on I-5 through the JBLM area. It will reduce traffic throughput and increase travel time along the corridor. There will be longer periods of stop and go traffic. Based on the model results, in 2020 only 67 percent of the I-5 peak hour demand can pass through the corridor; while 82 percent of the demand can pass through the I-5 corridor over a two-hour PM peak period. By 2040 only 26 percent of the I-5 peak hour demand can pass through the corridor; while 57 percent of the demand can pass through the I-5 corridor over a two-hour PM peak period.

I-5 PM Peak Hour Travel Forecasts – 2020 & 2040

Vehicle Trips: The average PM peak hour vehicle trips along I-5 between Mounts Road and Bridgeport Way in 2020 are approximately 4,830 vehicles southbound and 4,010 vehicles northbound. By 2040, the average PM peak hour vehicle trips along I-5 in the study area increases to approximately 5,000 vehicles southbound and decreases to approximately 3,760 vehicles northbound. Because of the increased congestion along I-5 and slower speeds in 2020 and 2040, traffic flow becomes unstable, especially in the northbound direction, and the actual capacity of I-5 decreases. This unstable flow allows fewer vehicle trips to travel along I-5 than were accommodated in 2014 with higher travel speeds. In both 2020 and 2040, about 21 percent of the traffic is HOV vehicle trips and 79 percent are SOV vehicle trips. The average 2020 and 2040 traffic flow by SOV and HOV vehicles along various segments of I-5 by direction is illustrated in Figure VI-9.

Person Trips: The average 2020 PM peak hour person trips along I-5 through the JBLM area are approximately 6,800 person trips southbound and 5,550 person trips northbound with an average of 42 percent being HOV person trips, 56 percent being SOV person trips, and two percent being transit trips.

The average 2040 PM peak hour person trips along I-5 through the JBLM area are approximately 7,050 person trips southbound and 5,510 person trips northbound, with an average of 43 percent being HOV person trips, 55 percent being SOV person trips, and two percent being transit trips. As with the vehicle trip reductions in 2020 and 2040, especially northbound, person trips are also reduced because of reduced throughput capacity and speeds.

Overall, there is very little change in person trips during the PM peak hour between 2020 and 2040 because of increased congestion along I-5. The average person trip by SOV, HOV and transit along various segments of I-5 by direction is illustrated in Figure VI-10.

Figure VI-9: 2020 and 2040 PM Peak Hour I-5 Vehicle Trips – P1

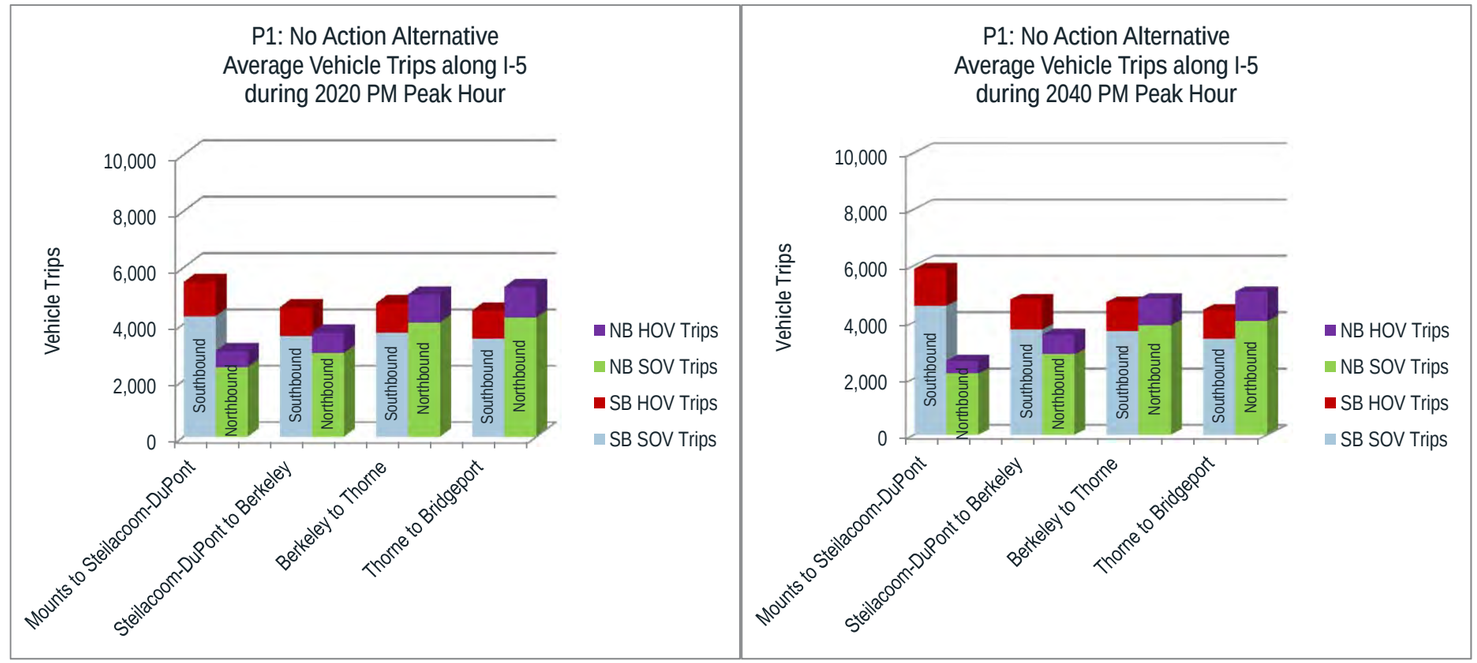
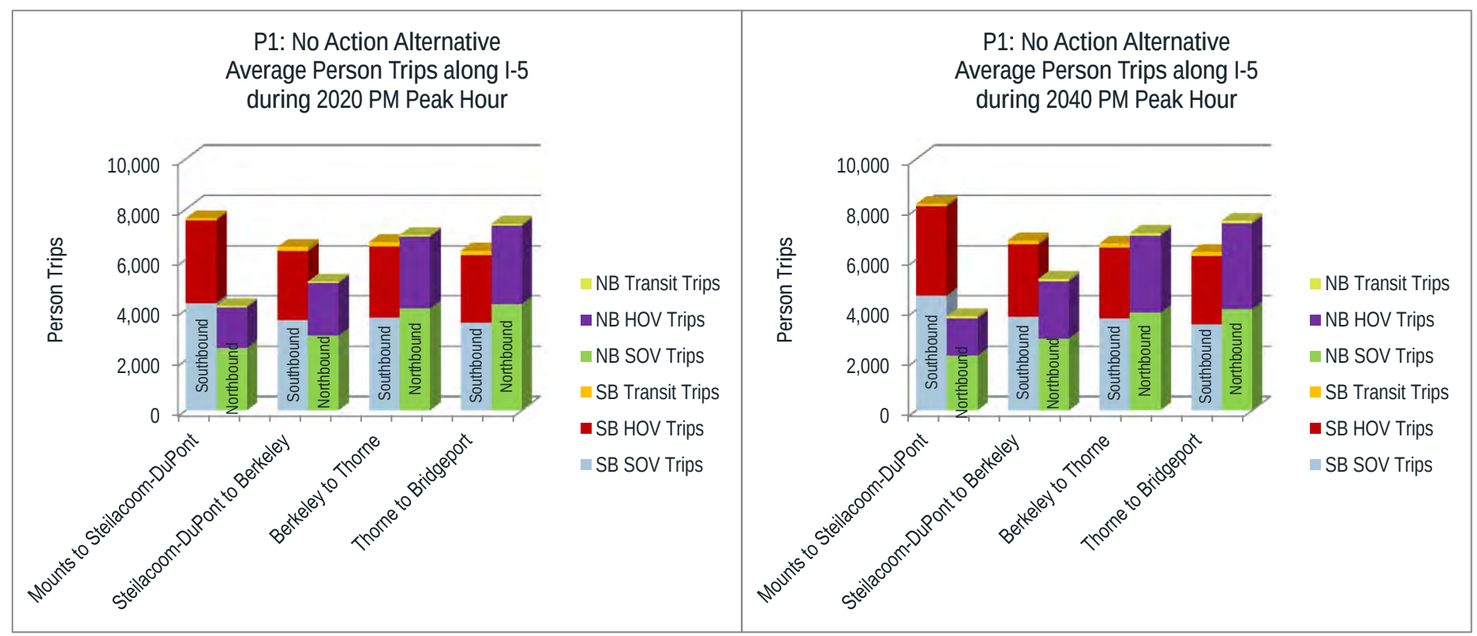


Figure VI-10: 2020 and 2040 PM Peak Hour I-5 Person Trips – P1



PM Peak Period I-5 Person Trips by Mode and Type

A comparison of 2020 and 2040 person trips along I-5 between Mount Road and Bridgeport Way during the 6-hour PM peak period is illustrated in Figure VI-11. Overall, in 2020 there were approximately 88,940 person trips traveling on I-5 during the 6-hour PM peak period in the study area. Of this total, about 61 percent were estimated to be SOV trips, 37 percent were estimated to be HOV trips (i.e., in carpools or vanpools), and about two percent were on transit vehicles.

These 2020 PM peak period person trips were also broken down into three categories, with about 47 percent being classified as regional trips (i.e., trips that travelled through the study area without stopping); about 38 percent were classified as trips entering or exiting I-5 in the study area; and about 15 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-2.

Table VI-2: 2020 PM 6-hour Peak Period – Person Trips by Mode and Type – P1

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	48%	48%	19%	47%
Entering/Exiting I-5 within Study Area	38%	36%	67%	38%
Both Entering & Exiting I-5 within Study Area	14%	16%	14%	15%

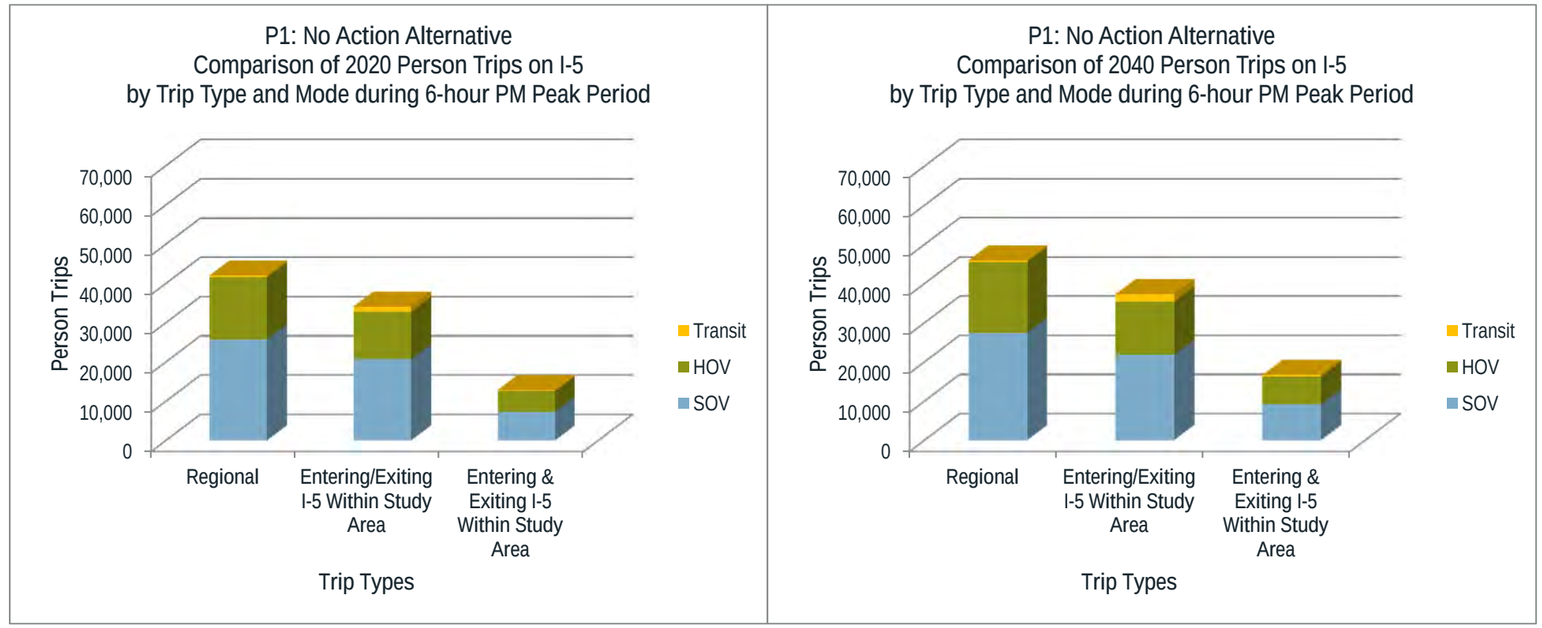
By 2040 there were approximately 99,880 person trips traveling on I-5 during the 6-hour PM peak period in the study area. Of this total, about 58 percent were estimated to be SOV trips, 39 percent were estimated to be HOV trips; and about three percent were on transit vehicles.

Of these 2040 PM 6-hour peak period person, about 46 percent were classified as regional trips; about 37 percent were classified as entering or exiting I-5 in the study area; and about 17 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-3.

Table VI-3: 2040 PM 6-hour Peak Period – Person Trips by Mode and Type

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	47%	47%	15%	46%
Entering/Exiting I-5 within Study Area	37%	35%	70%	37%
Both Entering & Exiting I-5 within Study Area	16%	18%	15%	17%

Figure VI-11: Comparison of 2020 & 2040 I-5 PM 6-hour Peak Period Person Trips by Mode and Type – P1

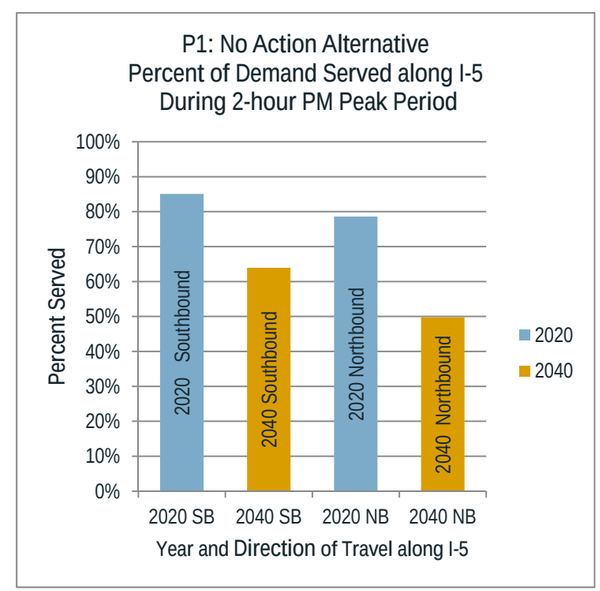


Percent of I-5 Travel Demand Served during the 2-hour PM Peak Period in 2020 & 2040

Using the Meso Model, an analysis was conducted to compare the PM 2-hour person-demand for travel along I-5 in the study area with the actual number of person trips traveling in the study area in 2020 and 2040. This analysis showed that in 2020 approximately 85 percent of the person-demand traveling southbound could use I-5 during the 2-hour peak period, and approximately 79 percent of the person-demand traveling northbound could use I-5 during the same 2-hour PM peak period.

In comparison, by 2040 the analysis showed that approximately 64 percent of the person-demand traveling southbound could use I-5 during the 2-hour peak period, and approximately 50 percent of the person-demand traveling northbound could use I-5 during the same 2-hour PM peak period, as illustrated in Figure VI-12. These percentages of unmet demand means that drivers wanting to use I-5 must travel outside of this 2-hour PM peak period, find an alternative route, or not make the trip at all.

Figure VI-12: Comparison of Percent of Demand Served in 2020 and 2040 – P1



I-5 PM Peak Hour Travel Speeds

Comparisons of the P1 – No Action Alternative 2020 and 2040 southbound and northbound travel speeds along I-5 from Mounts Road to Bridgeport Way are shown on Figure VI-13. In the southbound direction, only a short section of I-5 between Steilacoom-DuPont Road and Center Drive does the 2020 speed reach 50 mph; the rest of the corridor is generally operating below 40 mph with the section from Main Gate to Bridgeport Way operating at less than 25 mph. By 2040 travel speeds in most of the I-5 corridor in the southbound direction are less than 30 mph.

In the northbound direction, 2020 and 2040 travel speeds are similar, with slow travel speeds (less than 30 mph) from Mounts Road to Berkeley Street. By Thorne Lane, where a fourth lane is added, the average PM peak hour speeds increases.

Because of long sections of slow travel speeds, the average PM peak hour corridor speeds are slow with the overall southbound 2020 travel speeds averaging about 14 mph and the 2020 northbound travel speeds averaging about 19 mph.

By 2040, southbound travel speeds average decreases to about 11 mph along this section of I-5 and the 2040 northbound travel speeds decrease to about 16 mph.

The average speeds along I-5 by direction and time of day for 2020 and 2040 are illustrated in Figure VI-14. These speed-time diagrams show that the slow speeds extend for most of the PM 6-hour peak period at some locations along I-5 in 2020. By 2040 these slow travel speeds are expected to extend past the 6-hour PM peak period.

I-5 Hours of Congestion – 2020 & 2040 PM Peak Period

Due to the high traffic demand and the slow travel speeds in 2020 and 2040, the hours of congestion along I-5 extend well beyond the PM peak hour. To estimate how many hours of congestion drivers would experience along I-5, the number of hours that drivers in the various segments of I-5 would travel at speeds below 70 percent of posted speed was estimated from the Meso Model during the 6-hour PM peak period. During this time period, congestion along I-5 in the southbound direction between Steilacoom-DuPont Road and Berkeley Street will lasts for over four hours in 2020 and almost the full 6-hours in 2040. In the northbound direction congestion will lasts for nearly five hours in 2020 from Steilacoom-DuPont Road to Berkeley Street and

Figure VI-13: 2020 and 2040 Southbound Travel Speeds during the PM Peak Hour along I-5 – P1

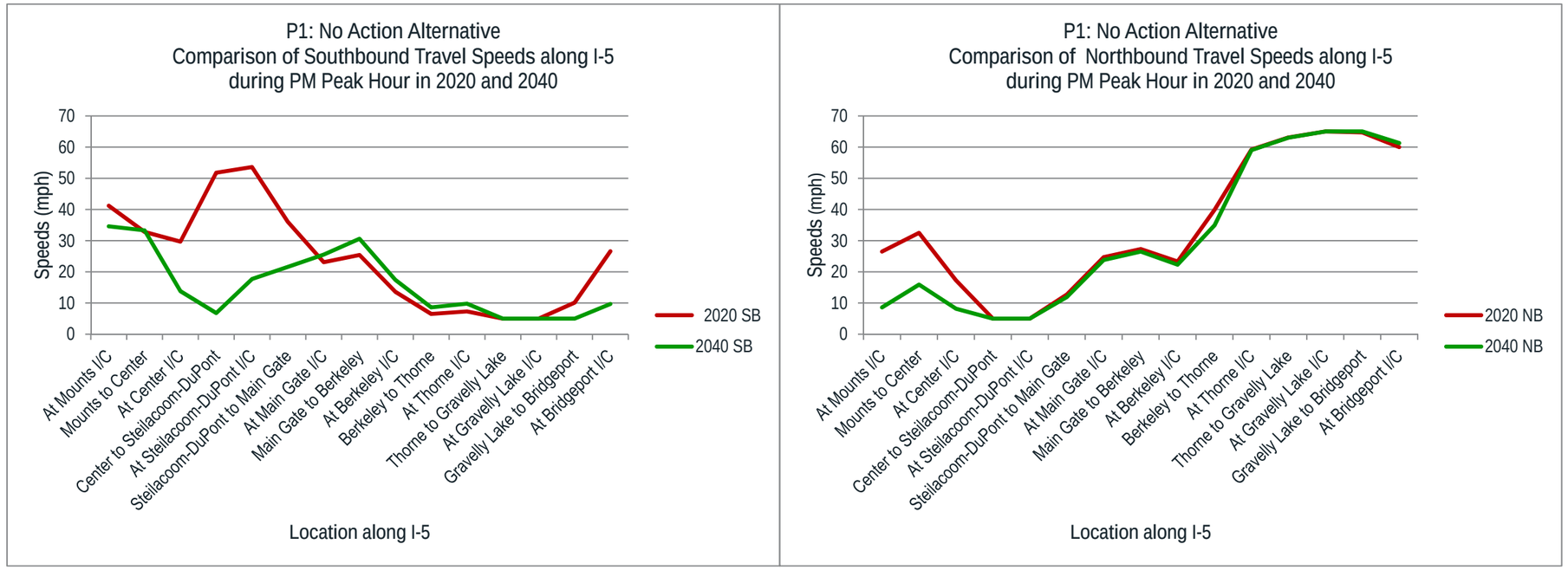
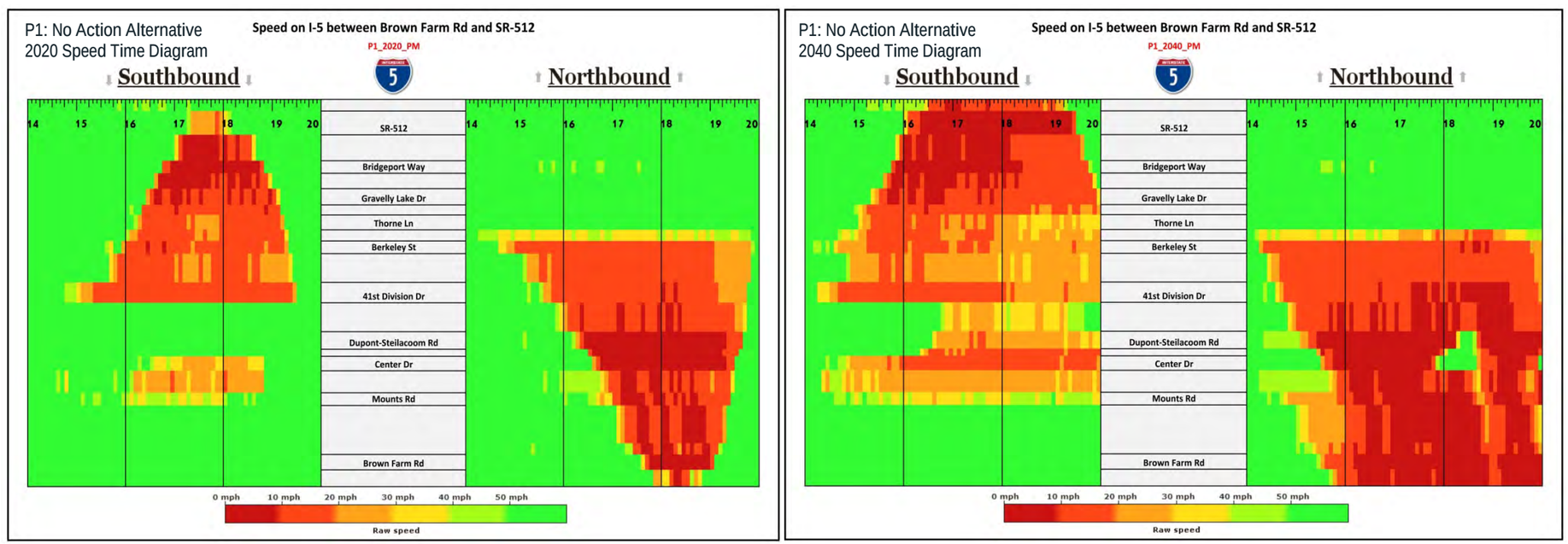


Figure VI-14: 2020 and 2040 PM Peak Period Speed-Time Diagrams along I-5 – P1



almost the full 6-hours in 2040. By 2040, the extended hours of congestion is expected to occur along all segments of I-5 through the JBLM area. As shown in the previous figure, this 2040 congestion is expected to last beyond our 8:00 PM analysis limit.

I-5 Travel Times during the 2020 & 2040 PM Peak Period

Travel times along I-5 between Mounts Road and Bridgeport Way by direction over the 6-hour PM peak period were estimated using the Meso Model. These travel are illustrated in Figure VI-16. Travel along this nine mile section of I-5 at the posted speed limit of 60 mph would generally take approximately 9 minutes. However, because of the increased congestion and reduced travel speeds, travel times are increased to approximately 30 minutes in the southbound direction in both 2020 and 2040.

In the northbound direction, the peak travel times are estimated to be about 40 to 55 minutes in both the 2020 and 2040 time periods. Because these travel times are limited to the study area, the 2040 travel times are more sensitive to variations because of congestion outside the study area and in Thurston County.

In the southbound direction, the average travel time during a 3-hour PM peak period is about 21 minutes in 2020 and about 27 minutes in 2040. In the northbound direction, the 3-hour PM peak period average travel time is estimate at about 28 minutes in 2020 and about 37 minutes in 2040.

In comparing these travel times to the existing 2014 travel times, it is important to note that in 2014 only about a third of the corridor is congested with slow travel speeds of 20 to 30 mph: whereas, in 2020 practically the entire corridor is characterized by slow travel speeds less than 30 mph with areas of speeds under 10 mph. These low speeds significantly increase the travel time along the corridor.

In comparing 2020 and 2040, the maximum travel times are similar because in 2020 due to the fact that the capacity of I-5 with slow speeds is reached and is maintained through 2040. The main difference in these travel statistics is the duration of the longer travel times. In 2020, the longer travel times last from about 4:30 to 6:30 PM and approach free-flow conditions by around 7:30 PM, while in 2040 with a higher demand than 2020, the longer travel times last from about 2:30 to 7:30PM and do not approach free-flow conditions until past 8:00 PM.

Summary of Traffic Operations in 2020 & 2040 for P1 – No Action Alternatives

With no additional improvements, beyond those currently programmed for the project area, traffic operations along I-5 will continue to deteriorate. Congestion is expected to increase and travel speeds will decrease, limiting the amount of traffic, whether SOV, HOV or transit, that can travel in and through the I-5 corridor in the vicinity of JBLM. As part of the SOV traffic, trucks and other freight haulers will also be subject to longer travel times and reduced reliability. The hours of congestion are also expected to increase and delay some drivers to travel outside the 6-hour PM peak period analysis timeframe.

Figure VI-15: Comparison of 2020 and 2040 Hours of Congestion by I-5 Segments – P1

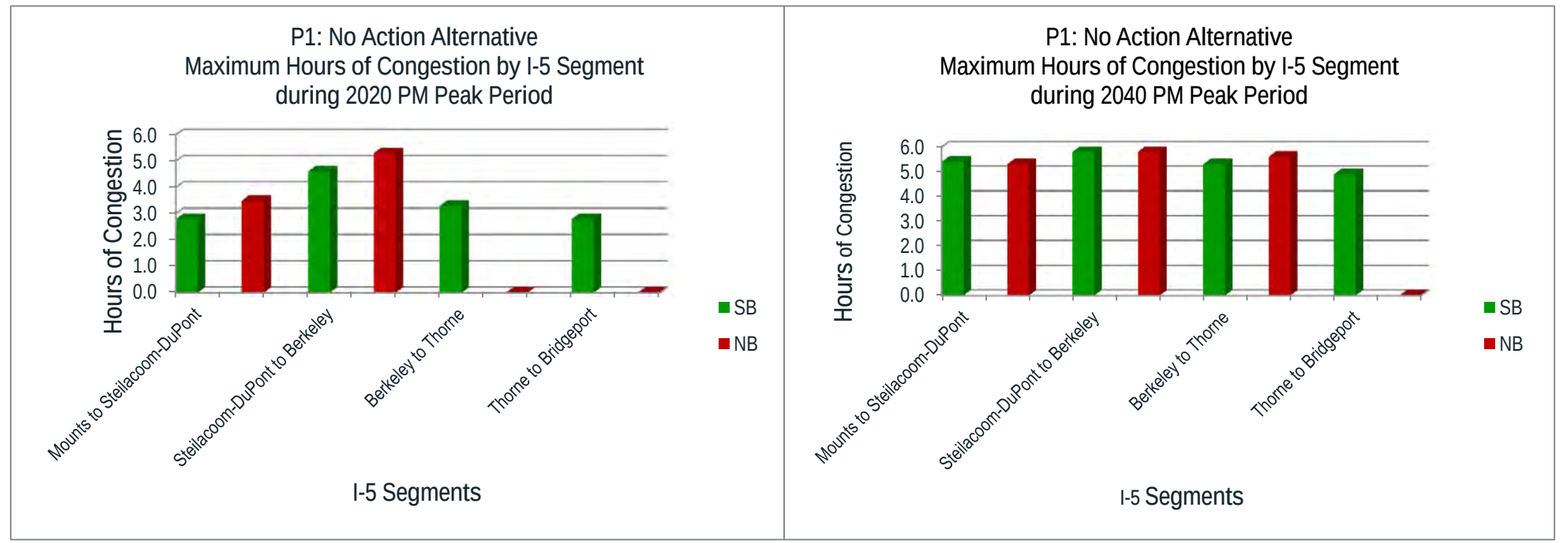
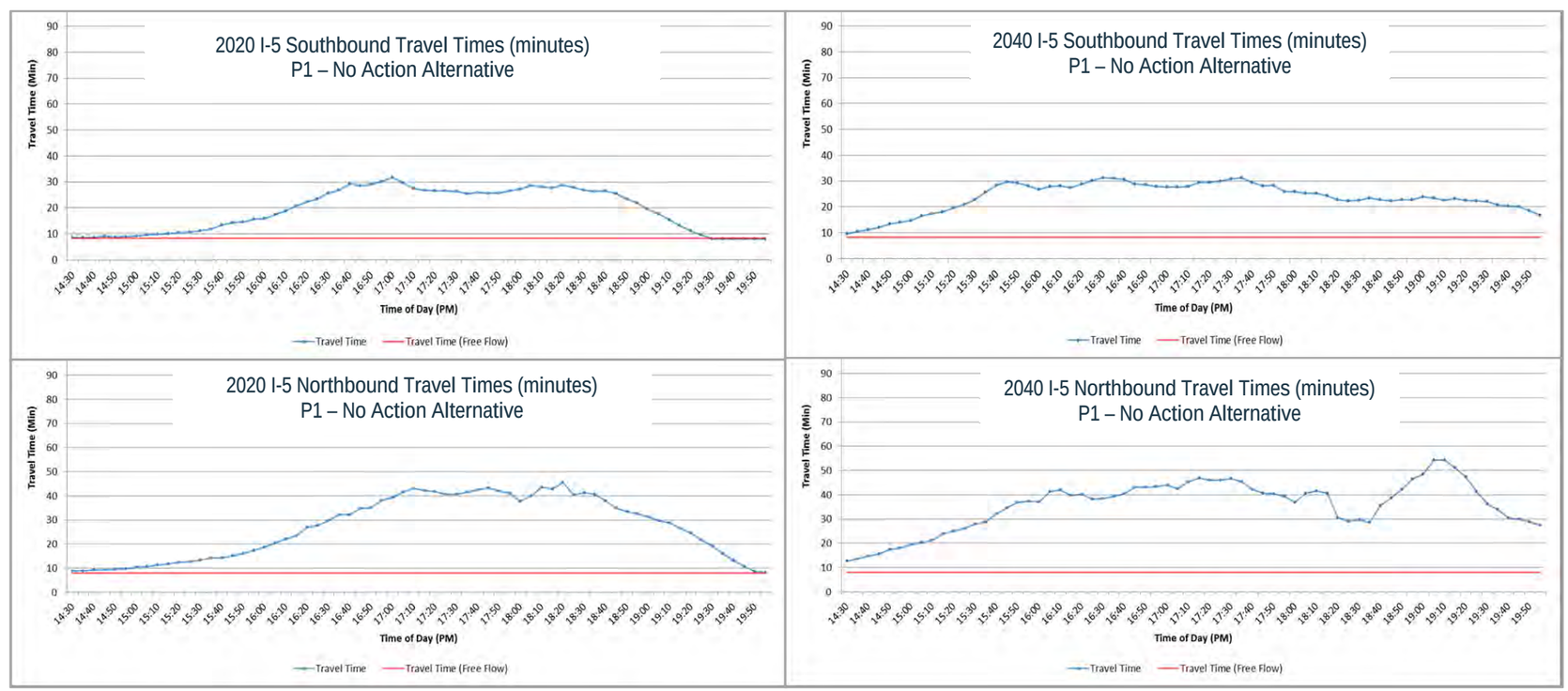


Figure VI-16: Average PM Peak Period Travel Time along I-5 between Mounts Road and Bridgeport Way by Time of Day – P1



Alternative P2 – Enhanced Transit

The Enhanced Transit Alternative (Alternative P2) in 2020 and 2040 includes the improvements contained in P1 – No Action Alternative and adds the enhance transit service, as described in Chapter III. Overall, the analysis of this alternative provides more transit service and attracts some additional riders. However, these transit vehicles still operate in the congested conditions with slow travel speeds, as previously described for the No Action Alternative. These slower operating speeds limit the attractiveness of transit and can discourage some potential riders from using transit. Based on the model results, in 2020 only 68 percent of the I-5 peak hour demand can pass through the corridor; and over a two-hour PM peak period about 83 percent of the demand can pass through the I-5 corridor. By 2040, these percentages are further reduced so that only about 28 percent of the I-5 peak hour demand can pass through the corridor; and over a two-hour PM peak period about 58 percent of the demand can pass through the I-5 corridor.

I-5 PM Peak Hour Travel Forecasts – 2020 & 2040

Vehicle Trips: For Alternative P2, the average PM peak hour vehicle trips along I-5 between Mounts Road and Bridgeport Way in 2020 are approximately 4,670 vehicles southbound (3.3 % less than Alternative P1) and 4,050 vehicles northbound (1.0% more than Alternative P1). By 2040, the average PM peak hour vehicle trips along I-5 in the study area increases to approximately 4,880 vehicles southbound (2.4% less than Alternative P1)and decreases to approximately 3,870 vehicles northbound (2.9% more than Alternative P1).

In both 2020 and 2040, about 21 percent of the traffic is HOV vehicle trips and 79 percent are SOV vehicle trips. Because of the increased congestion along I-5, especially in the northbound direction, fewer vehicle trips can be accommodated along I-5. The average 2020 and 2040 traffic flow by SOV and HOV vehicles along various segments of I-5 by direction is illustrated in Figure VI-17.

Person Trips: The average 2020 PM peak hour person trips along I-5 through the JBLM area are approximately 6,800 person trips southbound (same as Alternative P1) and 5,870 person trips northbound (5.8 % more than Alternative P1) with an average of 41 percent being HOV person trips, 54 percent being SOV person trips, and five percent being transit trips.

The average 2040 PM peak hour person trips along I-5 through the JBLM area are approximately 7,110 person trips southbound (.09% more than Alternative P1) and 5,960 person trips northbound (8.2% more than Alternative P1) with an average of 42 percent being HOV person trips, 53 percent being SOV person trips, and five percent being transit trips.

Overall, there is little change (4.5% southbound and 1.5% northbound) in person trips during the PM peak hour between 2020 and 2040 because of increased congestion along I-5. The average person trips by SOV, HOV and transit along various segments of I-5 by direction is illustrated in Figure VI-18.

Figure VI-17: 2020 and 2040 PM Peak Hour I-5 Vehicle Trips – P2

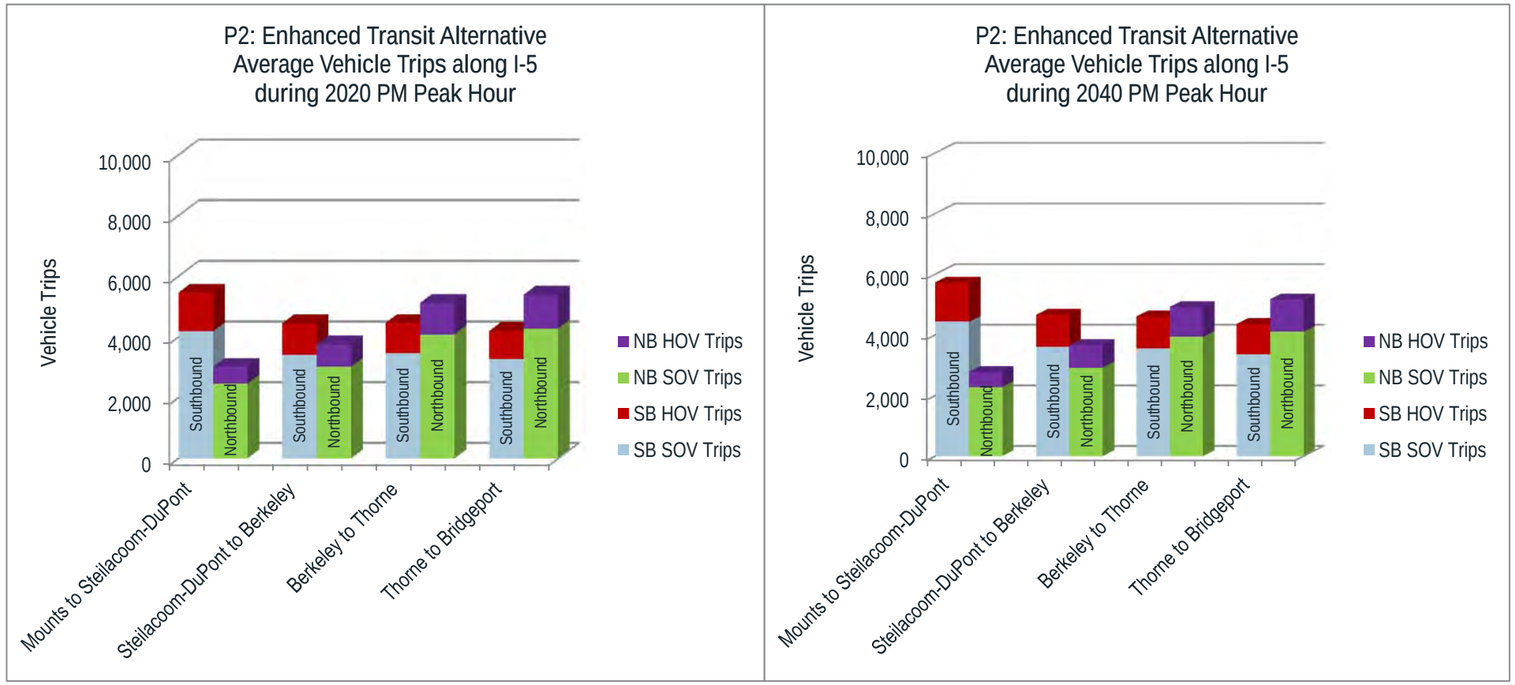
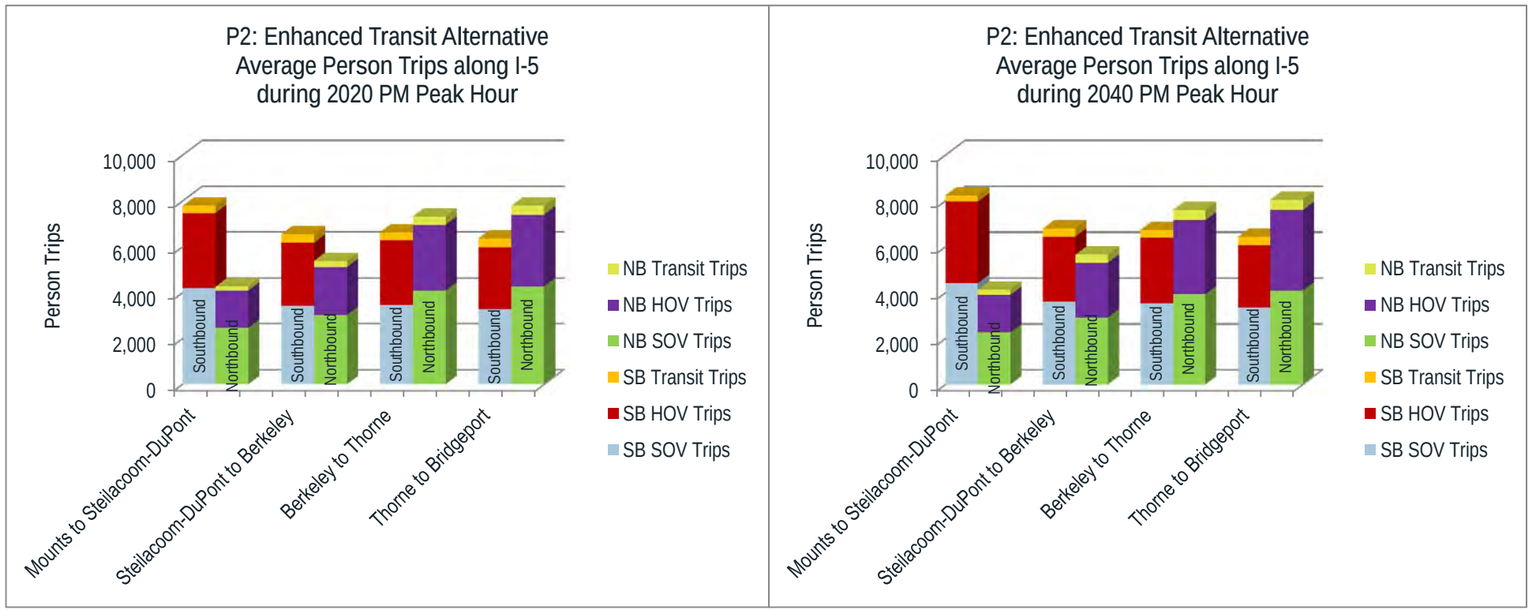


Figure VI-18: 2020 and 2040 PM Peak Hour I-5 Person Trips – P2



PM Peak Period I-5 Person Trips by Mode and Type

A comparison of 2020 and 2040 person trips along I-5 between Mount Road and Bridgeport Way during the 6-hour PM peak period is illustrated in Figure VI-19. Overall, in 2020 there were approximately 89,610 person trips traveling on I-5 during the 6-hour PM peak period in the study area. Of this total, about 59 percent were estimated to be SOV trips, 37 percent were estimated to be HOV trips, and about four percent on transit vehicles.

These 2020 PM peak period person trips were also broken down into three categories, with about 47 percent classified as regional trips, about 39 percent were classified as trips entering or exiting I-5 within the study area, and about 14 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-4.

Table VI-4: 2020 PM 6-hour Peak Period – Person Trips by Mode and Type – P2

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	48%	48%	20%	47%
Entering/Exiting I-5 within Study Area	39%	38%	65%	39%
Both Entering & Exiting I-5 within Study Area	13%	14%	15%	14%

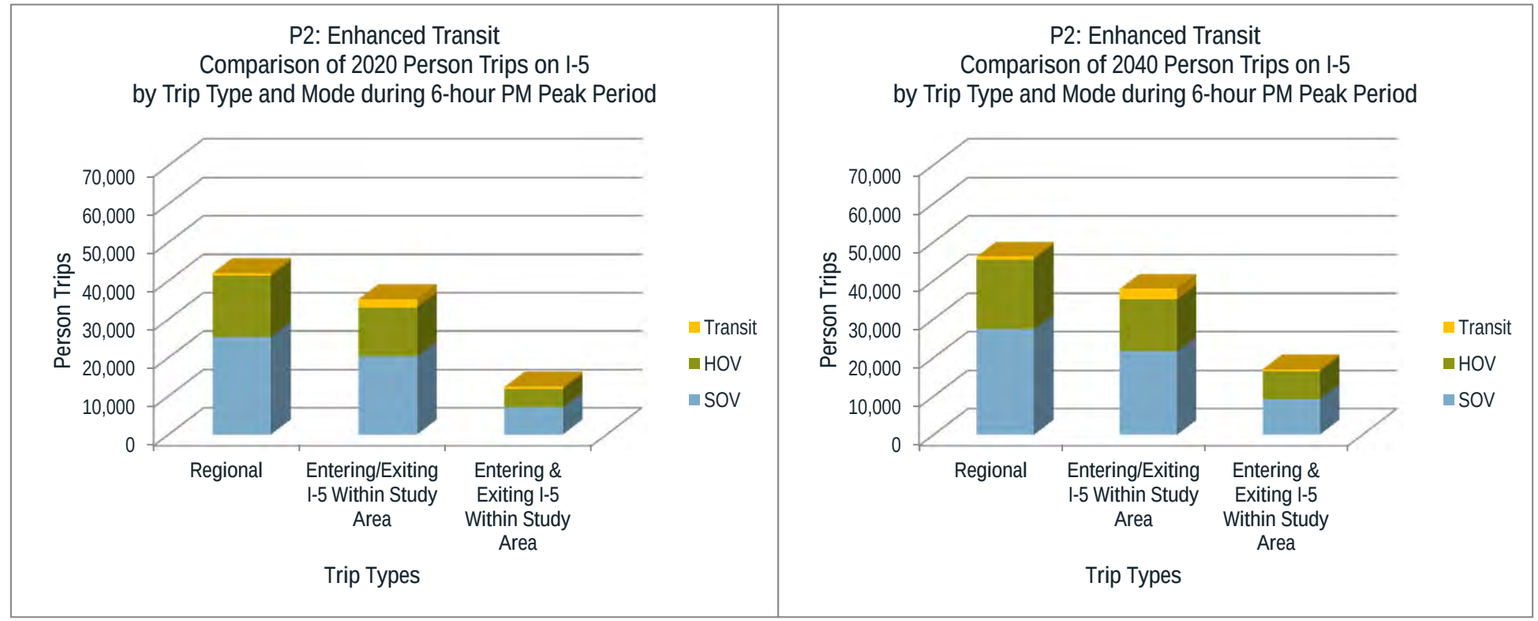
By 2040 there were approximately 101,070 person trips traveling on I-5 during the 6-hour PM peak period in the study area. Of this total, about 58 percent were estimated to be SOV trips, 38 percent were estimated to be HOV trips, and about four percent were on transit vehicles.

Of these 2040 PM 6-hour peak period person, about 46 percent were classified as regional trips, about 37 percent were classified as trips entering or exiting I-5 within the study area, and about 17 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-5.

Table VI-5: 2040 PM 6-hour Peak Period – Person Trips by Mode and Type – P2

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	47%	47%	17%	46%
Entering/Exiting I-5 within Study Area	37%	35%	68%	37%
Both Entering & Exiting I-5 within Study Area	16%	18%	15%	17%

Figure VI-19: Comparison of 2020 & 2040 I-5 PM 6-hour Peak Period Person Trips by Mode and Type – P2

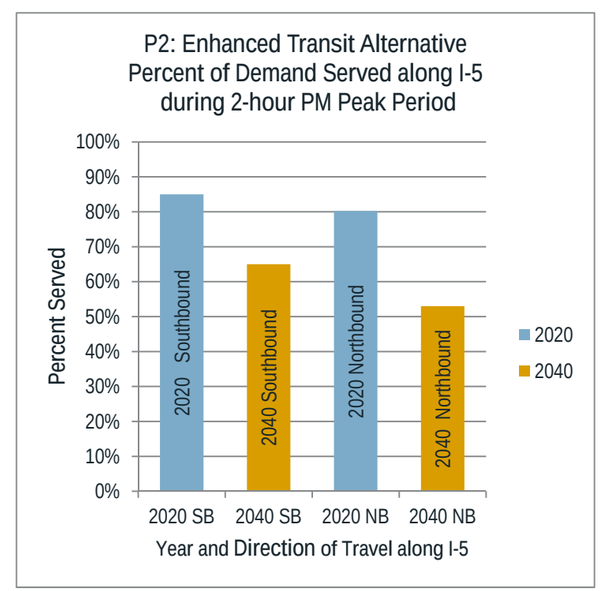


Percent of I-5 Travel Demand Served during the 2-hour PM Peak Period in 2020 & 2040

Using the Meso Model, the analysis of the 2-hour PM person-demand for travel along I-5 in each direction within the study area was compared with the actual number of person trips traveling in the study area for 2020 and 2040. This analysis showed that in 2020 approximately 85 percent of the person-demand traveling southbound could use I-5 during the 2-hour peak period, and approximately 80 percent of the person-demand traveling northbound could use I-5 during the same 2-hour PM peak period.

In comparison, by 2040 this analysis showed that approximately 63 percent of the person-demand traveling southbound could use I-5 during the 2-hour peak period, and approximately 53 percent of the person-demand traveling northbound could use I-5 during the same 2-hour PM peak period, as illustrated in Figure VI-20. These percentages are similar to the Alternative P1. The percentages of unmet demand means that drivers wanting to use I-5 must travel outside of this 2-hour PM peak period, find an alternative route, or not make the trip at all.

Figure VI-20: Comparison of Percent of Demand Served in 2020 and 2040 – P2



I-5 PM Peak Hour Travel Speeds

Comparisons of the Alternative P2 2020 and 2040 southbound and northbound travel speeds along I-5 from Mounts Road to Bridgeport Way are shown on Figure VI-21. These speed patterns for Alternative P2 are similar to the speed patterns for the No Action Alternative.

In the southbound direction, drivers traveling between Steilacoom-DuPont Road and Center Drive can reach 50 mph during the 2020 PM peak hour 50 mph; the rest of the corridor is generally operating below 40 mph with the section from Berkeley Street to Bridgeport Way operating at less than 25 mph. By 2040 travel speeds in most of the I-5 corridor in the southbound direction are less than 30 mph.

In the northbound direction, 2020 and 2040 travel speeds are similar, with slow travel speeds (less than 30 mph) from Mounts Road to Berkeley Street. By Thorne Lane, where a fourth lane is added, the average PM peak hour speeds increases.

Because of long sections of slow travel speeds, the average PM peak hour corridor speeds are slow with the overall southbound 2020 travel speeds averaging about 14 mph and the 2020 northbound travel speeds averaging about 23 mph.

By 2040, southbound travel speeds average decreases to about 10 mph along this section of I-5 and the 2040 northbound travel speeds decrease to about 16 mph.

The average speeds along I-5 by direction and time of day for 2020 and 2040 are illustrated in Figure VI-22. These speed-time diagrams show that the slow speeds extend for most of the PM 6-hour peak period at some locations along I-5 in 2020. By 2040 these slow travel speeds are expected to extend past the 6-hour PM peak period.

Figure VI-21: 2020 and 2040 Southbound Travel Speeds during the PM Peak Hour along I-5 – P2

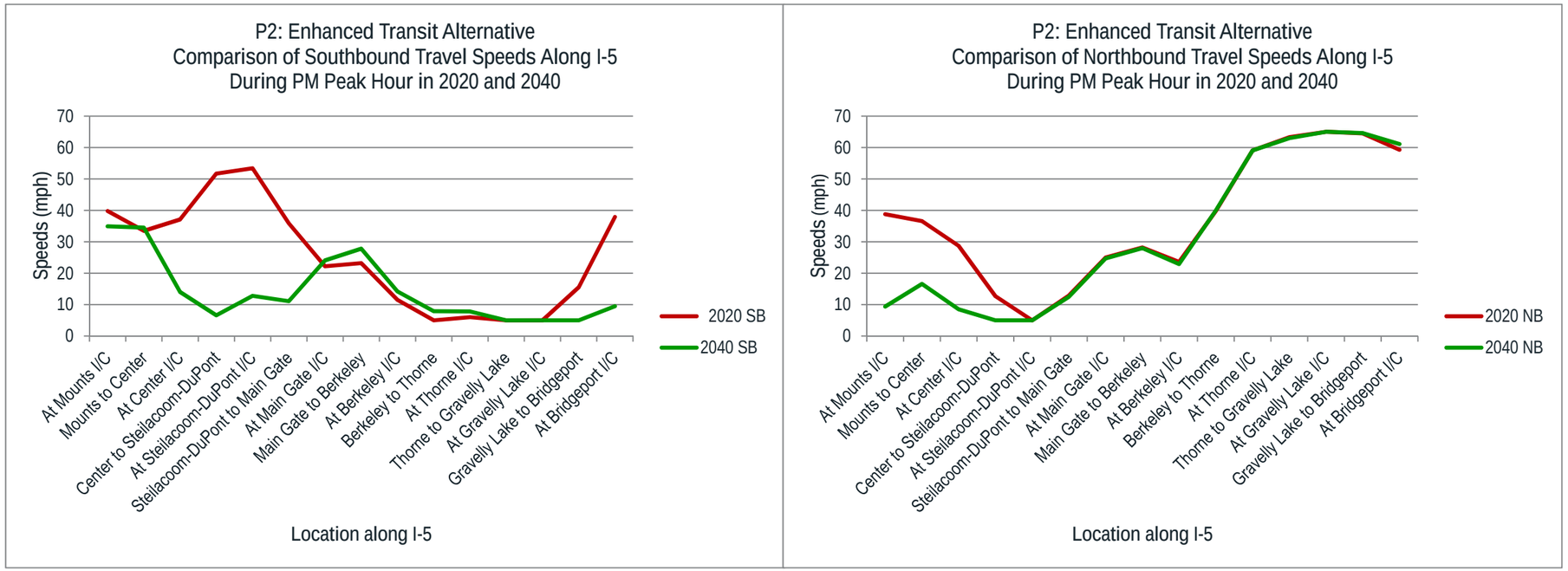
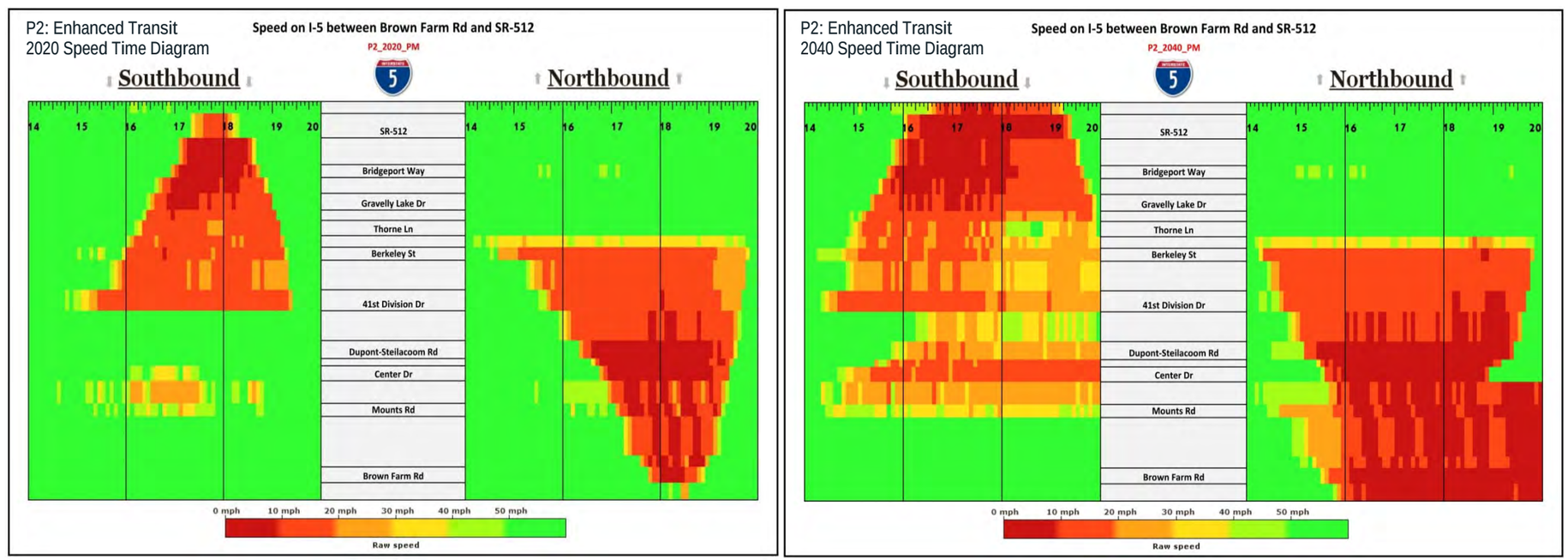


Figure VI-22: 2020 and 2040 PM Peak Period Speed-Time Diagrams along I-5



I-5 Hours of Congestion – 2020 & 2040 PM Peak Period

The hours of congestion for Alternative P2 are virtually identical to the results for Alternative P1, shown on page VI-7. Due to the high traffic demand and slow travel speeds in 2020 and 2040, the hours of congestion along I-5 extend well beyond the PM peak hour. To estimate how many hours of congestion drivers would experience along I-5, the number of hours that drivers in the various segments of I-5 would travel at speeds below 70 percent of posted speed was estimated from the Meso Model during the 6-hour PM peak period. As illustrated in Figure VI-23, congestion along I-5 in the southbound direction between Steilacoom-DuPont Road and Berkeley Street lasts for nearly four hours in 2020 and almost the full six hours in 2040. In the northbound direction congestion lasts for nearly five hours in 2020 from Steilacoom-DuPont Road to Thorne Lane and almost the full 6-hours in 2040. Also by 2040, the extended hours of congestion is expected to occur along all segments of I-5 through the JBLM area. As shown in Figure VI-22, the congestion in 2040 is expected to last beyond our 8 PM analysis limit.

I-5 Travel Times during the 2020 & 2040 PM Peak Period

The travel times for Alternative P2 are virtually identical to the results for Alternative P1, shown on page VI-7. Travel times along I-5 between Mounts Road Interchange and the Bridgeport Way Interchanges by direction over the hour PM peak period were estimated using the Meso Model. These travel are illustrated in Figure VI-24. Travel along this nine mile section of I-5 at the posted speed limit of 60 mph would generally take approximately 9 minutes. However, because of the increased congestion and reduced travel speeds, travel times are increased to approximately 30 minutes in the southbound direction in both 2020 and 2040. In the northbound direction, the peak travel times are estimated to be about 40 to 45 minutes in both the 2020 and 2040 time periods.

In the southbound direction, the average travel time during a 3-hour PM peak period is about 21 minutes in 2020 and about 28 minutes in 2040. In the northbound direction, the 3-hour PM peak period average travel time is estimate at about 26 minutes in 2020 and about 36 minutes in 2040.

Summary of Traffic Operations in 2020 & 2040 for P2 – Enhanced Transit Alternatives

With only enhanced transit service being added in this alternative, there is some increase in transit riders, but this increase is limited because buses still travel at slow speeds with no real travel time advantage, as compared to automobile traffic. Congestion is still expected to increase and travel speeds will decrease, limiting the amount of traffic, whether SOV, HOV or transit, that can travel in and through the I-5 corridor in the vicinity of JBLM. As part of the SOV traffic, trucks and other freight haulers will also be subject to longer travel times and reduced reliability. The hours of congestion are expected to be similar to the No Action Alternative and some drivers will have to travel outside the 6-hour PM peak period analysis timeframe.

Figure VI-23: Comparison of 2020 and 2040 Hours of Congestion by I-5 Segments – P2

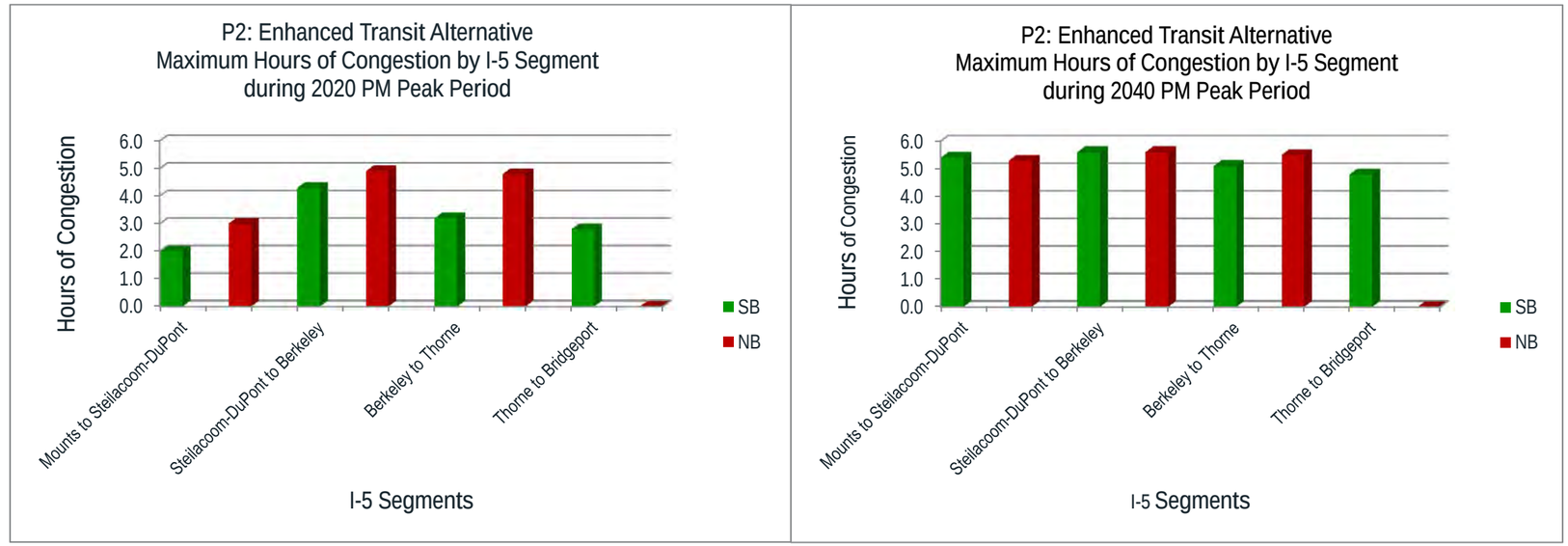
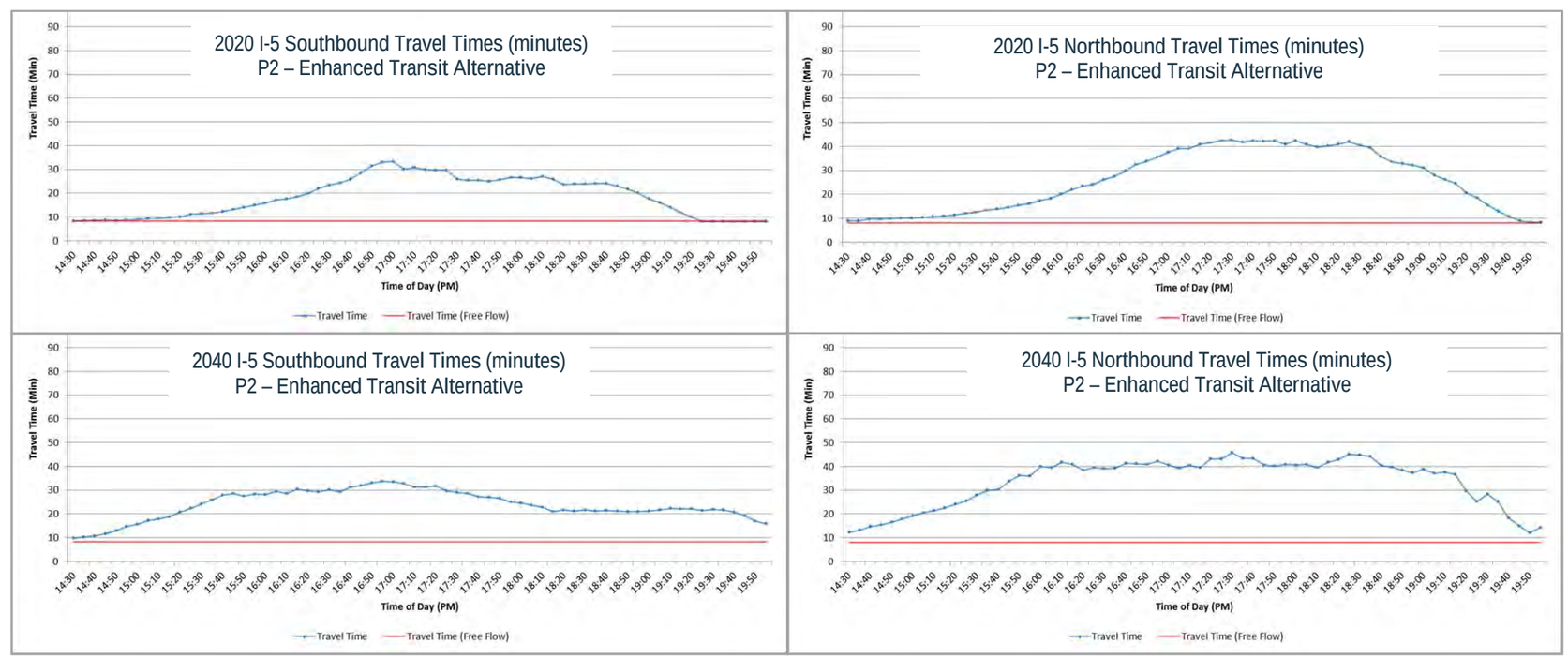


Figure VI-24: Average PM Peak Period Travel Time along I-5 between Mounts Road and Bridgeport Way by Time of Day – P2



Alternative P3 – Local Road Improvements with Enhanced Transit Service

The Local Road Improvements with Enhanced Transit Alternative in 2020 and 2040 includes the improvements contained in the Enhanced Transit Alternative (P2) and adds the several local street improvements, as described in Chapter III. Overall, the analysis of this alternative improves travel on several local roads and added new arterials and provides more transit service. However, I-5 still operates with slow travel speeds and several hours of congestion. This alternative, like P2, increases transit service, but these transit vehicles still operate in the congested conditions along I-5 with slow travel speeds. These slower operating speeds limit the attractiveness of transit and can discourage some potential riders from using transit. Based on the Meso Model results, about 71 percent of the I-5 peak hour demand can pass through the corridor, and over a two-hour PM peak period about 84 percent of the demand can pass through the I-5 corridor in 2020. By 2040, these percentages are further reduced so that only about 29 percent of the I-5 peak hour demand can pass through the corridor, and over a two-hour PM peak period about 59 percent of the demand can pass through the I-5 corridor.

I-5 PM Peak Hour Travel Forecasts – 2020 & 2040

Vehicle Trips: For Alternative P3, the average PM peak hour vehicle trips along I-5 between Mounts Road and Bridgeport Way in 2020 are approximately 4,470 vehicles southbound (7.5% less than Alternative P1)and 4,010 vehicles northbound (same as Alternative P1). By 2040, the average PM peak hour vehicle trips along I-5 in the study area increases to approximately 4,590 vehicles southbound (8.2% less than Alternative P1) and decreases to approximately 3,840 vehicles northbound (2.1% more than Alternative P1). In both 2020 and 2040, about 22 percent of the traffic is HOV vehicle trips and 78 percent are SOV vehicle trips. Because of the increased congestion along I-5, especially in the northbound direction, fewer vehicle trips can be accommodated along I-5. The average 2020 and 2040 traffic flow by SOV and HOV vehicles along various segments of I-5 by direction is illustrated in Figure VI-25.

Person Trips: For Alternative P3, the average 2020 PM peak hour person trips along I-5 through the JBLM area are approximately 6,530 person trips southbound (4.0% less than Alternative P1) and 5,780 person trips northbound (4.1% more than Alternative P1) with an average of 41 percent being HOV person trips, 54 percent being SOV person trips, and five percent being transit trips. By 2040, the average PM peak hour person trips along I-5 through the JBLM area is approximately 6,640 person trips southbound (5.8% less than Alternative P1) and 5,780 person trips northbound (4.9% more than Alternative P1) with an average of 41 percent being HOV person trips, 54 percent SOV person trips, and five percent being transit trips.

Overall, there is little change (1.5%) in person trips during the PM peak hour between 2020 and 2040 because of increased congestion along I-5. The average person trip by SOV, HOV and transit along various segments of I-5 by direction is illustrated in Figure VI-26.

Figure VI-25: 2020 and 2040 PM Peak Hour I-5 Vehicle Trips – P3

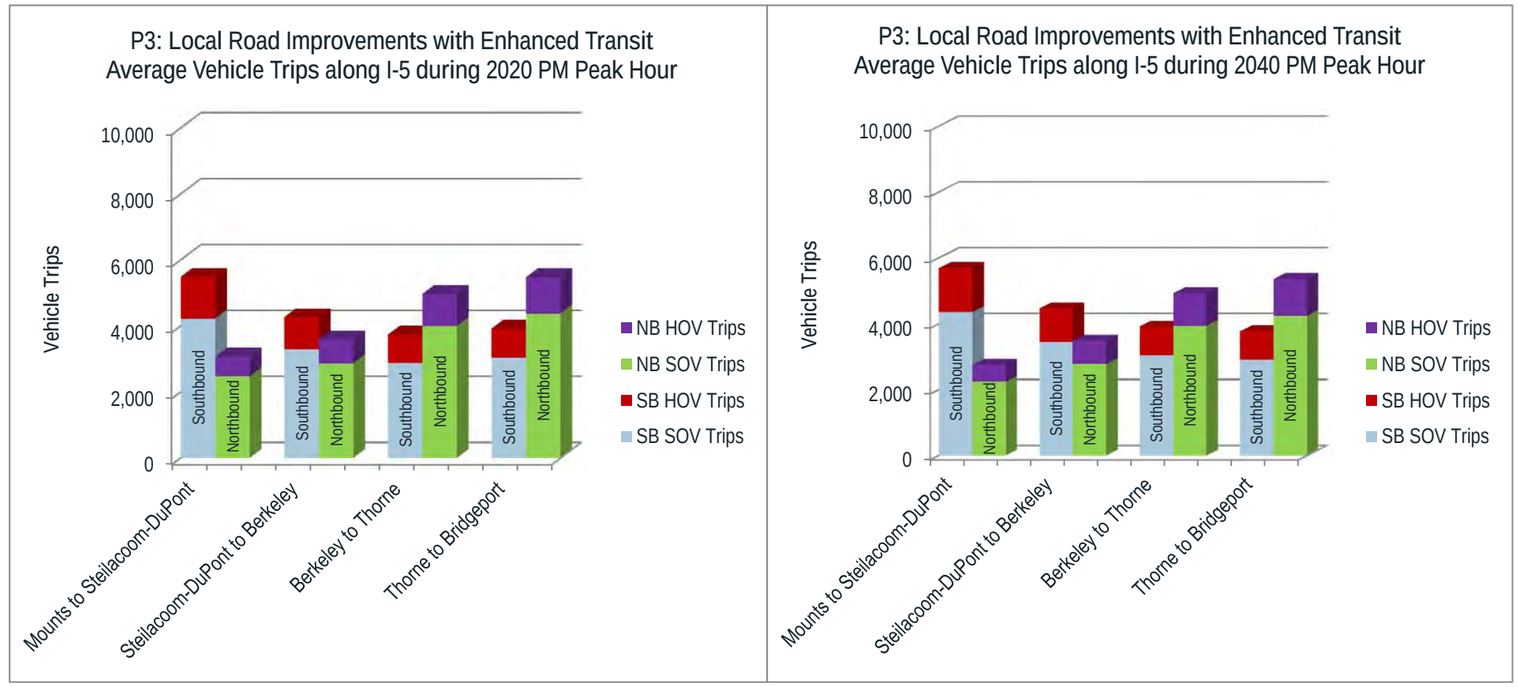
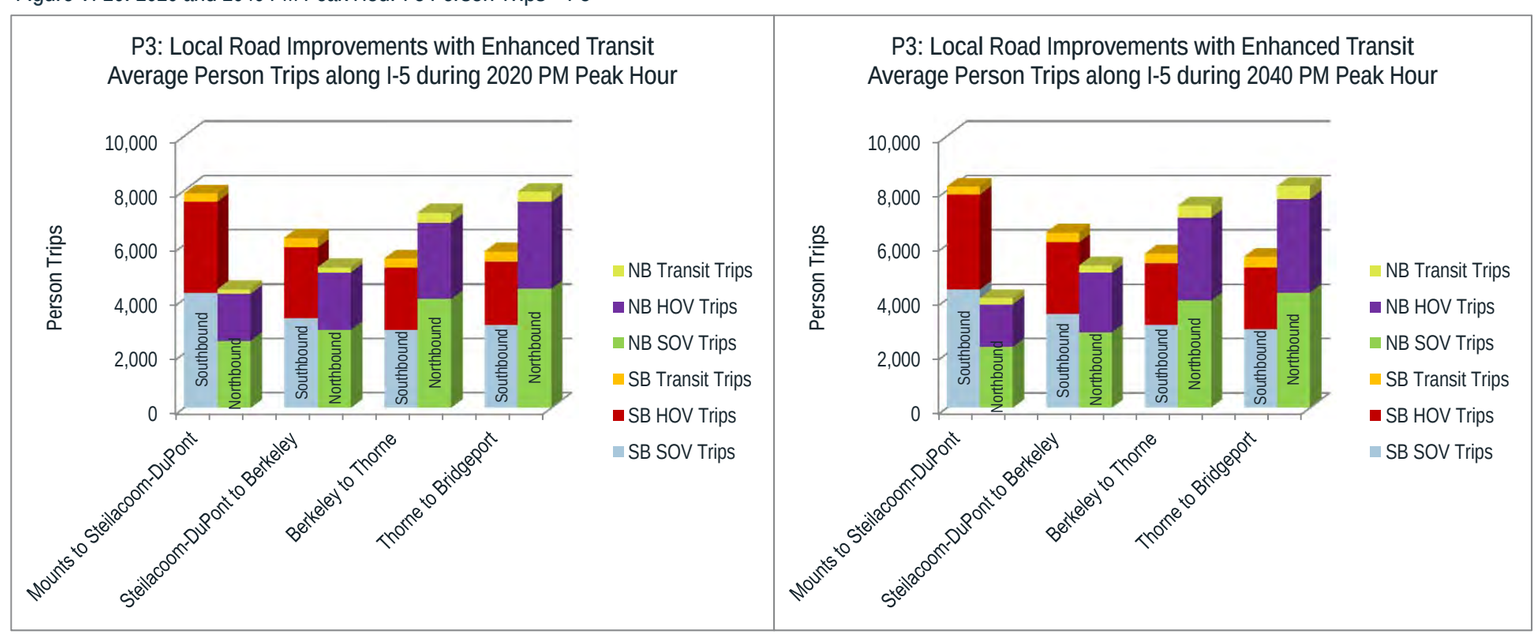


Figure VI-26: 2020 and 2040 PM Peak Hour I-5 Person Trips – P3



PM Peak Hour Period I-5 Person Trips by Mode and Type

A comparison of Alternative P3 person trips along I-5 in 2020 and 2040 between Mount Road and Bridgeport Way during the 6-hour PM peak period is illustrated in Figure VI-27. Overall, in 2020 there were approximately 85,780 person trips traveling on I-5 during the 6-hour PM peak period in the study area (3.6% less than Alternative P1). Of this total, about 59 percent were estimated to be SOV trips, 37 percent were estimated to be HOV trips, and about four percent on transit vehicles.

These 2020 PM peak period person trips were also broken down into three categories, with about 48 percent classified as regional trips, about 40 percent were classified as trips entering or exiting I-5 within the study area, and about 12 percent of the trips were classified as local trip, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-6.

Table VI-6: 2020 PM 6-hour Peak Period – Person Trips by Mode and Type – P3

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	49%	49%	20%	48%
Entering/Exiting I-5 within Study Area	40%	38%	66%	40%
Both Entering & Exiting I-5 within Study Area	11%	13%	14%	12%

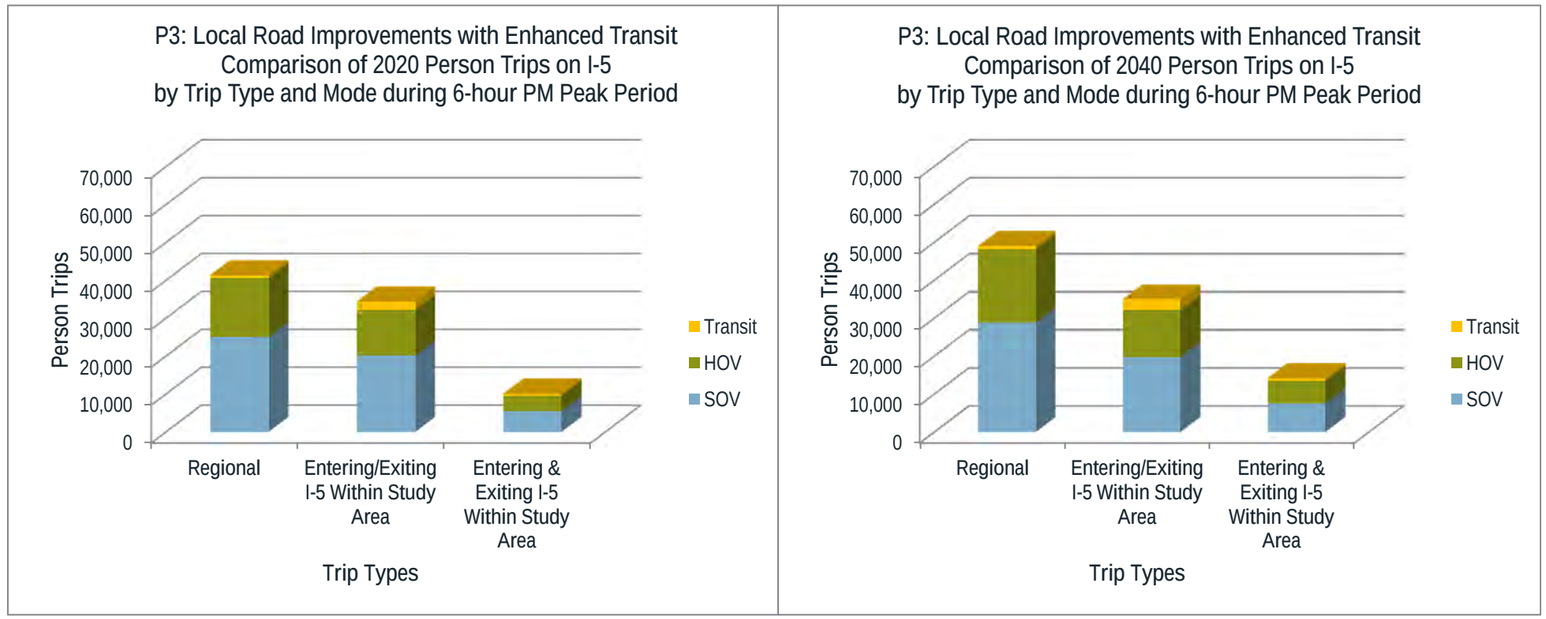
By 2040, there were approximately 98,050 person trips traveling on I-5 during the 6-hour PM peak period in the study area (1.8% less than Alternative P1). Of this total, about 57 percent were estimated to be SOV trips, 38 percent were HOV trips, and about percent five were on transit vehicles.

Of these 2040 PM 6-hour peak period person, about 50 percent were classified as regional trips, about 36 percent were classified as trips entering or exiting I-5 within the study area, and about 14 percent of the trips were classified as local, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-7.

Table VI-7: 2040 PM 6-hour Peak Period – Person Trips by Mode and Type – P3

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	51%	51%	19%	50%
Entering/Exiting I-5 within Study Area	35%	33%	65%	36%
Both Entering & Exiting I-5 within Study Area	14%	16%	16%	14%

Figure VI-27: Comparison of 2020 & 2040 I-5 PM 6-hour Peak Period Person Trips by Mode and Type – P3

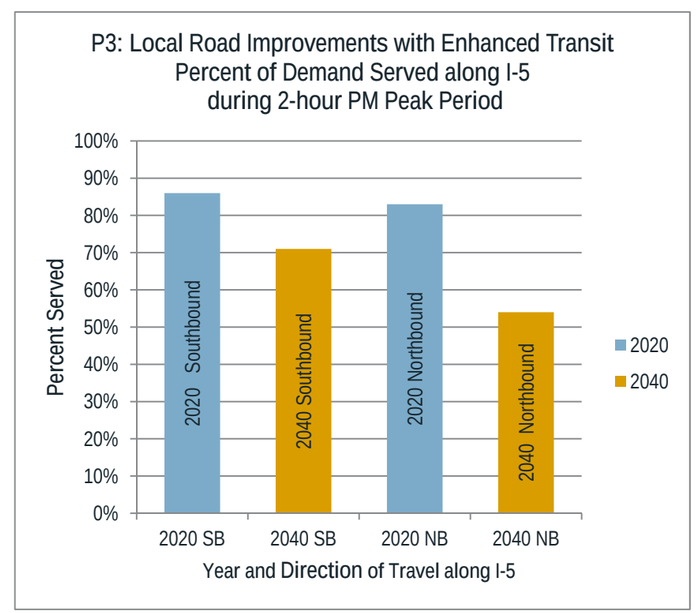


Percent of I-5 Travel Demand Served during the 2-hour PM Peak Period in 2020 & 2040

Using the Meso Model, the analysis of the 2-hour PM person-demand for travel along I-5 in each direction within the study area was compared with the actual number of person trips traveling in the study area for 2020 and 2040. This analysis showed that in 2020 approximately 86 percent of the person-demand traveling southbound (Alternative P1 has 85%) could use I-5 during the 2-hour peak period. Also approximately 83 percent of the person-demand traveling northbound (Alternative P1 has 79%) could use I-5 during the same 2-hour PM peak period. These percentages are 1% more southbound and 4% more northbound than Alternative P1.

In comparison by 2040, this analysis showed that approximately 71 percent of the person-demand traveling southbound (Alternative P1 has 64%) could use I-5 during the 2-hour peak period, and approximately 54 percent of the person-demand traveling northbound (Alternative P1 has 50%) could use I-5 during the same 2-hour PM peak period, as illustrated in Figure VI-28. The percentages of unmet demand means that drivers wanting to use I-5 must travel outside of this 2-hour PM peak period, find an alternative route, or not make the trip at all.

Figure VI-28: Comparison of Percent of Demand Served in 2020 and 2040 – P3



I-5 PM Peak HourTravel Speeds

Comparisons of 2020 and 2040 southbound and northbound travel speeds along I-5 from Mounts Road to the Bridgeport Way for Alternative P3 are shown on Figure VI-29. These speed patterns for Alternative P3 are similar to the speed pattern for the No Action Alternative.

In the southbound direction, only in short sections of I-5 between Steilacoom-DuPont Road and Center Drive, and north of Gravelly Lake Drive do drivers reach a speed of 50 mph in 2020. The rest of the corridor is generally operating below 40 mph, with the section from Main Gate to Gravelly Lake Drive operating at less than 25 mph. By 2040, travel speeds in most of the I-5 corridor in the southbound direction are less than 30 mph.

In the northbound direction, 2020 and 2040 travel speeds are similar, with slow travel speeds (less than 30 mph) from Center Drive to Berkeley Street. By Thorne Lane, where a fourth lane is added, the average northbound PM peak hour speeds increases.

Because of long sections of slow travel speeds, the average PM peak hour corridor speeds are slow with the overall southbound 2020 travel speeds averaging about 14 mph and the 2020 northbound travel speeds averaging about 22 mph.

By 2040, southbound travel speeds average decreases to about 9 mph along this section of I-5 and the 2040 northbound travel speeds decrease to about 16 mph.

The average speeds along I-5 by direction and time of day for 2020 and 2040 are illustrated in Figure VI-30. These speed-time diagrams show that the slow speeds extend for most of the PM 6-hour peak period at some locations along I-5 in 2020. By 2040 these slow travel speeds are expected to extend past the 6-hour PM peak period.

Figure VI-29: 2020 and 2040 Southbound Travel Speeds during the PM Peak Hour along I-5 – P3

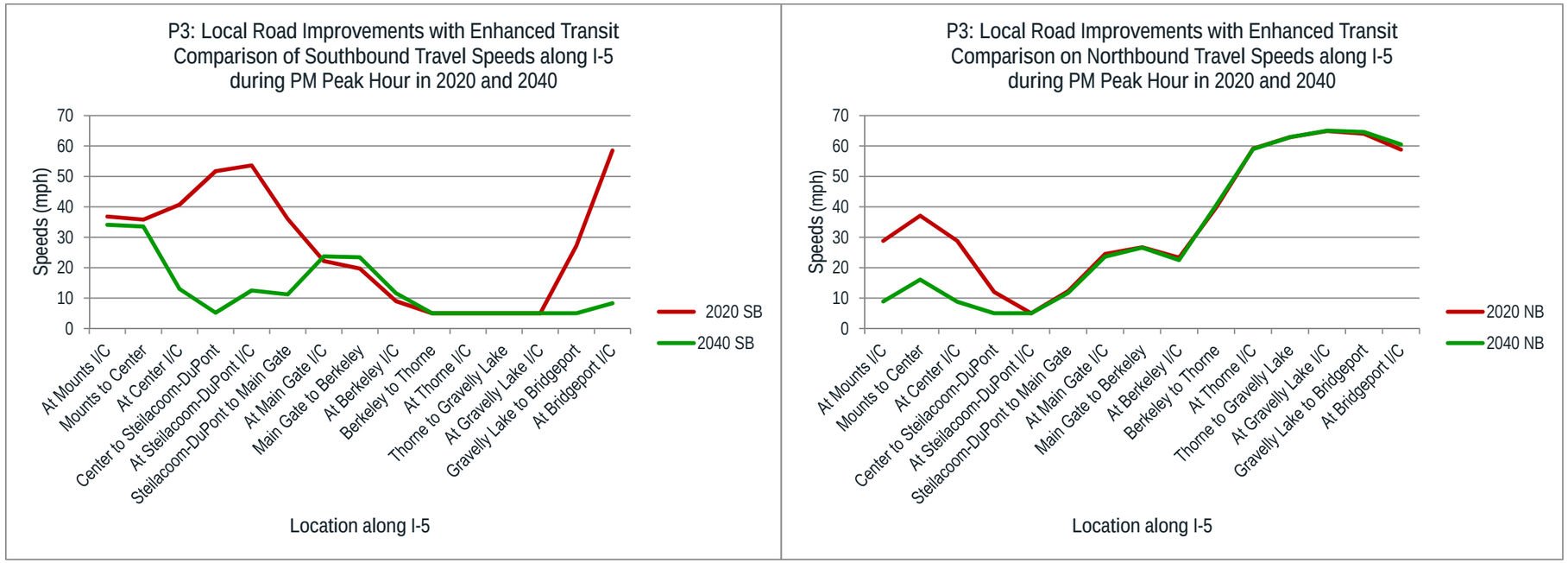
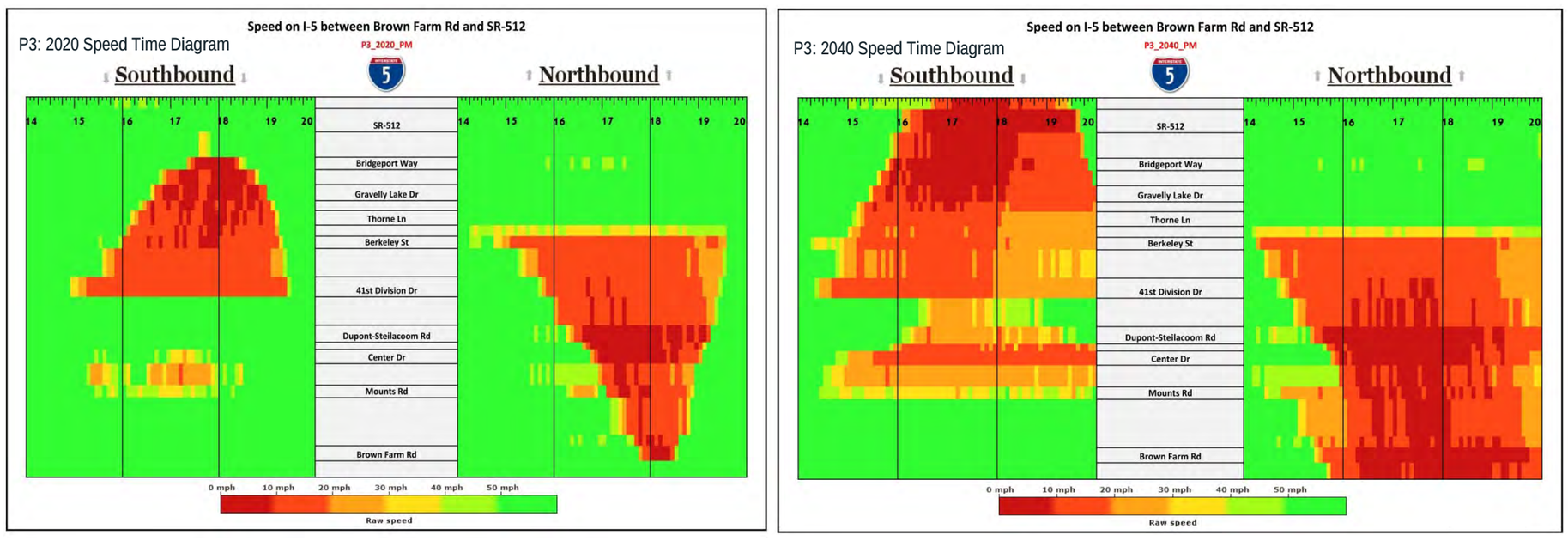


Figure VI-30: 2020 and 2040 PM Peak Period Speed-Time Diagrams along I-5 – P3



I-5 Hours of Congestion – 2020 & 2040 PM Peak Period

Due to the high traffic demand and the slow travel speeds in 2020 and 2040, the hours of congestion along I-5 extend well beyond the PM peak hour for Alternative P3. To estimate how many hours of congestion drivers would experience along I-5, the number of hours, that drivers in the various segments of I-5 would travel at speeds below 70 percent of posted speed, was estimated from the Meso Model during the 6-hour PM peak period. As illustrated in Figure VI-31, congestion along I-5 in the southbound direction between Steilacoom-DuPont Road and Berkeley Street will lasts for over four hours in 2020 and almost the full 6-hours in 2040. In the northbound direction congestion will lasts for nearly five hours in 2020 from Steilacoom-DuPont Road to Thorne Lane and almost the full 6-hours in 2040. Also by 2040, the extended hours of congestion is expected to occur along all segments of I-5 through the JBLM area. As shown in the previous figure, this 2040 congestion is expected to last beyond our 8 PM analysis limit.

I-5 Travel Times during the 2020 & 2040 PM Peak Period

For Alternative P3, travel times along I-5 between Mounts Road Interchange and the Bridgeport Way Interchanges by direction over the hour PM peak period were estimated using the mesoscopic model. These travel are illustrated in Figure VI-32. Travel along this nine miles section of I-5 at the posted speed limit of 60 mph would generally take approximately 9 minutes. However, because of the increased congestion and reduced travel speeds, travel times are increased to nearly 40 minutes in the southbound direction in both 2020 and 2040. In the northbound direction, the peak travel times are estimated to be about 40 minutes in both the 2020 and 2040 time periods.

In the southbound direction, the average travel time of a 3-hour PM peak period is about 23 minutes in 2020 and about 30 minutes in 2040. In the northbound direction, the 3-hour PM peak period average travel time is estimate at about 26 minutes in 2020 and about 36 minutes in 2040.

Summary of Traffic Operations in 2020 & 2040 for P3 – Local Road Improvements with Enhanced Transit Service

With local road improvements and enhanced transit service being added in this alternative, there is some increase in transit riders and reduction in local trips on I-5. However, congestion along I-5 is still expected to increase and travel speeds will decrease, limiting the amount of traffic, whether SOV, HOV or transit, that can travel in and through the I-5 corridor in the vicinity of JBLM. As part of the SOV traffic, trucks and other freight haulers will also be subject to longer travel times and reduced reliability. The hours of congestion are also expected to increase and delay some drivers to travel outside the 6-hour PM peak period analysis time frame.

Figure VI-31: Comparison of 2020 and 2040 Hours of Congestion by I-5 Segments – P3

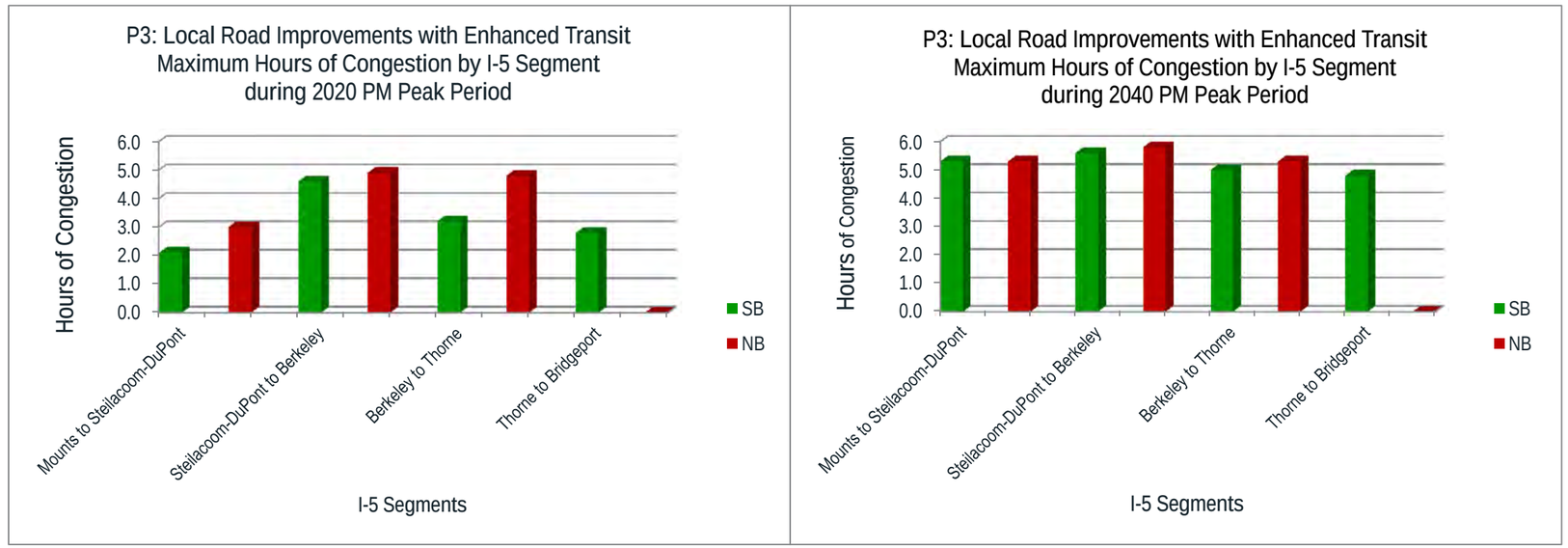
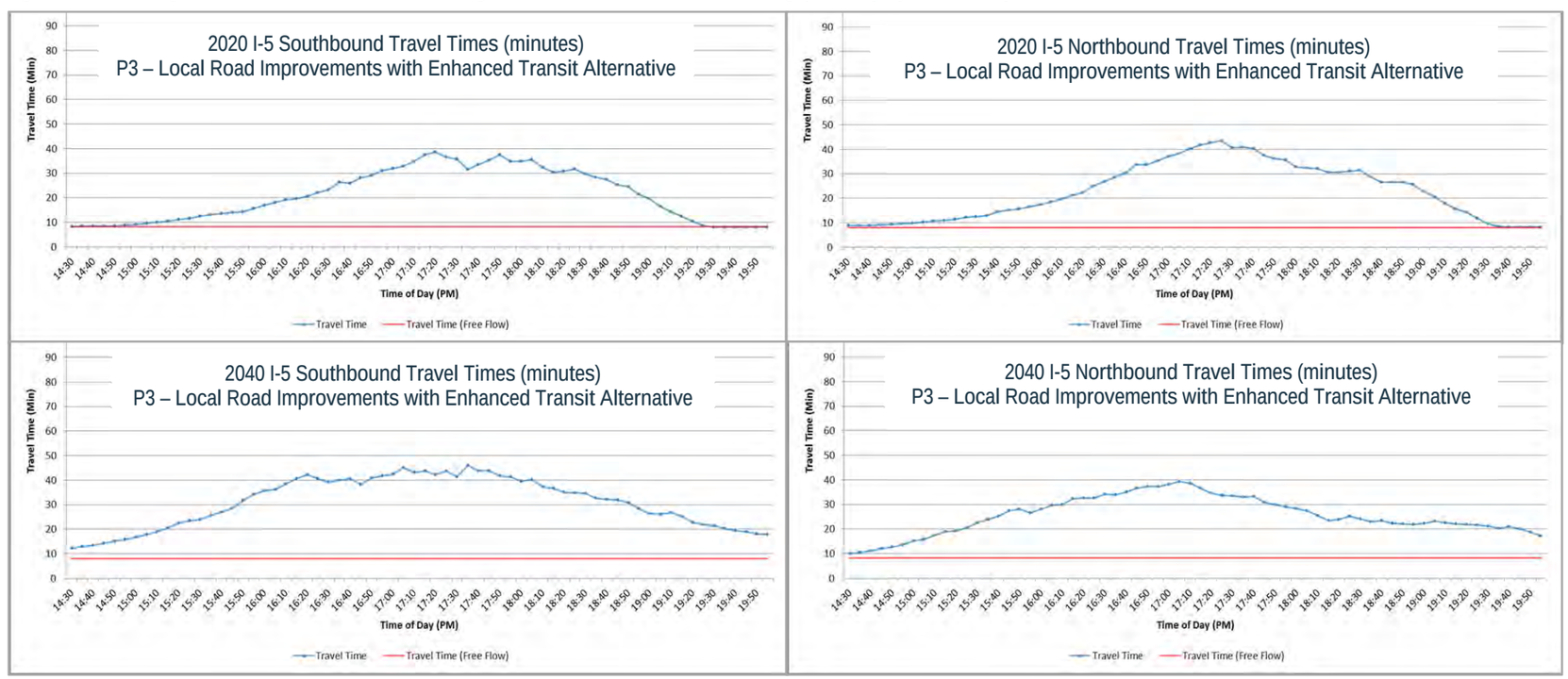


Figure VI-32: Average PM Peak Period Travel Time along I-5 between Mounts Road and Bridgeport Way by Time of Day – P3



Alternative P4 – Express Lanes

The Express Lanes Alternative (Package P4) in 2020 and 2040 adds express lanes from north of the Center Drive Interchange to north of Gravelly Lake Drive, as described in Chapter III. For our analysis, the express lanes contain one HOV lane and one general purpose (GP) lane in each direction. Overall, the analysis of this alternative improves I-5 operations; however I-5 still operates with slow travel speeds and several hours of congestion. Based on the Meso Model results, in 2020 about 91 percent of the I-5 peak hour demand can pass through the corridor (67% in Alternative P1); and over a two-hour PM peak period about 96 percent of the demand can pass through the I-5 corridor (82% in Alternative P1). By 2040, these percentages are reduced so that only about 79 percent of the I-5 peak hour demand can pass through the corridor (26% in Alternative P1); and over a two-hour PM peak period about 89 percent of the demand can pass through the I-5 corridor (57% in Alternative P1). These percentages are greatly improved over the 2040 No Action Alternative.

I-5 PM Peak Hour Travel Forecasts – 2020 & 2040

Vehicle Trips: For Alternative P4, the average PM peak hour vehicle trips along I-5 between Mounts Road and Bridgeport Way in 2020 are approximately 5,490 vehicles southbound (13.7% more than Alternative P1) and 5,490 vehicles northbound (37% more than Alternative P1). By 2040, the average PM peak hour vehicle trips along I-5 in the study area increases to approximately 6,720 vehicles southbound (34% more than Alternative P1) and to approximately 5,970 vehicles northbound (59% more than Alternative P1).

In 2020, about 21 percent of the traffic is HOV vehicle trips and 79 percent are SOV vehicle trips with the express lanes carrying about 32 percent of the traffic. By 2040, about 24 percent are HOV vehicle trips and 76 percent are SOV vehicle trips with the express lanes carrying about 40 percent of the traffic. Because of the increased capacity along I-5, especially in the northbound direction with this alternative, more vehicle trips can be accommodated along I-5. The average 2020 and 2040 traffic flow by SOV and HOV vehicles along various segments of I-5 by direction is illustrated in Figure VI-33.

Person Trips: For Alternative P4, the average 2020 PM peak hour person trips along I-5 through the JBLM area are approximately 7,420 person trips southbound (9% more than Alternative P1) and 7,310 person trips northbound (32% more than Alternative P1) with an average of 40 percent being HOV person trips, 58 percent being SOV person trips, and two percent being transit trips.

By 2040, the average PM peak hour person trips along I-5 through the JBLM area are approximately 9,390 person trips southbound (33% more than Alternative P1) and 8,190 person trips northbound (49% more than Alternative P1) with an average of 42 percent being HOV person trips, 55 percent SOV person trips, and three percent being transit trips.

Figure VI-33: 2020 and 2040 PM Peak Hour I-5 Vehicle Trips – P4

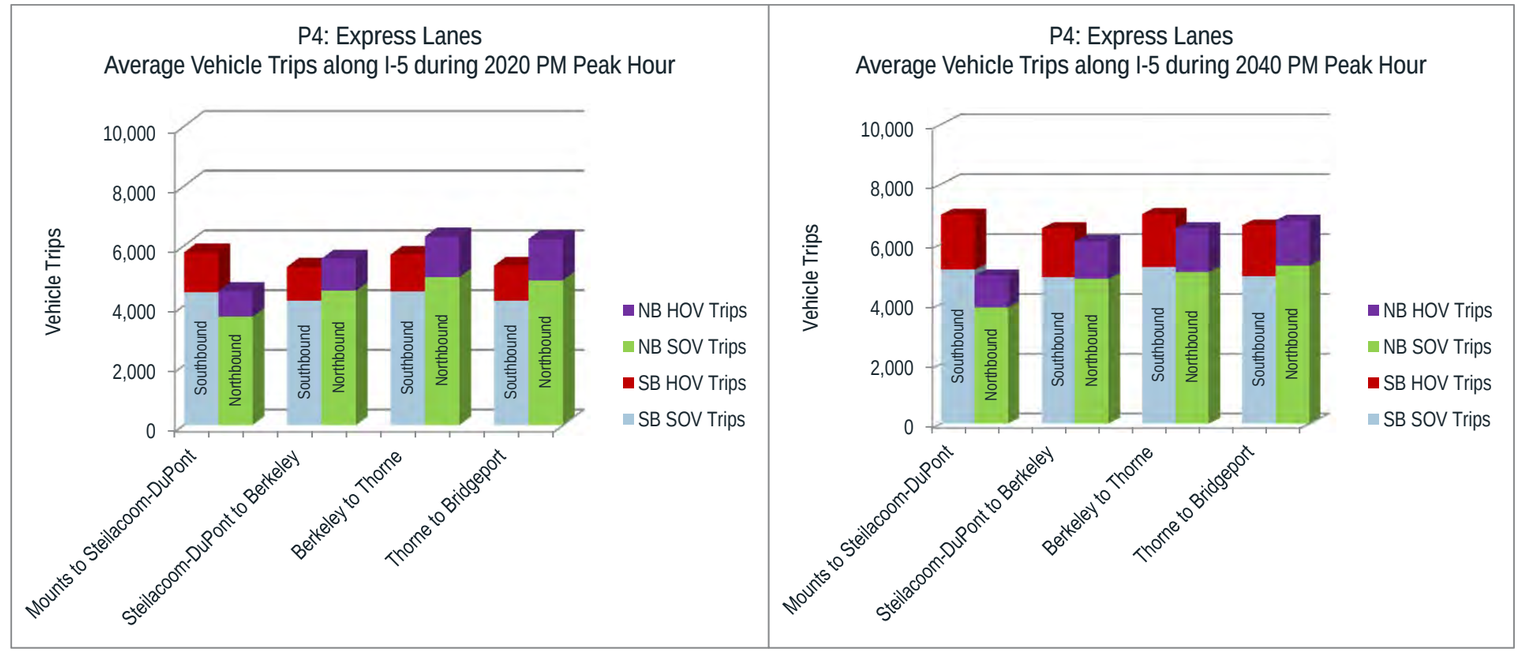
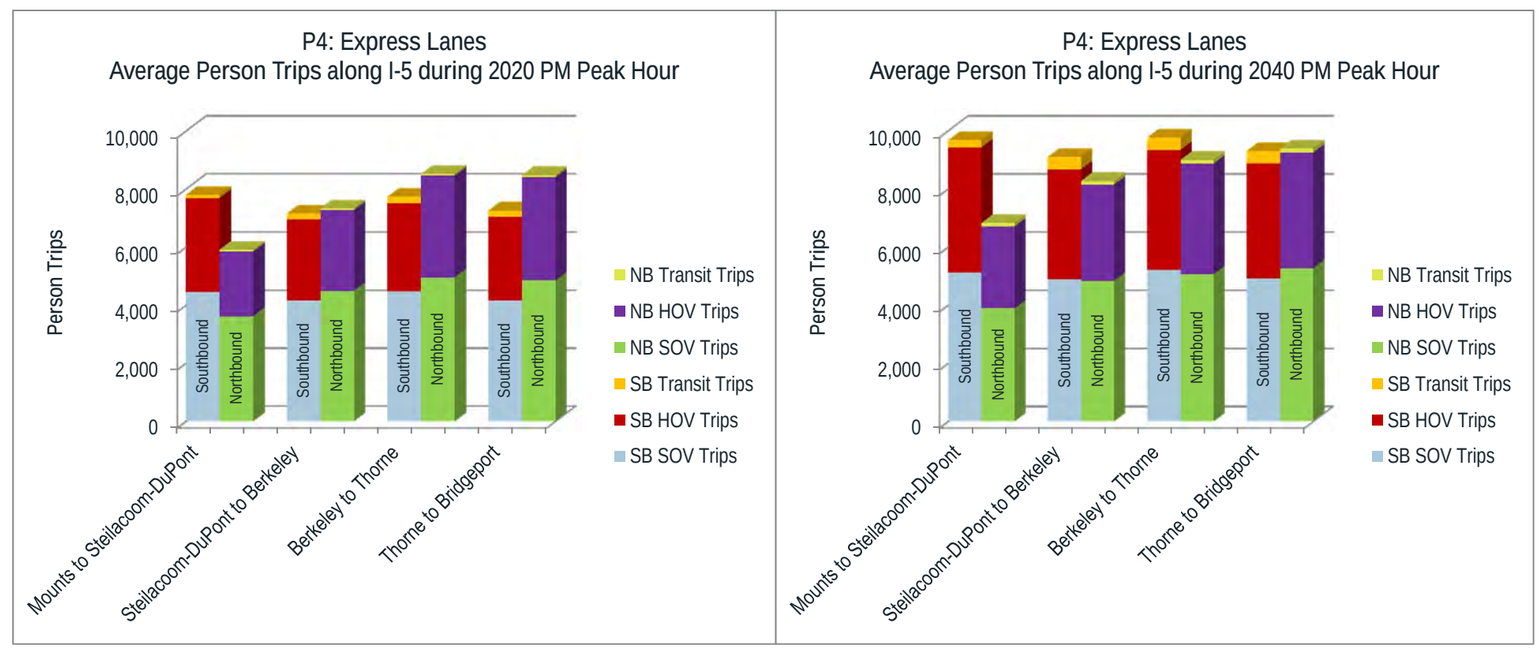


Figure VI-34: 2020 and 2040 PM Peak Hour I-5 Person Trips – P4



Overall, person trips increase by approximately 27 percent southbound and 12 percent northbound during the PM peak hour between 2020 and 2040 because of increased capacity and area development along I-5. The average person trips by SOV, HOV and transit along various segments of I-5 by direction are illustrated in Figure VI-34.

PM Peak Period I-5 Person Trips by Mode and Type

A comparison of 2020 and 2040 person trips along I-5 between Mounts Road and Bridgeport Way during the 6-hour PM peak period for Alternative P4 is illustrated in Figure VI-35. Overall, in 2020 there were approximately 91,250 person trips traveling on I-5 during the 6-hour PM peak period in the study area (2.6% more than Alternative P1). Of this total, about 59 percent were estimated to be SOV trips, 38 percent were estimated to be HOV trips, and about three percent were on transit vehicles.

These 2020 PM peak period person trips were also broken down into three categories, with about 48 percent classified as regional trips, about 36 percent were classified as trips entering or exiting I-5 within the study area, and about 16 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-8.

Table VI-8: 2020 PM 6-hour Peak Period – Person Trips by Mode and Type – P4

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	49%	49%	22%	48%
Entering/Exiting I-5 within Study Area	35%	35%	65%	36%
Both Entering & Exiting I-5 within Study Area	16%	16%	13%	16%

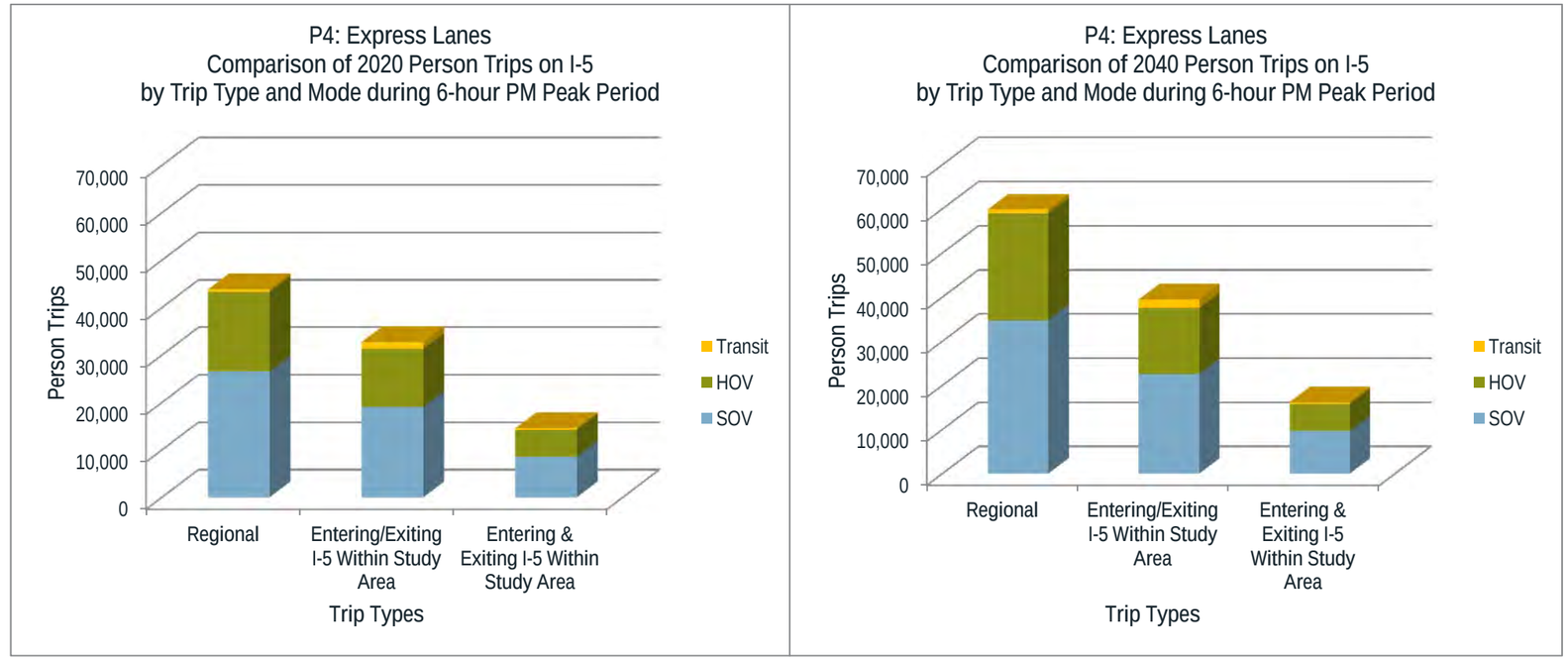
By 2040, there were approximately 115,580 person trips traveling on I-5 during the 6-hour PM peak period in the study area (15.7% more than Alternative P1). Of this total, about 58 percent were estimated to be SOV trips, 39 percent were estimated to be HOV trips, and about three percent were on transit vehicles.

Of these 2040 PM 6-hour peak period person, about 52 percent classified as regional trips, about 34 percent were classified as trips entering or exiting I-5 within the study area, and about 14 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-9.

Table VI-9: 2040 PM 6-hour Peak Period – Person Trips by Mode and Type – P4

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	52%	53%	27%	52%
Entering/Exiting I-5 within Study Area	34%	33%	61%	34%
Both Entering & Exiting I-5 within Study Area	14%	14%	12%	14%

Figure VI-35: Comparison of 2020 & 2040 I-5 PM 6-hour Peak Period Person Trips by Mode and Type – P4



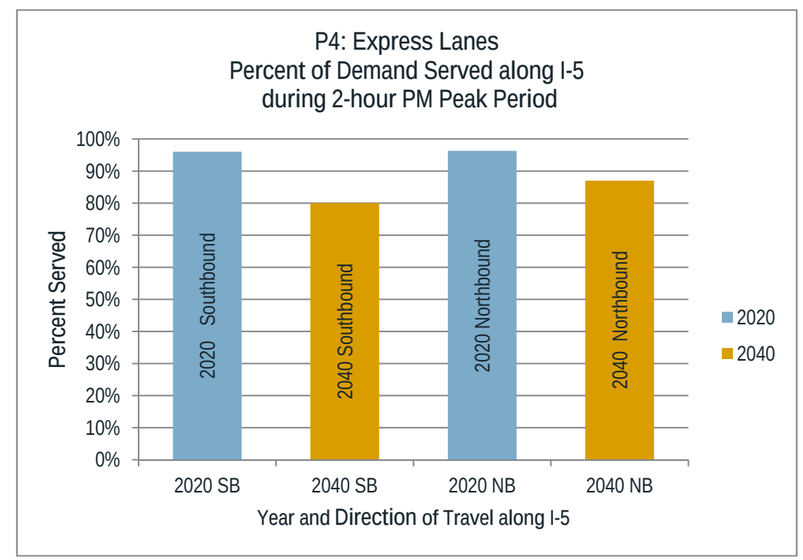
Percent of I-5 Travel Demand Served during the 2-hour PM Peak Period in 2020 & 2040

Using the Meso Model, the analysis of the 2-hour PM person-demand for travel along I-5 in each direction within the study area was compared with the actual number of person trips traveling in the study area for 2020 and 2040. This analysis showed that in 2020 approximately 96 percent of the person-demand traveling in both directions could use I-5 during the 2-hour peak period (Alternative P1 has 85% southbound and 79% northbound).

In comparison, by 2040 this analysis showed that approximately 80 percent of the person-demand traveling southbound (Alternative P1 has 64%) could use I-5 during the 2-hour peak period. Also approximately 87 percent of the person-demand traveling northbound (Alternative P1 has 50%) could use I-5 during the same 2-hour PM peak period, as illustrated in Figure VI-36.

The percentages of unmet demand in 2040 were much larger for the No Action Alternative (36 percent southbound and 50 percent northbound) as compared to 20 percent southbound and 13 percent northbound for the P4 – Express Lanes Alternative.

Figure VI-36: Comparison of Percent of Demand Served in 2020 and 2040 – P4



I-5 PM Peak Hour Travel Speeds

For Alternative P4, comparisons of 2020 and 2040 PM peak hour southbound and northbound non-express lane travel speeds along all lanes of I-5 from Mounts Road to Bridgeport Way are shown on Figure VI-37. These speed patterns for Alternative P4 are generally higher than the speed patterns for the No Action Alternative. At the beginning and ending of the express lanes there is more weaving occuring where drivers change lanes to enter or exit these express lanes. This weaving adversely effects the speeds in these areas.

More significantly, the 2020 configuration does not include additional lanes north or south of the study area. As a result, at the ends of the study area the number of lanes is reduced (six at the south end, eight at the north end.) In the southbound direction, this results in a slow-down in the vicinity of the Steilacoom-DuPont Interchange. In the northbound direction with one of the GP lanes converted to an HOV lane, GP traffic becomes more congested north of the Thorne Lane interchange. During the 2020 PM peak hour, the average southbound travel speed in the non-express lanes is about 21 mph and about 16 mph for the express lanes. The slower express lanes speed is caused by a GP traffic shifting into the express and HOV lanes south of Steilacoom-DuPont Road, as five lanes transition to three lanes which causes back-ups in the express lanes. In the rest of the express lanes sections, drivers travel at 50 mph or better. In the northbound direction, the average travel speed in non-express lanes is about 42 mph and about 51 mph for the express lanes.

By 2040 with the express lanes operational and the HOV system extended into Thurston County, southbound weaving traffic still slows drivers but they can recover reasonable speeds more quickly. Only in short sections of I-5, between Steilacoom-DuPont Road and Center Drive and near the Thorne Lane Interchange, do the average southbound travel speeds fall below 30 mph. Overall the average PM peak hour southbound speed in non-express lanes is about 17 mph and about 16 mph in the express lanes. Again, the slower express lanes speed is caused by GP traffic shifting left as the freeway narrows from five lanes to four lanes, which creates back-ups in the express lanes north of Steilacoom-DuPont Road. In the rest of the express lanes sections, drivers travel at 50 mph or better. In the northbound direction, traffic slows between Berkeley and Thorne Lane Interchanges because of GP drivers merging into what was the express lanes north of Gravelly Lake Drive but also recovers quickly. The average northbound travel speed in non-express lanes is about 41 mph and about 59 mph for the express lanes.

The PM peak period 2020 speeds along I-5 by direction and time of day for non-express lanes and express lanes are illustrated in Figure VI-38. These speed-time diagrams show that the Alternative P4 greatly reduces the hours of congestion for most of the PM 6-hour peak period at several locations along I-5 in 2020. In the southbound direction, congestion in the non-express lanes is caused by traffic conditions south of Mounts Road where the number of lanes

Figure VI-37: 2020 and 2040 Southbound Travel Speeds during the PM Peak Hour along I-5 in Non-Express Lanes – P4

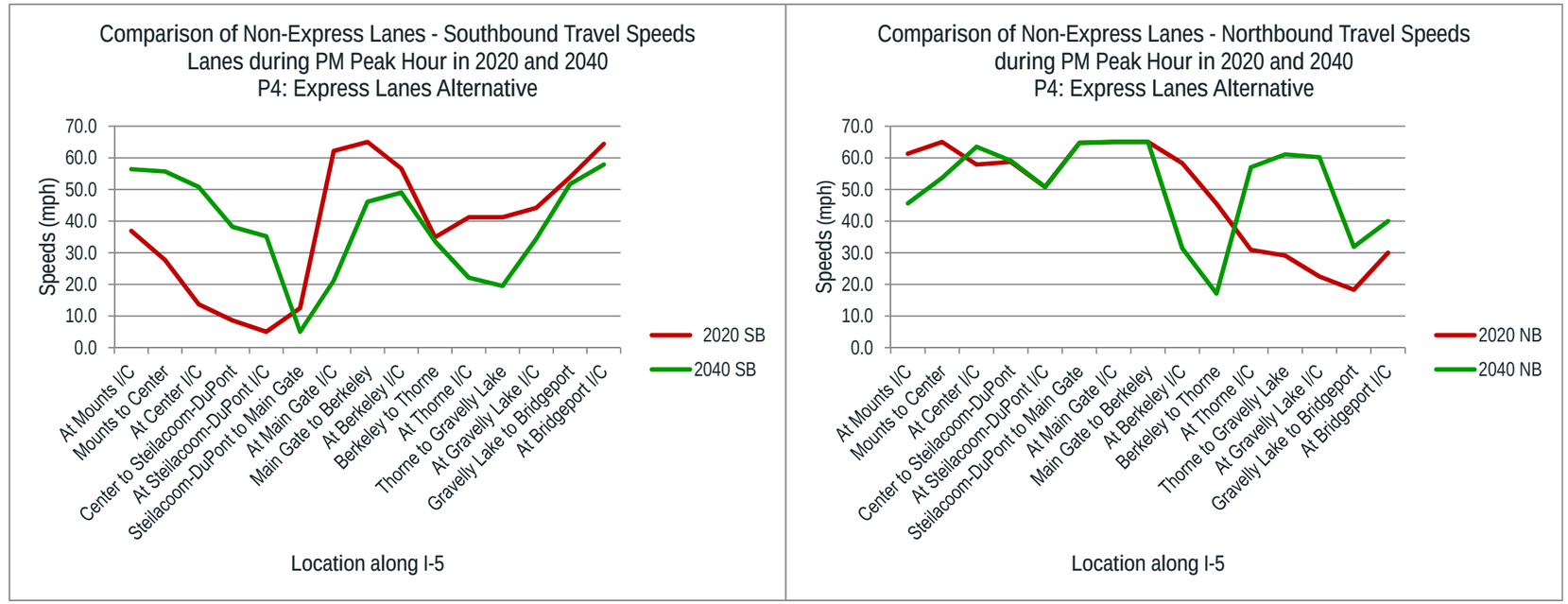
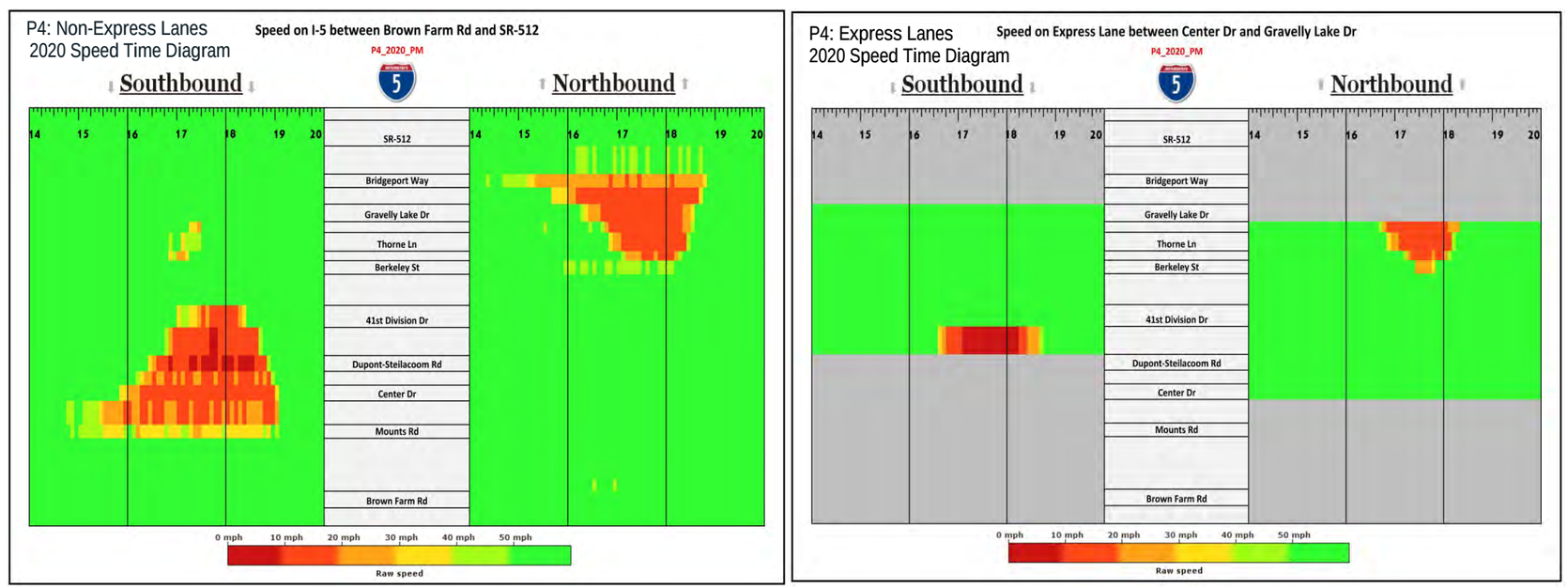


Figure VI-38: 2020 PM Peak Period Speed-Time Diagrams along I-5 – P4



are reduced to three lanes. The northbound lanes are affected by traffic at the SR 512 Interchange. Congestion in the express lanes is in the transition areas where the express lanes convert to GP lanes.

The PM peak period 2040 speeds along I-5 by direction and time of day for non-express lanes and express lanes are illustrated in Figure VI-39. These speed time diagrams show that the P4 Alternative reduces the magnitude of congestion, has overall faster speeds, and limits the number of hours of congestion, as compared to the No Action Alternative. However, substantial congestion still exists, caused by congestion north and south of the study area. This indicates that Alternative P4 is a feasible short-term solution but will be less satisfactory by 2040 without improvements outside the study area.

I-5 Hours of Congestion – 2020 & 2040 PM Peak Period

For non-express lane traffic operations, the number of hours of congestion that drivers would experience along I-5 was calculated by counting the number of hours that drivers would travel at speeds below 70 percent of posted speed in the Meso Model during the 6-hour PM peak period. As illustrated in Figure VI-40, Alternative P4 reduces the hours of congestion in the non-express lanes along the corridor to less than four hours in 2020. Most of the congestion is caused by congestion in the transitions areas at the north and south ends of the project area.

By 2040, the maximum duration of congestion in non-express lanes along the corridor is about four hours. However, at least two hours of congestions occurs along the entire corridor. This data indicates that in both the 2020 and 2040 time frames, congestion will be limited to the peak four hours, whereas, the congestion for the No Action Alternative began sooner and extended past 8PM.

For express lanes operations in 2020, these charts show one to two hours of congestion in short segments of I-5. In 2040, hours of congestion in the express lanes increase to about three hours.

Figure VI-39: 2040 PM Peak Period Speed-Time Diagrams along I-5 – P4

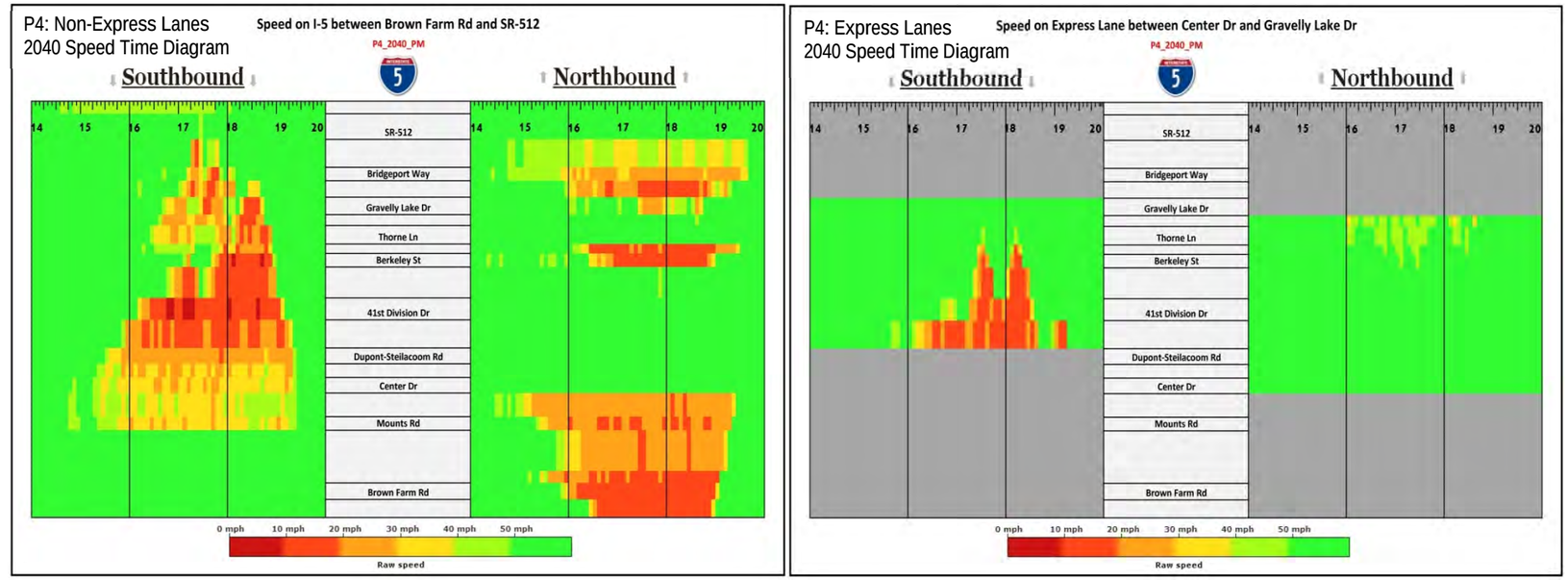
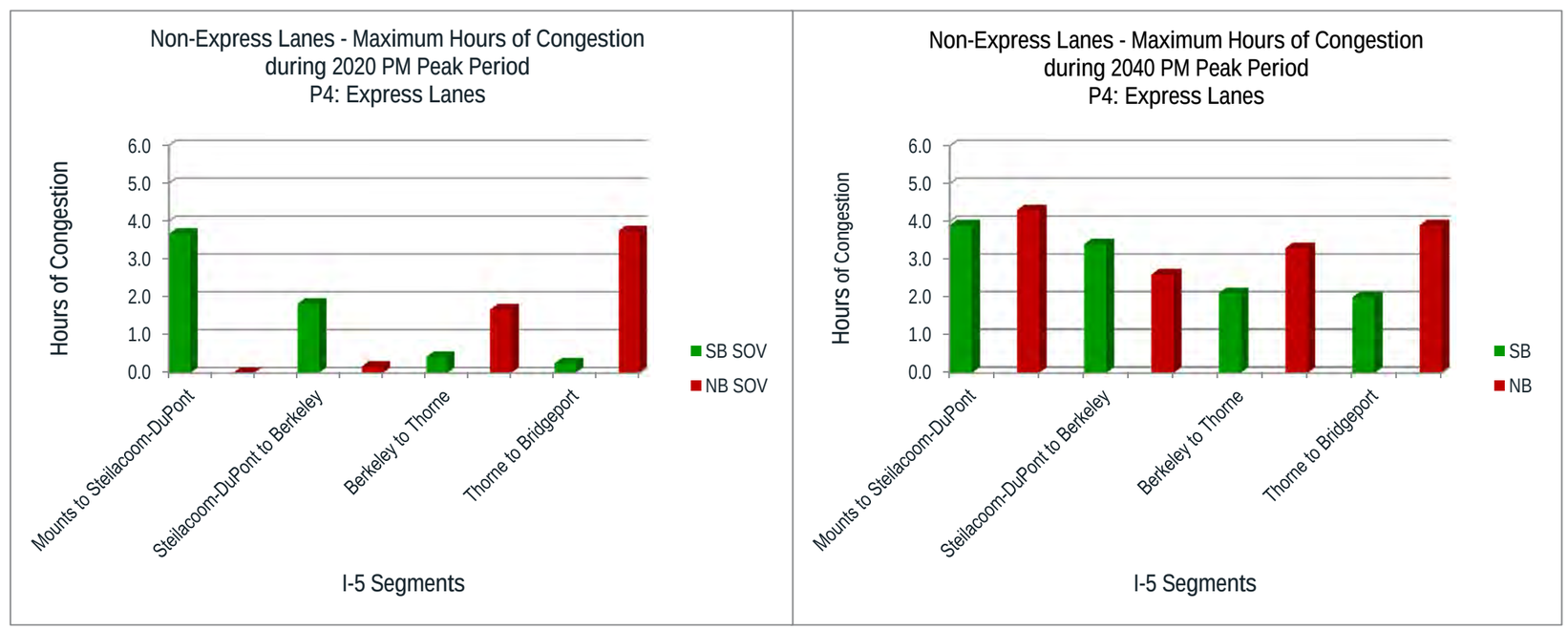


Figure VI-40: Comparison of 2020 and 2040 Hours of Congestion in Non-Express Lanes by I-5 Segments – P4



I-5 Travel Times during the 2020 & 2040 PM Peak Period

For Alternative P4, travel times along I-5 between Mounts Road Interchange and the Bridgeport Way Interchanges by direction over the 6-hour PM peak period were estimated using the Meso Model. These travel are illustrated in Figure VI-41. Travel along this nine mile section of I-5 at the posted speed limit of 60 mph would generally take approximately 9 minutes. However, because of the increased congestion and reduced travel speeds, travel times are increased to about 25 minutes in the southbound direction in both 2020 and 2040. In the northbound direction, the peak travel times are estimated to be about 18 minutes in both the 2020 and 2040 time periods.

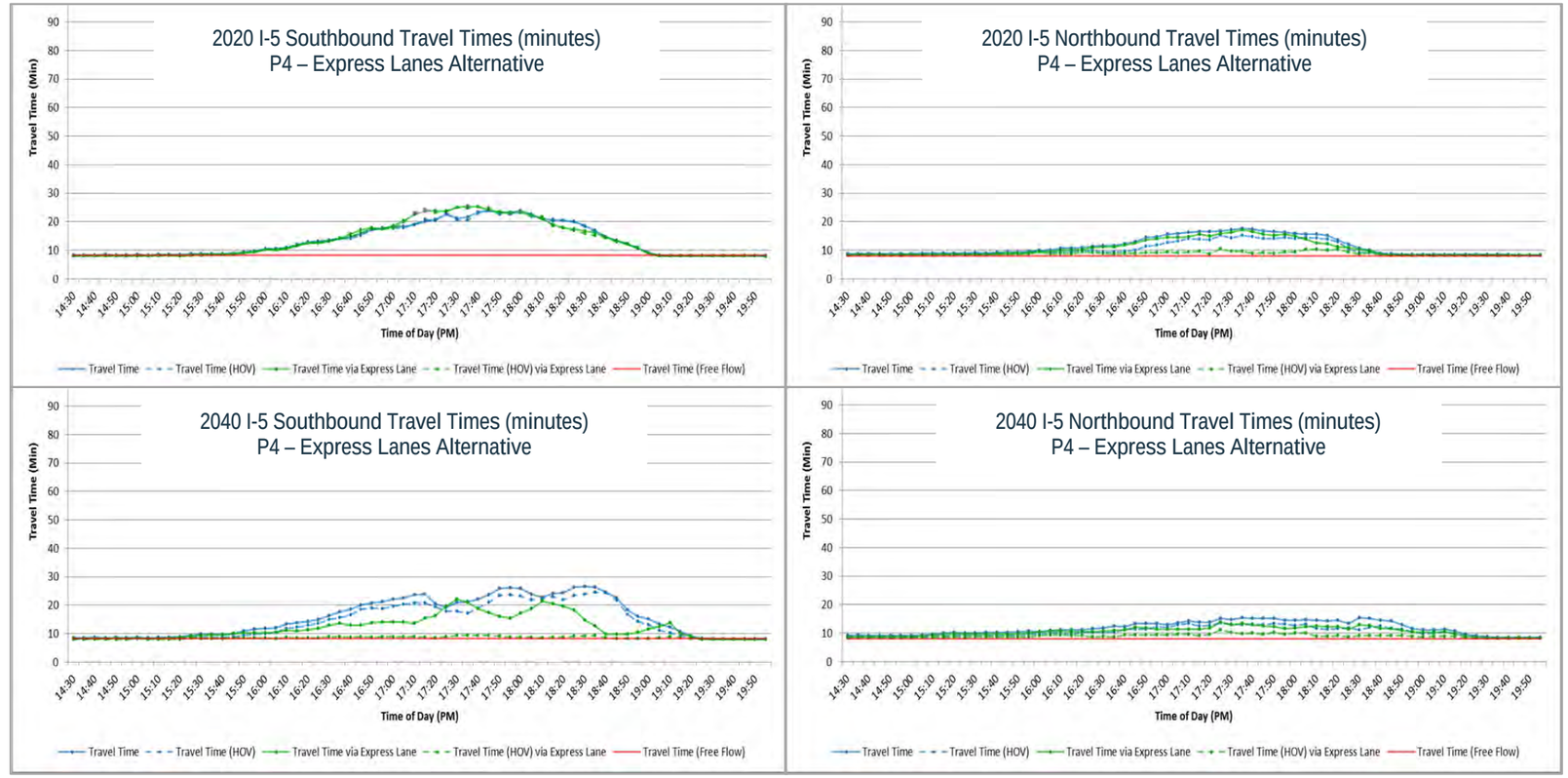
For non-express lanes in the southbound direction, the average travel time over a 3-hour PM peak period is about 14 minutes in 2020 and about 16 minutes in 2040. In the northbound direction, the 3-hour PM peak period average travel time is estimate at about 12 minutes in 2020 and about 12 minutes in 2040.

For express lanes, the average 3-hour travel times are similar to the non-express lanes travel time. In the southbound direction, the average travel time over a 3-hour PM peak period is about 15 minutes in 2020 and about 13 minutes in 2040. In the northbound direction, the 3-hour PM peak period average travel time is estimate at about 12 minutes in 2020 and about 11 minutes in 2040.

Summary of Traffic Operations in 2020 & 2040 for P4 – Express Lanes

With express lanes being added in this alternative, the operation on I-5 is improved in the PM peak hour and over the 6-hour PM peak period. With the added capacity of the express lanes, utilization of the I-5 lanes increased in terms of vehicles and person trips, travel speeds increase, and hours of congestion decrease, as compared to Alternative P1 – No Action. With the addition of the HOV lanes, transit ridership is expected to increase. However, in 2020 congestion in the transition areas along I-5 is still expected to last up to four hours. By 2040, this transition area congestion will expand into longer segments along I-5 with fewer periods of stop and go traffic during the PM peak hour. As part of the SOV traffic, trucks and other freight haulers will have shorter delays and more reliable service through the I-5 corridor.

Figure VI-41: Average PM Peak Period Travel Time along I-5 between Mounts Road and Bridgeport Way by Time of Day – P4



Alternative P4a – Express Lanes with Local Road Improvements

The Express Lanes with Local Road Improvements Alternative (Package P4a) includes the improvements contained in the Express Lanes (P4) and adds three local roads in both 2020 and 2040 timeframes, as described in Chapter III. Overall, in 2020 the analysis of this alternative has similar I-5 operational improvements as P4. Based on the model results, about 92 percent of the I-5 peak hour demand can pass through the corridor (67% in Alternative P1), and over a two-hour PM peak period about 96 percent of the demand can pass through the I-5 corridor (82% in Alternative P1). By 2040, these percentages are reduced so that only about 79 percent of the I-5 peak hour demand can pass through the corridor (26% in Alternative P1), and over a two-hour PM peak period about 89 percent of the demand can pass through the I-5 corridor (57% in Alternative P1). These percentages are greatly improved over the No Action (Alternative P1) conditions.

I-5 PM Peak Hour Travel Forecasts – 2020 & 2040

Vehicle Trips: For Alternative P4a, the average PM peak hour vehicle trips along I-5 between Mounts Road and Bridgeport Way in 2020 are slightly lower than vehicle trip on I-5 with P4. There are approximately 5,280 vehicles southbound (9% more than Alternative P1) and 5,370 vehicles northbound (34% more than Alternative P1). By 2040, the average PM peak hour vehicle trips along I-5 in the study area increases to approximately 6,510 vehicles southbound (30% more than Alternative P1) and to approximately 5,900 vehicles northbound (57% more than Alternative P1).

In 2020, about 21 percent of the traffic is HOV vehicle trips and 79 percent are SOV vehicle trips with the express lanes carrying about 28 percent of the traffic. By 2040, about 24 percent are HOV vehicle trips and 76 percent are SOV vehicle trips with the express lanes carrying about 42 percent of the traffic. The addition of the local improvements only slightly reduces the amount of traffic on I-5 by about 100 to 200 vehicles per direction in the PM peak hour. The average 2020 and 2040 traffic flow by SOV and HOV vehicles along various segments of I-5 by direction is illustrated in Figure VI-42.

Person Trips: For Alternative P4a, the average 2020 PM peak hour person trips along I-5 through the JBLM area are approximately 7,150 person trips in each direction (5% more than southbound and 28% more than northbound for Alternative P1) with an average of about 39 percent being HOV person trips, 59 percent being SOV person trips, and about two percent being transit trips. About 28 percent of the SOV and HOV trips used the express lanes. By 2040, the average PM peak hour person trips along I-5 through the JBLM area are approximately 9,100 person trips southbound (29% more than Alternative P1) and 8,090 person trips northbound (47% more than Alternative P1) with an average of 42 percent being HOV person trips, 55 percent SOV person trips, and about three percent being transit trips.

Overall, person trips increase by approximately 27 percent southbound and 13 percent northbound during the PM peak hour between 2020 and 2040 because of the

Figure VI-42: 2020 and 2040 PM Peak Hour I-5 Vehicle Trips – P4a

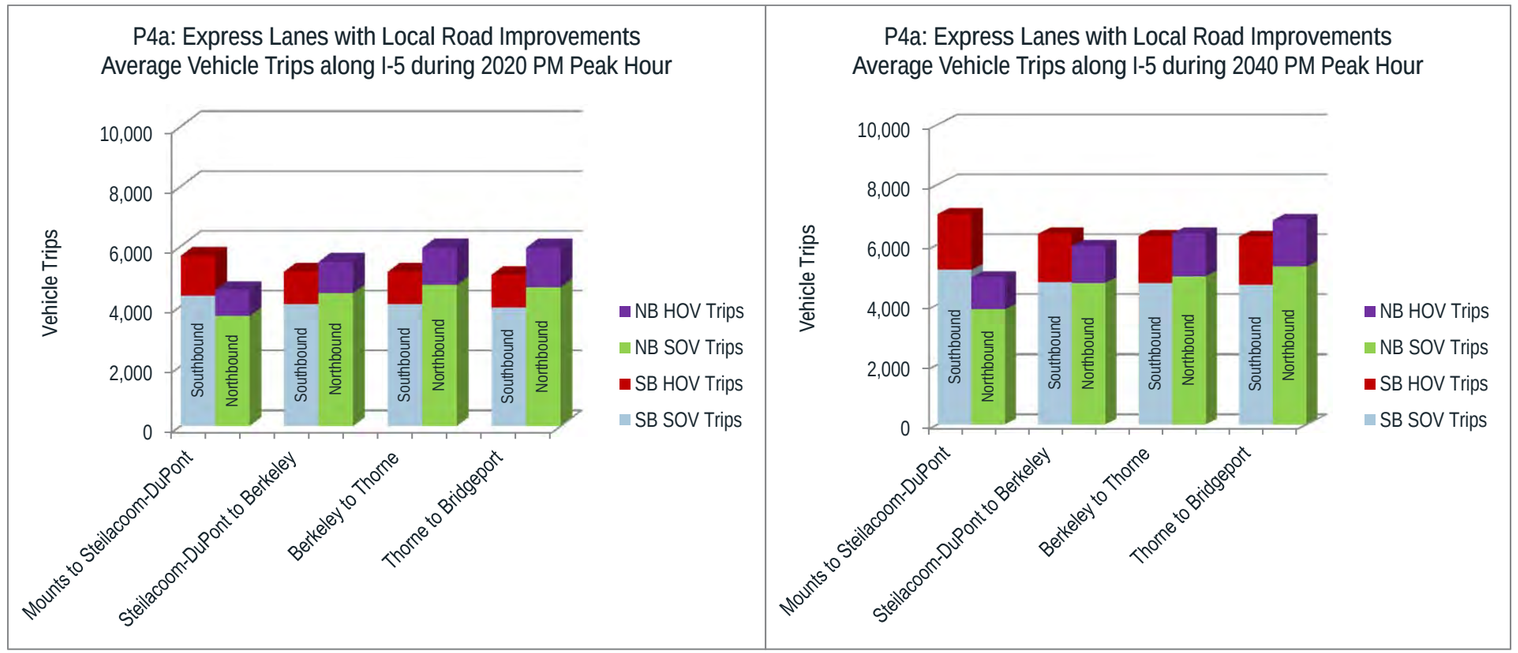
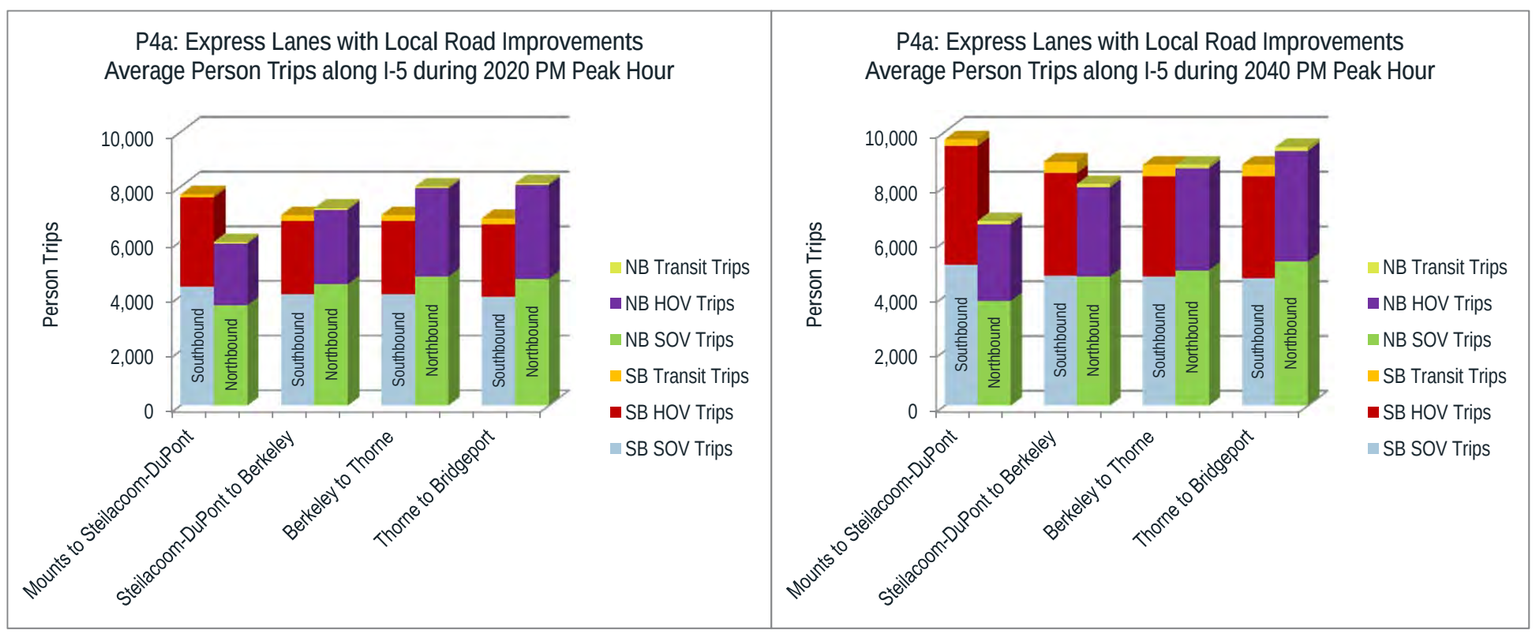


Figure VI-43: 2020 and 2040 PM Peak Hour I-5 Person Trips – P4a



increased capacity along I-5. With addition of the local improvements, person trips along I-5 were only lowered by about one to three percent, as compared to Alternative P4. The average person trips by SOV, HOV and transit along various segments of I-5 by direction are illustrated in Figure VI-43.

PM Peak Period I-5 Person Trips by Mode and Type

For Alternative P4a, a comparison of person trips along I-5 between Mounts Road and Bridgeport Way during the 6-hour PM peak period in 2020 and 2040 is illustrated in Figure VI-44. Overall, in 2020 there were approximately 88,250 person trips traveling on I-5 during the 6-hour PM peak period in the study area. This is about a 0.8% decrease, as compared to Alternative P1, because of trips staying on local roads longer. Of this total, about 59 percent were estimated to be SOV trips, 38 percent were estimated to be HOV trips; and about three percent were on transit vehicles.

These 2020 PM peak period person trips were also broken down into three categories, with about 50 percent classified as regional trips, about 36 percent were classified as trips entering or exiting I-5 within the study area, and about 14 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-10.

Table VI-10: 2020 PM 6-hour Peak Period – Person Trips by Mode and Type – P4a

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	50%	50%	21%	50%
Entering/Exiting I-5 within Study Area	36%	36%	67%	36%
Both Entering & Exiting I-5 within Study Area	14%	14%	12%	14%

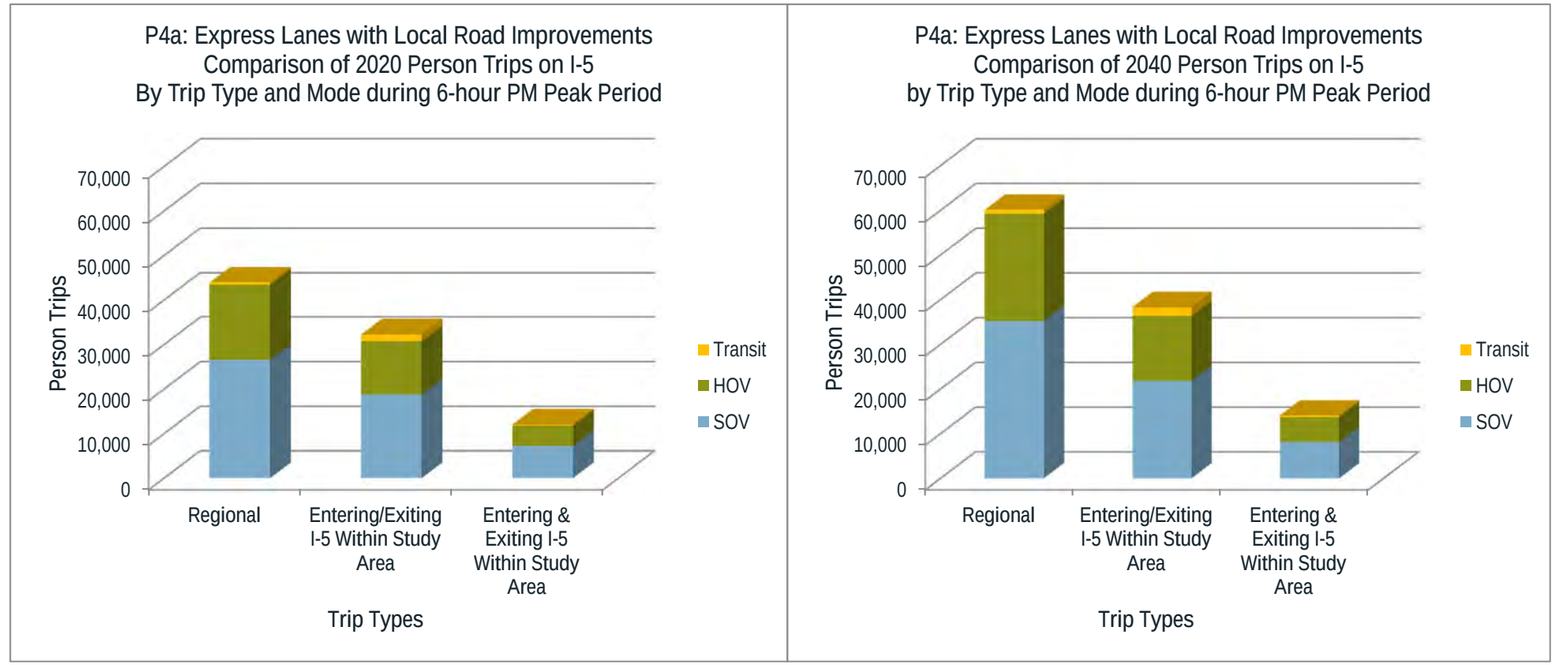
By 2040, there were approximately 112,610 person trips traveling on I-5 during the 6-hour PM peak period in the study area (13% above Alternative P1). Of this total, about 58 percent were estimated to be SOV trips, 39 percent were estimated to be HOV trips, and about three percent were on transit vehicles.

Of these 2040 PM 6-hour peak period person, about 53 percent classified as regional trips, about 34 percent were classified as trips entering or exiting I-5 within the study area, and about 13 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-11.

Table VI-11: 2040 PM 6-hour Peak Period – Person Trips by Mode and Type – P4a

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	54%	54%	27%	53%
Entering/Exiting I-5 within Study Area	33%	33%	61%	34%
Both Entering & Exiting I-5 within Study Area	13%	13%	12%	13%

Figure VI-44: Comparison of 2020 and 2040 I-5 PM 6-hour Peak Period Person Trips by Mode and Type – P4a



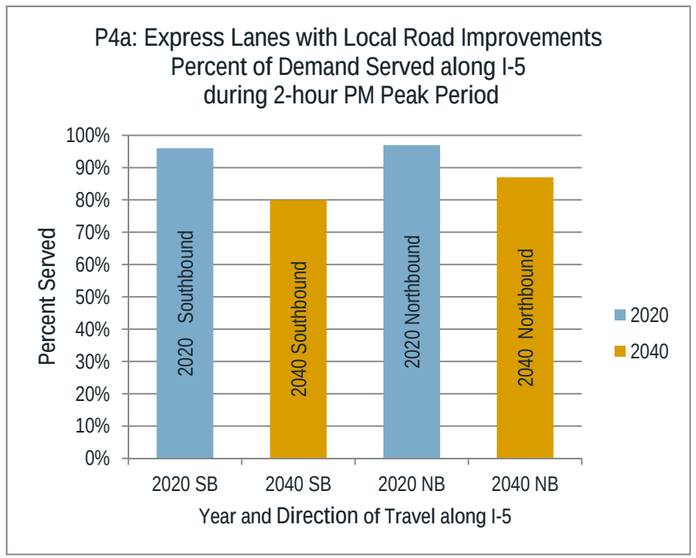
Percent of I-5 Travel Demand Served during the 2-hour PM Peak Period in 2020 & 2040

Using the Meso Model, the analysis of the 2-hour PM person-demand for travel along I-5 in each direction within the study area was compared with the actual number of person trips traveling in the study area for 2020 and 2040. This analysis showed that in 2020 approximately 96 percent of the person-demand traveling southbound (Alternative P1 has 85%) and 97 percent traveling northbound (Alternative P1 has 79%) could use I-5 during the 2-hour peak period.

In comparison, by 2040 this analysis showed that approximately 80 percent of the person-demand traveling southbound (Alternative P1 has 64%) could use I-5 during the 2-hour peak period. Also approximately 87 percent of the person-demand traveling northbound (Alternative P1 has 50%) could use I-5 during the same 2-hour PM peak period, as illustrated in Figure VI-45.

The percentages of unmet demand in 2040 were much larger for the No Action Alternative (36 percent southbound and 50 percent northbound) as compared to 20 percent southbound and 13 percent northbound for the P4a – Express Lanes with Local Improvements. These percentages remain similar to the unmet demand for Alternative P4.

Figure VI-45: Comparison of Percent of Demand Served in 2020 and 2040 – P4a



I-5 PM Peak Hour Travel Speeds

For Alternative P4a, a comparison of the 2020 and 2040 southbound and northbound non-express lanes, PM peak hour travel speeds along all lanes of I-5 from Mounts Road to Bridgeport Way are shown on Figure VI-46. The speed patterns for Alternative P4a are generally higher than the speed patterns for the No Action Alternative. However, these PM peak hour speed patterns are similar to those produced by Alternative P4 without the local improvements.

In the 2020 configuration, HOV lanes do not extend beyond the southern limit of this study area (Steilacoom-DuPont Rd.). As a result, southbound drivers are shifting lanes causing slow-down in the vicinity of the Steilacoom-DuPont Interchange. Northbound, with of one GP lanes converted to an HOV lane north of Thorne Lane, traffic becomes more congested north of the Thorne Lane Interchange. In 2020, the average PM peak hour southbound travel speed in the non-express lanes is about 19 mph and about 16 mph for the express lanes. The slower express lanes speed is caused by GP traffic shifting into the express and HOV lanes as the freeway narrows from five lanes to three lanes which causes back-ups in the express lanes north of Steilacoom-DuPont Road. In the rest of the express lane sections, drivers travel at 50 mph or better. In the northbound direction, the average travel speed in non-express lanes is about 42 mph and about 54 mph for the express lanes.

By 2040, with the express lanes operational and assuming the HOV system is extended into Thurston County, southbound weaving traffic still slows but drivers can recover reasonable speeds more quickly. Only in short sections of I-5, between Steilacoom-DuPont Road and Center Drive, and near the Thorne Lane Interchange, do the average travel speeds fall below 30 mph. Overall the average PM peak hour speed in non-express lanes is about 18 mph and about 13 mph in the express lanes. Again, the slower express lanes speed is caused by a shifting traffic which creates back-ups in the express lanes north of Steilacoom-DuPont Road. In the rest of the express lanes sections, driver travel at 50 mph or better. In the northbound direction, traffic slows between Berkeley Street and Thorne Lane because of GP drivers merging into what was the express lanes north of Gravelly Lake Drive, but also recovers quickly. The average travel speed in the non-express lanes is about 44 mph and about 60 mph for the express lanes.

The average 2020 speeds along I-5 by direction and time of day for non-express lanes and express lanes are illustrated in Figure VI-47. These speed-time diagrams show that the Alternative P4a reduces the hours of congestion during the 6-hour PM peak period at some locations along I-5 in 2020, as compared to the No Action Alternative but are similar to Alternative P4. In the southbound direction, congestion in the non-express lanes is caused by traffic conditions south of Mounts Road where the number of lanes are reduce to three lanes.

Figure VI-46: 2020 and 2040 Southbound Travel Speeds during the PM Peak Hour along I-5 in Non-Express Lanes – P4a

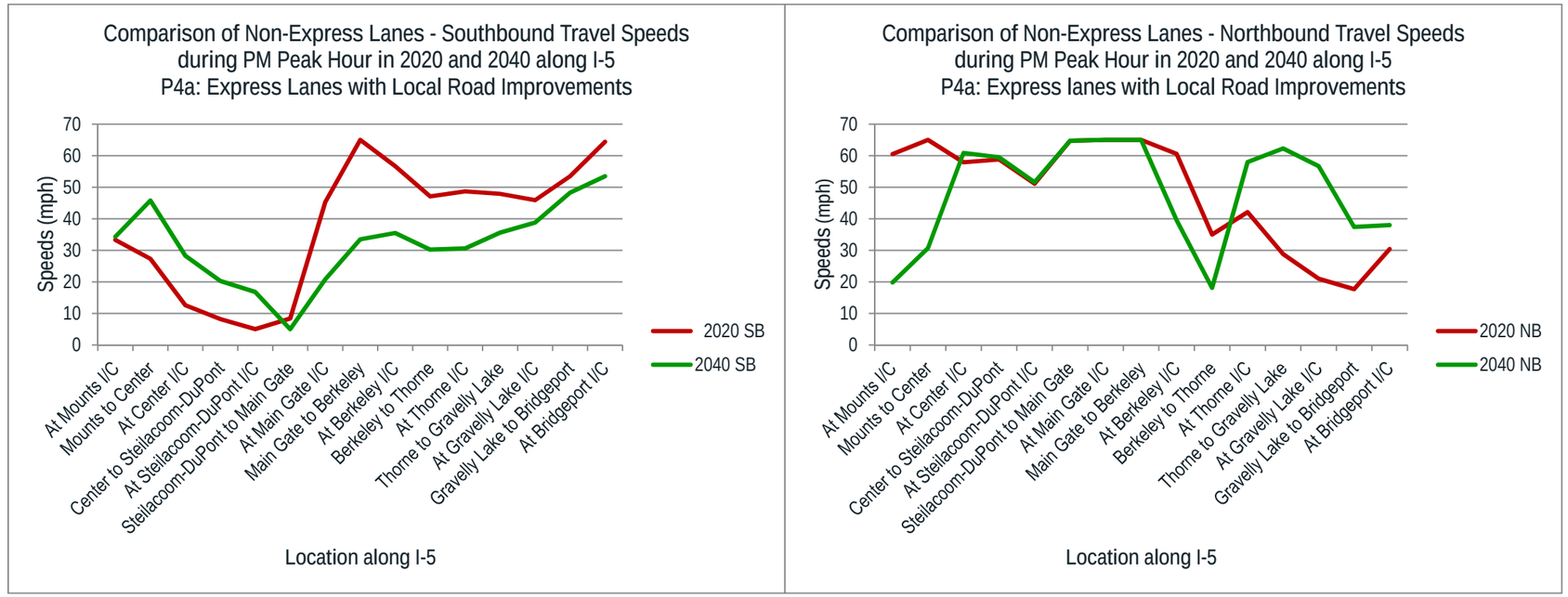
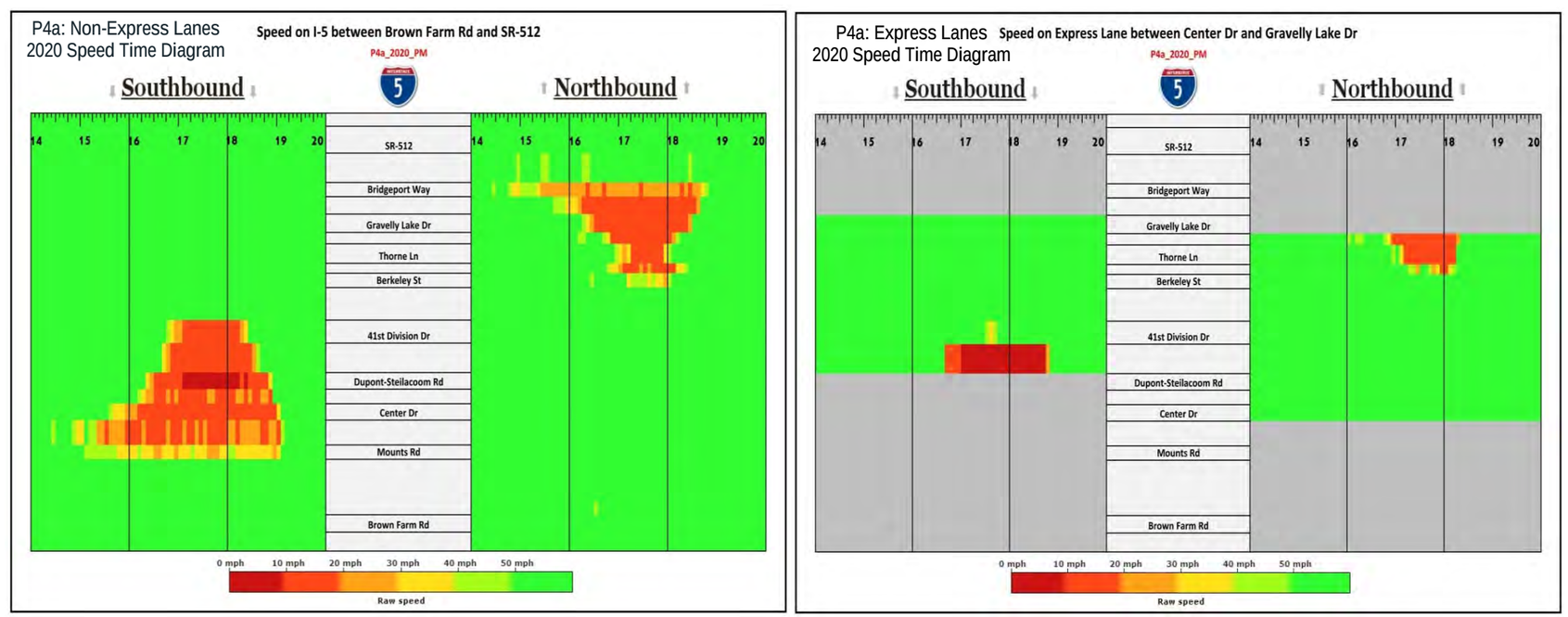


Figure VI-47: 2020 PM Peak Period Speed-Time Diagrams along I-5 – P4a



The northbound lanes are affected by traffic at the SR 512 Interchange. Express lane congestion is at the transition areas where the express lanes convert to GP lanes.

The average 2040 speeds along I-5 by direction and time of day for non-express lanes and express lanes are illustrated in Figure VI-48. These speed-time diagrams show that the P4a Alternative reduces the hours of congestion during the 6-hour PM peak period at some locations along I-5 in 2040, as compared to the No Action Alternative but are similar to Alternative P4. In the southbound direction, congestion in the GP lanes is caused by traffic conditions south of Mounts Road where the number of GP lanes are reduce to three lanes with an additional HOV lane. In the northbound direction, congestion is caused by drivers changing lanes to enter the express lanes and also by unrelated congestion at the SR 512 interchange. Express lane congestion is generally located at transition areas and radiating back along the traffic stream.

I-5 Hours of Congestion – 2020 & 2040 PM Peak Period

For non-express lane traffic operations, the number of hours of congestion that drivers would experience along I-5 was calculated by counting the number of hours that drivers would travel at speeds below 70 percent of posted speed in the Meso Model during the 6-hour PM peak period. As illustrated in Figure VI-49, Alternative P4a reduces the hours of congestion in the non-express lanes along the corridor to less than four hours in 2020. Most of the congestion is located at the north and south ends of the study area.

By 2040, the maximum duration of congestion in non-express lanes along the corridor is about four hours. However, about two hours of congestions occurs along the entire corridor. This data indicates that in both the 2020 and 2040 time frames, congestion in non-express lanes will be limited to the peak four hours, whereas the congestion for the No Action Alternative began sooner and extended past 8:00 PM. With the additional of the local improvements in this alternative, the hours of congestion remained relatively the same as with Alternative P4.

For express lanes in 2020, congestion is limited to the transition areas where the express lanes end. By 2040, the congestion at these transition areas extends longer along the express lanes because of increased traffic and delays in the non-express lanes.

Figure VI-48: 2040 PM Peak Period Speed-Time Diagrams along I-5 – P4a

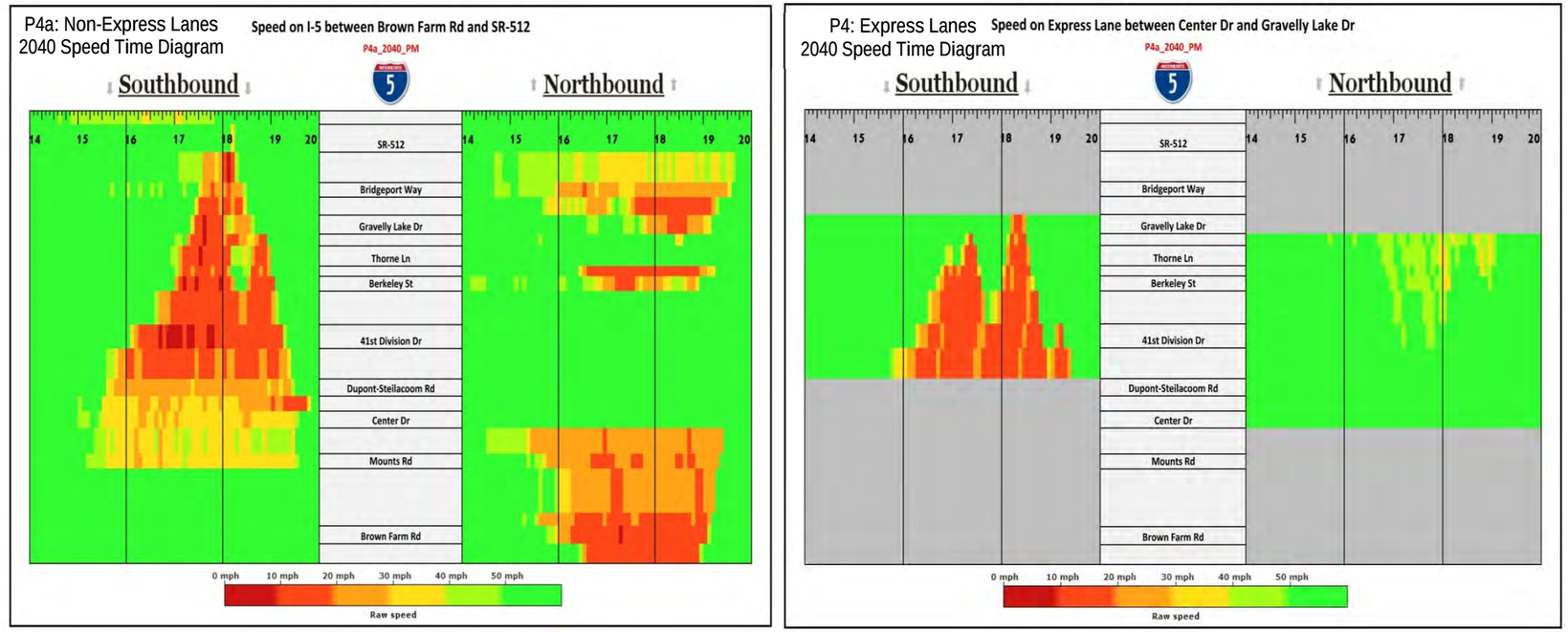
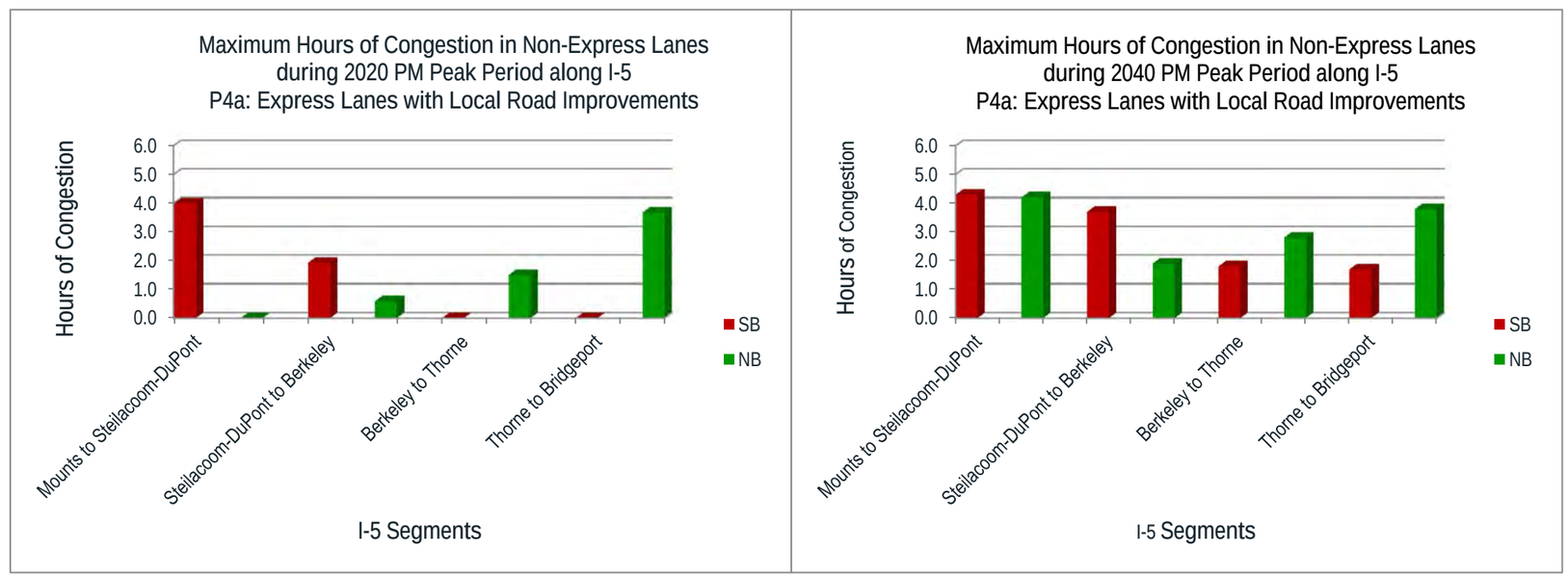


Figure VI-49: Comparison of 2020 and 2040 Hours of Congestion in Non Express Lanes by I-5 Segments – P4a



I-5 Travel Times during the 2020 & 2040 PM Peak Period

For Alternative P4a, travel times along I-5 between Mounts Road and Bridgeport Way by direction over the 6-hour PM peak period were estimated using the Meso Model. These travel times are illustrated in Figure VI-50. Average travel time along this nine mile section of I-5 for drivers traveling at the posted speed limit of 60 mph would generally be approximately nine minutes. However, because of the increased congestion and reduced travel speeds, travel times are increased to 20 to 30 minutes in the southbound direction in both 2020 and 2040. In the northbound direction, the peak travel times are estimated to be less than 20 minutes in both the 2020 and 2040 time periods.

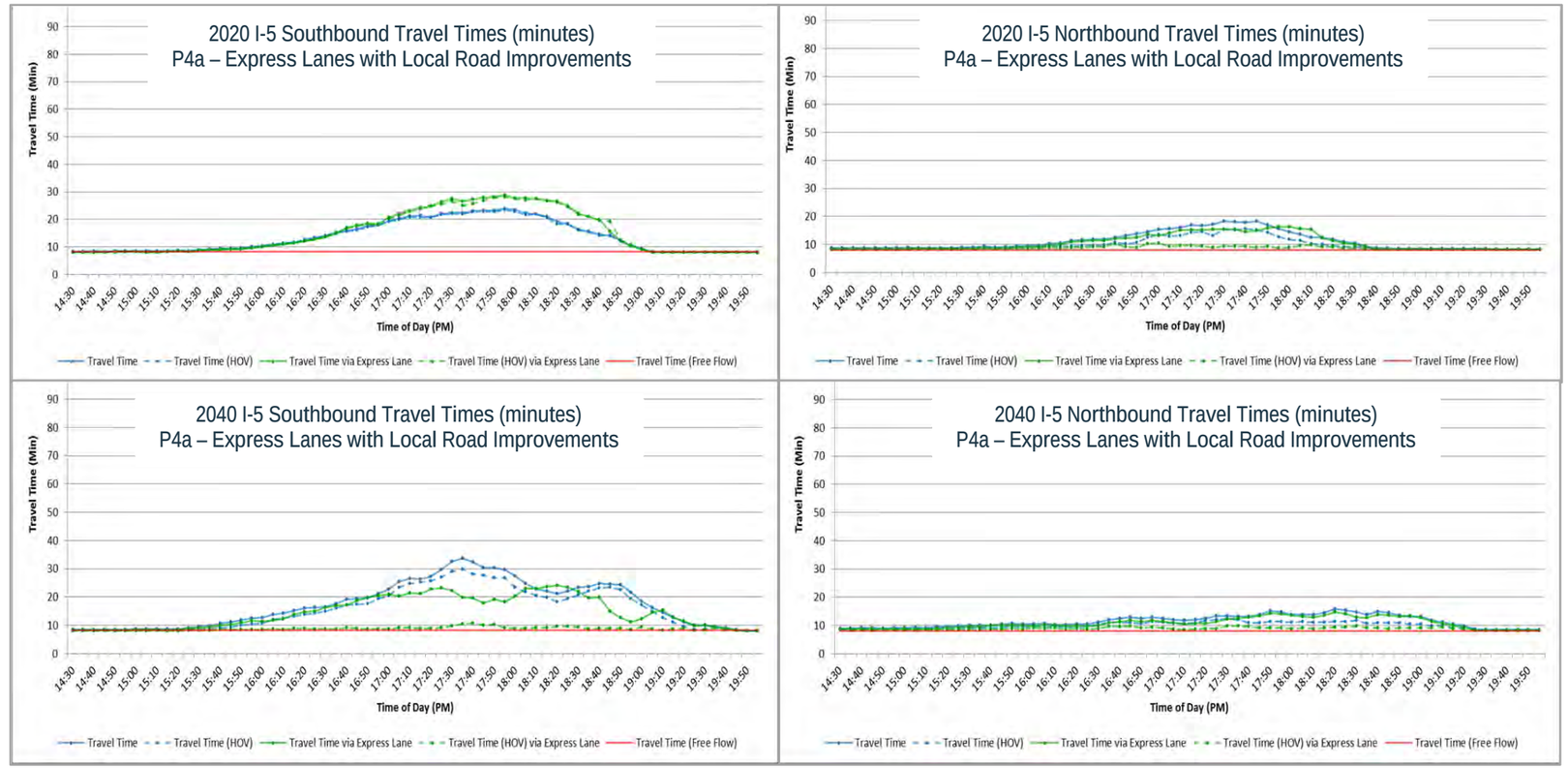
For non-express lanes in the southbound direction, the average travel time over a 3-hour PM peak period is about 15 minutes in 2020 and about 19 minutes in 2040. In the northbound direction, the 3-hour PM peak period average travel time is estimate at about 12 minutes in 2020 and about 11 minutes in 2040.

For express lanes, the average 3-hour travel times are similar to the non-express lanes travel time. In the southbound direction, the average travel time over a 3-hour PM peak period is about 16 minutes in 2020 and about 15 minutes in 2040. In the northbound direction, the 3-hour PM peak period average travel time is estimate at about 12 minutes in 2020 and about 11 minutes in 2040.

Summary of Traffic Operations in 2020 & 2040 for P4a – Express Lanes with Local Road Improvements

With express lanes and local road improvements being added in this alternative, traffic operations on I-5 are improved in the PM peak hour and over the 6-hour PM peak period as compared to the No Action Alternative, but about the same as Alternative P4 without the local improvements. With the added capacity of the express lanes, utilization of the I-5 lanes increased in terms of vehicles and person trips, travel speeds increased and hours of congestion decreased. With the addition of the HOV lanes, transit ridership is expected to increase. However, congestion along I-5 is still expected to last up to four hours, and there will be some time of stop and go traffic during the peak hour especially at transition areas into and out of the express lanes. As part of the SOV traffic, trucks and other freight haulers will have shorter delays and more reliable service through the I-5 corridor.

Figure VI-50: Average PM Peak Period Travel Time along I-5 between Mounts Road and Bridgeport Way by Time of Day – P4a



Alternative P5 – HOV and CD Lanes

The HOV and CD Lanes Alternative (Package 5) in 2020 and 2040 includes the improvements contained in the No Action Alternative (P1) and adds HOV lanes and two sets of CD lanes connected with auxiliary lanes, as described in Chapter III. Overall, the analysis of this alternative improves I-5 operations. However I-5 still operates with slow travel speeds and several hours of congestion especially in the transition areas. Based on the Meso Model results, in 2020 about 89 percent of the I-5 peak hour demand can pass through the corridor (67% in Alternative P1), and over a two-hour PM peak period about 95 percent of the demand can pass through the I-5 corridor (82% in Alternative P1). By 2040, these percentages increase so that only about 84 percent of the I-5 peak hour demand can pass through the corridor (26% in Alternative P1), and over a two-hour PM peak period about 92 percent of the demand can pass through the I-5 corridor (57% in Alternative P1). These percentages are greatly improved over the No Action conditions.

I-5 PM Peak Hour Travel Forecasts – 2020 & 2040

Vehicle Trips: For Alternative P5, the average PM peak hour vehicle trips along I-5 mainline between Mounts Road and Bridgeport Way in 2020 are approximately 5,600 vehicles southbound (16% more than Alternative P1) and 4,960 vehicles northbound (24% more than Alternative P1). By 2040, the average PM peak hour vehicle trips along I-5 in the study area increases to approximately 6,570 vehicles southbound (31% more than Alternative P1) and to 6,060 vehicles northbound (61% more than Alternative P1).

In 2020, about 22 percent of the traffic along I-5 mainline is HOV vehicle trips and 78 percent are SOV vehicle trips. By 2040, about 24 percent are HOV vehicle trips and 76 percent are SOV vehicle trips. Because of the added CD and auxiliary lane system that reduced friction along I-5 mainline, more vehicle trips can be accommodated along I-5. The average 2020 and 2040 traffic flow by SOV and HOV vehicles along various segments of I-5 by direction is illustrated in Figure VI-51.

Person Trips: For Alternative P5, the average PM peak hour person trips in 2020 along the I-5 mainline through the JBLM area are approximately 7,700 person trips southbound (13% more than Alternative P1) and 6,660 person trips northbound (20% more than Alternative P1) with an average of 41 percent being HOV person trips, 57 percent being SOV person trips, and about two percent being transit trips.

By 2040, the average PM peak hour person trips along I-5 through the JBLM area are approximately 8,990 person trips southbound (27% more than Alternative P1) and 8,170 person trips northbound (48% more than Alternative P1) with an average of 42 percent being HOV person trips, 56 percent being SOV person trips, and about two percent being transit trips.

Overall, person trips increases by approximately 17 percent southbound and 23 percent northbound during the PM peak hour between 2020 and 2040.

Figure VI-51: 2020 and 2040 PM Peak Hour I-5 Vehicle Trips – P5

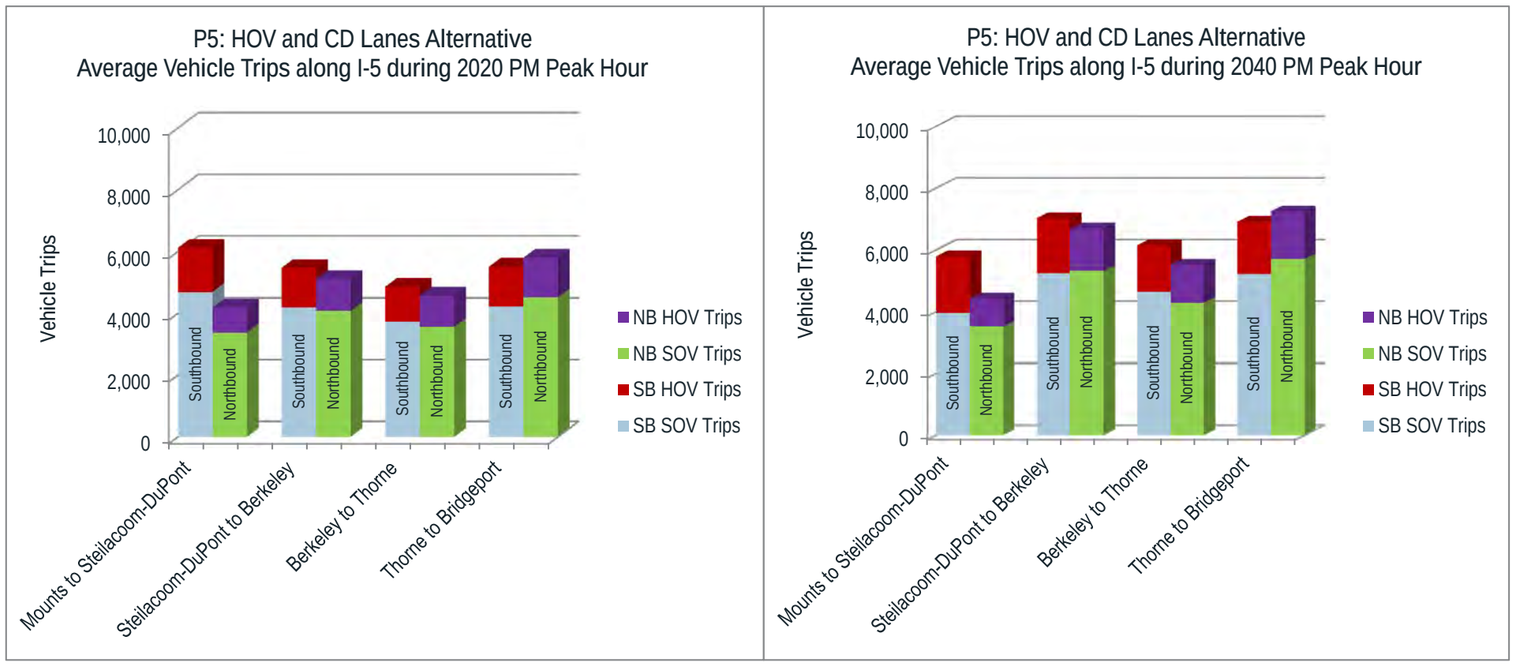
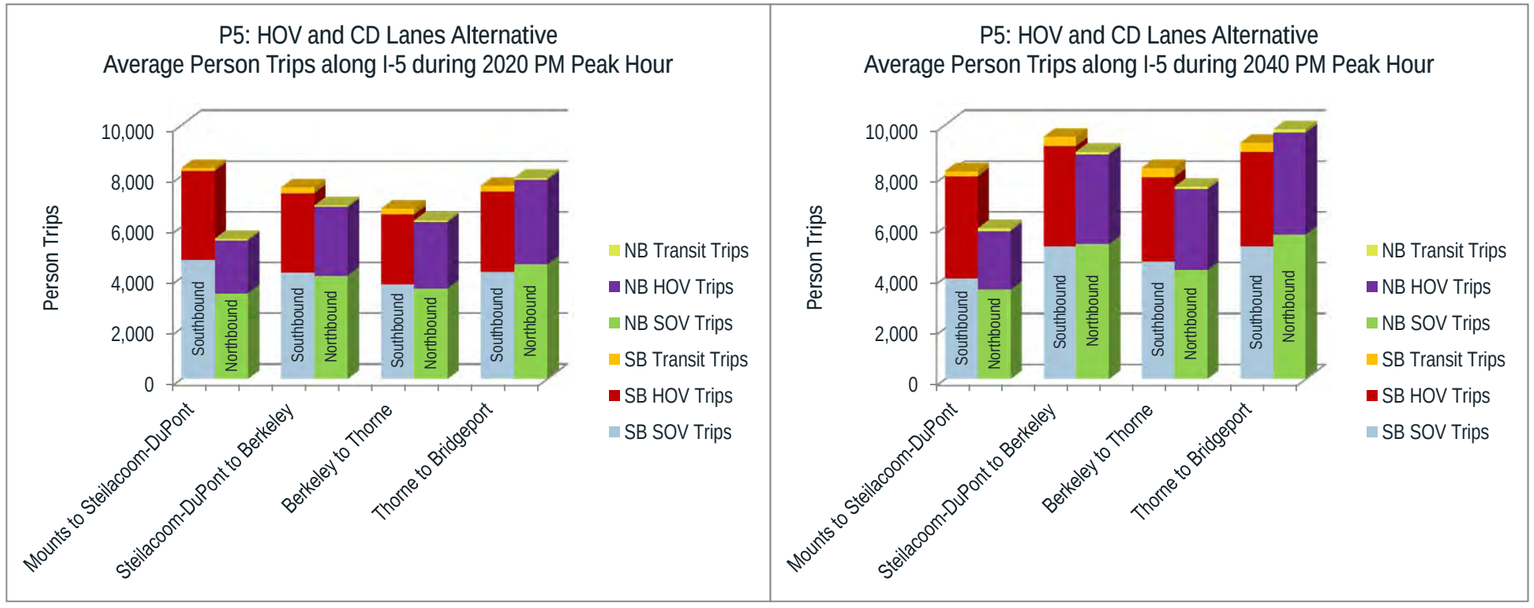


Figure VI-52: 2020 and 2040 PM Peak Hour I-5 Person Trips – P5



The average person trips by SOV, HOV and transit along various segments of I-5 by direction are illustrated in Figure VI-52.

PM Peak Hour Period I-5 Person Trips by Mode and Type

For Alternative P5, a comparison of 2020 and 2040 person trips along I-5 between Mount Road and Bridgeport Way during the 6-hour PM peak period is illustrated in Figure VI-53. Overall, in 2020 there were approximately 90,400 person trips traveling on I-5 during the 6-hour PM peak period in the study area (1.6% more than Alternative P1). Of this total, about 59 percent were estimated to be SOV trips, 38 percent were estimated to be HOV trips, and about three percent were on transit vehicles.

These 2020 PM peak period person trips were also broken down into three categories, with about 48 percent classified as regional trips, about 37 percent were classified as trips entering or exiting I-5 within the study area, and about 15 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-12.

Table VI-12: 2020 PM 6-hour Peak Period – Person Trips by Mode and Type – P5

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	48%	49%	21%	48%
Entering/Exiting I-5 within Study Area	36%	37%	67%	37%
Both Entering & Exiting I-5 within Study Area	16%	14%	12%	15%

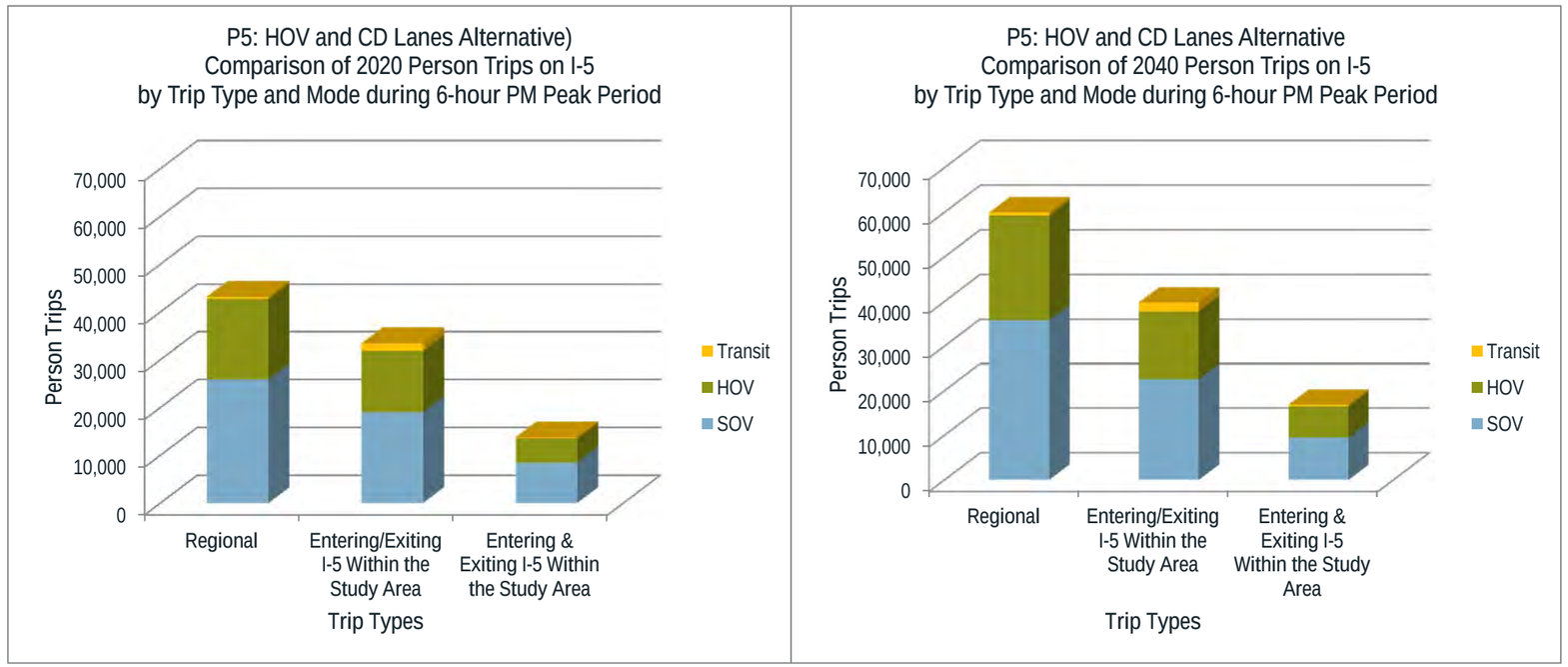
By 2040, there were approximately 116,710 person trips traveling on I-5 during the 6-hour PM peak period in the study area (17% more than Alternative P1). Of this total, about 58 percent were estimated to be SOV trips, 39 percent were estimated to be HOV trips, and about three percent were on transit vehicles.

Of these 2040 PM 6-hour peak period person, about 51 percent classified as regional trips, about 34 percent were classified as trips entering or exiting I-5 within the study area, and about 15 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-13.

Table VI-13: 2040 PM 6-hour Peak Period – Person Trips by Mode and Type – P5

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	53%	51%	23%	51%
Entering/Exiting I-5 within Study Area	33%	34%	64%	34%
Both Entering & Exiting I-5 within Study Area	14%	15%	13%	15%

Figure VI-53: Comparison of 2020 and 2040 I-5 PM 6-hour Peak Period Person Trips by Mode and Type – P5



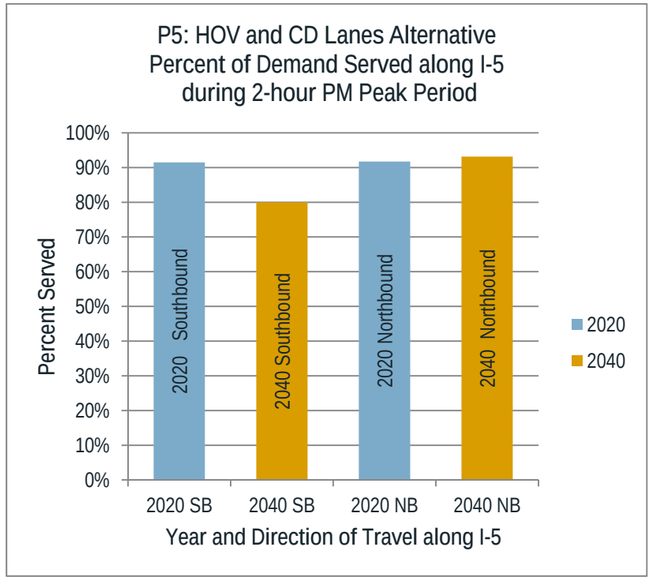
Percent of I-5 Travel Demand Served during the 2-hour PM Peak Period in 2020 & 2040

Using the Meso Model, the analysis of the 2-hour PM person-demand for travel along I-5 in each direction within the study area was compared with the actual number of person trips traveling in the study area for 2020 and 2040. This analysis showed that in 2020, approximately 91 percent of the person-demand traveling (Alternative P1 has 85%) and 92 percent traveling northbound (Alternative P1 has 79%) could use I-5 during the 2-hour peak period.

In comparison, by 2040 this analysis showed that approximately 80 percent of the person-demand traveling southbound (Alternative P1 has 64%) could use I-5 during the 2-hour peak period. Also approximately 93 percent of the person-demand traveling northbound (Alternative P1 has 50%) could use I-5 during the same 2-hour PM peak period, as illustrated in Figure VI-54.

The percentages of unmet demand in 2040 were much larger for the No Action Alternative (36 percent southbound and 50 percent northbound) as compared to 20 percent southbound and 13 percent northbound for the P5 – HOV and CD Lanes Alternative.

Figure VI-54: Comparison of Percent of Demand Served in 2020 and 2040 – P5



I-5 PM Peak Hour Travel Speeds

For Alternative P5, a comparison of 2020 and 2040 southbound and northbound travel speeds along all the mainline lanes of I-5 from Mounts Road to the Bridgeport Way are shown in Figure VI-55. These speed patterns for Alternative P5 are generally higher than the speed pattern for the No Action Alternative.

In 2020, with only the CD lanes between Berkeley Street and Thorne Lane operational, drivers are still experiencing side friction, caused by vehicles entering and exiting at multiple on- and off-ramps between Mounts Road Interchange and the Main Gate Interchange. North of Thorne Lane Interchange, speeds are also slowed because of the conversion of one of the GP lanes to an HOV lane, which limits the capacity for SOV drivers. In 2020, the average southbound travel speed in the mainline lanes is about 30 mph and about 28 mph in the northbound direction.

By 2040, with the complete CD and auxiliary lane system constructed and HOV system extended into Thurston County, southbound traffic still slows south of Center Drive because of the ending of the CD lanes and transitioning into to three mainline GP lanes and one HOV lane. In the northbound direction, travel is slowed because of unrelated congestion at the SR 512 interchange, causing drivers to shift lanes into and out of the right lanes. There is also congestion south of the study area as traffic is constrained to three GP lanes and one HOV lane. Overall the average travel speed in the mainline lanes is about 27 mph southbound and about 38 mph northbound with the HOV lanes operating at about 45 mph southbound and 53 mph northbound.

The average 2020 and 2040 speeds along I-5 by direction and time of day for mainline lanes are illustrated in Figure VI-56. These speed-time diagrams show that the P5 Alternative reduces the time of congestion extent for most of the PM 6-hour peak period in some locations along I-5. In the southbound direction, congestion is caused by traffic conditions south of Mounts Road as the CD system transitions back to three GP lanes in 2020 and three GP lanes and one HOV lane in 2040. The northbound lanes are affected by traffic at the SR 512 Interchange.

Overall, these speed-time diagrams show that the P5 Alternative reduces the magnitude congestion, has overall faster speeds, and limits the number of hours of congestion, as compared to the No Action Alternative.

Figure VI-55: 2020 and 2040 Southbound Travel Speeds for all Modes during the PM Peak Hour along I-5 – P5

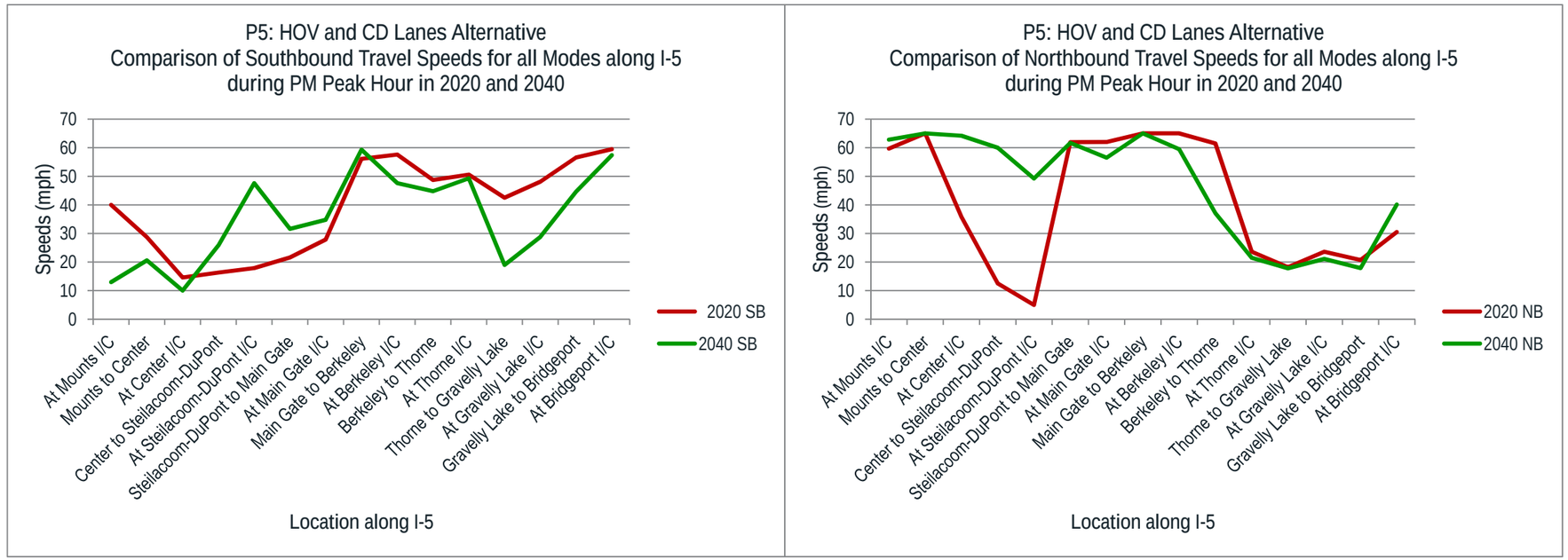
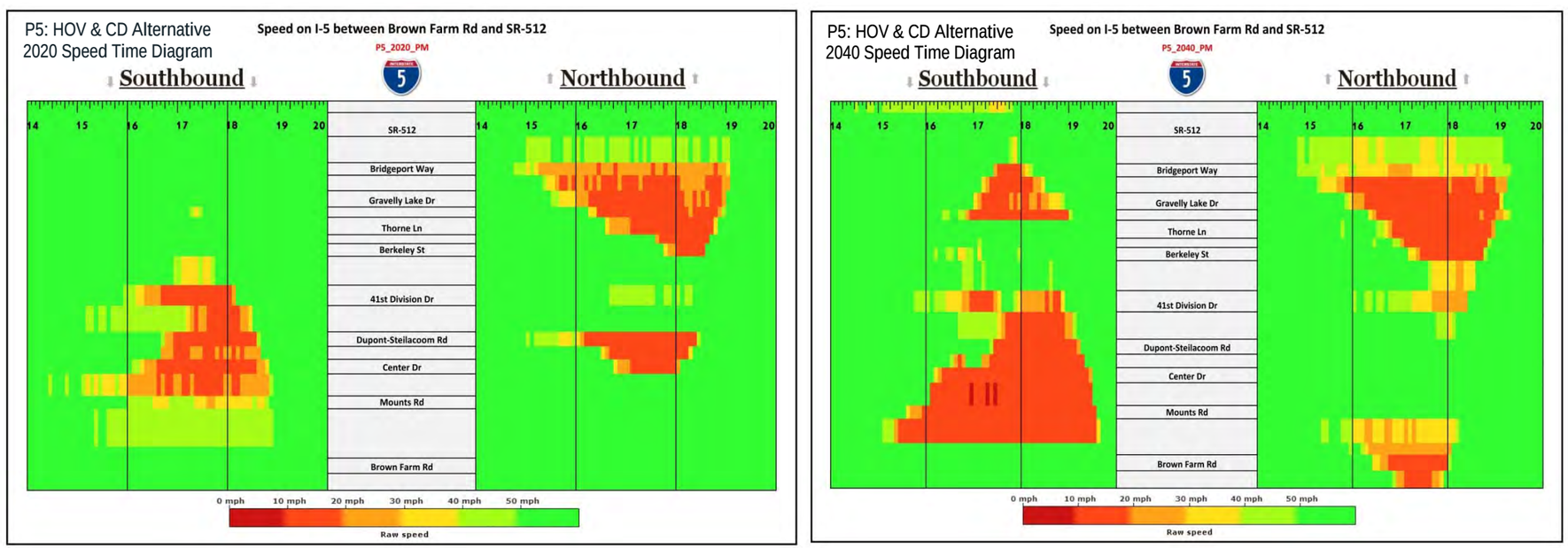


Figure VI-56: 2020 and 2040 PM Peak Period Speed-Time Diagrams along I-5 – P5



I-5 Hours of Congestion – 2020 & 2040 PM Peak Period

For Alternative P5, the hours of congestion that drivers would experience along I-5 was estimated by determining the number of hours that drivers in the various segments of I-5 would travel at speeds below 70 percent of posted speed during the 6-hour PM peak period. As illustrated in Figure VI-57, Alternative P5 reduces the average hours of congestion in all mainline lanes along the corridor to less than four hours in both the 2020 and 2040 analysis periods. Most of the congestion is caused by travel in the transition area at the north and south ends of the project area. Through the focus area between Steilacoom-DuPont Road and Thorne Lane, congestion would last about two hours in 2040; whereas, the congestion for the No Action Alternative began sooner and extended past 8PM.

I-5 Travel Times during the 2020 & 2040 PM Peak Period

For Alternative P5, travel times along I-5 between Mounts Road and Bridgeport Way by direction over the 6-hour PM peak period were estimated using the Meso Model. These travel times are illustrated in Figure VI-58. Travel along this nine mile section of I-5 at the posted speed limit of 60 mph would generally take approximately 9 minutes. However, because of the increased congestion and reduced travel speeds, travel times are about 20 minutes in both directions in 2020. Because of the increased demand and congestion, 2040 travel times are expected to increase to about 25 to 30 minutes in both directions. These times are improved over the No Action Alternative which has 2040 travel times of 40 to 50 minutes.

For travel in the southbound direction, the average mainline travel time over a 3-hour PM peak period is about 13 minutes in 2020 and about 14 minutes in 2040. In the northbound direction, the 3-hour PM peak period average travel time is estimate at about 15 minutes in 2020 and about 14 minutes in 2040. HOV travel times are about 12 minutes in 2020 and reduce to 9 to 10 minutes in 2040 with the completion of the HOV, CD and auxiliary lane system.

Summary of Traffic Operations in 2020 & 2040 for P5 – HOV and CD Lanes

With HOV lanes and the CD/Auxiliary Lane system being added in this alternative, the traffic operations on I-5 is improved in the PM peak hour and over the 6-hour PM peak period. With the added capacity of the HOV lanes and the reductions in mainline conflict points, utilization of the I-5 lanes increases in terms of vehicles and person trips, travel speeds increase and hours of congestion decrease. With the addition of the HOV lanes, transit ridership is expected to increase.

Figure VI-57: Comparison of 2020 and 2040 Average Hours of Congestion for all Modes by I-5 Segments – P5

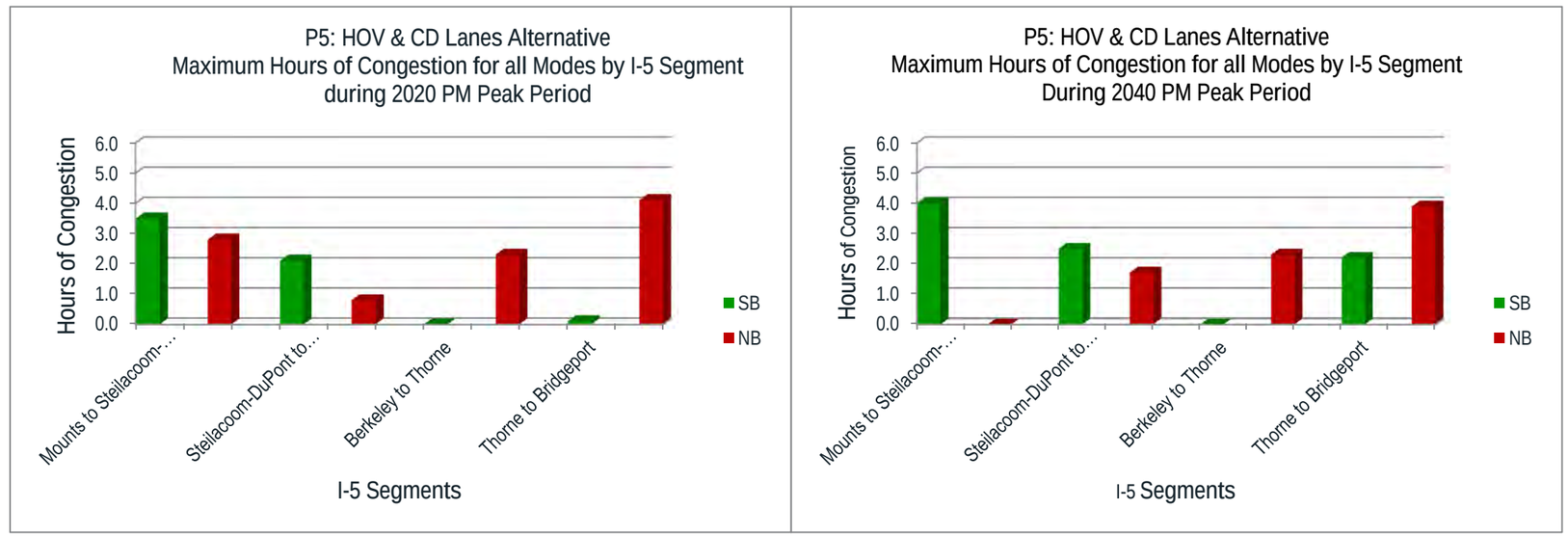
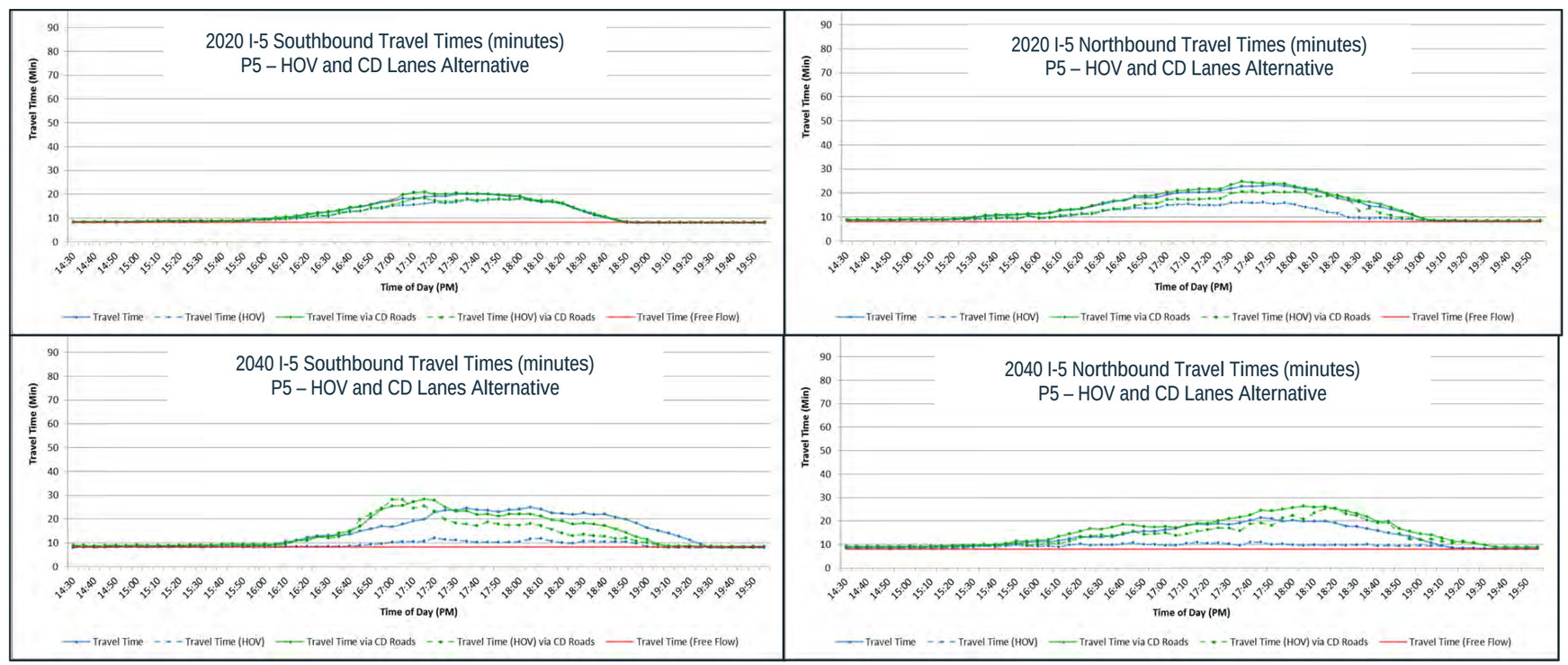


Figure VI-58: Average 2020 and 2040 PM Peak Period Travel Times along I-5 between Mounts Road and Bridgeport Way by Time of Day – P5



Alternative Package P5a – HOV and CD Lanes with Local Road Improvements

The HOV and CD Lanes with Local Improvements Alternative (Package 5a) in 2020 and 2040 includes the improvements contained in the HOV and CD Lanes (P5) and adds three local roads, as described in Chapter III. Overall, the analysis of this alternative has similar I-5 operational improvements as Alternative P5. Based on the Meso Model results, in 2020 about 90 percent of the I-5 peak hour demand can pass through the corridor (67% in Alternative P1), and over a two-hour PM peak period about 96 percent of the demand can pass through the I-5 corridor (82% in Alternative P1). By 2040, these percentages are slightly reduced so that only about 88 percent of the I-5 peak hour demand can pass through the corridor (26% in Alternative P1), and over a two-hour PM peak period about 94 percent of the demand can pass through the I-5 corridor (57% in Alternative P1). These percentages are greatly improved over the No Action conditions.

I-5 PM Peak Hour Travel Forecasts – 2020 & 2040

Vehicle Trips: For Alternative P5a, the average PM peak hour vehicle trips along I-5 between Mounts Road and Bridgeport Way in 2020 are slightly lower than vehicle trip on I-5 with Alternative P5. There are approximately 5,460 vehicles southbound (13% more than Alternative P1) and 4,960 vehicles northbound (24% more than Alternative P1). By 2040, the average PM peak hour vehicle trips along I-5 in the study area increase to approximately 6,460 vehicles southbound (29% more than Alternative P1) and to 6,030 vehicles northbound (60% more than Alternative P1).

In 2020, about 22 percent of the traffic is HOV vehicle trips and 78 percent are SOV vehicle. By 2040, about 24 percent are HOV vehicle trips and 76 percent are SOV vehicle trips. The addition of the local improvements only slightly reduces the amount of traffic on I-5 by about 140 to 210 vehicles southbound and about 30 vehicles northbound in the PM peak hour. The average 2020 and 2040 traffic flow by SOV and HOV vehicles along various segments of I-5 by direction is illustrated in Figure VI-59.

Person Trips: For Alternative P5a, the average 2020 PM peak hour person trips along I-5 through the JBLM area are approximately 7,500 person trips in the southbound (10% more than Alternative P1) and 6,660 person trips northbound (20% more than Alternative P1) with an average of about 41 percent being HOV person trips, 57 percent being SOV person trips, and about two percent being transit trips. By 2040, the average PM peak hour person trips along I-5 through the JBLM area are approximately 8,840 person trips southbound (25% more than Alternative P1) and 8,080 person trips northbound (47% more than Alternative P1) with an average of 42 percent being HOV person trips, 55 percent being SOV person trips, and about three percent being transit trips.

Overall, person trips increase by approximately 18 percent southbound and 21 percent northbound during the PM peak hour between 2020 and 2040 because of increased demand and reduced congestion along I-5. With the addition of the local

Figure VI-59: 2020 and 2040 PM Peak Hour I-5 Vehicle Trips – P5a

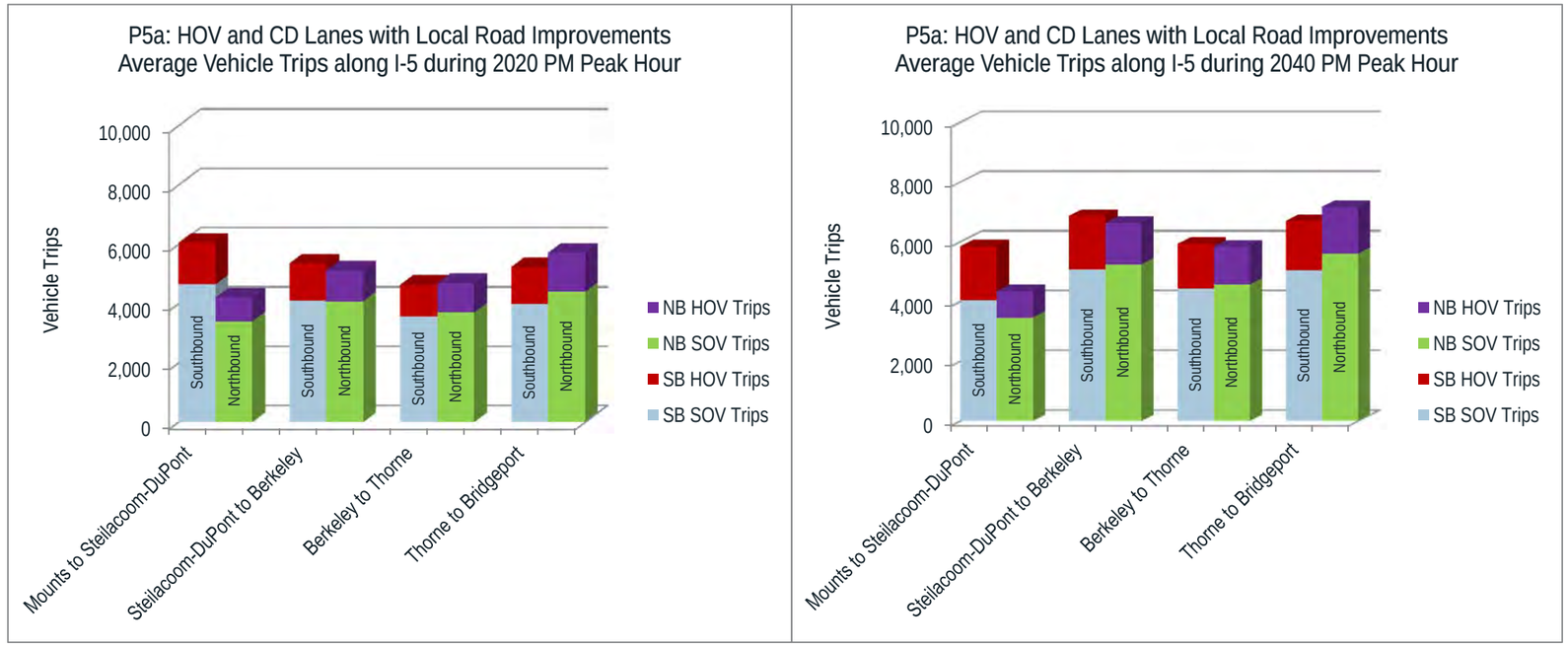
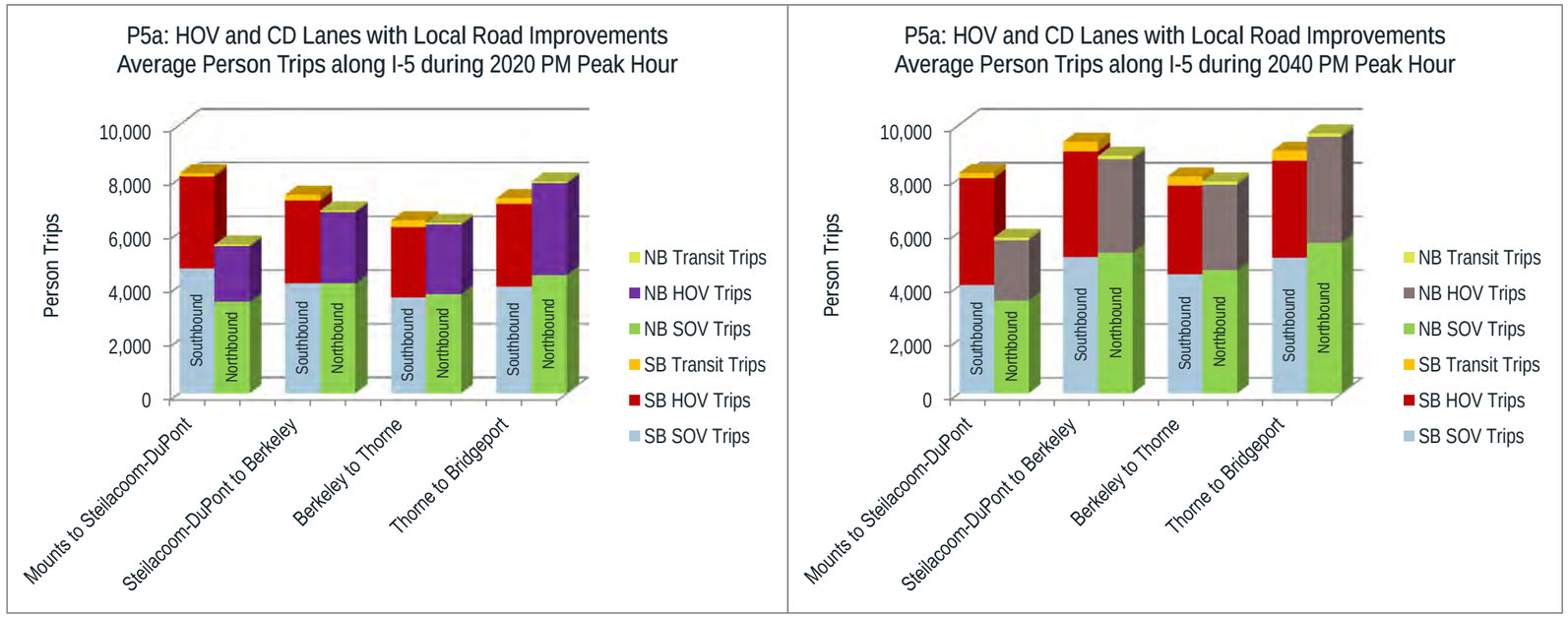


Figure VI-60: 2020 and 2040 PM Peak Hour I-5 Person Trips – P5a



improvements, person trips along I-5 were only lowered by about one to three percent as compared to Alternative P5. The average person trips by SOV, HOV and transit along various segments of I-5 by direction are illustrated in Figure VI-60.

PM Peak Hour Period I-5 Person Trips by Mode and Type

For Alternative P5a, a comparison of the 2020 and 2040 person trips along I-5 between Mount Road and Bridgeport Way during the 6-hour PM peak period is illustrated in Figure VI-61. Overall, in 2020 there were approximately 87,450 person trips traveling on I-5 during the 6-hour PM peak period in the study area. This is about a 1.7% decrease, as compared to Alternative P1, because of trips staying on local roads longer. Of this total, about 59 percent were estimated to be SOV trips, 38 percent were estimated to be HOV trips; and about three percent were on transit vehicles.

These 2020 PM peak period person trips were also broken down into three categories, with about 49 percent classified as regional trips, about 37 percent were classified as trips entering or exiting I-5 within the study area, and about 14 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-14.

Table VI-14: 2020 PM 6-hour Peak Period - Person Trips by Mode and Type – P5a

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	50%	51%	22%	49%
Entering/Exiting I-5 within Study Area	36%	36%	65%	37%
Both Entering & Exiting I-5 within Study Area	14%	13%	13%	14%

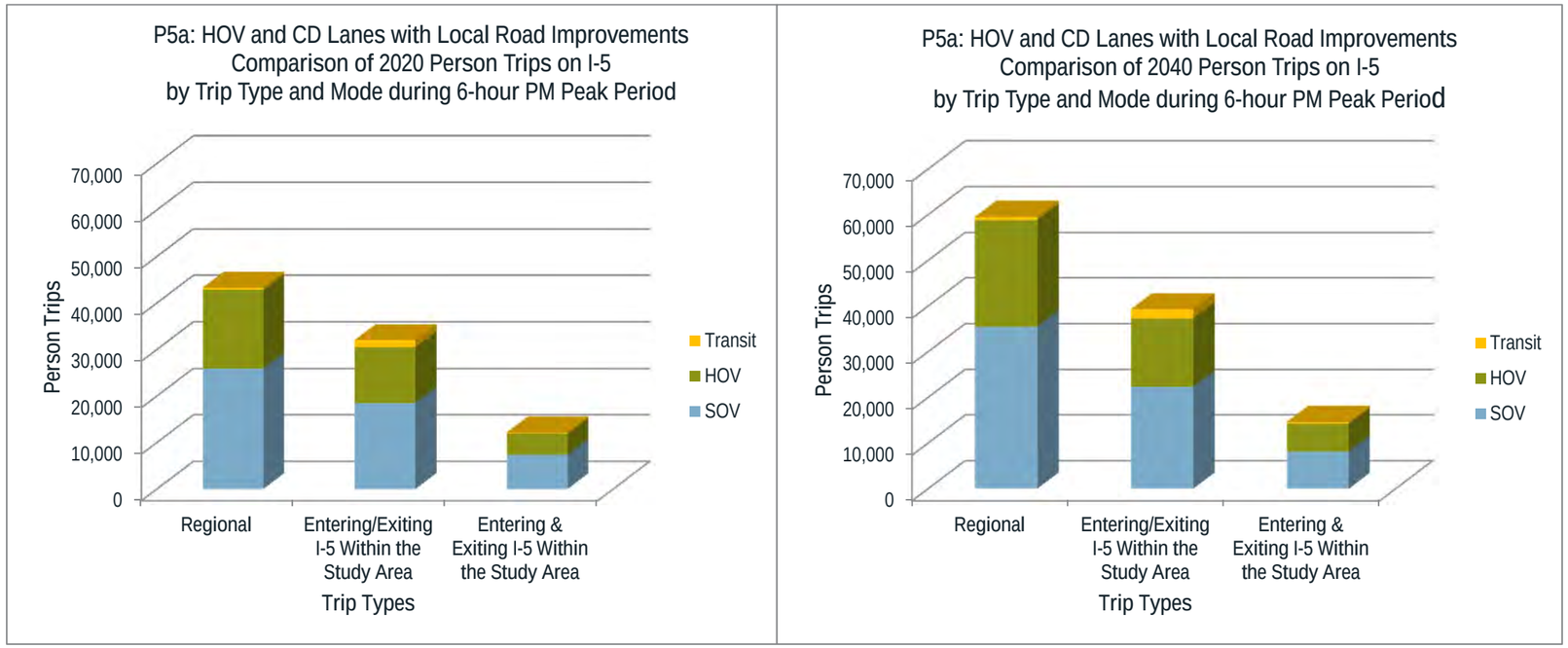
By 2040 there were approximately 113,510 person trips traveling on I-5 during the 6-hour PM peak period in the study area (14% above Alternative P1). Of this total, about 58 percent were estimated to be SOV trips, 39 percent were estimated to be HOV trips, and about three percent were on transit vehicles.

Of these 2040 PM 6-hour peak period person, about 52 percent classified as regional trips, about 35 percent were classified as trips entering or exiting I-5 within the study area, and about 13 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-15.

Table VI-15: 2040 PM 6-hour Peak Period - Person Trips by Mode and Type – P5a

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	54%	52%	23%	52%
Entering/Exiting I-5 within Study Area	34%	34%	64%	35%
Both Entering & Exiting I-5 within Study Area	12%	14%	13%	13%

Figure VI-61: Comparison of 2020 & 2040 I-5 PM 6-hour Peak Period Person Trips by Mode and Type – 5a



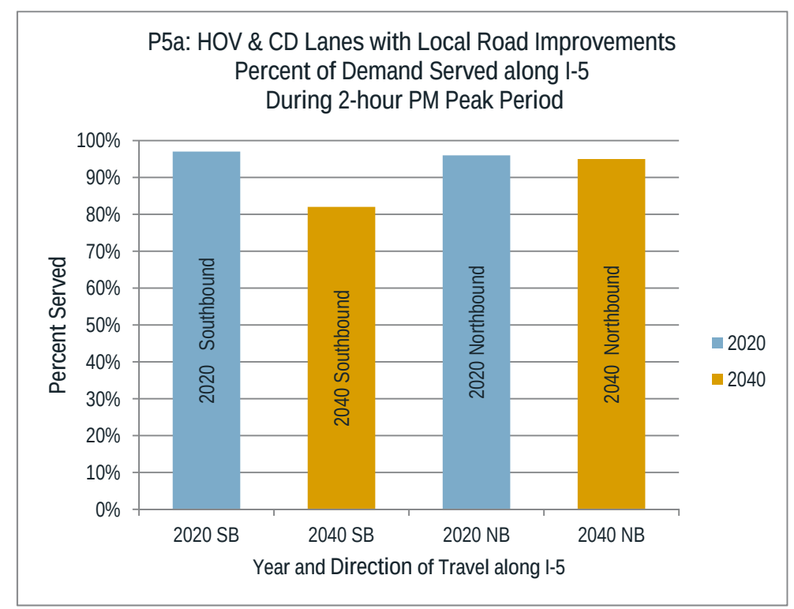
Percent of I-5 Travel Demand Served during the 2-hour PM Peak Period in 2020 & 2040

For Alternative P5a, a comparison of the 2-hour PM person-demand for travel along I-5 in each direction within the study area with the actual number of person trips traveling in the study area for 2020 and 2040 were conducted. This comparison showed that in 2020, approximately 97 percent of the person-demand traveling southbound (Alternative P1 has 85%) and 96 percent traveling northbound (Alternative P1 has 79%) could use I-5 during the 2-hour peak period.

In comparison by 2040, this analysis showed that approximately 82 percent of the person-demand traveling southbound (Alternative P1 has 64%) could use I-5 during the 2-hour peak period. Also approximately 95 percent of the person-demand traveling northbound (Alternative P1 has 50%) could use I-5 during the same 2-hour PM peak period, as illustrated in Figure VI-62.

The percentages of unmet demand in 2040 were much larger for the No Action Alternative (36 percent southbound and 50 percent northbound) as compared to 18 percent southbound and 5 percent northbound for the Alternative P5a – HOV and CD Lanes with Local improvements. These percentages for Alternative P5a are similar to the unmet demand for Alternative P5.

Figure VI-62: Comparison of Percent of Demand Served in 2020 and 2040 – P5a



I-5 PM Peak Hour Travel Speeds

For Alternative P5a, a comparison of the 2020 and 2040 southbound and northbound travel speeds along all the mainline lanes of I-5 from Mounts Road to Bridgeport Way are shown on Figure VI-63. These speed patterns for Alternative P5a are similar to the speed pattern for the Alternative P5.

In 2020 with only the CD lanes between Berkeley Street and Thorne Lane in operation, drivers still experience side friction caused by the multiple on- and off-ramps between Mounts Road Interchange and the Main Gate Interchange. North of Thorne Lane Interchange, speeds are slowed because of the conversion of one of the GP lanes to an HOV lane, which limits the capacity for SOV drivers. In 2020, the average southbound travel speed in the mainline lanes is about 29 mph and about 28 mph in the northbound direction.

By 2040, with the CD and auxiliary lane system operational, the HOV system extended into Thurston County, and local road improvements added, southbound traffic still slows because of the ending of the CD lanes into the three mainline GP lanes and one HOV lane. In the northbound direction, travel is slowed because of unrelated congestion at the SR 512 interchange, causing drivers to shift into and out of the right lanes. Overall, the average travel speed in the mainline lanes is about 28 mph southbound and about 43 mph northbound with the HOV lanes operating at about 49 mph southbound and 56 mph northbound.

The average 2020 and 2040 speeds along I-5 by direction and time of day for the mainline lanes are illustrated in Figure VI-64. These speed time-diagrams show that for P5a Alternative the hours of congestions are reduced in the PM 6-hour peak period at some locations along I-5. In the southbound direction, this congestion is caused by traffic conditions south of Mounts Road as the CD system transitions back to three southbound lanes in 2020 and three GP lanes and one HOV lane in 2040. The northbound lanes are affected by traffic at the SR 512 Interchange.

Overall, these speed-time diagrams show that the P5a Alternative reduces the magnitude congestion, has overall faster speeds, and limits the number of hours of congestion, as compared to the No Action Alternative.

Figure VI-63: 2020 and 2040 Southbound Travel Speeds during the PM Peak Hour along I-5 – P5a

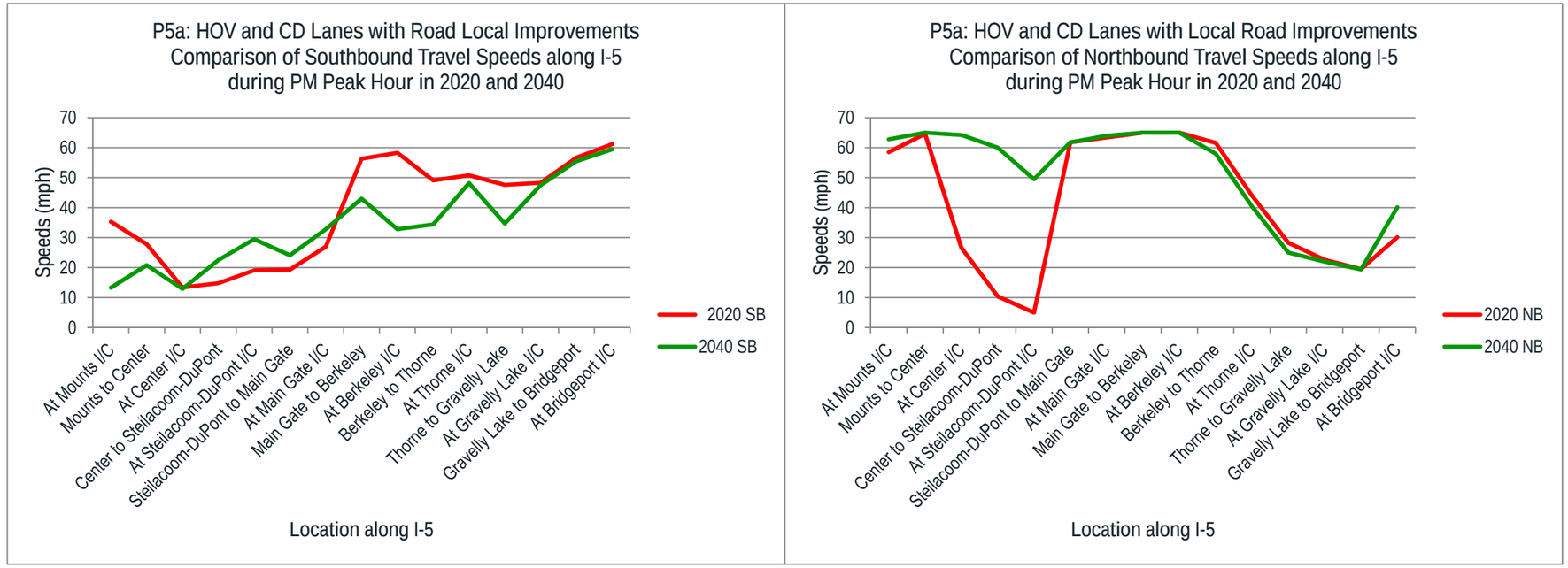
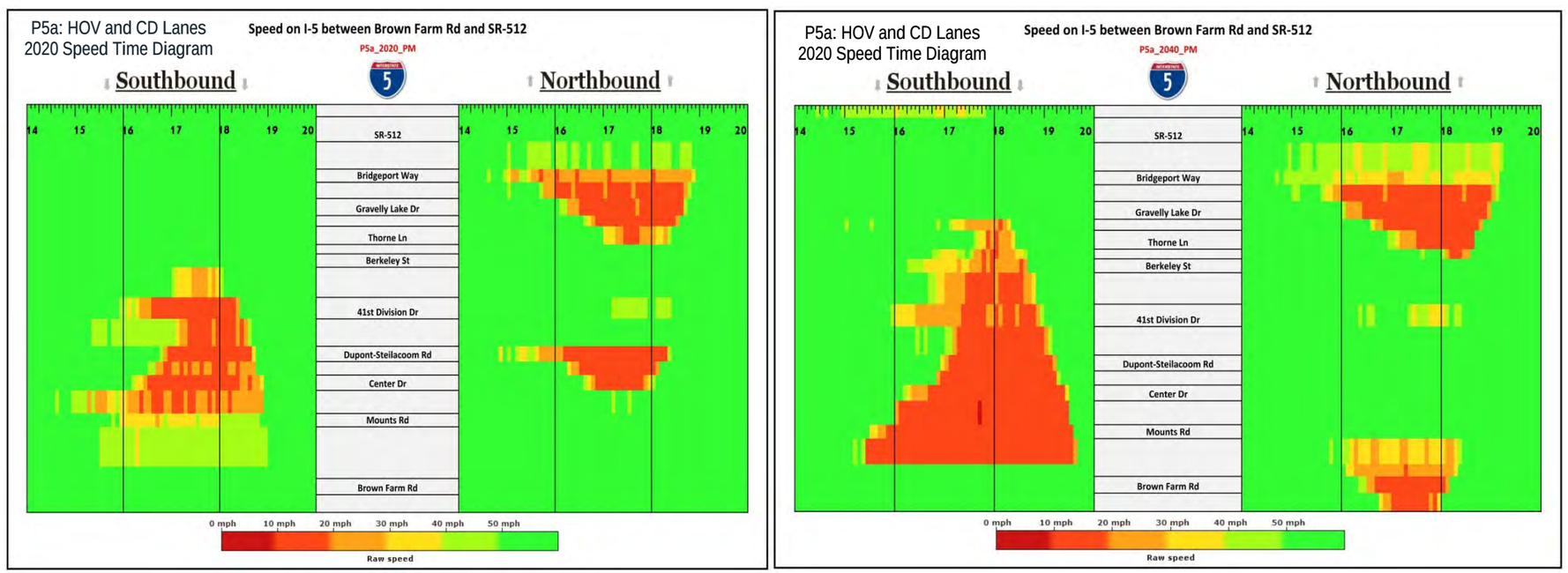


Figure VI-64: 2020 and 2040 PM Peak Period Speed-Time Diagrams along I-5 – P5a



I-5 Hours of Congestion – 2020 & 2040 PM Peak Period

Hours of congestion for Alternative P5a were estimated using the number of hours that drivers in the various segments of I-5 would travel at speeds below 70 percent of posted speed during the 6-hour PM peak period. As illustrated in Figure VI-65, Alternative P5a reduces the hours of congestion in the I-5 mainline lanes to less than four hours in 2020. Most of the congestion is caused by travel in the transition areas at the north and south ends of the project area. By 2040, the maximum duration of congestion along the corridor is about four hours, traveling southbound on I-5 because of the ending of the CD system and transitioning normal lanes. In the northbound direction, most of the congestion is north of the focus area as the CD system transitions back to existing conditions. Through the focus area between Steilacoom-DuPont Road and Thorne Lane, congestion would last about two hours in 2020 and three hours in 2040. This data indicates that in both the 2020 and 2040 time frames, congestion will be less than the peak four hours, whereas the congestion for the No Action Alternative began sooner and extended past 8:00 PM. With the additional of the local improvements in Alternative P5a, the hours of congestion remained relatively the same as with Alternative P5.

I-5 Travel Times during the 2020 & 2040 PM Peak Period

For Alternative P5a, travel times along I-5 between Mounts Road and Bridgeport Way by direction over the hour PM peak period are illustrated in Figure VI-66. In 2020, travel times in either direction of I-5 is between 20 and 25 minutes. By 2040, southbound travel time can reach almost 30 minutes while northbound travel time are less than 20 minutes. The longer southbound travel times are because of increased congestion at the south end backing up traffic into the focus area.

During a 3-hour PM peak period, the average travel time between Mounts Road and Bridgeport Way is 14 to 15 minutes in 2020 with an HOV travel time of 12 minutes. By 2040 with the completion of the CD system and the assumed extension of the HOV lanes into Thurston County, the average 3-hour PM peak period southbound travel time remains at about 15 minutes, while the northbound travel time is reduced to about 12 minutes. HOV travel times are also improved to nearly free-flow conditions.

Summary of Traffic Operations in 2020 & 2040 for P5a – HOV & CD Lanes with Local Road Improvements

With the HOV and CD system, as well as local road improvements being added in this alternative, the traffic operations along I-5 are improved in the PM peak hour and over the 6-hour PM peak period over the No Action Alternative but about the same as Alternative P5 without the local improvements. With the added capacity of the HOV and CD system, utilization of the I-5 lanes increase in terms of vehicles and person trips, travel speeds increase and hours of congestion decrease. With the addition of the HOV lanes, transit ridership is expected to increase. However, congestion along I-5 is still expected to last up to four hours, and there will be some time of stop and go traffic during the peak hour especially at transition areas into and out of the CD system.

Figure VI-65: Comparison of 2020 and 2040 Hours of Congestion in Mainline Lanes by I-5 Segments – P5a

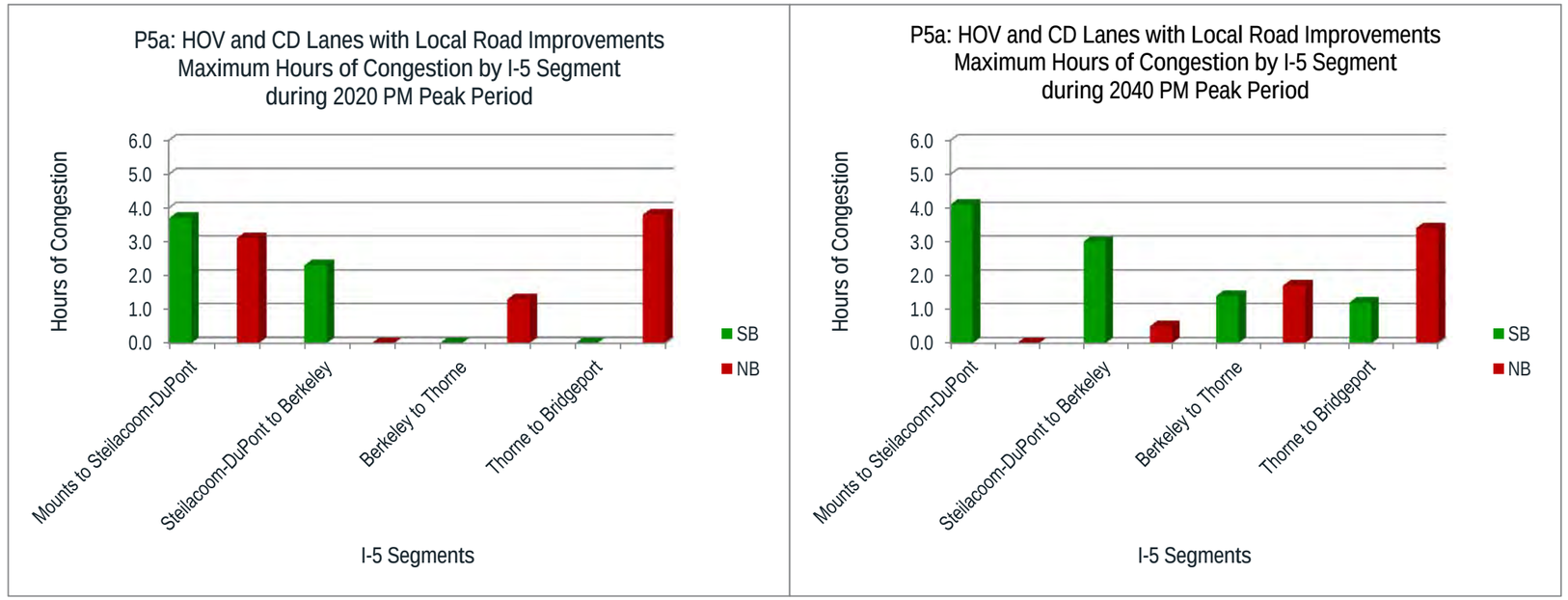
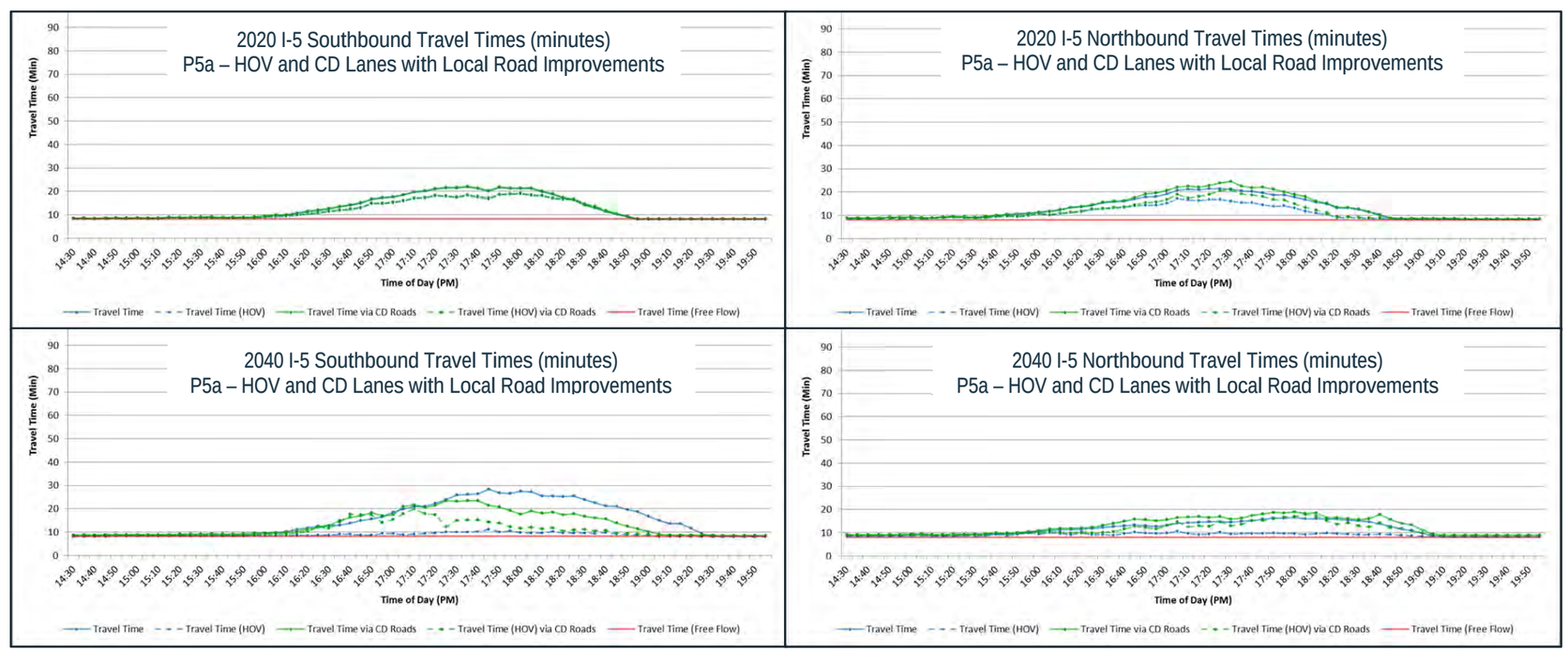


Figure VI-66: Average PM Peak Period Travel Time along I-5 between Mounts Road and Bridgeport Way by Time of Day – P5a



Alternative Package P6 – HOV and GP Lanes

The 2020 and 2040 HOV and GP Lanes Alternatives includes the improvements contained in the No Action Alternative (P1) and adds one HOV lane and one GP lane in each direction, as described in Chapter III. Overall, the analysis of this alternative improves I-5 operations. However, I-5 still operates with slow travel speeds and several hours of congestion, especially in the transition areas. Based on the Meso Model results, in 2020 about 91 percent of the I-5 peak hour demand can pass through the corridor (67% in Alternative P1). Over a 2-hour PM peak period about 96 percent of the demand can pass through the I-5 corridor (82% in Alternative P1). By 2040, these percentages decrease so that about 81 percent of the I-5 peak hour demand can pass through the corridor (26% in Alternative P1), and over a 2-hour PM peak period about 90 percent of the demand can pass through the I-5 corridor (57% in Alternative P1). However, these 2040 percentages are greatly improved over the No Action Alternative.

I-5 PM Peak Hour Travel Forecasts – 2020 & 2040

Vehicle Trips: For Alternative P6, the average PM peak hour vehicle trips along I-5 mainline between Mounts Road and Bridgeport Way in 2020 are approximately 5,730 vehicles southbound (19% more than Alternative P1) and 5,390 vehicles northbound (34% more than Alternative P1). By 2040, the average PM peak hour vehicle trips along I-5 in the study area increase to approximately 6,590 vehicles southbound (32% more than Alternative P1) and to 6,360 vehicle trips northbound (69% more than Alternative P1).

In 2020, about 22 percent of the traffic along I-5 mainline is HOV vehicle trips and 78 percent are SOV vehicle. By 2040, about 24 percent are HOV vehicle trips and 76 percent are SOV vehicle trips. Because of increased the added capacity of the HOV and GP lanes along I-5 mainline, more vehicle trips can be accommodated along I-5. The average 2020 and 2040 traffic flow by SOV and HOV vehicles along various segments of I-5 by direction are illustrated in Figure VI-67.

Person Trips: For Alternative P6, the average 2020 PM peak hour person trips along the I-5 mainline through the JBLM area are approximately 7800 person trips southbound (15% more than Alternative P1) and 7,130 person trips northbound (28% more than Alternative P1), with an average of 40 percent being HOV person trips, 58 percent being SOV person trips, and about two percent being transit trips.

By 2040, the average PM peak hour person trips along I-5 through the JBLM area are approximately 8,940 person trips southbound (27% more than Alternative P1) and 8,580 person trips northbound (56% more than Alternative P1). An average of 42 percent is HOV person trips, 56 percent are SOV person trips, and about two percent are transit trips.

Overall, person trips increase by approximately 15 percent southbound and 20 percent northbound during the PM peak hour between 2020 and 2040 from the area growth and the addition of the HOV and GP lanes. The average person trip by SOV, HOV and transit along various segments of I-5 by direction are illustrated in Figure VI-68.

Figure VI-67: 2020 and 2040 PM Peak Hour I-5 Vehicle Trips – P6

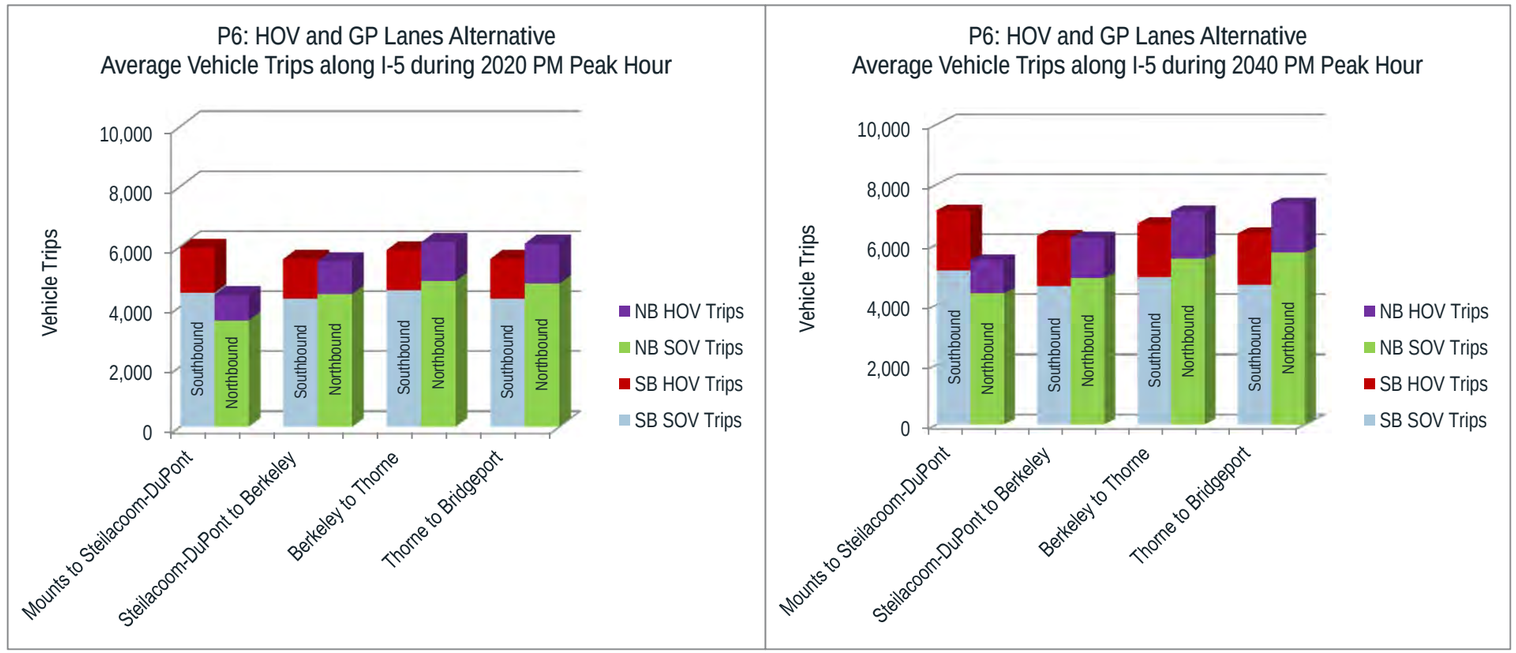
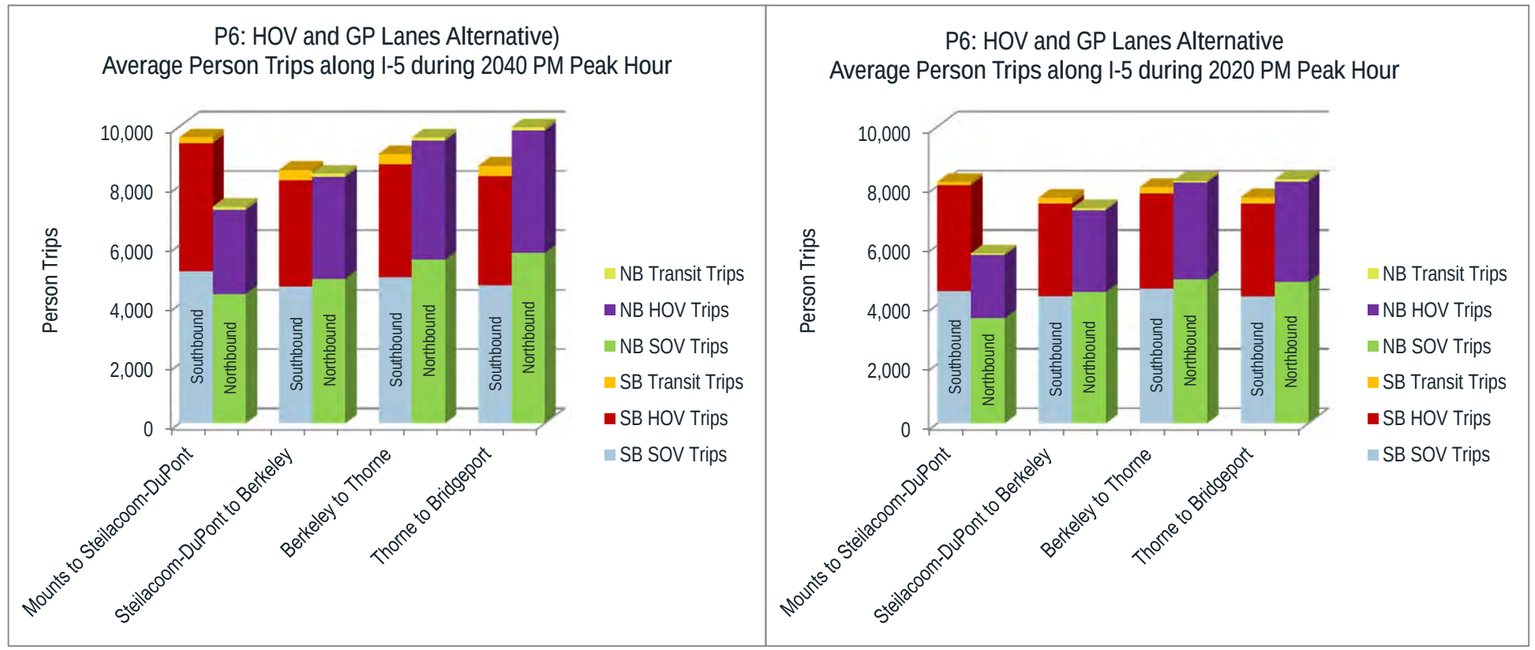


Figure VI-68: 2020 and 2040 PM Peak Hour I-5 Person Trips – P6



PM Peak Period I-5 Person Trips by Mode and Type

For Alternative P6, a comparison of the 2020 and 2040 person trips along I-5 between Mount Road and Bridgeport Way during the 6-hour PM peak period is illustrated in Figure VI-69. Overall, in 2020 there were approximately 91,250 person trips traveling on I-5 during the 6-hour PM peak period in the study area (2.6% more than Alternative P1). Of this total, about 60 percent were estimated to be SOV trips, 38 percent were estimated to be HOV trips, and about two percent were on transit vehicles.

These 2020 PM peak period person trips were also broken down into three categories, with about 48 percent classified as regional trips, about 37 percent were classified as trips entering or exiting I-5 within the study area, and about 15 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-16.

Table VI-16: 2020 PM 6-hour Peak Period – Person Trips by Mode and Type – P6

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	49%	48%	18%	48%
Entering/Exiting I-5 within Study Area	36%	36%	68%	37%
Both Entering & Exiting I-5 within Study Area	15%	16%	14%	15%

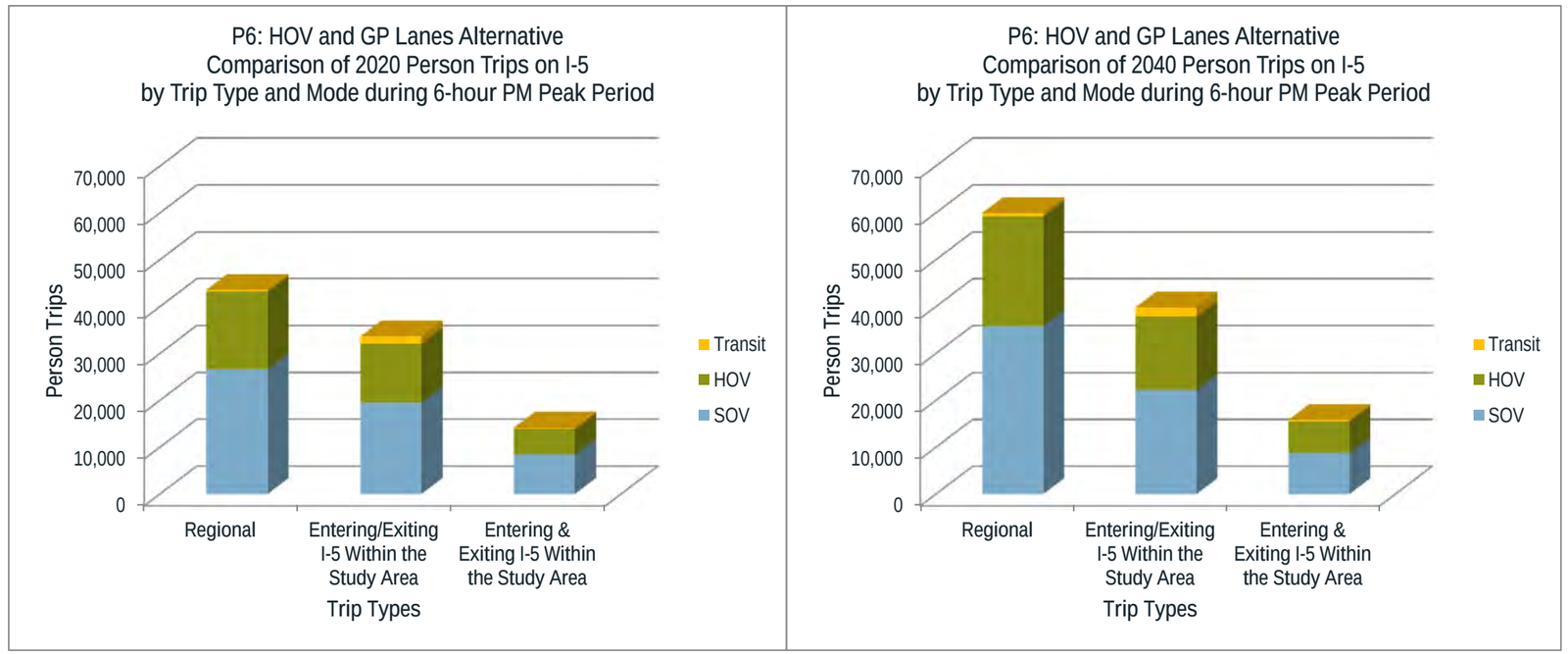
By 2040, there were approximately 115,580 person trips traveling on I-5 during the 6-hour PM peak period in the study area (15.7% more than Alternative P1). Of this total, about 58 percent were estimated to be SOV trips, 39 percent were estimated to be HOV trips, and about three percent were on transit vehicles.

Of these 2040 PM 6-hour peak period person, about 52 percent classified as regional trips, about 34 percent were classified as trips entering or exiting I-5 within the study area, and about 14 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-17.

Table VI-17: 2040 PM 6-hour Peak Period – Person Trips by Mode and Type – P6

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	54%	51%	23%	52%
Entering/Exiting I-5 within Study Area	33%	34%	64%	34%
Both Entering & Exiting I-5 within Study Area	13%	15%	13%	14%

Figure VI-69: Comparison of 2020 and 2040 I-5 PM 6-hour Peak Period Person Trips by Mode and Type – P6



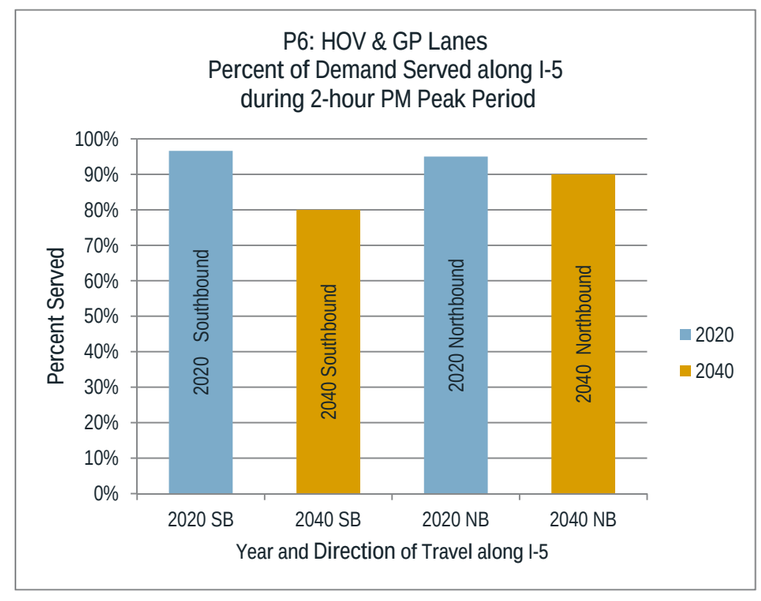
Percent of I-5 Travel Demand Served during the 2-hour PM Peak Period in 2020 & 2040

Using the Meso Model, the analysis of the 2-hour PM person-demand for travel along I-5 in each direction within the study area was compared with the actual number of person trips traveling in the study area for 2020 and 2040. This analysis showed that in 2020 approximately 97 percent of the person-demand traveling southbound (Alternative P1 has 85%) and 95 percent traveling northbound (Alternative P1 has 79%) could use I-5 during the 2-hour peak period.

In comparison, by 2040 this analysis showed that approximately 80 percent of the person-demand traveling southbound (Alternative P1 has 64%) could use I-5 during the 2-hour peak period. Also approximately 90 percent of the person-demand traveling northbound (Alternative P1 has 50%) could use I-5 during the same 2-hour PM peak period, as illustrated in Figure VI-54.

The percentages of unmet demand in 2040 were much larger for the No Action Alternative (36 percent southbound and 50 percent northbound) as compared to 20 percent southbound and 10 percent northbound for the P6 – HOV and GP Lanes Alternative.

Figure VI-70: Comparison of Percent of Demand Served in 2020 and 2040 – P6



I-5 PM Peak Hour Travel Speeds

For Alternative P6, a comparison of the 2020 and 2040 PM peak hour southbound and northbound travel speeds along the mainline lanes of I-5 from Mounts Road to Bridgeport Way is shown on Figure VI-71. These speed patterns for Alternative P6 are generally higher than the speed pattern for the No Action Alternative.

In 2020, drivers are still experiencing congestion south of Steilacoom-DuPont Interchange as the added southbound lanes transition back to the existing lanes. North of Thorne Lane Interchange, speeds are also slowed because of the conversion of one of the GP lanes to an HOV lane, which limits the capacity for SOV drivers, as well as unrelated congestion at the SR 512 Interchange. In 2020, the average PM peak hour southbound travel speed in the mainline lanes is about 23 mph and about 48 mph in the northbound direction. During the PM peak hour HOV drivers travel at average speeds of 23 mph southbound and 58 mph northbound. The slow southbound HOV speeds are caused by congestion in the transition area backing up into the HOV lane.

By 2040, with the HOV system assumed to be extended into Thurston County, southbound traffic is still slow because the GP lanes are reduced from four lanes to three lanes. In the northbound direction, travel is slow because of the number of vehicles entering and exiting I-5. Overall the average PM peak hour travel speed in the mainline lanes during the PM peak hour is about 15 mph southbound and about 36 mph northbound with the HOV lanes operating at about 23 mph southbound and 52 mph northbound.

The average 2020 and 2040 speeds along I-5 by direction and time of day for mainline lanes are illustrated in Figure VI-72. These speed-time diagrams show that the P6 Alternative reduces the hours of congestion for most of the PM 6-hour peak period as compared to the No Action Alternative. In the southbound direction, congestion is caused by traffic conditions south of Mounts Road as the GP system transitions back to three lanes. Speeds in the northbound lanes are affected by traffic entering and existing at Berkeley Street and Thorne Lane, as well as around the SR 512 Interchange.

Overall, these speed-time diagrams show that the P6 Alternative reduces the magnitude of congestion, has overall faster speeds, and limits the number of hours of congestion, as compared to the No Action Alternative.

Figure VI-71: 2020 and 2040 Southbound Travel Speeds during the PM Peak Hour along I-5 – P6

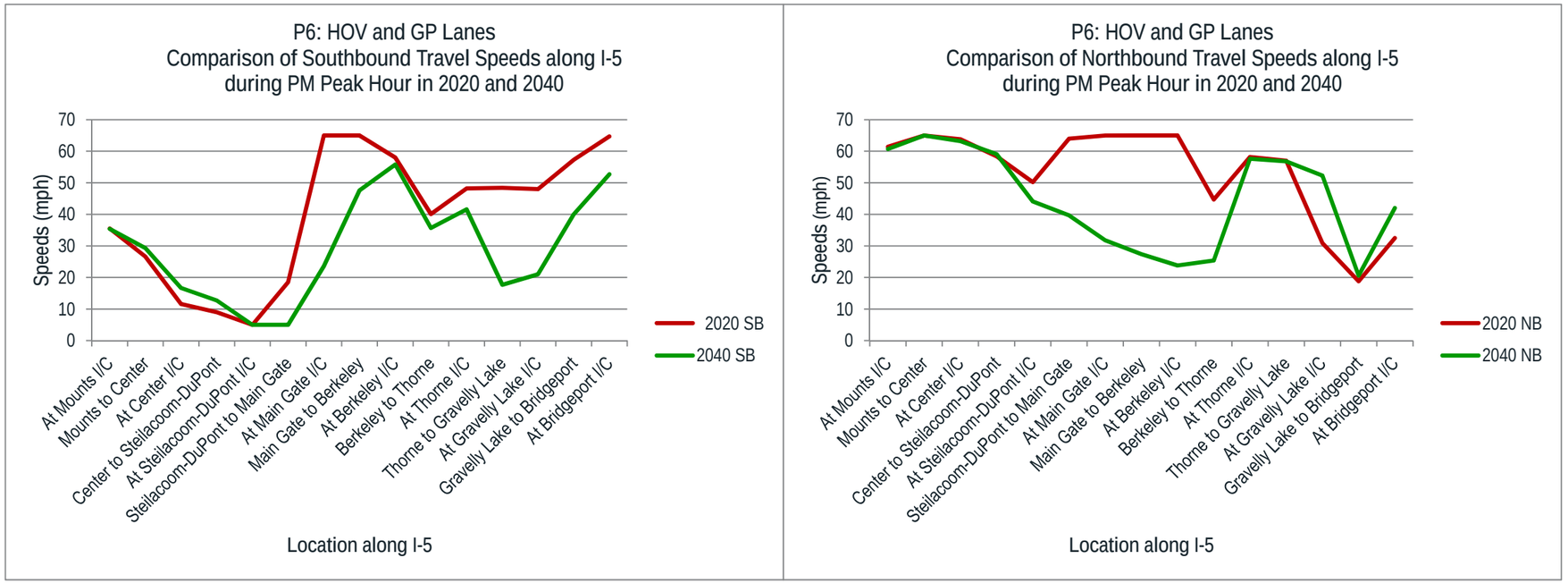
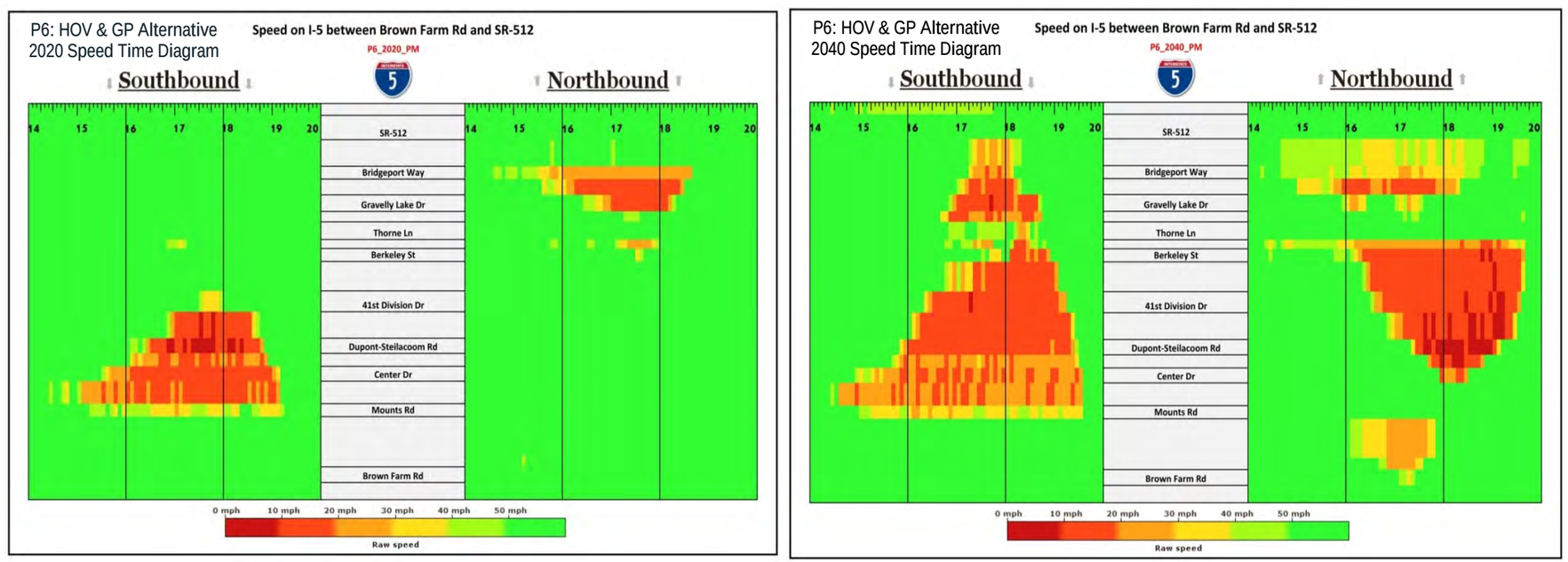


Figure VI-72: 2020 and 2040 PM Peak Period Speed-Time Diagrams along I-5 – P6



I-5 Hours of Congestion – 2020 & 2040 PM Peak Period

Hours of congestion that drivers would experience along I-5 were estimated by determining the number of hours that drivers in the various segments of I-5 would travel at speeds below 70 percent of posted speed during the 6-hour PM peak period. As illustrated in Figure VI-73, Alternative P6 reduces the hours of congestion in the mainline lanes along the corridor to about four hours in 2020 and about five hours in 2040 analysis periods. Most of the congestion is caused by travel in the transition area at the north and south ends of the project area. Through the focus area between Steilacoom-DuPont Road and Thorne Lane, congestion would last about two hours in 2020 and about five hours in 2040; whereas the congestion for the No Action Alternative began sooner and extended past 8PM.

I-5 Travel Times during the 2020 & 2040 PM Peak Period

For Alternative P6, travel times along I-5 between Mounts Road and Bridgeport Way by direction over the hour PM peak period were estimated using the Meso Model. These travel times are illustrated in Figure VI-74. Travel along this nine mile section of I-5 at the posted speed limit of 60 mph would generally take approximately 9 minutes. However, because of the increased congestion and reduced travel speeds, travel times are about 20 minutes or less in both directions in 2020. Due to the increased demand and congestion in 2040, travel times are expected to increase to around 30 minutes in both directions. These times are shorter than travel times with the No Action Alternative which have 2040 travel times of 40 to 50 minutes.

For travel in the southbound direction, the average mainline travel time over a 3-hour PM peak period is about 14 minutes in 2020 and about 19 minutes in 2040. In the northbound direction, the 3-hour PM peak period average travel time is estimate at about 11 minutes in 2020 and about 17 minutes in 2040. HOV travel times are about 9 to 13 minutes in 2020 and reduce to 10 to 11 minutes in 2040 with the completion of the HOV lane and GP lanes.

Summary of Traffic Operations in 2020 & 2040 for P6 – HOV and GP Lanes

With the added HOV and GP lanes in this alternative, the overall traffic operations along I-5 are improved in the PM peak hour and over the 6-hour PM peak period. With the added capacity of the HOV and GP lanes utilization of the I-5 lanes increases in terms of vehicles and person trips, travel speeds increase and hours of congestion decrease. With the addition of the HOV lanes, transit ridership is expected to increase.

Figure VI-73: Comparison of 2020 and 2040 Hours of Congestion in Mainline Lanes by I-5 Segments – P6

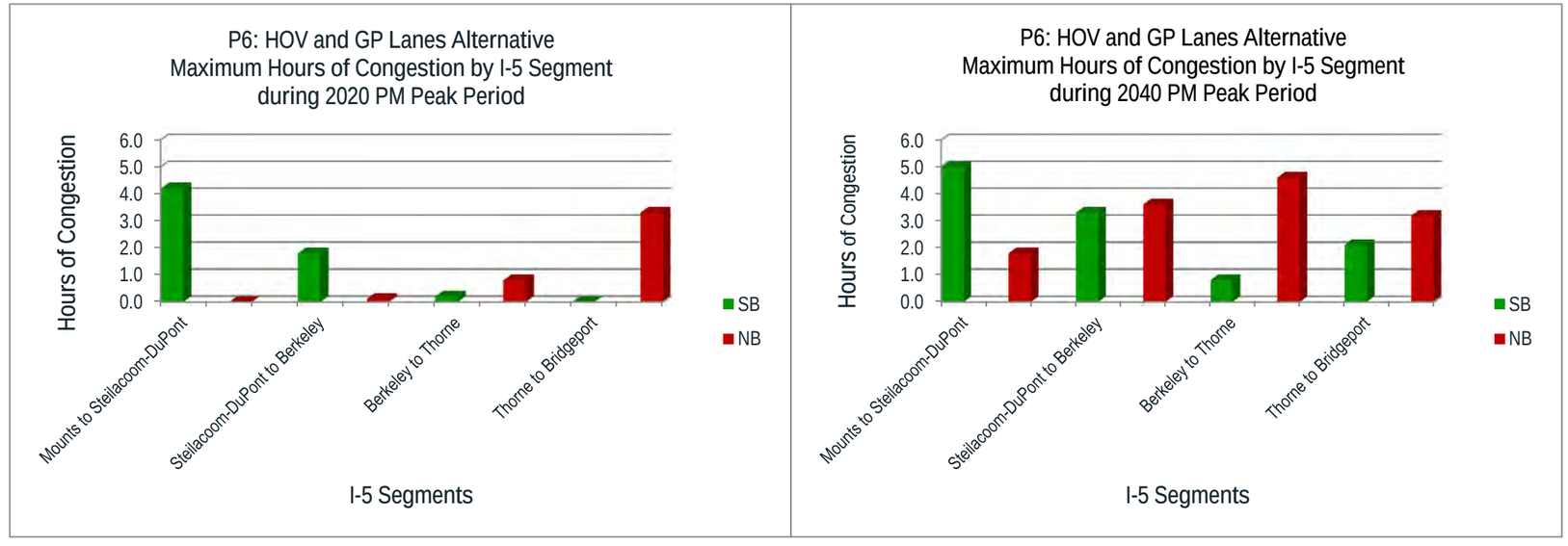
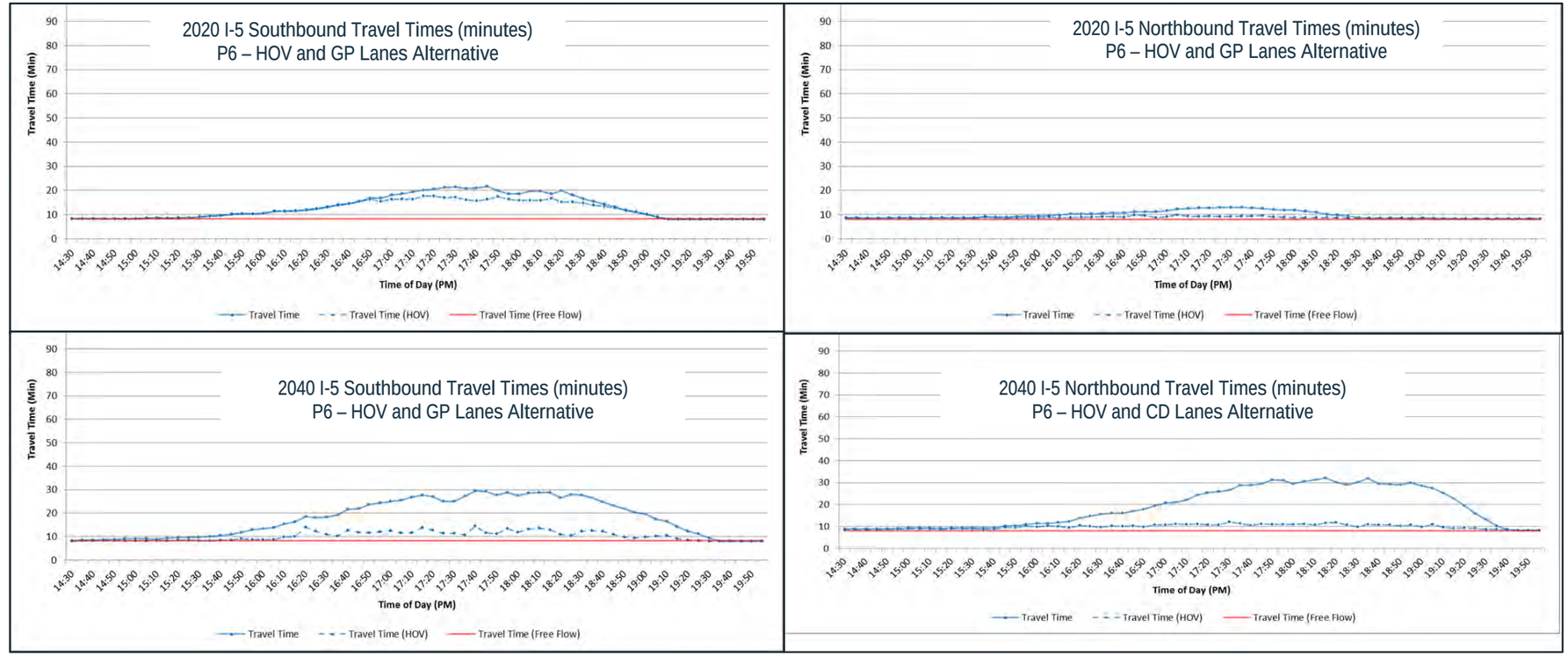


Figure VI-74: Average 2020 and 2040 PM Peak Period Travel Times along I-5 between Mounts Road and Bridgeport Way by Time of Day – P6



Alternative Package P6a – HOV and GP Lanes with Local Road Improvements

Alternative P6a, HOV and GP Lanes with Local Road Improvements Alternative (Package 6a), includes the improvements contained in the HOV and GP Lanes (Alternative P6) and adds three local roads, as described in Chapter III. Overall, the analysis of this alternative has similar I-5 operational improvements as Alternative P6. Based on the Meso Model results, in 2020 about 91 percent of the I-5 peak hour demand can pass through the corridor (67% in Alternative P1); and over a 2-hour PM peak period about 96 percent of the demand can pass through the I-5 corridor (82% in Alternative P1). By 2040, these percentages are reduced so that about 84 percent of the I-5 peak hour demand can pass through the corridor (26% in Alternative P1), and over a 2-hour PM peak period about 91 percent of the demand can pass through the I-5 corridor (57% in Alternative P1). These percentages are greatly improved over the 2040 No Action.

I-5 PM Peak Hour Travel Forecasts – 2020 & 2040

Vehicle Trips: For Alternative P6a, the average PM peak hour vehicle trips along I-5 between Mounts Road and Bridgeport Way in 2020 are slightly different than vehicle trips on I-5 with Alternative P6. There are approximately 5,340 vehicles southbound (11% more than Alternative P1) and 5,260 vehicles northbound (31% more than Alternative P1). By 2040, the average PM peak hour vehicle trips along I-5 in the study area increase to approximately 6,530 vehicles southbound (31% more than Alternative P1) and to 6,580 vehicles northbound (75% more than Alternative P1).

In 2020, about 22 percent of the traffic is HOV vehicle trips and 78 percent are SOV vehicle. By 2040, about 24 percent are HOV vehicle trips and 76 percent are SOV vehicle trips. The addition of the local improvements only slightly reduces the amount of traffic on I-5 by about 130 to 390 vehicles in 2020. In 2040 there is about a 60 vehicle decrease southbound and a 220 vehicle increase northbound in the PM peak hour. The average 2020 and 2040 traffic flow by SOV and HOV vehicles along various segments of I-5 by direction are illustrated in Figure VI-75.

Person Trips: For Alternative P6a, the average 2020 PM peak hour person trips along I-5 through the JBLM area are approximately 7,280 person trips in the southbound (7% more than Alternative P1) and 6,950 person trips northbound (25% more than Alternative P1), with an average of about 40 percent being HOV person trips, 58 percent being SOV person trips, and about two percent being transit trips. By 2040, the average PM peak hour person trips along I-5 through the JBLM area are approximately 8,850 person trips southbound (25% more than Alternative P1) and 8,870 person trips northbound (61% more than Alternative P1), with an average of 41 percent being HOV person trips, 57 percent SOV person trips, and about two percent being transit trips.

Overall, person trips increase by approximately 22 percent southbound and 28 percent northbound during the PM peak hour between 2020 and 2040 because of increased demand and reduced congestion along I-5. With the addition of the local improvements, person trips along I-5 were lowered by about five percent in 2020 but increased by one

Figure VI-75: 2020 and 2040 PM Peak Hour I-5 Vehicle Trips – P6a

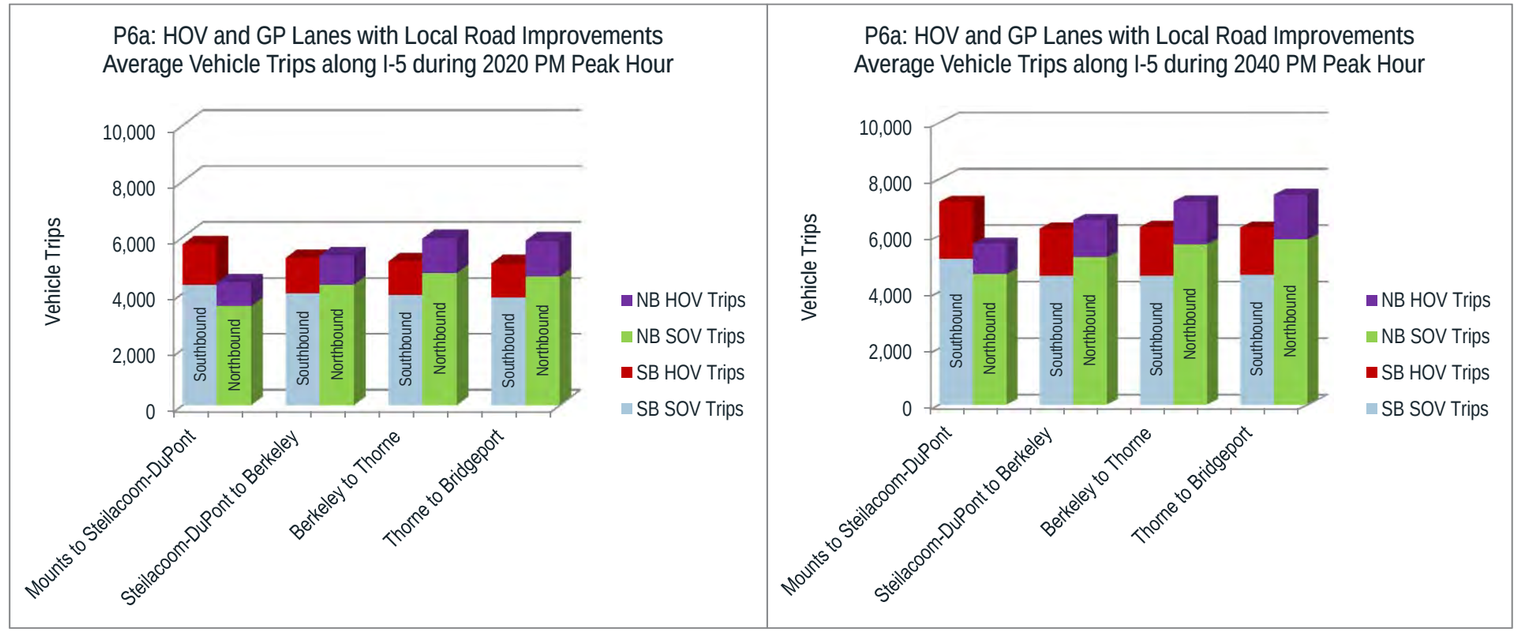
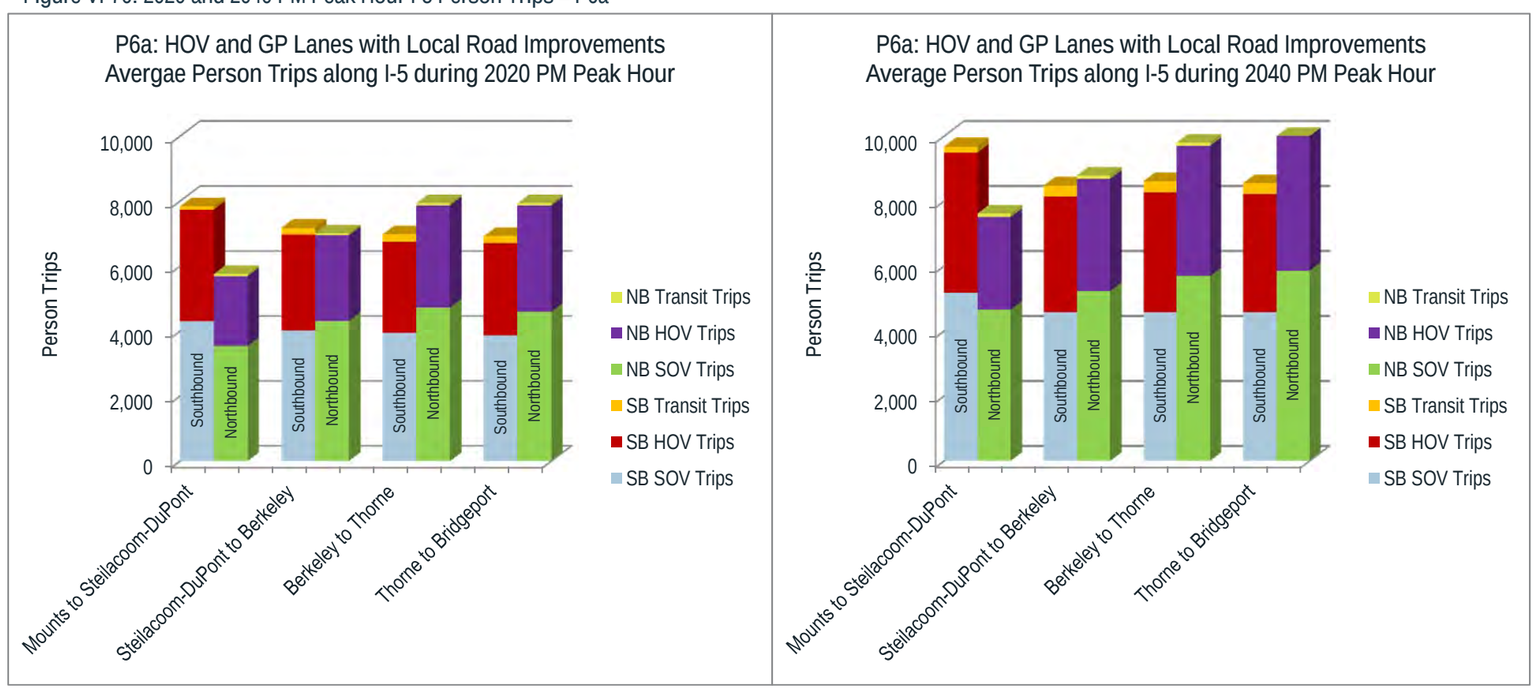


Figure VI-76: 2020 and 2040 PM Peak Hour I-5 Person Trips – P6a



percent in 2040, as compared to Alternative P6. The average person trips by SOV, HOV and transit along various segments of I-5 by direction are illustrated in Figure VI-76.

PM Peak Period I-5 Person Trips by Mode and Type

For Alternative P6a, a comparison of the 6-hour PM peak period person trips along I-5 between Mount Road and Bridgeport Way in 2020 and 2040 are illustrated in Figure VI-77. Overall, in 2020 there were approximately 88,160 person trips traveling on I-5 during the 6-hour PM peak period in the study area. This is about a 0.9% decrease, as compared to Alternative P1, because of trips staying on local roads longer. Of this total, about 60 percent were estimated to be SOV trips, 38 percent were estimated to be HOV trips, and about two percent were on transit vehicles.

These 2020 PM peak period person trips were also broken down into three categories, with about 49 percent classified as regional trips, about 37 percent were classified as trips entering or exiting I-5 within the study area, and about 14 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-18.

Table VI-18: 2020 PM 6-hour Peak Period – Person Trips by Mode and Type – P6a

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	51%	50%	18%	49%
Entering/Exiting I-5 within Study Area	36%	36%	68%	37%
Both Entering & Exiting I-5 within Study Area	13%	14%	14%	14%

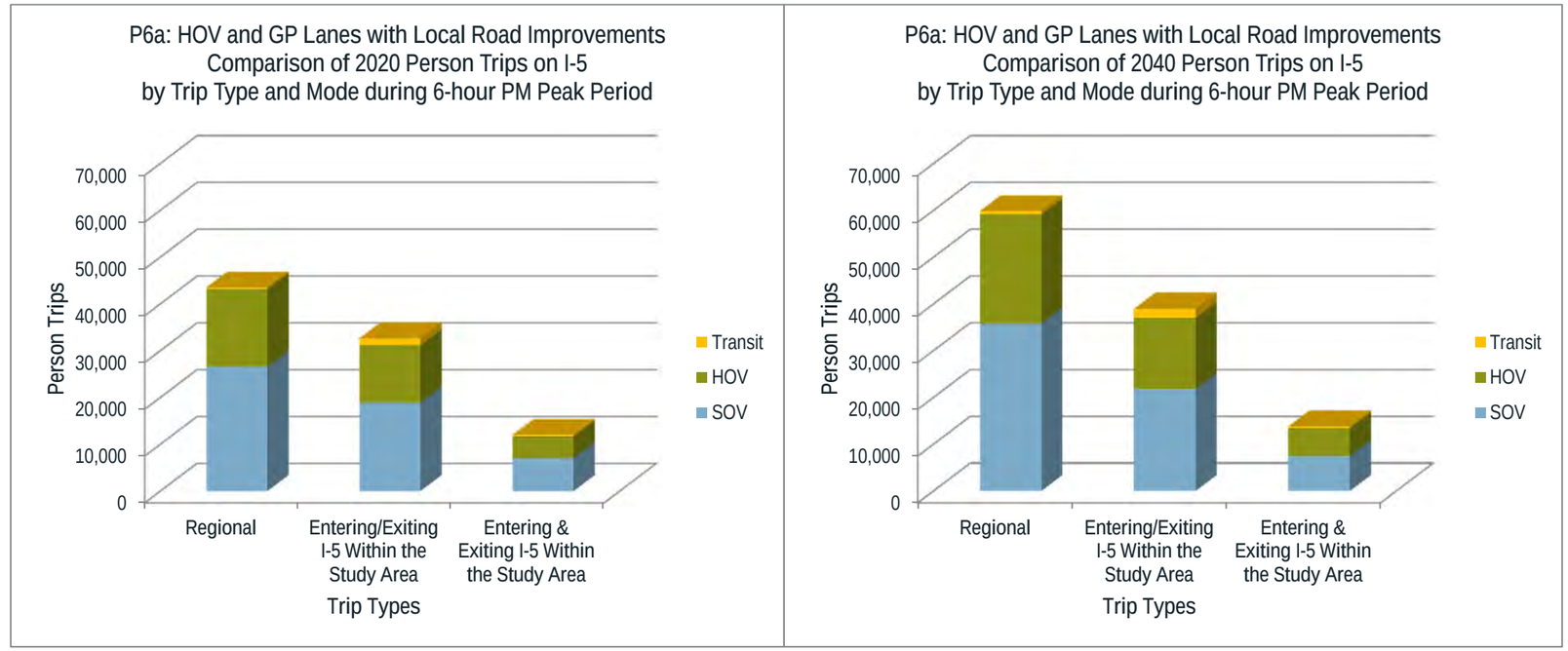
By 2040, there were approximately 112,660 person trips traveling on I-5 during the 6-hour PM peak period in the study area (13% more than Alternative P1). Of this total, about 58 percent were estimated to be SOV trips, 39 percent were estimated to be HOV trips, and about three percent were on transit vehicles.

Of these 2040 PM 6-hour peak period person, about 53 percent classified as regional trips, about 35 percent were classified as trips entering or exiting I-5 within the study area, and about 12 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-19.

Table VI-19: 2040 PM 6-hour Peak Period – Person Trips by Mode and Type – P6a

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	55%	53%	23%	53%
Entering/Exiting I-5 within Study Area	33%	34%	64%	35%
Both Entering & Exiting I-5 within Study Area	12%	13%	13%	12%

Figure VI-77: Comparison of 2020 and 2040 I-5 PM 6-hour Peak Period Person Trips by Mode and Type – P6a



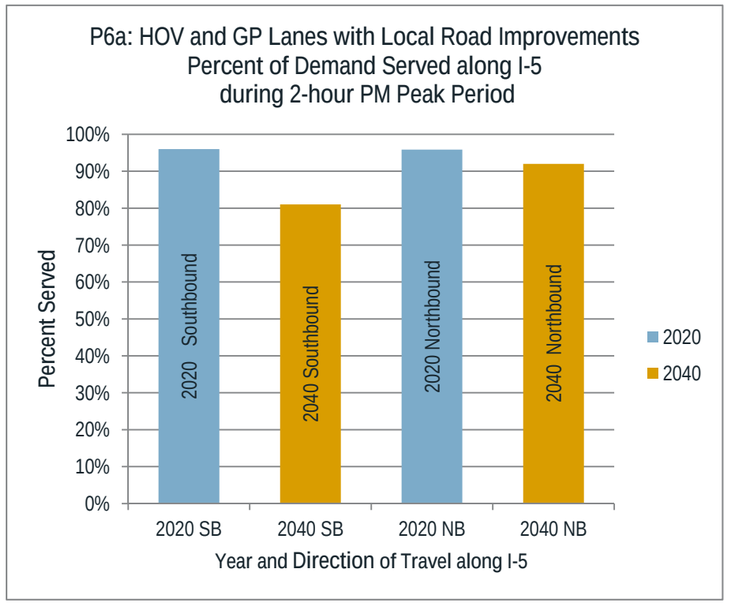
Percent of I-5 Travel Demand Served during the 2-hour PM Peak Period in 2020 & 2040

For Alternative P6a, comparisons of the 2-hour PM person-demand for travel along I-5 in each direction within the study area with the actual number of person trips traveling in the study area for 2020 and 2040 were conducted. These comparisons showed that in 2020 approximately 96 percent of the person-demand traveling in both directions (Alternative P1 has 85% southbound and 79% northbound) could use I-5 during the 2-hour peak period.

In comparison, by 2040 this analysis showed that approximately 81 percent of the person-demand traveling southbound (Alternative P1 has 64%) could use I-5 during the 2-hour peak period. Also approximately 92 percent of the person-demand traveling northbound (Alternative P1 has 50%) could use I-5 during the same 2-hour PM peak period, as illustrated in Figure VI-78.

The percentage of unmet demand in 2040 was much larger for the No Action Alternative (36 percent southbound and 50 percent northbound) as compared to 19 percent southbound and 8 percent northbound for the P6a – HOV and GP Lanes with local improvements. These percentages for Alternative P6a are similar to the unmet demand for Alternative P6.

Figure VI-78: Comparison of Percent of Demand Served in 2020 & 2040 – P6a



I-5 PM Peak Hour Travel Speeds

For Alternative P6a, a comparison of the 2020 and 2040 PM peak hour southbound and northbound travel speeds along all the mainline lanes of I-5 from Mounts Road to Bridgeport Way are shown on Figure VI-79. These speed patterns for Alternative P6a are similar to the speed pattern for the Alternative P6.

In 2020 with GP lanes added north of Mounts Road to Thorne Lane Interchange and the HOV lanes extended north from Steilacoom-DuPont Road to Tacoma, drivers are still experiencing congestion in the transition areas, south of Steilacoom-DuPont Road in the south bound direction and north of Thorne Lane in the northbound direction. The southbound congestion south of Center Drive is generally caused by the added lanes transitioning back to three GP lanes, while north of Thorne Lane one of the existing northbound GP lanes is converted to an HOV lane, reducing the GP lane capacity. In 2020, the average PM peak hour southbound travel speed in the mainline lanes is about 15 mph and about 46 mph in the northbound direction.

By 2040 with the assumption of new lanes added to the south and north, southbound traffic still slows because as the GP lanes transition back to three lanes. In the northbound direction, travel is slowed because of the number of vehicles entering and exiting I-5 and unrelated congestion in the SR 512 interchange area. Overall the average PM peak hour travel speed in the mainline lanes is still about 15 mph southbound and about 40 mph northbound with HOV speed averaging 21 mph southbound and 53 mph northbound.

The average 2020 and 2040 speeds along I-5 by direction and time of day for mainline lanes are illustrated in Figure VI-80. These speed-time diagrams show that the P6a Alternative reduces the time of congestion extent for most of the PM 6-hour peak period at some locations along I-5. In the southbound direction, congestion is caused by traffic conditions south of Mounts Road, as the GP system transitions back to three GP lanes in 2020 and to three GP lanes and one HOV lane in 2040. Speeds in the northbound lanes are affected by traffic entering and existing at Berkeley Street and Thorne Lane, as well around the SR 512 Interchange.

Overall, these speed-time diagrams show that the P6a Alternative is similar to Alternative P6, as they both reduce the magnitude congestion, have overall faster speeds, and reduce the number of hours of congestion, as compared to the No Action Alternative.

Figure VI-79: 2020 and 2040 Southbound Travel Speeds during the PM Peak Hour along I-5 – P6a

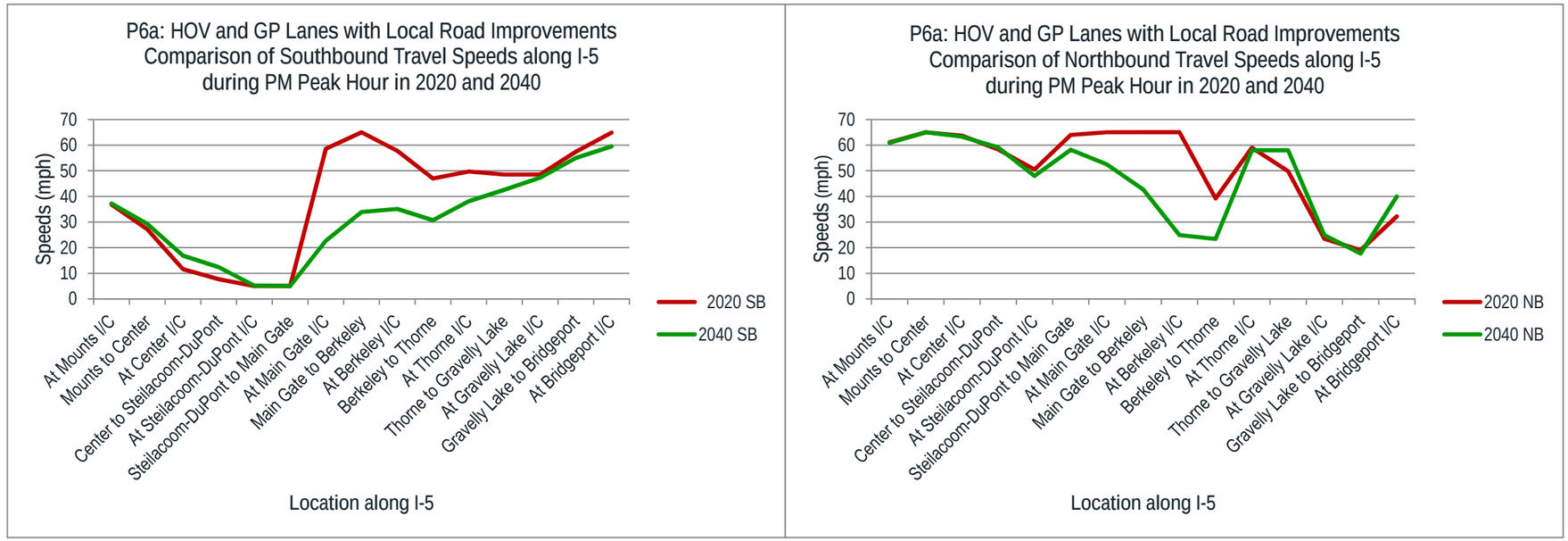
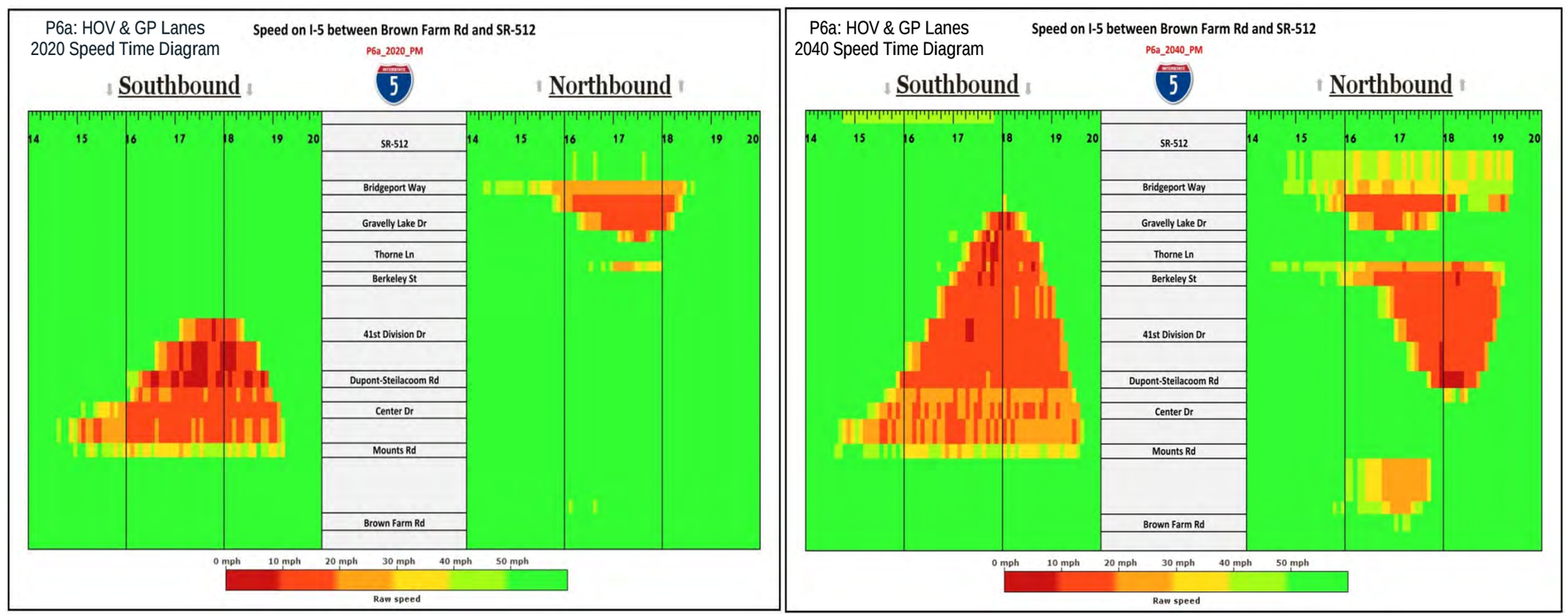


Figure VI-80: 2020 and 2040 PM Peak Period Speed-Time Diagrams along I-5 – P6a



I-5 Hours of Congestion – 2020 & 2040 PM Peak Period

As with P6, the hours of congestion for Alternative P6a were estimated using the number of hours that drivers in the various segments of I-5 would travel at speeds below 70 percent of posted speed during the 6-hour PM peak period. As illustrated in Figure VI-81, Alternative P6a reduces the hours of congestion in the mainline lanes along the corridor to about four hours in 2020 and about five hours in 2040 analysis periods. Most of the congestion is caused by travel in the transition area at the north and south ends of the project area. Through the focus area between Steilacoom-DuPont Road and Thorne Lane, congestion would last about two hours in 2020 and about three hours in 2040, whereas the congestion for the No Action Alternative began sooner and extended past 8:00 PM.

I-5 Travel Times during the 2020 & 2040 PM Peak Period

For Alternative P6a, travel times along I-5 between Mounts Road and Bridgeport Way by direction over the hour PM peak period are illustrated in Figure VI-82. In 2020, travel times in the southbound direction along I-5 is about 25 minutes in the peak hour and about 15 minutes northbound. By 2040 southbound peak travel time reach about 35 minutes and the northbound travel time increases to about 30 minutes. The longer travel times is caused by increased congestion in the transition areas.

During a 3-hour PM peak period, the average travel time between Mounts Road and Bridgeport Way is about 16 minutes southbound and 11 minutes northbound with the HOV travel times about two minutes shorter. By 2040, the average 3-hour PM peak period travel time is about 19 minutes southbound and 15 minutes northbound. HOV travel times are also improved to nearly free-flow conditions at 10 to 11 minutes.

Summary of Traffic Operations in 2020 & 2040 for P6a – HOV and GP Lanes with Local Road Improvements

With the added local improvements in conjunction with the HOV and GP lanes in this alternative, the overall traffic operations along I-5 are improved in the PM peak hour and over the 6-hour PM peak period. With the added local improvements in this alternative, the lane utilization in terms of person trips and vehicle trips, travel speeds and hours of congestion are similar to the operation of Alternative P6.

Figure VI-81: Comparison of 2020 and 2040 Hours of Congestion in Mainline Lanes by I-5 Segments – P6a

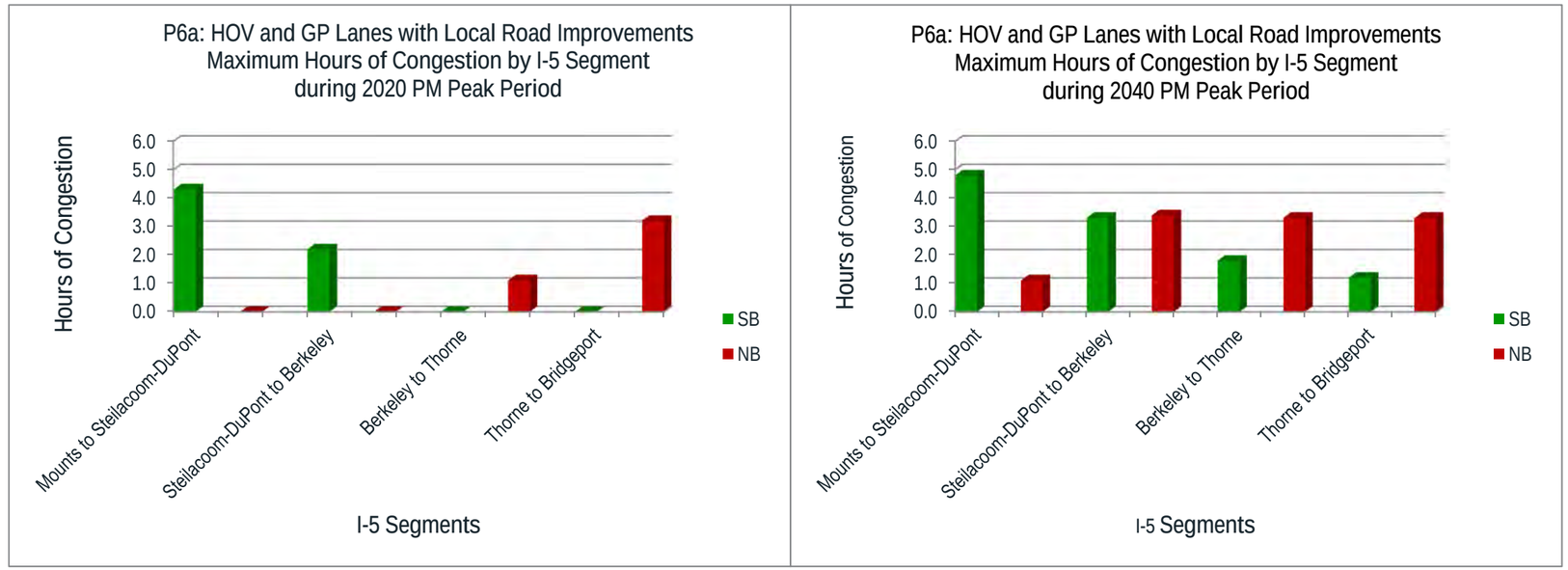
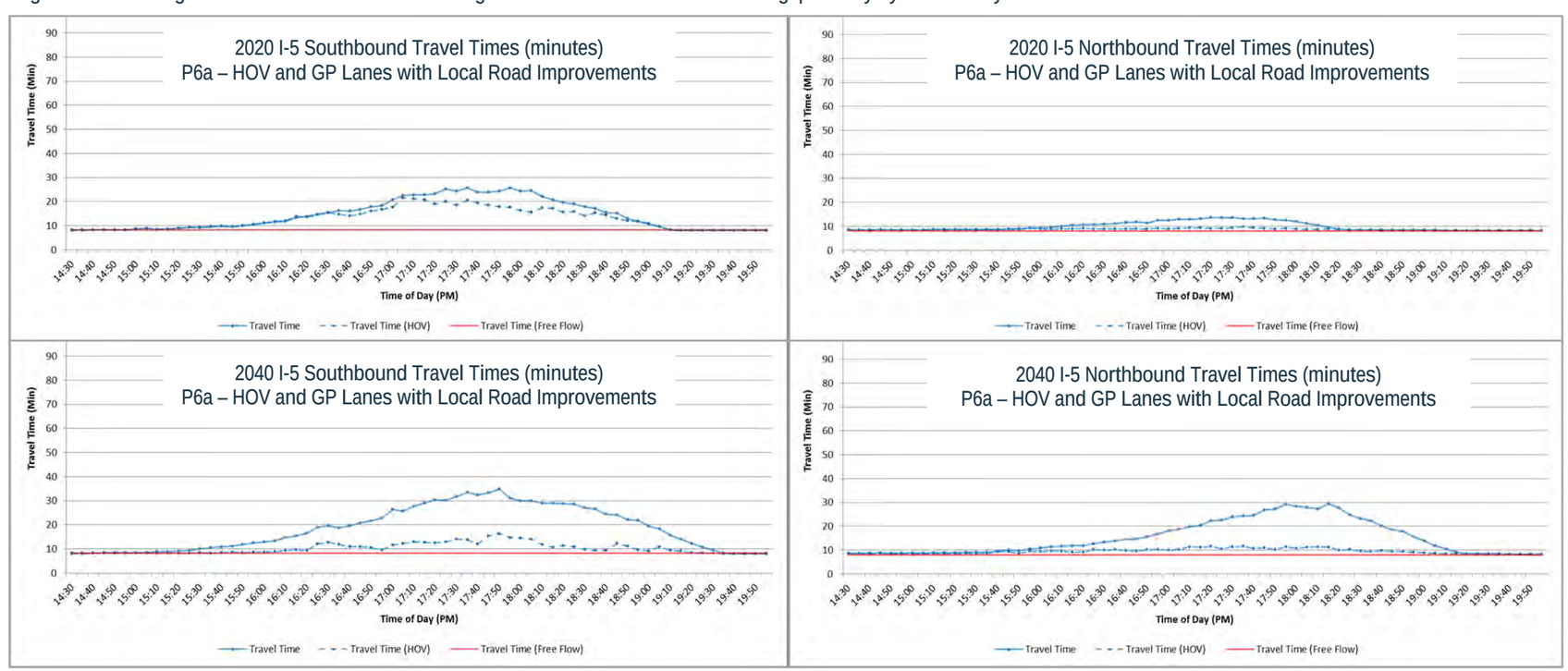


Figure VI-82: Average PM Peak Period Travel Time along I-5 between Mounts Road and Bridgeport Way by Time of Day – P6a



Alternative P7 – HOV Lanes

The HOV Lanes Alternative (Package P7) in 2020 and 2040 adds HOV lanes, as described in Chapter III. Overall, the analysis of this alternative improves I-5 traffic operations. However, I-5 still operates with slow travel speeds and several hours of congestion. Based on the Meso Model results, in 2020 about 88 percent of the I-5 peak hour demand can pass through the corridor (67% in Alternative P1), and over a 2-hour PM peak period about 95 percent of the demand can pass through the I-5 corridor (82% in Alternative P1). By 2040, about 70 percent of the I-5 peak hour demand can pass through the corridor (26% in Alternative P1), and over a 2-hour PM peak period about 83 percent of the demand can pass through the I-5 corridor (57% in Alternative P1). These percentages are greatly improved over the No Action Alternative.

I-5 PM Peak Hour Travel Forecasts – 2020 & 2040

Vehicle Trips: For Alternative P7, the average PM peak hour vehicle trips along I-5 between Mounts Road and Bridgeport Way in 2020 are approximately 4,910 vehicles southbound (1.7% more than Alternative P1) and 5,210 vehicles northbound (30% more than Alternative P1). By 2040, the average PM peak hour vehicle trips along I-5 in the study area increases to approximately 6,200 vehicles southbound (24% more than Alternative P1) and decreases to approximately 4,600 vehicles northbound (22% more than Alternative P1).

In 2020, about 25 percent of the traffic is HOV vehicle trips and 75 percent are SOV vehicle trips. By 2040, about 28 percent are HOV vehicle trips and 72 percent are SOV vehicle trips. Because of the increased capacity along I-5, especially in the northbound direction with this alternative, more vehicle trips can be accommodated along I-5 in 2020. However, by 2040 northbound traffic volume is decreased because of increased congestion north of Thorne Lane. The average 2020 and 2040 traffic flow by SOV and HOV vehicles along various segments of I-5 by direction is illustrated in Figure VI-83.

Person Trips: For Alternative P7, the average 2020 PM peak hour person trips along I-5 through the JBLM area are approximately 6,800 person trips southbound (about the same as Alternative P1) and 7,210 person trips northbound (30% more than Alternative P1), with an average of 43 percent being HOV person trips, 55 percent being SOV person trips, and about two percent being transit trips.

By 2040, the average PM peak hour person trips along I-5 through the JBLM area are approximately 8,790 person trips southbound (25% more than Alternative P1) and 6,440 person trips northbound (17% more than Alternative P1), with an average of 45 percent being HOV person trips, 51 percent SOV person trips, and about four percent being transit person trips.

Overall, person trips increase by approximately 29 percent southbound, but decrease by 11 percent northbound during the PM peak hour between 2020 and 2040 because of increased capacity along I-5. The southbound increase is due to the HOV lanes extending into Thurston County, while the decreasing northbound person trips are caused by the increased GP congestion north of Thorne Lane, where an existing GP

Figure VI-83: 2020 and 2040 PM Peak Hour I-5 Vehicle Trips – P7

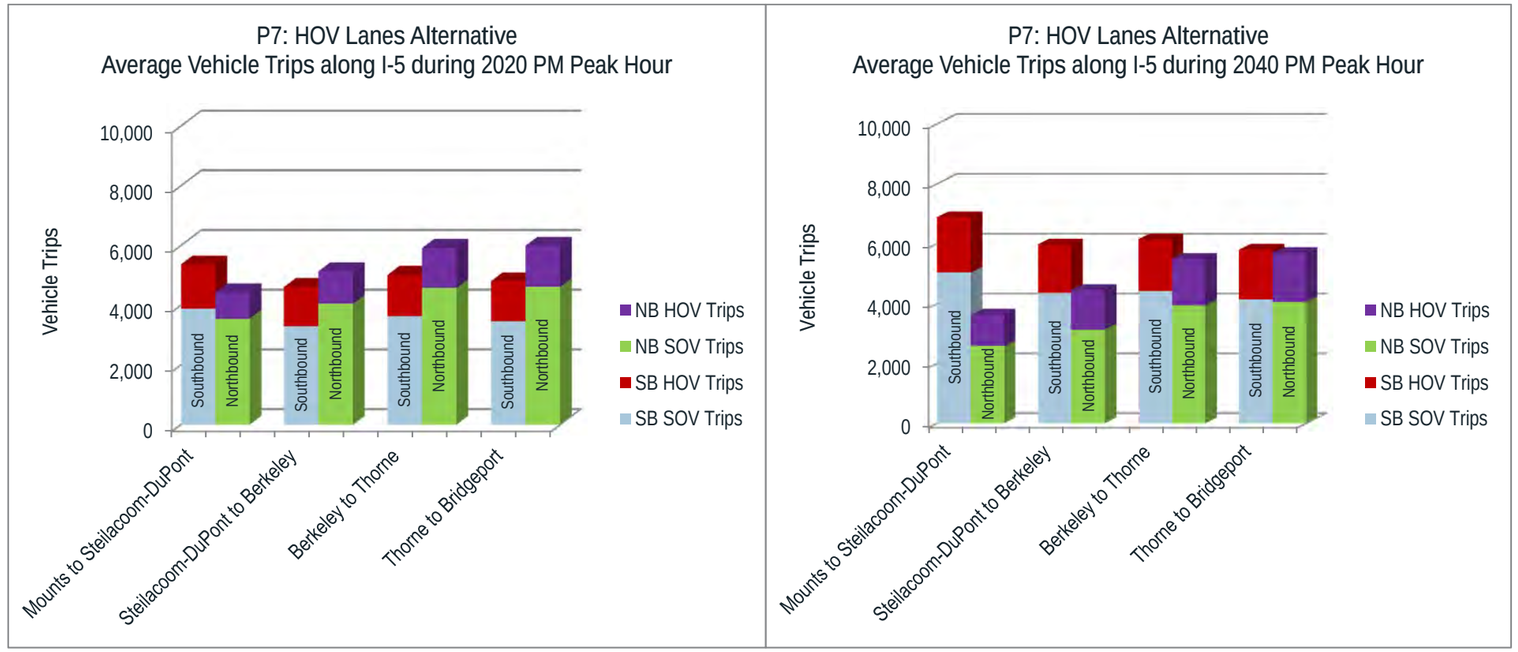
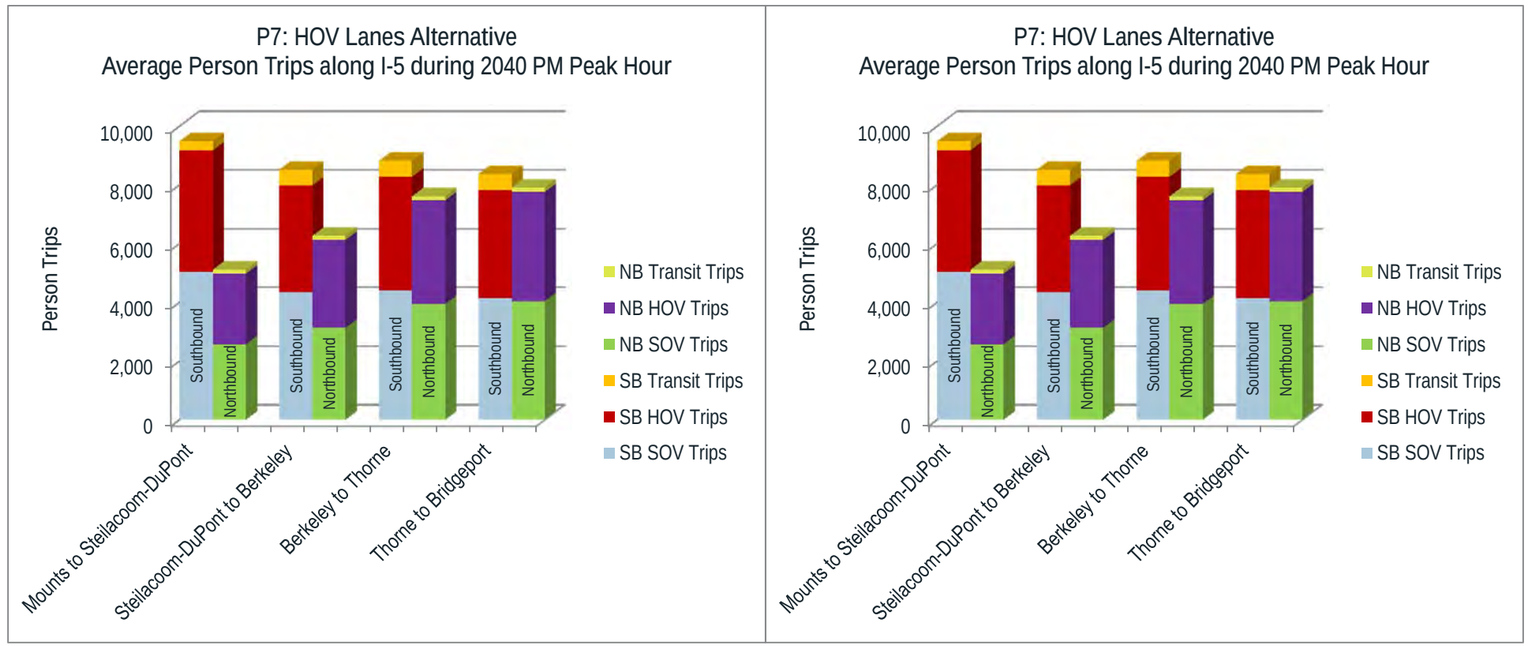


Figure VI-84: 2020 and 2040 PM Peak Hour I-5 Person Trips – P7



lane is converted into an HOV lane. The average person trips by SOV, HOV and transit along various segments of I-5 by direction are illustrated in Figure VI-84.

PM Peak Period I-5 Person Trips by Mode & Type

For Alternative P7, a comparison of 2020 and 2040 person trips along I-5 between Mount Road and Bridgeport Way during the 6-hour PM peak period is illustrated in Figure VI-85. Overall, there were approximately 89,650 person trips traveling on I-5 during the 6-hour PM peak period in the study area in 2020 (0.8% more than Alternative P1). Of this total, about 58 percent were estimated to be SOV trips, 39 percent were estimated to be HOV trips, and about three percent were on transit vehicles.

These 2020 PM peak period person trips were also broken down into three categories, with about 48 percent classified as regional trips, about 37 percent were classified as trips entering or exiting I-5 within the study area, and about 15 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-20.

Table VI-20: 2020 PM 6-hour Peak Period – Person Trips by Mode and Type – P7

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	49%	49%	21%	48%
Entering/Exiting I-5 within Study Area	36%	37%	67%	37%
Both Entering & Exiting I-5 within Study Area	15%	14%	12%	15%

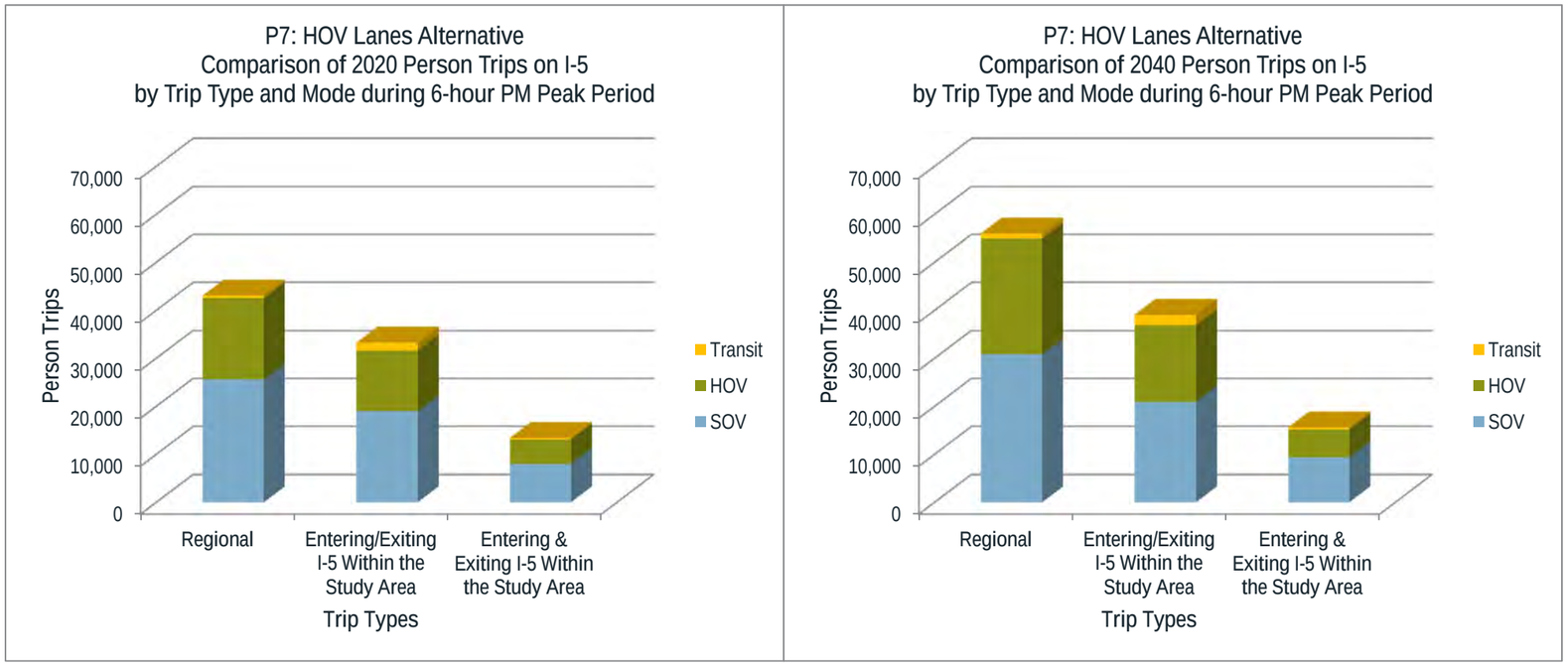
By 2040, there were approximately 110,670 person trips traveling on I-5 during the 6-hour PM peak period in the study area (11% more than Alternative P1). Of this total, about 55 percent were estimated to be SOV trips, 42 percent were estimated to be HOV trips, and about three percent were on transit vehicles.

Of these 2040 PM 6-hour peak period person, about 51 percent classified as regional trips, about 35 percent were classified as trips entering or exiting I-5 within the study area, and about 14 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-21.

Table VI-21: 2040 PM 6-hour Peak Period – Person Trips by Mode and Type – P7

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	51%	52%	30%	51%
Entering/Exiting I-5 within Study Area	34%	35%	59%	35%
Both Entering & Exiting I-5 within Study Area	15%	13%	11%	14%

Figure VI-85: Comparison of 2020 and 2040 I-5 PM 6-hour Peak Period Person Trips by Mode and Type – P7



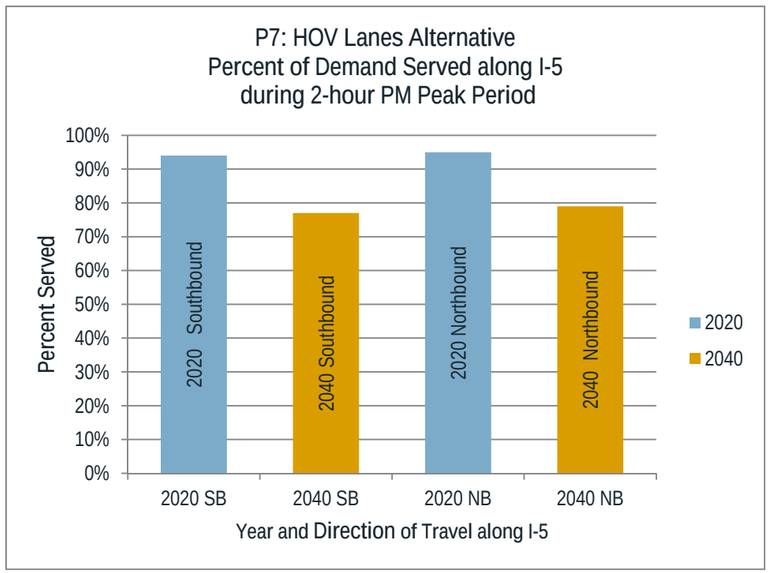
Percent of I-5 Travel Demand Served during the 2-hour PM Peak Period in 2020 & 2040

Using the Meso Model, the analysis of the 2-hour PM person-demand for travel along I-5 in each direction within the study area was compared with the actual number of person trips traveling in the study area for 2020 and 2040. This analysis showed that in 2020 approximately 94 percent of the person-demand traveling southbound (Alternative P1 has 85%) and 95 percent of the trips traveling northbound (Alternative P1 has 79%) could use I-5 during the 2-hour peak period.

In comparison by 2040, this analysis showed that approximately 77 percent of the person-demand traveling southbound (Alternative P1 has 64%) could use I-5 during the 2-hour peak period. Also approximately 79 percent of the person-demand traveling northbound (Alternative P1 has 50%) could use I-5 during the same 2-hour PM peak period, as illustrated in Figure VI-86.

The percentages of unmet demand in 2040 were much larger for the No Action Alternative (36 percent southbound and 50 percent northbound) as compared to 23 percent southbound and 21 percent northbound for the P7 – HOV Lanes Alternative.

Figure VI-86: Comparison of Percent of Demand Served in 2020 and 2040 – P7



I-5 PM Peak Hour Travel Speeds

For Alternative P7, a comparison of the 2020 and 2040 PM peak hour southbound and northbound travel speeds along all lanes of I-5 from Mounts Road to Bridgeport Way are shown on Figure VI-87. The speed patterns for Alternative P7 through the focus area between Steilacoom-DuPont Road are generally higher than the speed patterns for the No Action Alternative.

For 2020 in the southbound direction, the transition area south of the focus area shows slow traffic caused by the ending of the HOV lane and transitioning from four lanes to three lanes. North of Thorne Lane, speeds are decreased due to the conversion of one GP lane to an HOV lane and reducing the number of GP lanes to three lanes. An evaluation of the north transition area will be conducted during the next phase to determine the viability of lane conversion and the appropriate lane configuration. The overall average PM peak hour southbound SOV speed is about 14 mph in 2020 with an average HOV speed of 22 mph.

For 2020 northbound, travel speeds are increased because of the HOV lane, but again north of Thorne Lane speeds are decreased due to the conversion of one GP lane to an HOV lane and reducing the number of GP lanes to three. The overall average PM peak hour northbound SOV speed is about 38 mph in 2020 with an average HOV speed of 53 mph.

By 2040 in the southbound direction, speeds are improved because the HOV lane is assumed to be extended into Thurston County, but speeds are lower in the north transition area because of the conversion of one GP lane to and HOV lane which reduces the number of GP lanes to three lanes. The overall average PM peak hour southbound SOV speed is about 28 mph in 2040 with an average HOV speed of 44 mph.

In the northbound direction, 2040 PM peak hour travel speeds are generally less than 30 mph because of the congestion caused by converting one GP lane to an HOV lane which lowers the capacity of the GP lanes. The overall average northbound SOV speed is about 14 mph in 2040 with an average HOV speed of 46 mph.

The average 2020 and 2040 speeds along I-5 by direction and time of day for all lanes are illustrated in Figure VI-88. The 2020 speed-time diagrams show that P7 Alternative improves the overall northbound speeds as compared to the No Action Alternative, as well as the extent of congested segments along I-5. In 2040, the southbound magnitude and extent of congestion is reduced by adding the P7 improvements, but in the northbound direction, congestion is increased north of Thorne Lane due to the conversion of one GP lane to an HOV lane and reducing GP capacity.

Figure VI-87: 2020 and 2040 Southbound Travel Speeds during the PM Peak Hour along I-5 – P7

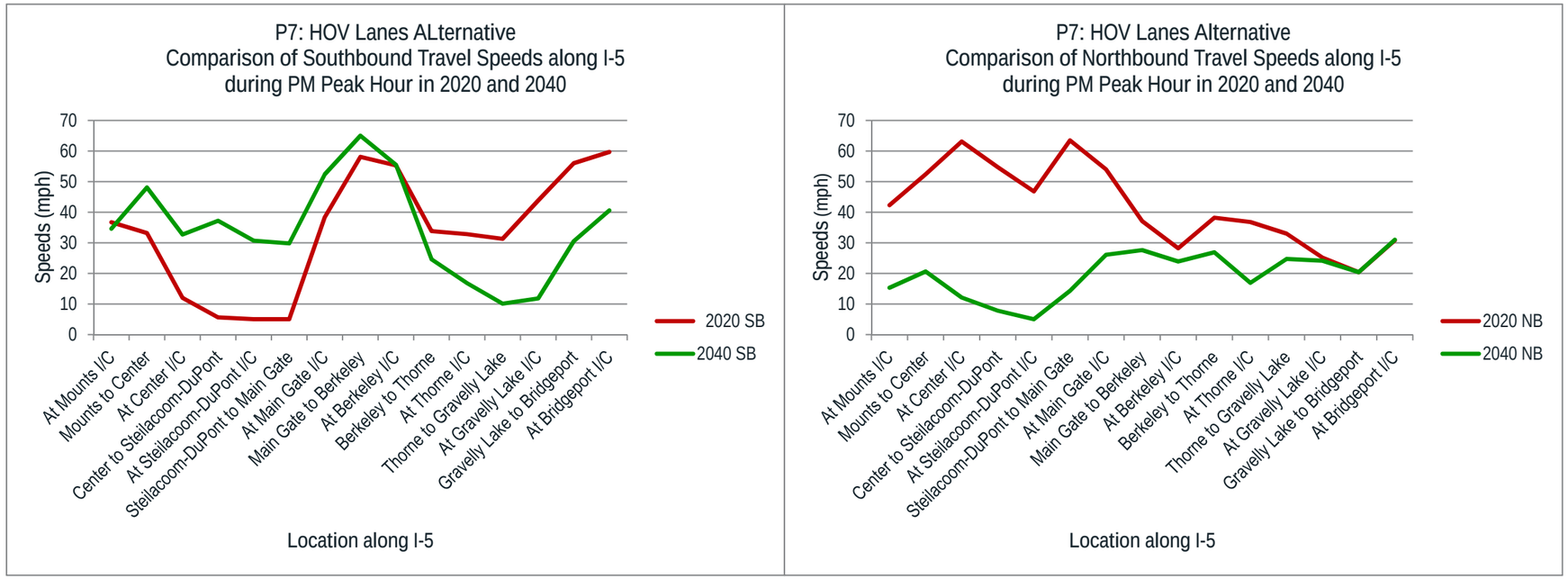
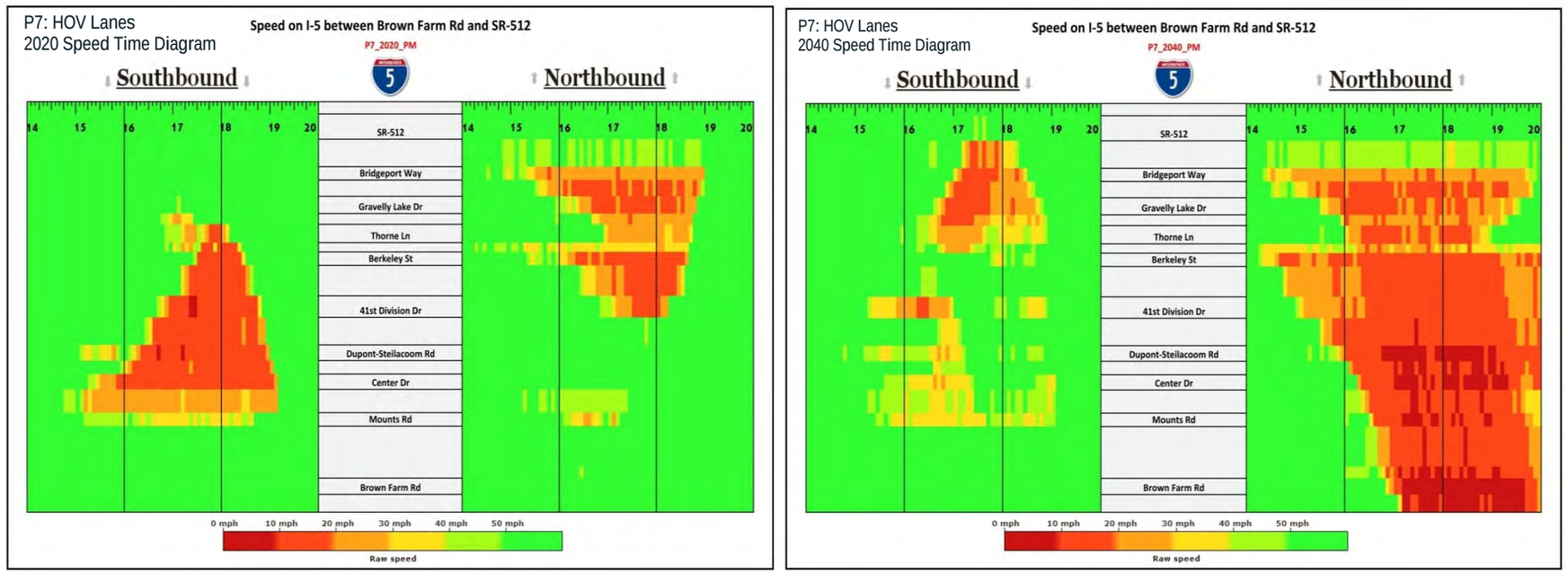


Figure VI-88: 2020 and 2040 PM Peak Period Speed-Time Diagrams along I-5 – P7



I-5 Hours of Congestion – 2020 & 2040 PM Peak Periods

As illustrated in Figure VI-89, Alternative P7 reduces the hours of congestion in the focus area of the corridor but in the transition areas, congestion levels increase in 2020. By 2040, the maximum duration of congestion along the corridor for P7 in the northbound direction is about the same as the No Action Alternative. However, the 2040 hours of congestion in the southbound direction is reduced to about 2.5 hours as compared to the nearly six hours for the No Action Alternative.

I-5 Travel Times during 2020 & 2040 PM Peak Periods

For Alternative P7, travel times along I-5 between Mounts Road and Bridgeport Way by direction over the hour PM peak period were estimated using the Meso Model. These travel times are illustrated in Figure VI-90. Travel along this nine mile section of I-5 at the posted speed limit of 60 mph would generally take approximately 9 minutes. With the addition of the HOV lane through the focus area, travel times in 2020 and 2040 are improved in both directions along I-5, as compared to the No Action Alternative. In 2020, southbound travel times reaches a maximum of about 30 minutes for the peak hour with a 3-hour peak period average travel time of 18 minutes for all lanes while HOV traffic travels at an average of 13 minutes. Northbound 2020 travel times are general less than 20 minutes with a 3-hour average travel time for all lanes at 14 minutes and HOV vehicles travel at nearly free-flow conditions with a travel time of about 10 minutes.

For 2040, southbound travel times are less than 20 minutes with a 3-hour peak period average travel time of 12 minutes for all lanes with the HOV lanes operating at free-flow conditions. In the northbound direction by 2040, however, travel times are expected to increase to approximately 40 minutes. The average 3-hour northbound travel time will be about 29 minutes for all lanes, while HOV travel times remain low at about 11 minutes. These slow northbound speeds are caused by the reduced GP capacity north Thorne Lane.

Summary of Traffic Operations in 2020 & 2040 for P7 – HOV Lanes

With HOV lanes being added in this alternative, the traffic operations along on I-5 through the focus area is improved in the 2020 PM peak hour and over the 6-hour PM peak period. However, in the transition areas, more congestion may occur. In the transition area on the south end, congestion is increased as the number of lanes is reduced from four lanes to three lanes in the southbound direction. In the northbound direction, operations are improved with the added lane north of Steilacoom-DuPont Road. North of Thorne Lane, congestion may occur because one of the GP lanes is assumed to be converted to an HOV lane, which decreases the GP lane capacity. By 2040, this reduced GP capacity may cause back-up extending through the focus area in the northbound direction, while metering the number of drivers getting into the focus area in the southbound direction. Further evaluation of transition areas will be conducted, particularly at north end, during the next phase of the project to determine the viability of lane conversion to an HOV lane and the appropriate lane configuration.

Figure VI-89: Comparison of 2020 and 2040 Hours of Congestion in Mainline Lanes by I-5 Segments – P7

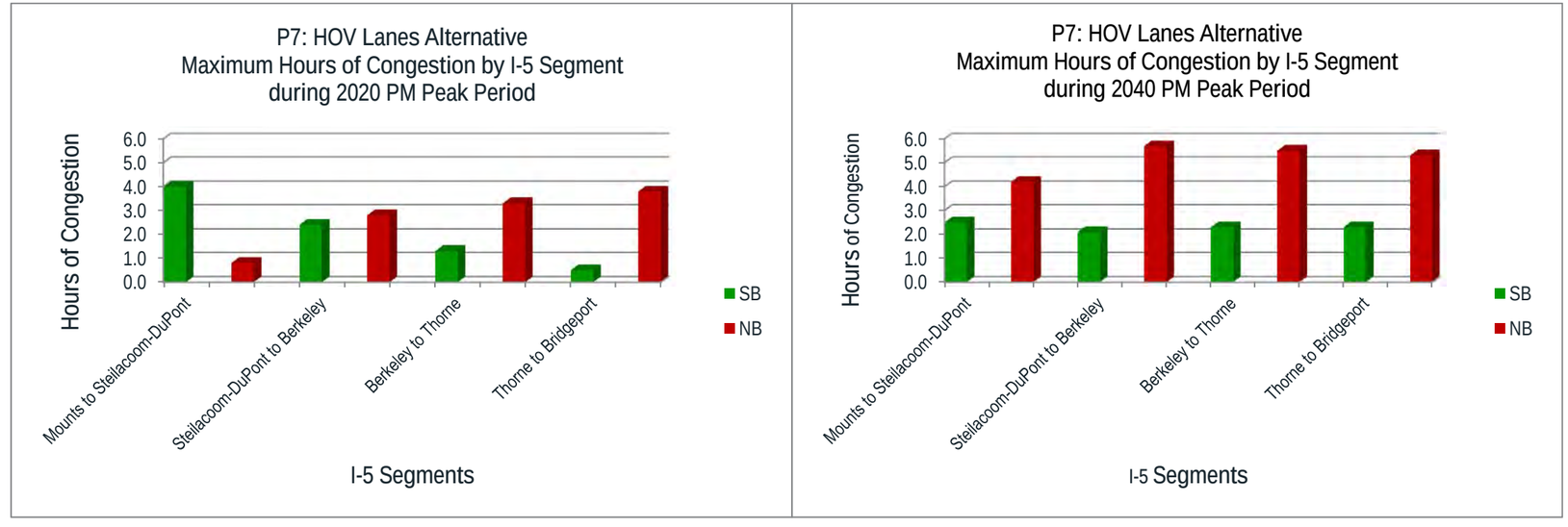
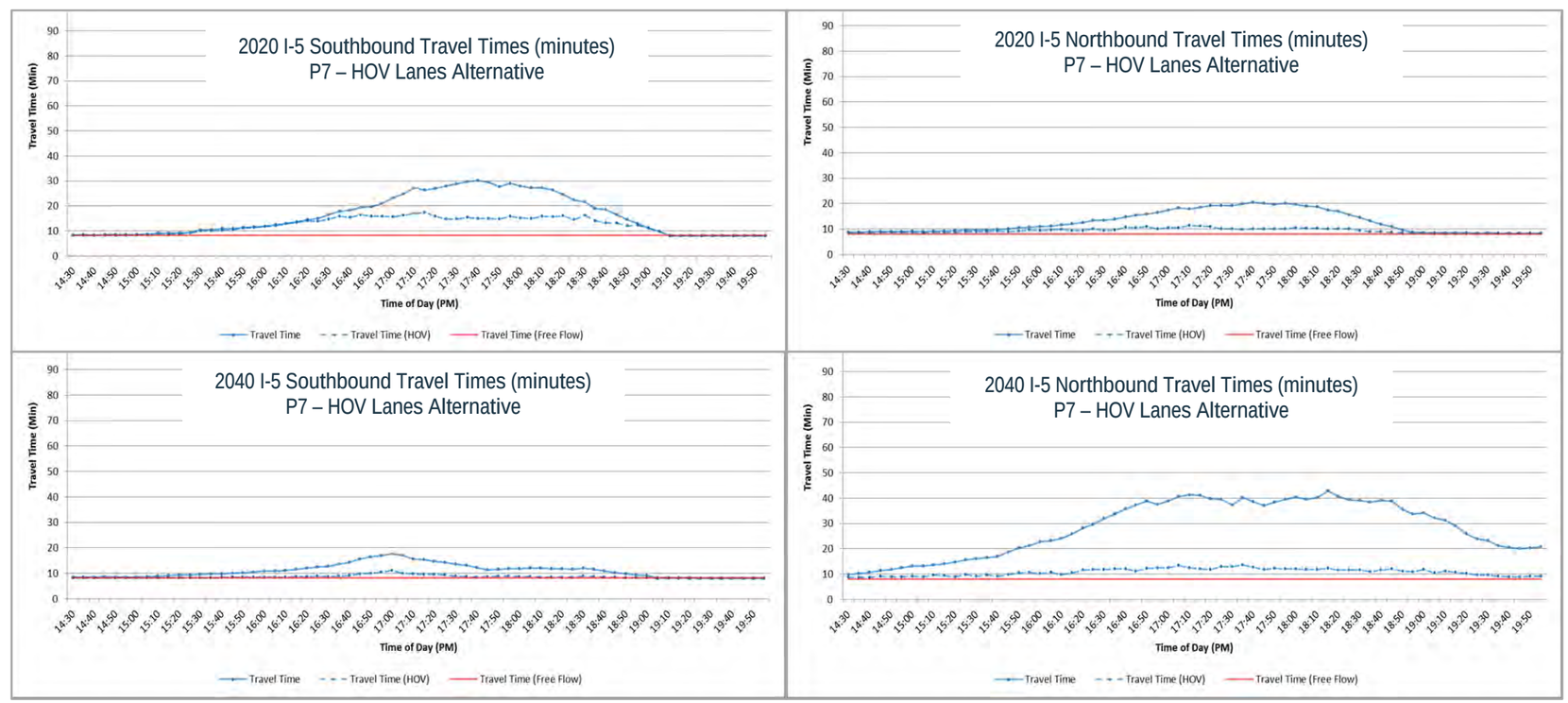


Figure VI-90: Average PM Peak Period Travel Time along I-5 between Mounts Road and Bridgeport Way by Time of Day – P7



Alternative Package P7a – HOV Lanes with Local Improvements and Enhanced Transit

The HOV Lanes Alternative with Local Road Improvements and Enhanced Transit (Package P7a) in 2020 and 2040 includes the improvements contained in Alternative P7 and adds three local improvements and enhanced transit, as described in Chapter III. Overall, the analysis of this alternative improves I-5 traffic operations. However, I-5 still operates with slow travel speeds and several hours of congestion. Based on the Meso Model results, in 2020 about 91 percent of the I-5 peak hour demand can pass through the corridor (67% in Alternative P1); and over a 2-hour PM peak period about 96 percent of the demand can pass through the I-5 corridor (82% in Alternative P1). By 2040, these percentages are reduced so that about 77 percent of the I-5 peak hour demand can pass through the corridor (26% in Alternative P1), and over a 2-hour PM peak period about 87 percent of the demand can pass through the I-5 corridor (57% in Alternative P1). These percentages are greatly improved over the No Action conditions.

I-5 PM Peak Hour Travel Forecasts – 2020 & 2040

Vehicle Trips: For Alternative P7a, the average PM peak hour vehicle trips along I-5 between Mounts Road and Bridgeport Way in 2020 are approximately 4,820 vehicles southbound (0.2% less than Alternative P1) and 5,130 vehicles northbound (28% more than Alternative P1). Factors affecting the reduced southbound 2020 traffic volumes include trips diverted to the enhanced transit service or onto the added local roads. By 2040, with the added HOV lane assumed to be extended from Thurston County to Tacoma, the average PM peak hour vehicle trips along I-5 in the study area increases to approximately 6,170 vehicles southbound (23% more than Alternative P1) and decreases to approximately 4,780 vehicles northbound (27% more than Alternative P1).

In 2020, about 24 percent of the traffic is HOV vehicle trips and 76 percent are SOV vehicle trips. By 2040, about 29 percent are HOV vehicle trips and 71 percent are SOV vehicle trips. Because of the increased capacity along I-5, local improvements and enhanced transit service, especially in the northbound direction with this alternative, more vehicle trips can be accommodated along I-5 in 2020. However, by 2040 northbound traffic volume is decrease because of increased congestion north of Thorne Lane. The average 2020 and 2040 traffic flow by SOV and HOV vehicles along various segments of I-5 by direction is illustrated in Figure VI-91.

Person Trips: For Alternative P7a, the average 2020 PM peak hour person trips along I-5 through the JBLM area are approximately 6,920 person trips southbound (2% more than Alternative P1) and 7,110 person trips northbound (28% more than Alternative P1) with an average of 41 percent being HOV person trips, 54 percent being SOV person trips, and about five percent being transit trips. By 2040, the average PM peak hour person trips along I-5 through the JBLM area are approximately 9,230 person trips southbound (31% more than Alternative P1) and 6,960 person trips northbound (26% more than Alternative P1) with an average of 44 percent being HOV person trips, 48 percent SOV person trips, and about eight percent being transit trips.

Figure VI-91: 2020 and 2040 PM Peak Hour I-5 Vehicle Trips – P7a

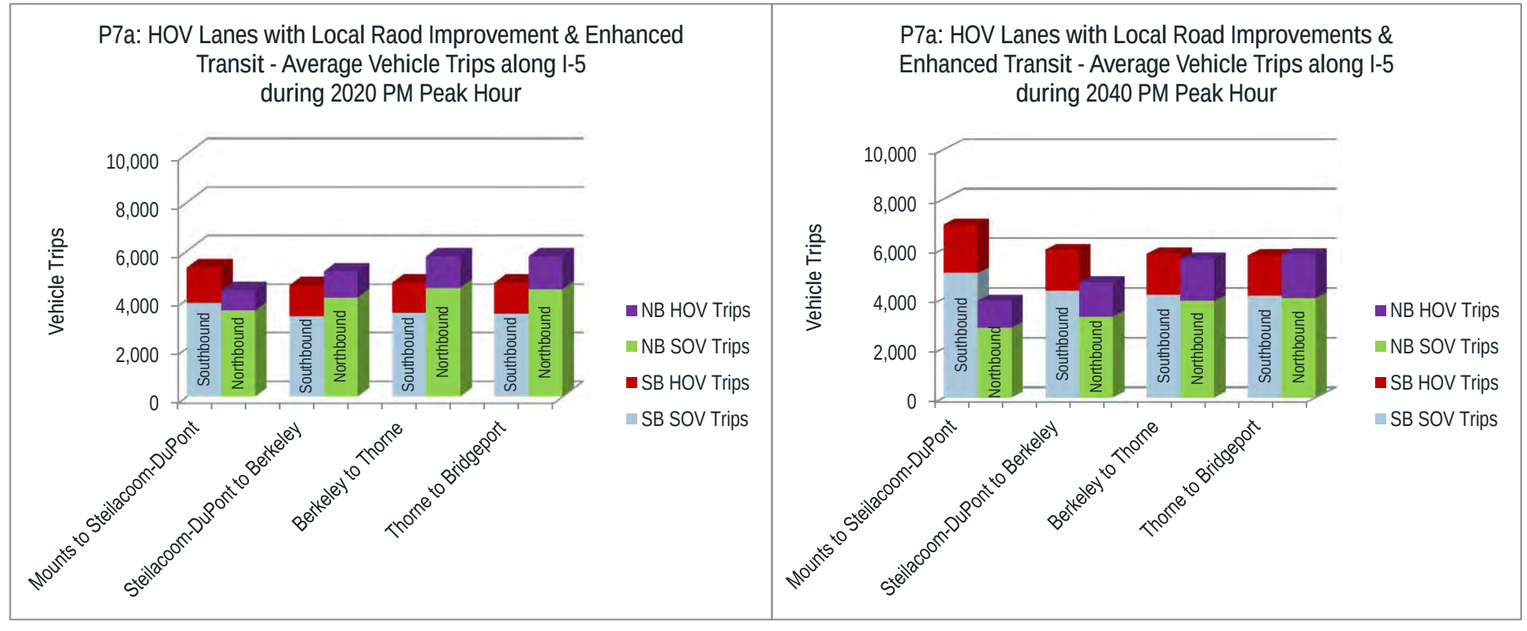
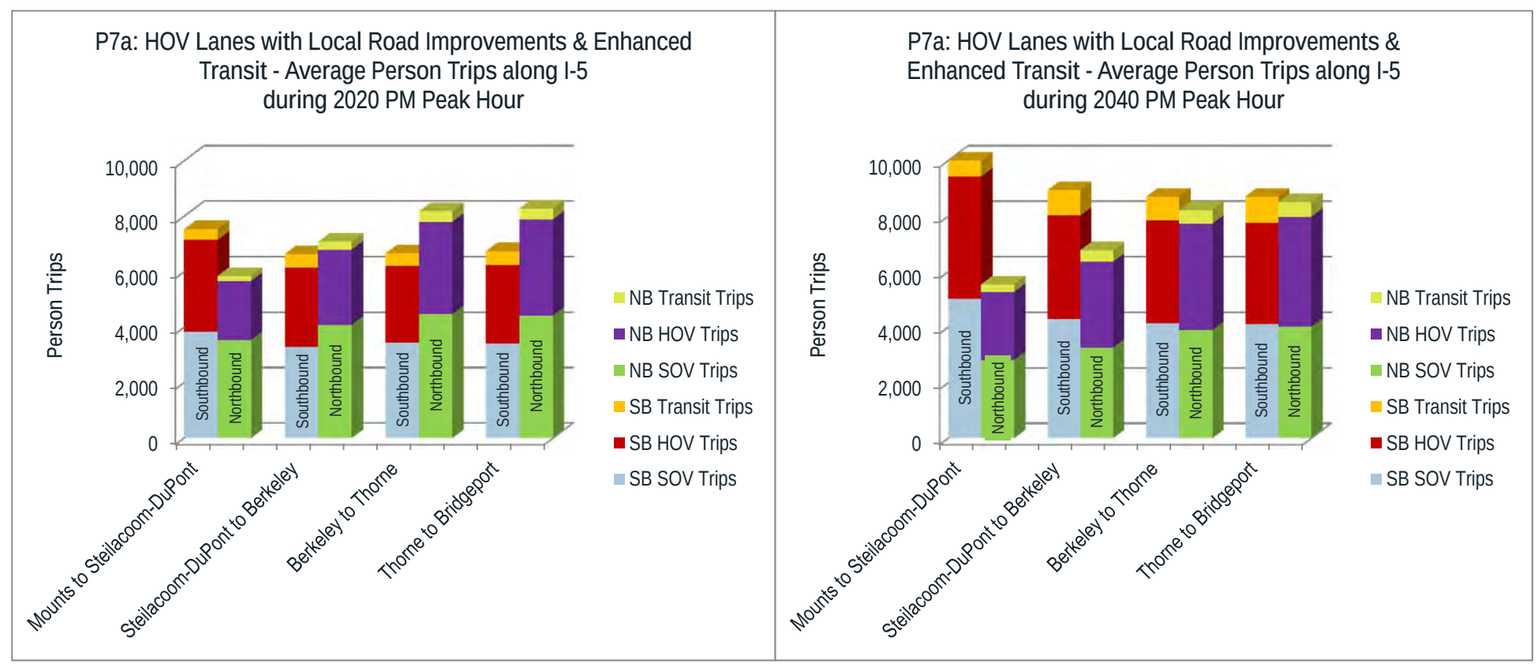


Figure VI-92: 2020 and 2040 PM Peak Hour I-5 Person Trips – P7a



Overall, person trips increase by approximately 33 percent southbound but decrease by about two percent northbound during the PM peak hour between 2020 and 2040 along I-5. The southbound increase is due to the HOV lanes extending into Thurston County and the northbound decrease in person trips is caused by the increased GP congestion north of Thorne Lane, where an existing GP lane is converted into an HOV lane. The average person trip by mode along I-5 by direction is illustrated in Figure VI-92.

PM Peak Period I-5 Person Trips by Mode and Type

For Alternative P7a, a comparison of 2020 and 2040 person trips along I-5 between Mounts Road and Bridgeport Way during the 6-hour PM peak period is illustrated in Figure VI-93. Overall, in 2020 there were approximately 87,440 person trips traveling on I-5 during the 6-hour PM peak period in the study area (1.7% less than Alternative P1). Because of trips being diverted to local roads, the overall usage of I-5 is about the same as Alternative P1 in 2020. Of this total, about 58 percent were estimated to be SOV trips, 38 percent were estimated to be HOV trips, and about four percent were on transit vehicles.

These 2020 PM peak period person trips were also broken down into three categories, with about 49 percent classified as regional trips, about 37 percent were classified as trips entering or exiting I-5 within the study area, and about 14 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-22.

Table VI 22: 2020 PM 6-hour Peak Period – Person Trips by Mode and Type – P7a

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	50%	51%	23%	49%
Entering/Exiting I-5 within Study Area	36%	36%	62%	37%
Both Entering & Exiting I-5 within Study Area	14%	13%	15%	14%

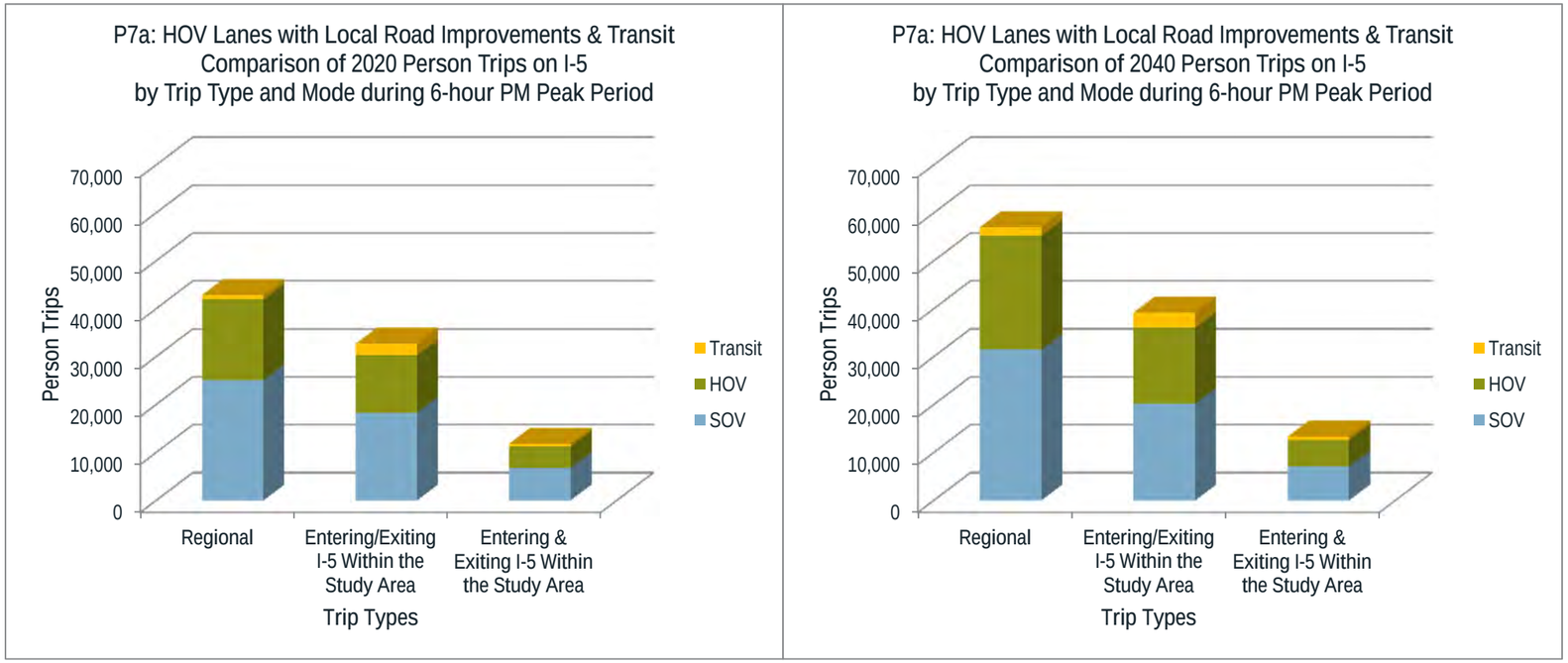
By 2040, there were approximately 109,590 person trips traveling on I-5 during the 6-hour PM peak period in the study area (10% more than Alternative P1). Of this total, about 54 percent were estimated to be SOV trips, 41 percent were estimated to be HOV trips, and about five percent on transit vehicles.

Of these 2040 PM 6-hour peak period person, about 52 percent listed as regional trips, about 36 percent were listed as trips entering or exiting I-5 within the study area, and about 12 percent of the trips were listed as local trips, entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-23.

Table VI-23: 2040 PM 6-hour Peak Period – Person Trips by Mode and Type – P7a

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	54%	53%	32%	52%
Entering/Exiting I-5 within Study Area	34%	35%	56%	36%
Both Entering & Exiting I-5 within Study Area	12%	12%	12%	12%

Figure VI-93: Comparison of 2020 & 2040 I-5 PM 6-hour Peak Period Person Trips by Mode and Type – P7a



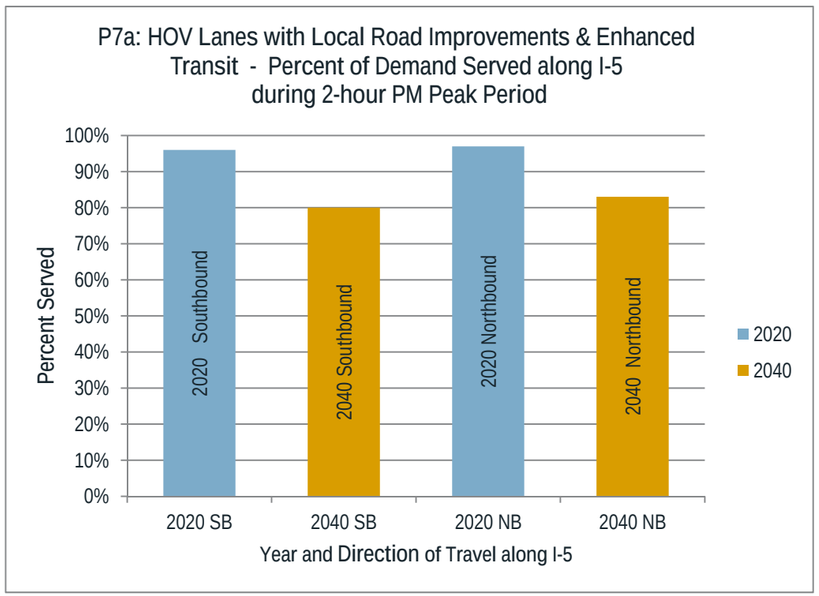
Percent of I-5 Travel Demand Served during the 2-hour PM Peak Period in 2020 & 2040

Using the Meso Model, the analysis of the 2-hour PM person-demand for travel along I-5 in each direction within the study area was compared with the actual number of person trips traveling in the study area for 2020 and 2040. This analysis showed that in 2020 approximately 96 percent of the person-demand traveling southbound (Alternative P1 has 85%) and 97 percent of the trips traveling northbound (Alternative P1 has 79%) could use I-5 during the 2-hour peak period.

In comparison by 2040, this analysis showed that approximately 80 percent of the person-demand traveling southbound (Alternative P1 has 64%) could use I-5 during the 2-hour peak period. Also approximately 83 percent of the person-demand traveling northbound (Alternative P1 has 50%) could use I-5 during the same 2-hour PM peak period, as illustrated in Figure VI-94.

The percentages of unmet demand in 2040 were much larger for the No Action Alternative (36 percent southbound and 50 percent northbound) as compared to 20 percent southbound and 17 percent northbound for the P7a – HOV Lanes with local improvements and enhanced transit Alternative. However, Alternative P7a has similar unmet demand volumes as Alternative P7.

Figure VI-94: Comparison of Percent of Demand Served in 2020 and 2040 – P7a



I-5 PM Peak Hour Travel Speeds

For Alternative P7a, comparisons of the PM peak hour 2020 and 2040 southbound and northbound travel speeds along all lanes of I-5 from Mounts Road to Bridgeport Way are shown on Figure VI-95. The speed patterns for Alternative P7a through the focus area between Steilacoom-DuPont Road are generally higher than the speed patterns for the No Action Alternative and similar to those for Alternative P7.

For 2020 in the southbound direction, the transition area south of the focus area shows slow traffic, caused by ending the HOV lane and transitioning from four lanes to three lanes. North of Thorne Lane, speeds are decreased due to the conversion of one GP lane to an HOV lane and reducing the number of GP lanes to three lanes. An evaluation of the north transition area will be conducted during the next phase to determine the viability of lane conversion and the appropriate lane configuration. The overall average PM peak hour southbound SOV speed is about 15 mph in 2020 with an average HOV speed of 22 mph.

For 2020 northbound, travel speeds are increased because of the addition of the HOV lane, but again north of Thorne Lane, speeds are decreased due to the conversion of one GP lane to an HOV lane and reducing the number of GP lanes to three lanes. The overall average PM peak hour northbound SOV speed is about 37 mph in 2020 with an average HOV speed of 53 mph.

By 2040 in the southbound direction, speeds are improved because the HOV lane is assumed to be extended into Thurston County, but speeds are slower in the north transition area because the conversion of one GP lane to an HOV lane which reduces the capacity of the GP lanes. The overall average PM peak hour southbound SOV speed is about 25 mph in 2040 with an average HOV speed of 46 mph.

In the northbound direction, 2040 travel speeds are generally less than 30 mph because of the congestion caused by converting one GP lane to an HOV lane which lowers the capacity of the GP lanes. The overall average PM peak hour northbound SOV speed is about 15 mph in 2040 with an average HOV speed of 46 mph.

The average 2020 and 2040 speeds along I-5 by direction and time of day for all lanes are illustrated in Figure VI-96. The 2020 speed-time diagrams show that Alternative P7a improves the overall northbound speeds, as compared to the No Action Alternative, as well as the hours of congestion along I-5. In 2040, the southbound magnitude and extent of congestion is reduced by adding Alternative P7a improvements, but the northbound congestion is increased north of Thorne Lane due to the conversion of one GP lane to an HOV lane and reducing GP capacity.

Figure VI-95: 2020 and 2040 Southbound Travel Speeds during the PM Peak Hour along I-5 – P7a

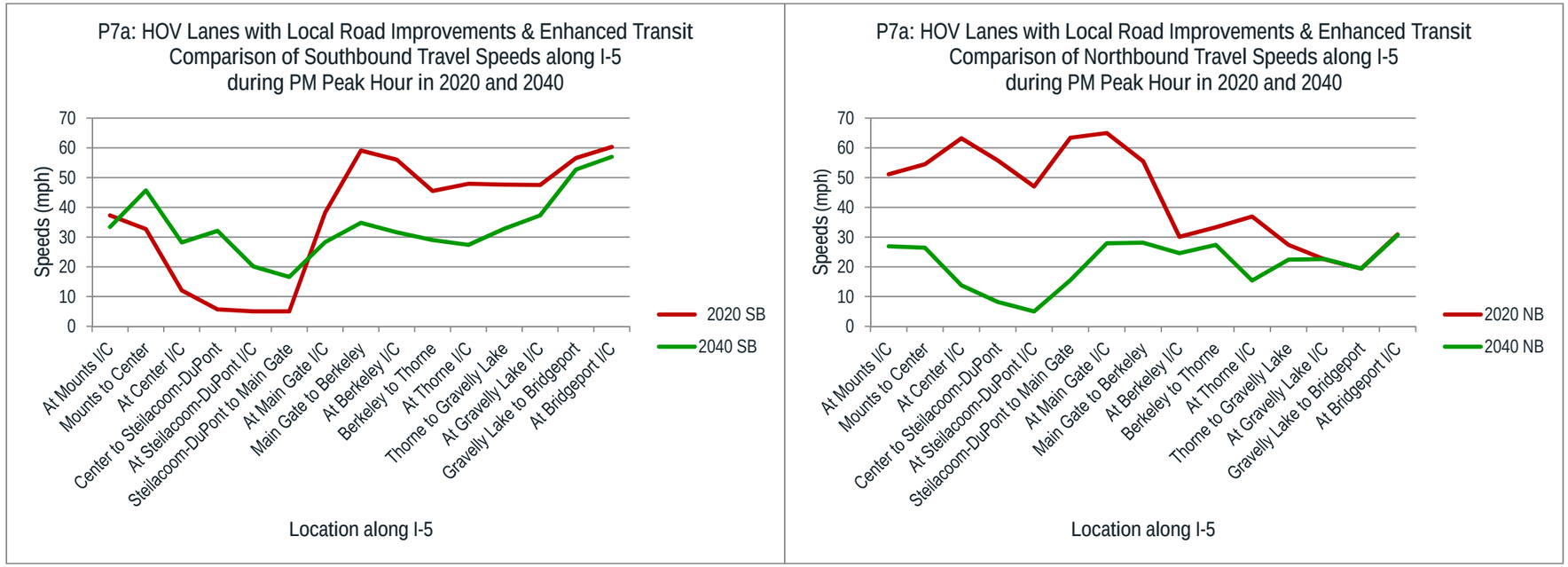
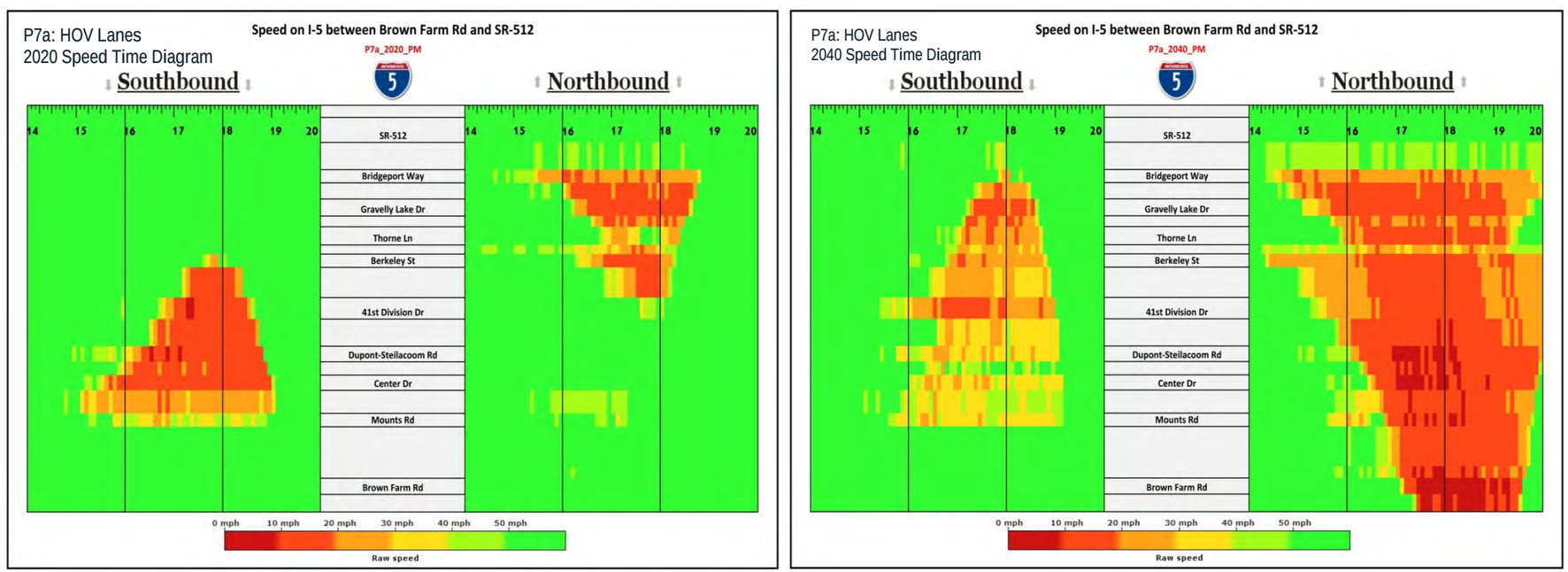


Figure VI-96: 2020 and 2040 PM Peak Period Speed-Time Diagrams along I-5 – P7a



I-5 Hours of Congestion – 2020 & 2040 PM Peak Period

As illustrated in Figure VI-97, Alternative P7a reduces the hours of congestion in the focus area of the the corridor, but in the transition areas the congestion levels increase in 2020. By 2040, the maximum duration of congestion along the corridor for P7a in the northbound direction is about the same as the No Action Alternative. However, the 2040 hours of congestion in the southbound direction is reduced to about three hours as compared to the nearly six hours for the No Action Alternative.

I-5 Travel Times during the 2020 & 2040 PM Peak Period

For Alternative P7a, travel times along I-5 between Mounts Road and Bridgeport Way by direction over the hour PM peak period were estimated using the Meso Model. These travel times are illustrated in Figure VI-98. Average travel along this nine mile section of I-5 for drivers would generally take approximately 9 minutes. With addition of the HOV lane through the focus area with local improvements and enhanced transit, travel times in 2020 and 2040 are improved in both directions along I-5, as compared to the No Action Alternative. In 2020, southbound travel times are less than about 30 minutes for the peak hour with an average travel time over the 3-hour PM peak period to 17 minutes for all lanes while HOV traffic travels at an average of 13 minutes. Northbound 2020 travel times are general less than 20 minutes with a 3-hour average travel time for all lanes at 13 minutes and HOV vehicles travel at nearly free-flow conditions with a travel time of about 10 minutes.

For 2040, southbound travel times reach a maximum of about 20 minutes with a 3-hour peak period average travel time of 14 minutes for all lanes with the HOV lanes operating at free-flow conditions. In the northbound direction by 2040, however, travel times are expected to increase to approximately 40 minutes. The average 3-hour northbound travel time will be about 27 minutes for all lanes, while HOV travel times remain low at about 11 minutes

Summary of Traffic Operations in 2020 and 2040 for P7a – HOV Lanes with Local Road Improvements and Enhanced Transit

With a combination of HOV lanes, local improvements and enhanced transit being added in this alternative, the traffic operations along on I-5 through the focus area are improved in the 2020 PM peak hour and over the 6-hour PM peak period. However, in the transition areas, south of the focus area, more congestion may occur. North of Thorne Lane, congestion may occur because one of the GP lanes is assumed to be converted to an HOV lane, which decreases the GP lane capacity. By 2040, this reduced GP capacity may cause back-up extending through the focus area in the northbound direction; while metering the number of drivers getting into the focus area in the southbound direction. Further evaluation of the transition areas will be conducted during the next phase to determine the viability of lane conversion and the appropriate lane configuration. These P7a conditions are similar to Alternative P7 without local improvements and enhanced transit.

Figure VI-97: Comparison of 2020 and 2040 Hours of Congestion in Mainline Lanes by I-5 Segments – P7a

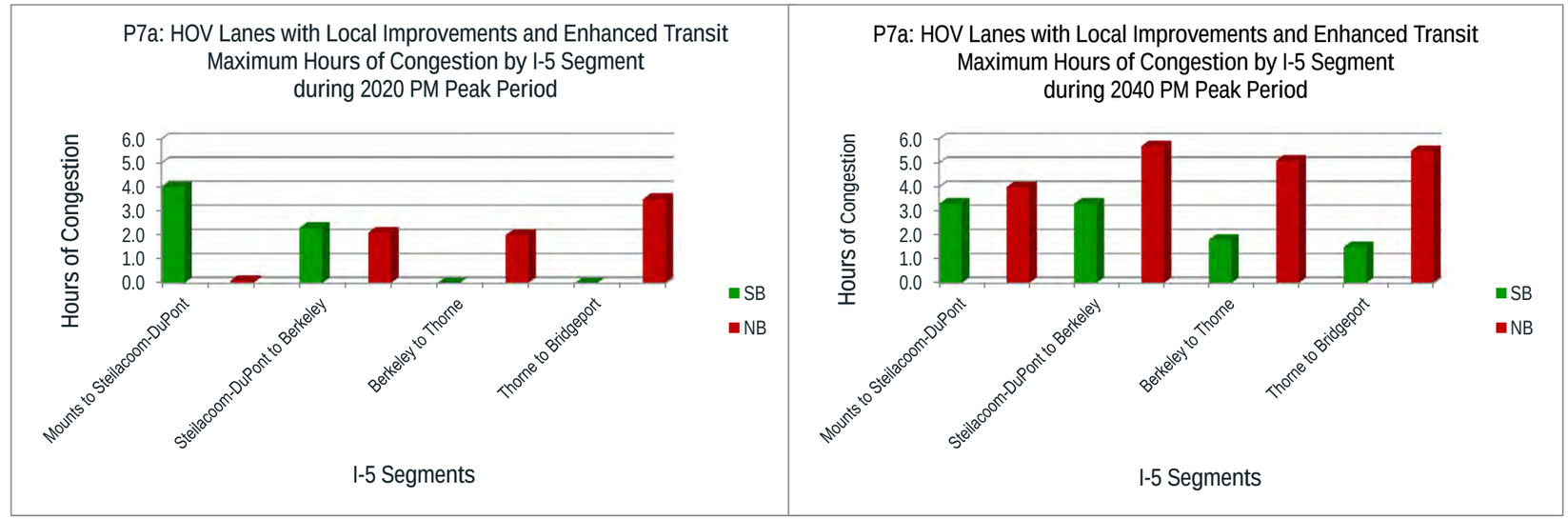
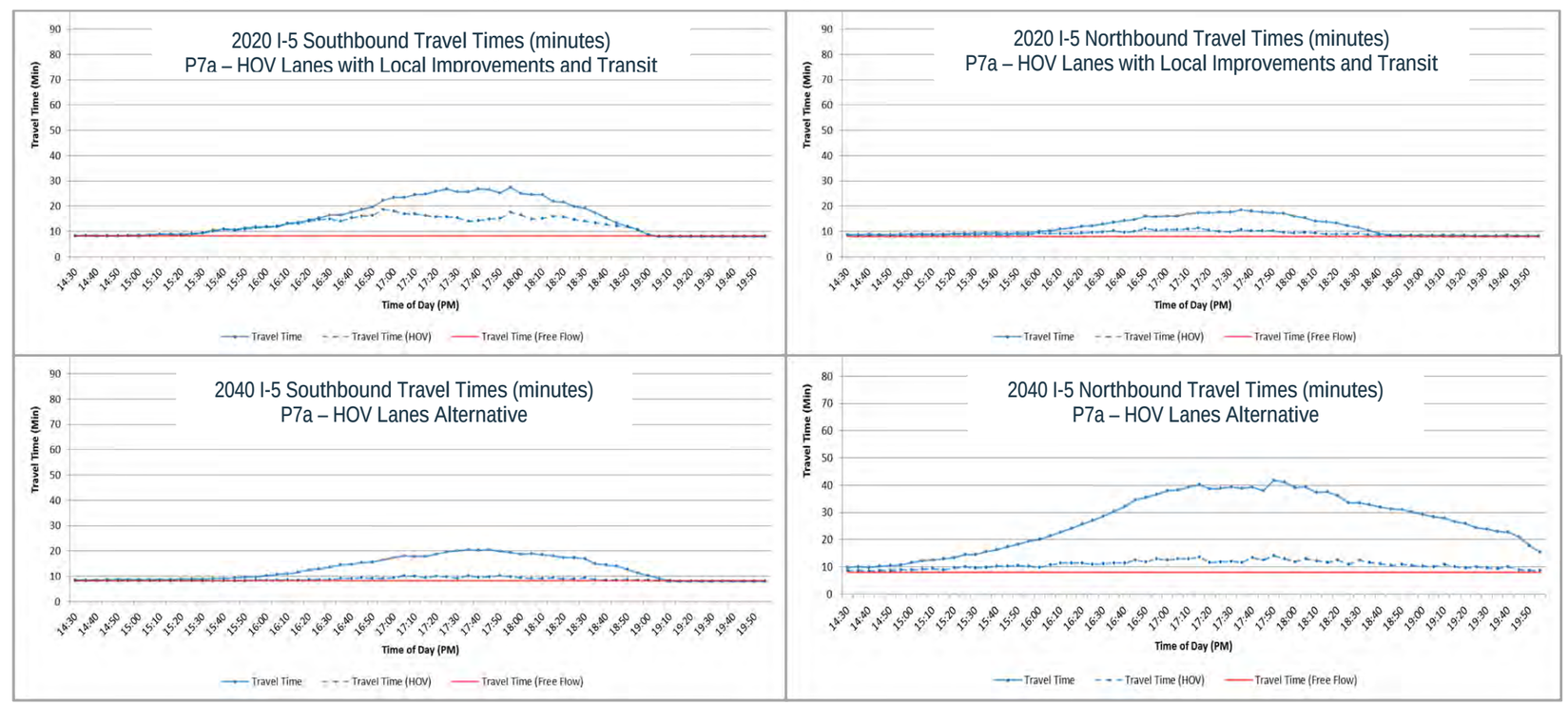


Figure VI-98: Average PM Peak Period Travel Time along I-5 between Mounts Road and Bridgeport Way by Time of Day – P7a



Alternative Package P7b – HOV Lanes with Local Road Improvements

The HOV Lanes Alternatives with local road improvements (Package P7b) contains all improvements included in the Alternative P7 and adds local improvements, as described in Chapter III. Overall, the analysis of Alternative P7b shows similar traffic operation result, compared to Alternative P7, and improves I-5 operations, compared to the No Action Alternative. However, traffic on I-5 still operates at slow travel speeds with several hours of congestion. Based on the Meso Model results, in 2020 about 90 percent of the I-5 peak hour demand can pass through the corridor (67% in Alternative P1), and over a 2-hour PM peak period about 96 percent of the demand can pass through the I-5 corridor (82% in Alternative P1). By 2040, these percentages are reduced so that about 73 percent of the I-5 peak hour demand can pass through the corridor (26% in Alternative P1), and over a 2-hour PM peak period about 85 percent of the demand can pass through the I-5 corridor (57% in Alternative P1). These percentages are greatly improved over the No Action.

I-5 PM Peak Hour Travel Forecasts – 2020 & 2040

Vehicle Trips: For Alternative P7b, the average PM peak hour vehicle trips along I-5 between Mounts Road and Bridgeport Way in 2020 are approximately 4,870 vehicles (0.8% more than Alternative P1) southbound and 5,140 vehicles (28% more than Alternative P1) northbound. The small increase southbound is due to vehicles staying on the improved local road system. By 2040, the average PM peak hour vehicle trips along I-5 in the study area increases to approximately 6,110 vehicles southbound (22% more than Alternative P1) and decreases to approximately 4,820 vehicles northbound (28% more than Alternative P1).

In 2020, about 24 percent of the traffic on I-5 is HOV vehicle trips and about 76 percent are SOV vehicle trips. By 2040, about 29 percent are HOV vehicle trips and 71 percent are SOV vehicle trips. With this alternative, more vehicle trips can use I-5 in 2020. However by 2040, northbound traffic volume is decreased because of increased congestion north of Thorne Lane. The average 2020 and 2040 traffic flow by SOV and HOV vehicles along various segments of I-5 by direction is illustrated in Figure VI-99.

Person Trips: For Alternative P7b, the average 2020 PM peak hour person trips along I-5 through the JBLM area are approximately 6,740 person trips southbound (0.9% less than Alternative P1) and 6,910 person trips northbound (24% more than Alternative P1) with an average of 43 percent being HOV person trips, 55 percent being SOV person trips, and about two percent being transit trips. The small decrease southbound is due to trips staying on the improved local road system. By 2040, the average PM peak hour person trips along I-5 is approximately 8,640 person trips southbound (22% more than Alternative P1) and 6,750 person trips northbound (22% more than Alternative P1) with an average of 45 percent being HOV person trips, 51 percent SOV person trips, and about four percent being transit trips.

Overall, person trips increase by approximately 28 percent southbound but decrease by about two percent northbound during the PM peak hour between 2020 and 2040.

Figure VI-99: 2020 and 2040 PM Peak Hour I-5 Vehicle Trips – P7b

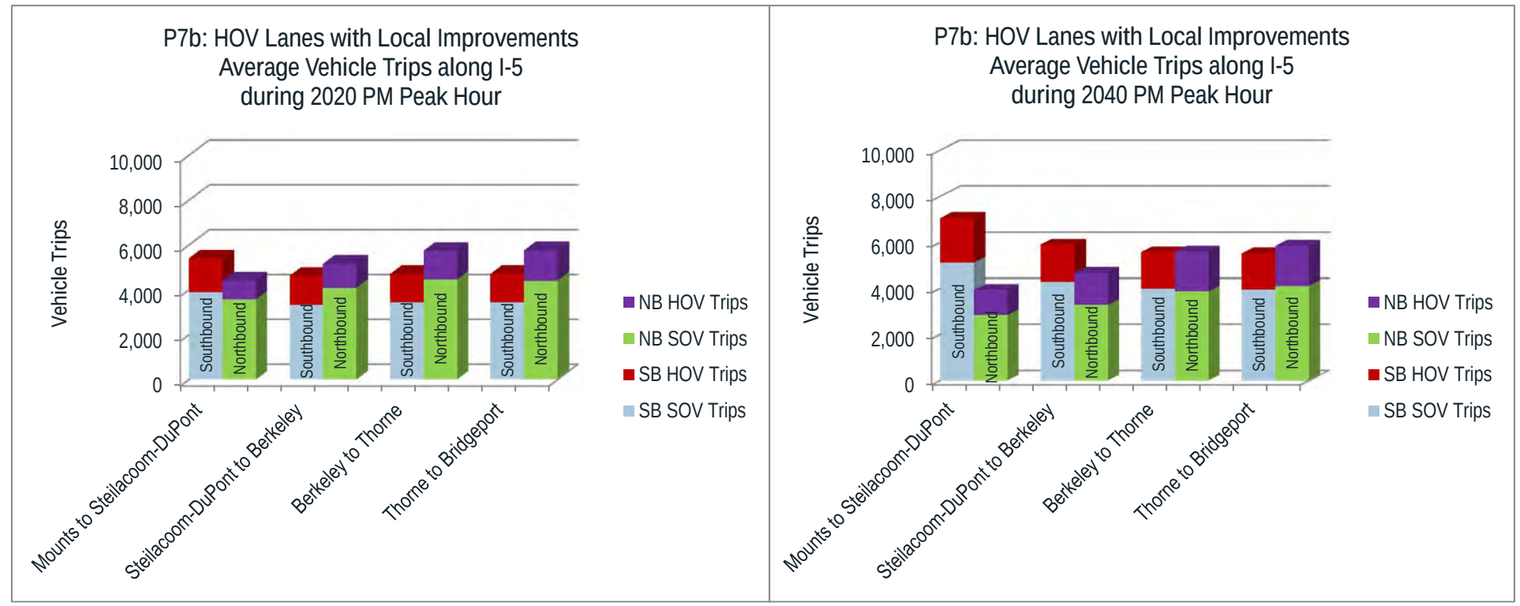
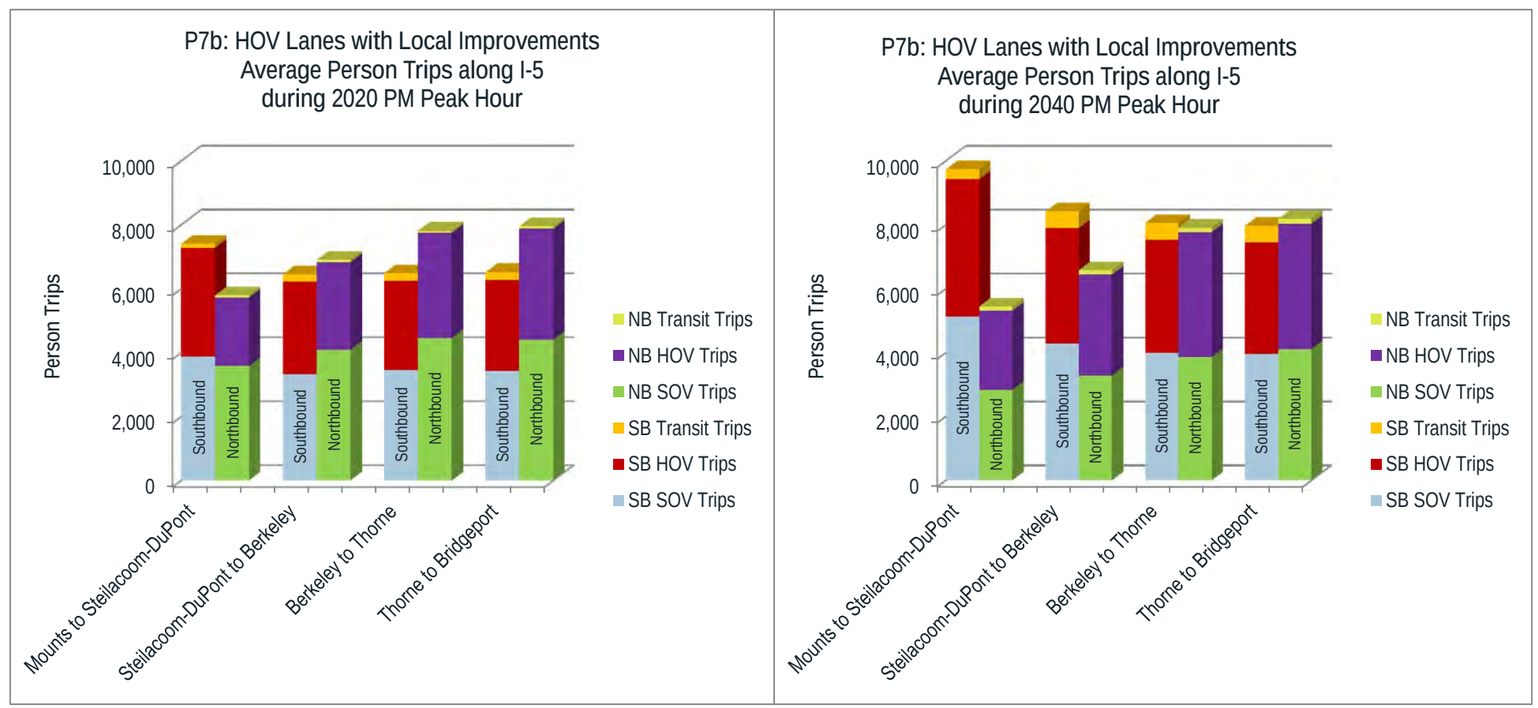


Figure VI-100: 2020 and 2040 PM Peak Hour I-5 Person Trips – P7b



The southbound increase is due to the HOV lanes extending into Thurston County, while the decreasing northbound person trips is caused by the increased GP congestion north of Thorne Lane, where an existing GP lane is converted into an HOV lane. An evaluation of the transition areas will be conducted during the next phase to determine the viability of lane conversion and the appropriate lane configuration. The average person trip by SOV, HOV and transit along various segments of I-5 by direction is illustrated in Figure VI-100.

PM Peak Period I-5 Person Trips by Mode and Type

For Alternative P7b, a comparison of 2020 and 2040 person trips along I-5 between Mount Road and Bridgeport Way during the 6-hour PM peak period is illustrated in Figure VI-101. Overall, in 2020 there were approximately 86,680 person trips traveling on I-5 during the 6-hour PM peak period in the study area (2.6% less than Alternative P1 because of reduced SOV capacity north of Throne Lane and trips diverted to local roads). Of this total, about 59 percent were estimated to be SOV trips, 38 percent were estimated to be HOV trips, and about three percent were on transit vehicles.

These 2020 PM peak period person trips were also broken down into three categories, with about 50 percent classified as regional trips, about 37 percent were classified as trips entering or exiting I-5 within the study area, and about 13 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-24.

Table VI-24: 2020 PM 6-hour Peak Period – Person Trips by Mode and Type – P7b

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	50%	51%	21%	50%
Entering/Exiting I-5 within Study Area	36%	36%	67%	37%
Both Entering & Exiting I-5 within Study Area	14%	13%	12%	13%

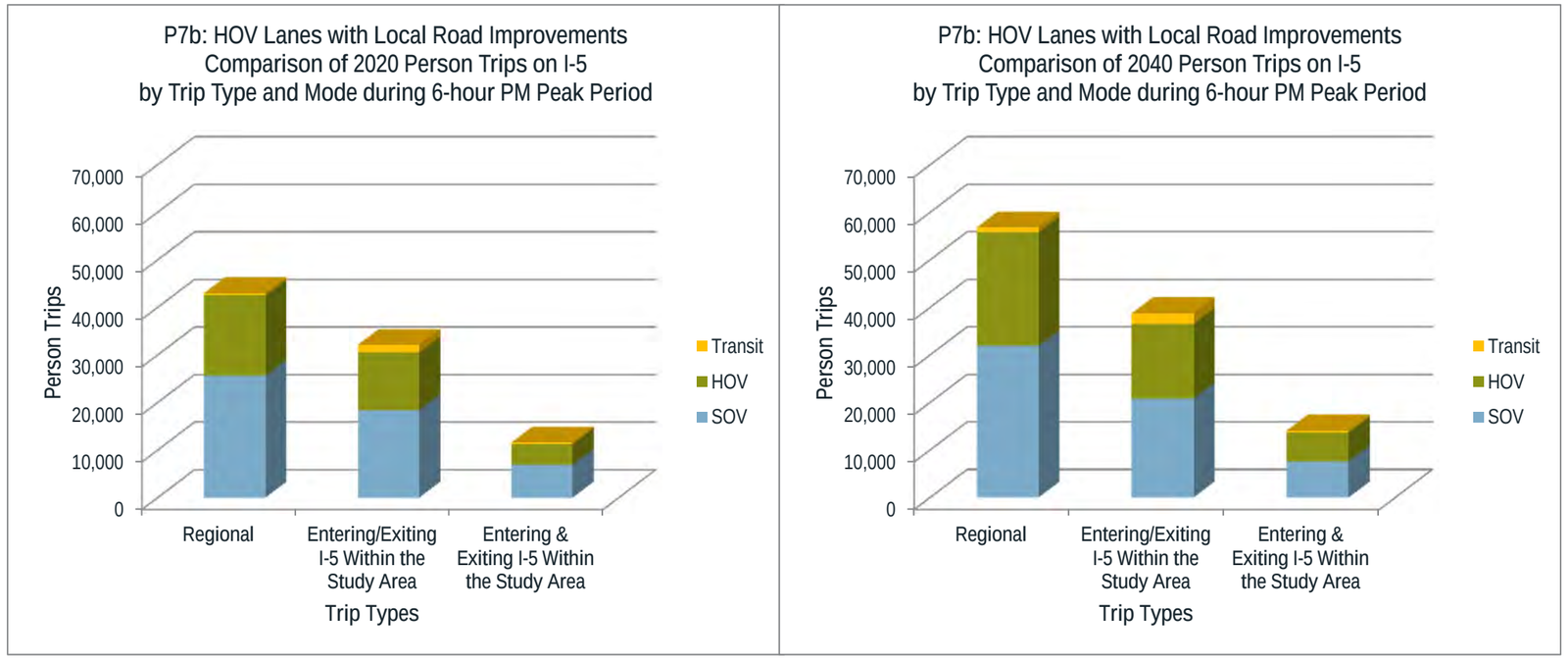
By 2040, there were approximately 109,670 person trips traveling on I-5 during the 6-hour PM peak period in the study area (10% more than Alternative P1). Of this total, about 55 percent were estimated to be SOV trips, 42 percent were estimated to be HOV trips, and about three percent were on transit vehicles.

Of these 2040 PM 6-hour peak period person, about 52 percent classified as regional trips, about 35 percent were classified as trips entering or exiting I-5 within the study area, and about 13 percent of the trips were classified as local trips, both entering and exiting I-5 within the study. A detailed breakdown of person trips by mode and trip type is listed in Table VI-25.

Table VI-25: 2040 PM 6-hour Peak Period – Person Trips by Mode and Type – P7b

Trip Types / Modes	SOV Trips	HOV Trips	Transit Trips	Average
Regional	53%	52%	30%	52%
Entering/Exiting I-5 within Study Area	34%	35%	59%	35%
Both Entering & Exiting I-5 within Study Area	13%	13%	11%	13%

Figure VI-101: Comparison of 2020 and 2040 I-5 PM 6-hour Peak Period Person Trips by Mode and Type – P7b



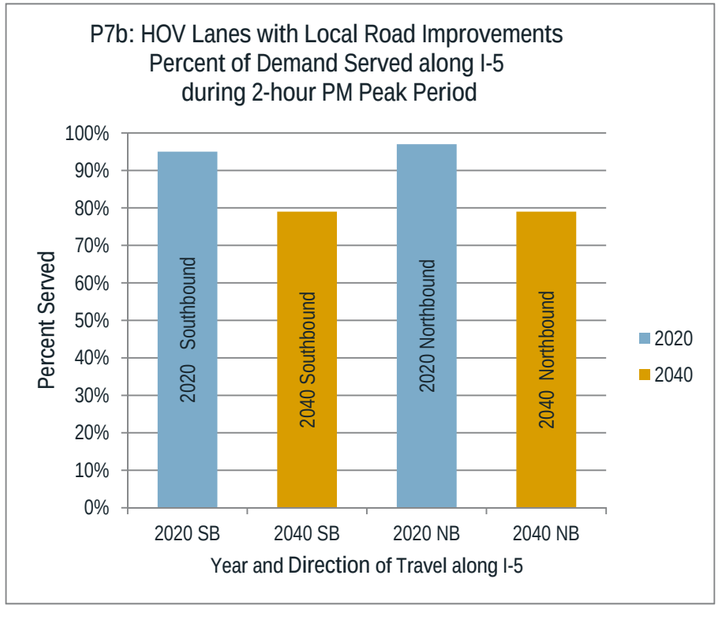
Percent of I-5 Travel Demand Served during the 2-hour PM Peak Period in 2020 & 2040

Using the Meso Model, an analysis of the 2-hour PM person-demand for travel along I-5 in each direction within the study area was made with the actual number of person trips traveling in the study area for 2020 and 2040. This analysis showed that in 2020 approximately 95 percent of the person-demand traveling southbound (Alternative P1 has 85%) and 97 percent of the trips traveling northbound (Alternative P1 has 79%) could use I-5 during the 2-hour peak period.

By 2040, this analysis showed that approximately 79 percent of the person-demand traveling in both directions (Alternative P1 has 64% southbound and 50% northbound) could use I-5 during the 2-hour peak period, as illustrated in Figure VI-102.

The percentages of unmet demand in 2040 were much larger for the No Action Alternative (36 percent southbound and 50 percent northbound) as compared to 21 percent for the P7b – HOV Lanes with Local Improvements Alternative and similar to the results of Alternative P7.

Figure VI-102: Comparison of Percent of Demand Served in 2020 and 2040 – P7b



I-5 PM Peak Hour Travel Speeds

For Alternative P7b, a comparison of the 2020 and 2040 PM peak hour southbound and northbound travel speeds along all lanes of I-5 from Mounts Road to Bridgeport Way are shown on Figure VI-103. The speed patterns for Alternative P7b through the focus area between Steilacoom-DuPont Road are generally higher than the speed patterns for the No Action Alternative.

For 2020 in the southbound direction, the transition area south of the focus area shows slow traffic caused by ending the HOV lane and transitioning from four lanes to three lanes. North of Thorne Lane, speeds are decreased due to the conversion of one GP lane to an HOV lane and reducing the number of GP lanes to three lanes. The overall average PM peak hour southbound SOV speed is about 14 mph in 2020 with an average HOV speed of 15 mph.

For 2020 northbound, travel speeds are increased because of the addition of the HOV lane, but again north of Thorne Lane speeds are decreased due to the conversion of one GP lane to an HOV lane and reducing the number of GP lanes to three. An evaluation of the transition areas will be conducted during the next phase to determine the viability of lane conversion and the appropriate lane configuration. The overall average PM peak hour northbound SOV speed is about 37 mph in 2020 with an average HOV speed of 54 mph.

By 2040 in the southbound direction, speeds are improved because the HOV lane is assumed to be extended into Thurston County. However, speeds are lower in the north transition area because the conversion of one GP lane to and HOV lane which reduces the capacity of GP lanes. The overall average PM peak hour southbound SOV speed is about 21 mph in 2040 with an average HOV speed of 45 mph.

In the northbound direction, 2040 travel speeds are generally less than 30 mph because of the congestion caused by converting one GP lane to an HOV lane which lowers the capacity of the GP lanes. The overall average PM peak hour northbound SOV speed is about 15 mph in 2040 with an average HOV speed of 43 mph.

The average 2020 and 2040 speeds along I-5 by direction and time of day for all lanes are illustrated in Figure VI-1048. The 2020 speed-time diagrams show that P7b Alternative improves the overall northbound speeds, as compared to the No Action Alternative as well as the hour of congestion along I-5. In 2040, the southbound magnitude and hours of congestion are reduced by adding P7b improvements, but the northbound congestion is increased north of Thorne Lane due to the conversion of one GP lane to an HOV lane and reducing GP Capacity.

Figure VI-103: 2020 and 2040 Southbound Travel Speeds during the PM Peak Hour along I-5 – P7b

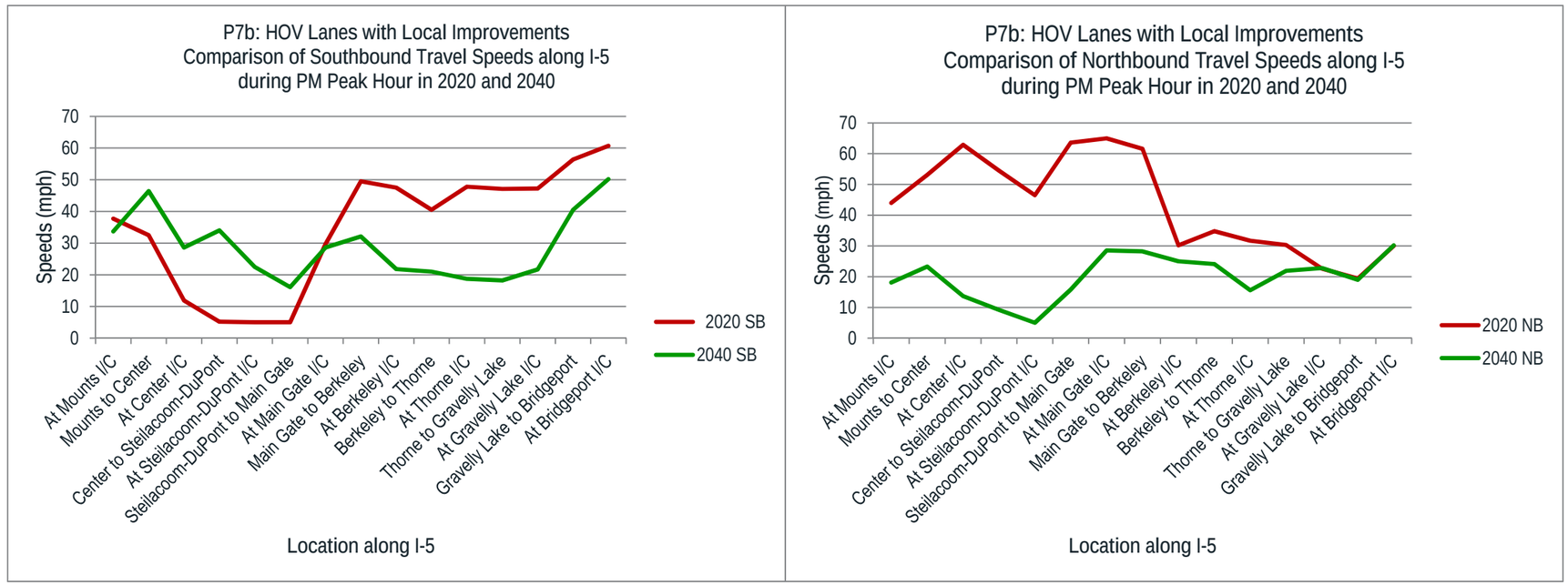
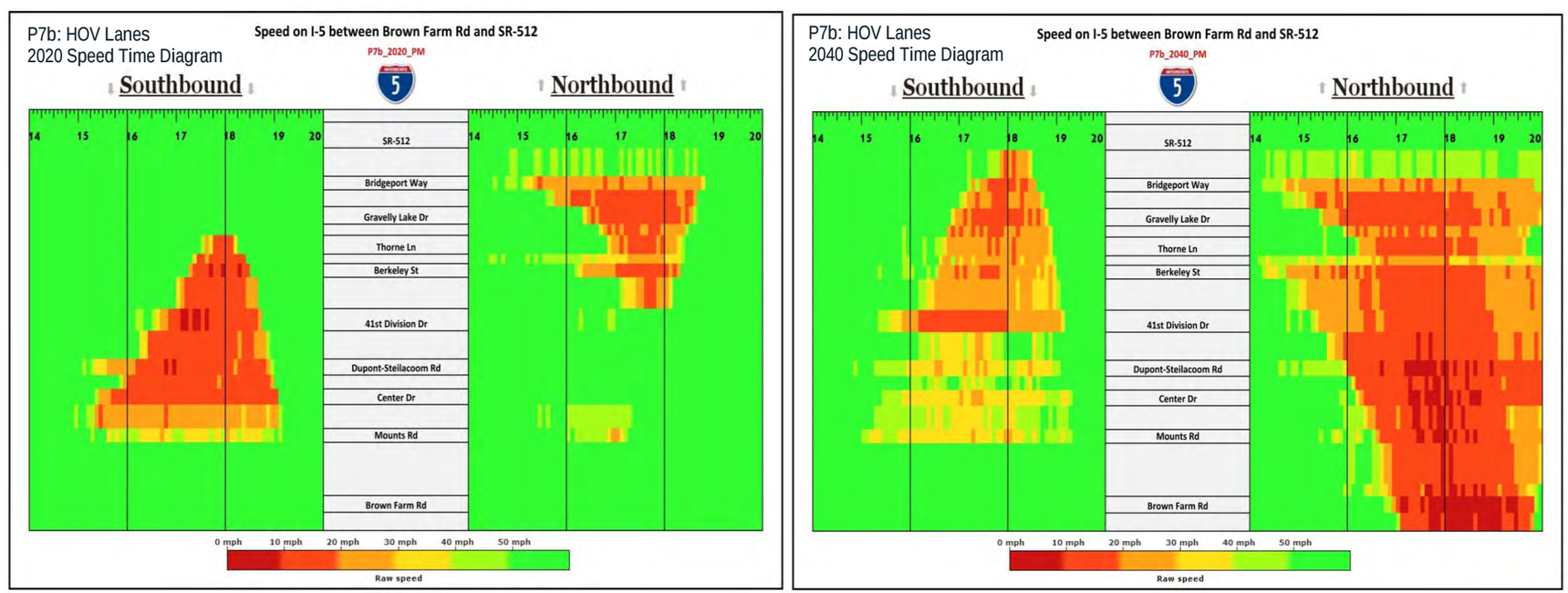


Figure VI-104: 2020 and 2040 PM Peak Period Speed-Time Diagrams along I-5 – P7b



I-5 Hours of Congestion – 2020 & 2040 PM Peak Period

As illustrated in Figure VI-105, Alternative P7b reduces the hours of congestion in the focus area of the the corridor but in the transition areas, the congestion levels increase to about four hours in 2020. By 2040, the maximum duration of congestion along the corridor for P7b in the northbound direction is about the same as the No Action Alternative. However, the 2040 hours of congestion in the southbound direction is reduced to about three hours, as compared to the nearly six hours for the No Action Alternative.

I-5 Travel Times during the 2020 & 2040 PM Peak Period

For Alternative P7b, travel times along I-5 between Mounts Road and Bridgeport Way by direction over the hour PM peak period were estimated using the Meso Model. These travel times are illustrated in Figure VI-106. Drivers traveling along this nine mile section of I-5 at the posted speed limit of 60 mph would generally take approximately 9 minutes. With addition of the HOV lane through the focus area, travel times in 2020 and 2040 are improved in both directions along I-5, as compared to the No Action Alternative. In 2020, southbound travel times reaches a maximum of about 30 minutes for the peak hour, but then reduces less than 20 minutes with an average travel time over the 3-hour peak period of 19 minutes for all lanes while HOV traffic travels at an average of 14 minutes. Northbound 2020 travel times are general less than 20 minutes with a 3-hour average travel time for all lanes at 13 minutes and HOV vehicles travel at nearly free-flow conditions with a travel time of about 10 minutes.

For 2040, southbound travel times reach about 20 minutes in the peak hour with a 3-hour peak period average travel time of 15 minutes for all lanes with the HOV lanes operating at free-flow conditions. In the northbound direction by 2040, however, travel times are expected to increase to approximately 45 minutes. The average 3-hour northbound travel time will be about 28 minutes for all lanes, while HOV travel times remain low at about 11 minutes

Summary of Traffic Operations in 2020 & 2040 for P7b – HOV Lanes with Local Road Improvements

With HOV lanes and local improvements being added in this alternative, the traffic operations along on I-5 through the focus area is improved in the 2020 PM peak hour and over the 6-hour PM peak period. However, in the transition areas, south of the focus area, more congestion may occur. North of Thorne Lane, congestion may occur because one of the GP lanes is assumed to be converted to an HOV lane, which decreases the GP lane capacity. Further evaluation of the transition areas will be conducted during the next phase to determine the appropriate lane configuration. By 2040, this reduced GP capacity may cause back-up extending through the focus area in the northbound direction, while metering the number of drivers getting into the focus area in the southbound direction. These conditions are similar to Alternative P7b without local improvements.

Figure VI-105: Comparison of 2020 and 2040 Hours of Congestion in Mainline Lanes by I-5 Segments – P7b

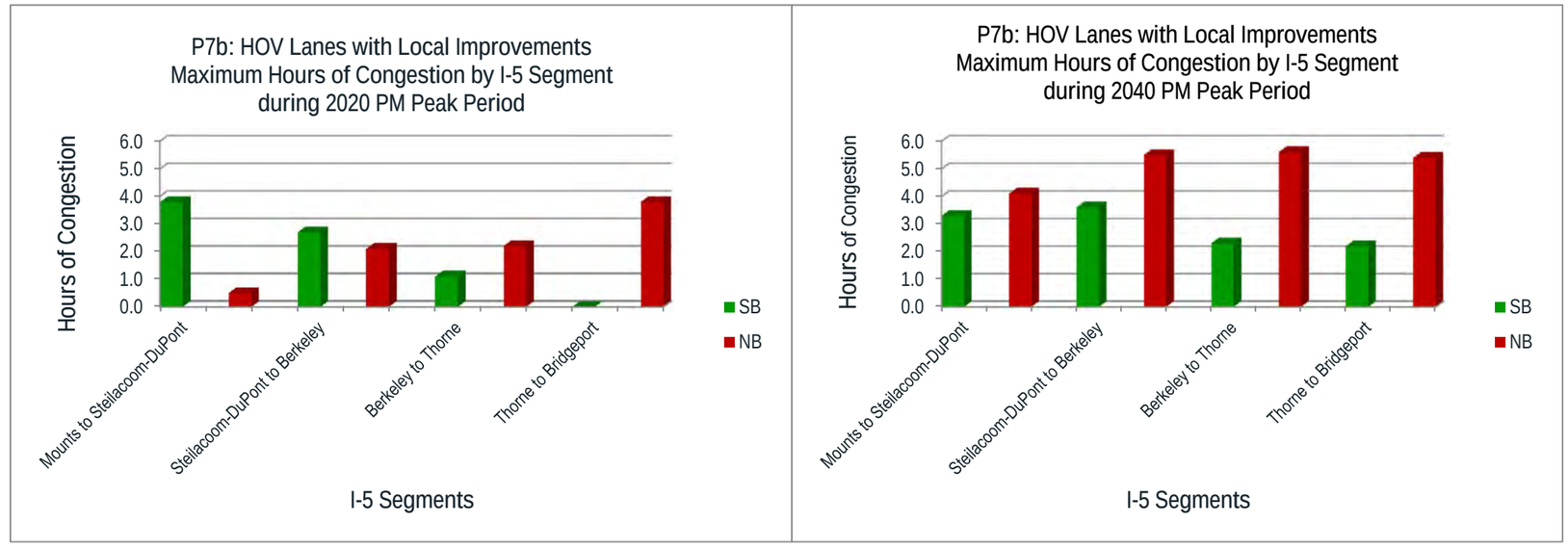
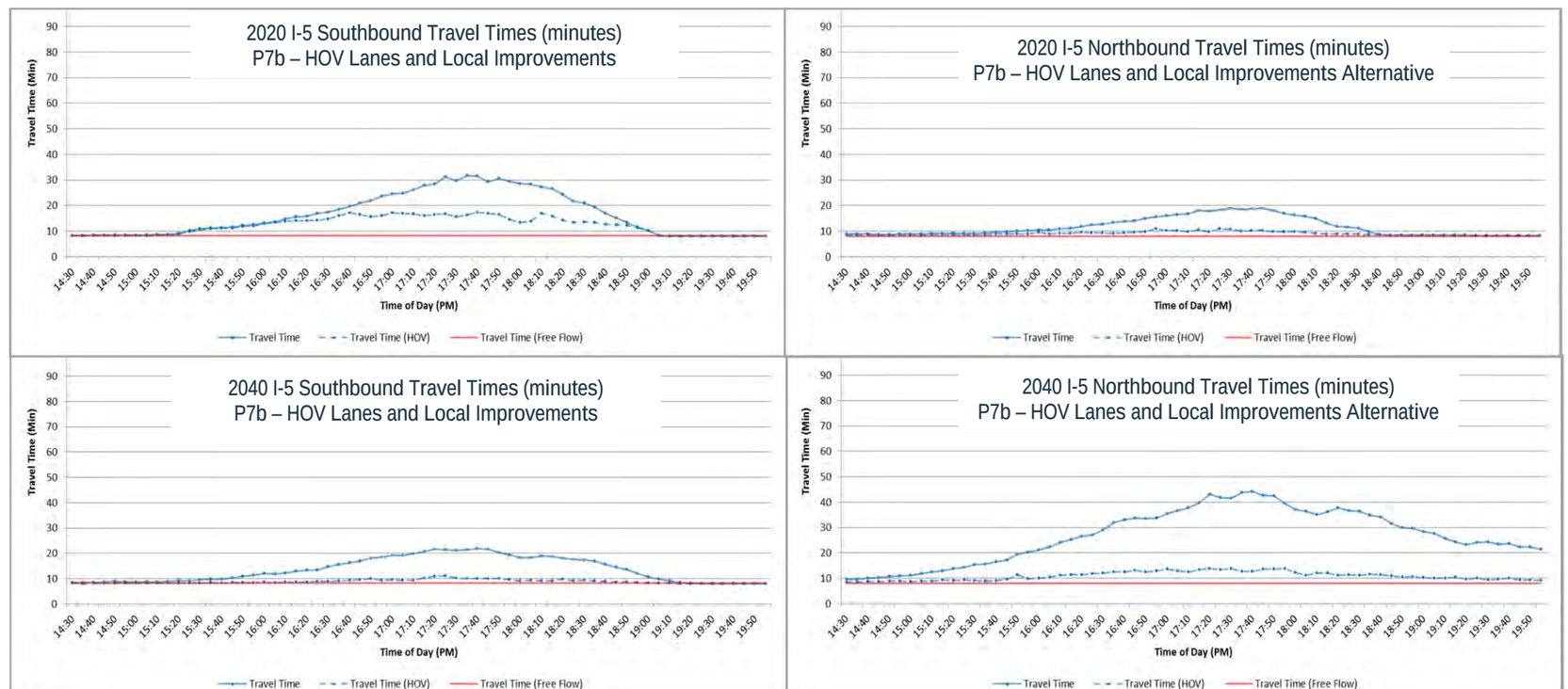



Figure VI-106: Average PM Peak Period Travel Time along I-5 between Mounts Road and Bridgeport Way by Time of Day –