

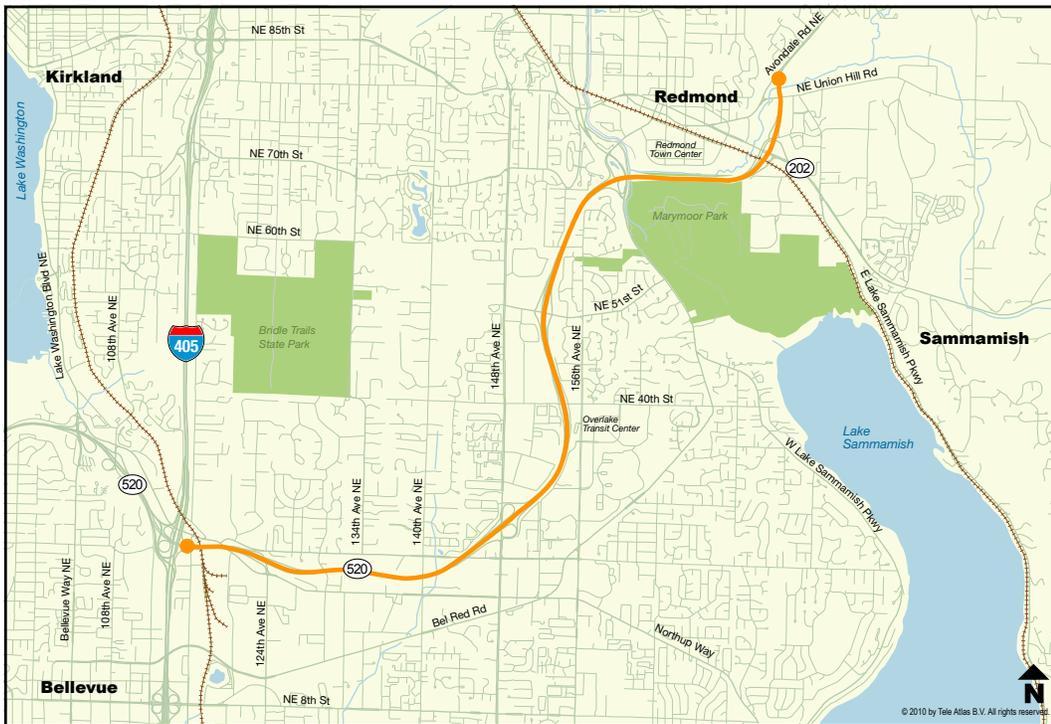
Chapter 4:

Travel Demand Modeling and Traffic Analysis

This chapter provides historical, current and estimated future traffic conditions for the study corridor. In addition, the chapter provides modeling methodology and traffic analysis for the base year and future year conditions for the study area.

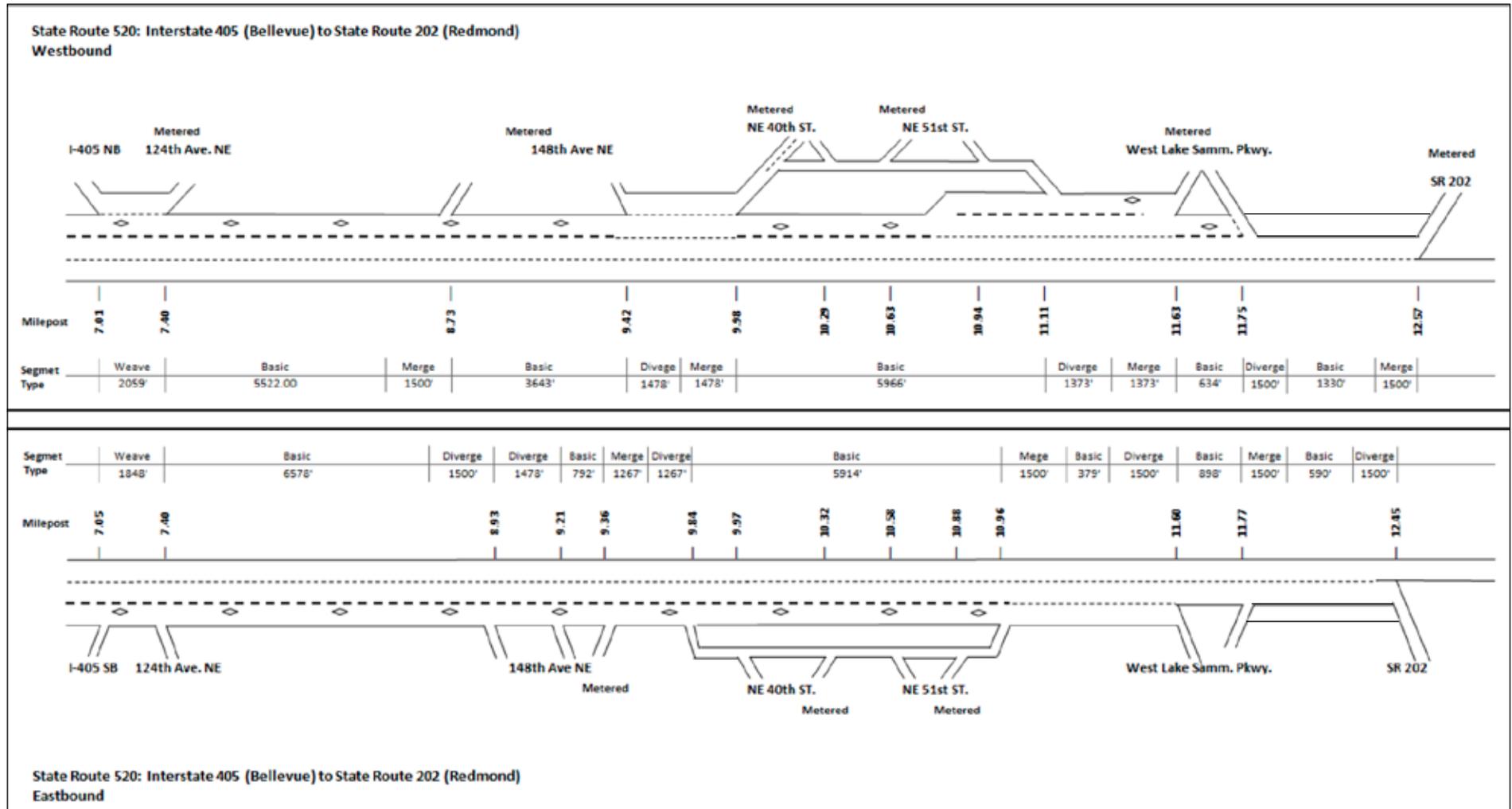
The primary focus of analyses in this study was on the SR 520 corridor from east of the I-405 interchange in Bellevue (SRMP 6.98/ARM 6.97) to Avondale Road in Redmond. Exhibit 4.1 shows the limits of the study corridor. The key findings in this chapter concentrate on the current and projected congestion and operations that occur on the SR 520 corridor, all ramp termini intersections and some of the nearby arterial intersections within the study area.

Exhibit 4.1: Limits of SR 520 Multi-modal Corridor Study



Based on roadway geometry and traffic interactions from the ramps and lane changing due to merging, diverging, or weaving; the SR 520 corridor was divided into segments (basic, weave, merge and diverge) as shown in Exhibit 4.2. These segments are based on the Highway Capacity Manual, which is the standard resource used in traffic engineering analyses. Each of these segments was analyzed separately for estimating operating speed.

Exhibit 4.2: SR 520 Segments in the Study Area



The project team, after discussion with the study's stakeholders, concluded that analyzing only up to the end of the ramp intersections might not be sufficient in determining potential queue spill-backs onto the SR 520 mainline. To accurately capture queuing issues that might be occurring onto the SR 520 mainline, the study team analyzed 13 ramp termini and 10 arterial intersections located in the vicinity of the SR 520 study corridor. See Exhibit 4.3 for a map and list of the intersections and ramp termini.

Exhibit 4.3: Analyzed Intersections and Ramp Termini



Ramp Termini:

- | | |
|--|--|
| 1. SR 520/Northup Way & 124th Avenue NE | 8. SR 520 westbound ramps & NE 51st Street |
| 2. SR 520 eastbound ramps & 124th Avenue NE (future ramp terminus) | 9. SR 520 eastbound ramps & West Lake Sammamish Parkway |
| 3. SR 520 eastbound off-ramp & 148th Avenue NE | 10. SR 520 westbound ramps & West Lake Sammamish Parkway |
| 4. SR 520 westbound ramps & 148th Avenue NE | 11. SR 520 eastbound off-ramp & SR 202 |
| 5. SR 520 eastbound ramps & NE 40th Street | 12. SR 520 westbound on-ramp & SR 202 |
| 6. SR 520 westbound ramps & NE 40th Street | 13. SR 520 & Union Hill Road |
| 7. SR 520 eastbound ramps & NE 51st Street | |

Arterial Intersections:

- | | |
|---|---|
| 14. Bellevue-Redmond Road & 148th Avenue NE | 21. NE 51st Street & 156th Avenue NE |
| 15. NE 20th Street & 148th Avenue NE | 22. NE 70th Street & Redmond Way (SR 202) |
| 16. NE 24th Street & 148th Avenue NE | 23. Redmond Way (SR 202) & East Lake Sammamish Parkway NE |
| 17. NE 36th Street & 148th Avenue NE | |
| 18. NE 40th Street & 148th Avenue NE | |
| 19. NE 40th Street & 156th Avenue NE | |
| 20. NE 51st Street & 148th Avenue NE | |

Modeling Methodology and Assumptions

The travel demand forecasts were conducted with the travel demand model that was used for the SR 520 Final Environment Impact Statement. This model was based on the Puget Sound Regional Council's (PSRC) regional travel demand model (Version 1.0bb) in EMME software. The 2030 baseline roadway networks were constrained to only include funded road projects. Though the study corridor area can influence traffic on local streets, the travel demand forecasts were done for the central Puget Sound Region to capture the full system dynamics and impacts of traffic patterns in the study area.

The travel demand model generates demand data based on population and employment and provides information about travel demand on the road network in terms of volumes (the number of vehicles on the road), travel times, travel speed, and mode of travel (car, transit, etc.)

The following three scenarios were modeled and analyzed for the a.m. and p.m. peak hours:

Base Year 2010

The base year of this study is Year 2010, since this study started in 2011. The widening on the SR 520 mainline between SR 202 and West Lake Sammamish Parkway was opened after the base year. Therefore, this widening improvement is not in the base year but is shown in the future scenarios. The tolls on the SR 520 bridge were started in December 2011. Another base year with toll in place would be hard to be analyze without sufficient and stable traffic data to support the model.

2030 Baseline

To develop 2030 baseline demand, the study team reviewed the comprehensive plans and transportation improvement programs for the cities of Bellevue, Kirkland, Redmond, and Sammamish; and King County and updated the road network in the model accordingly. Based on this review, there are currently no funded projects in the study area. However, two recently completed mainline improvements have been coded into the 2030 model. One is the auxiliary lanes between West Lake Sammamish Parkway and the SR 202 ramps in both directions, which opened to traffic in December 2010. The other project is the new northbound I-405 to eastbound SR 520 braided ramp, which opened in 2012. Other projects the team assumed are:

- The HOV lanes on SR 520 would be moved from outside to inside
- The occupancy requirements for the HOV lanes would be increased to HOV 3+ by 2030
- Tolling would be in-place on the SR 520 bridge and Alaskan Way Viaduct Tunnel; and
- East Link Light Rail would be extended to downtown Redmond.

2030 Scenario 1

After the 2030 baseline analysis, the project team developed a new scenario known as Scenario 1. This scenario includes those improvements that would likely be funded and completed by 2030. In addition to the baseline scenario, Scenario 1 assumes the following improvements would be completed by 2030 or earlier:

- 124th Ave NE Full Interchange
- 148th Ave NE Overlake Access Ramp
- Auxiliary lanes between 124th Ave NE & 148th Ave NE in both directions

The project team also assumed that operational efficiency (e.g., ramp meeting) and transportation demand strategies such as carpooling, vanpooling, telework, etc; would result in a five percent reduction in vehicular travel demand system wide. Since the assumed improvements in Scenario 1 would be funded by 2030, further improvement needs would be identified based on the analysis results of this scenario.

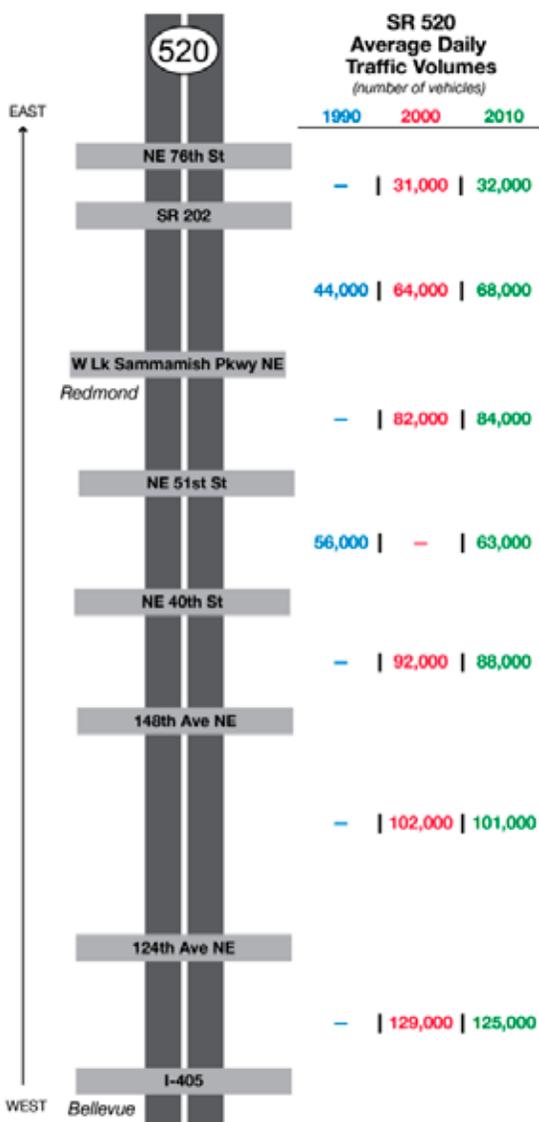
The freeway analyses were done based on the flow-speed relationship concept in the Highway Capacity Manual (HCM) methodology. The HCM is not suitable for analyzing oversaturated freeway conditions, so the project team extended the HCM methodology and developed a demand-to-capacity (D/C)-speed relationship. Considering the SR 520 mainline is congested during the peak hours and the counts would not be meaningful during the oversaturated conditions, the actual speed data derived from the WSDOT loops were used to get the corresponding demand to capacity ratio for the base year. The demands for the future scenarios were projected based on the travel demand model's forecasts and the base year demand estimated according to the actual speed data. Then, the future estimated speed could be derived using the D/C-speed relationship.

Ramp termini and intersections were also analyzed using HCM methodology with Synchro 7 (Build 763). The operating speeds on the mainline freeway for the base year 2010, 2030 baseline, and 2030 Scenarios 1 conditions are presented later in this chapter. The level of service at ramp termini and intersections will be also presented later in this chapter.

Historical Traffic Volume

WSDOT collects Average Daily Traffic (ADT) volumes statewide, and uses this data as an indicator of existing demand as well as for the demand model validation. Exhibit 4.4 shows ADT on SR 520 for three different years - 1990, 2000 and 2010. The ADT did not change significantly between 2000 and 2010. However, it grew significantly between 1990 and 2000. For example, the segment between West Lake Sammamish Parkway and SR 202 shows an increase of 20,000 vehicles a day (about 45% growth), which can partly be attributed to the rapid growth of hi-tech industries along the corridor and land use changes in Redmond.

Exhibit 4.4: SR 520 Average Daily Traffic Volumes



Missing volumes due to lack of reliable data

Travel Demand Model Inputs

A corridor plan requires reasonable estimates of current and future operating conditions to identify the causes of operational issues and the effects of proposed transportation improvements. The travel demand model was used to determine demand produced by population and employment growth in the study area. The base year (2010) traffic data was used as input for the regional travel forecast model validation. The base year (2010) actual speed data was used to derive the corresponding base year demand.

The analysis periods for this study were morning (7 a.m. - 8 a.m.) and evening (5 p.m. - 6 p.m.) peak hours for the years of 2010 and 2030. The current and horizon year needs were identified using relevant WSDOT thresholds and performance measures developed as part of this corridor study process.

Land use

Current and horizon year land use of the study area as well as the four-county (King, Kitsap, Pierce and Snohomish) Central Puget Sound region are shown in Exhibit 4.5. The Bellevue and Redmond land use data were updated with the local land use data, while land use for the rest of the region remained the same as in the PSRC regional model.

Exhibit 4.5: Current and Future Land Use

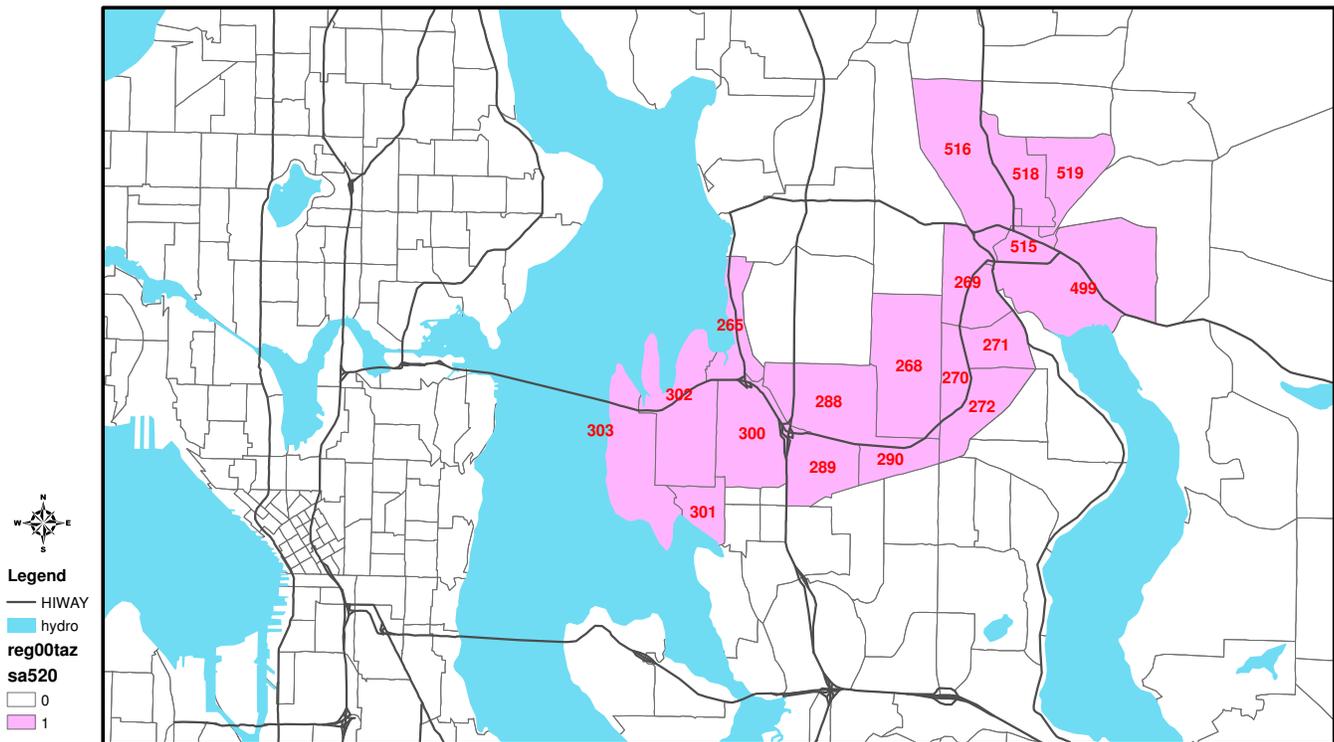
Jurisdiction	2008		2030		% Change	
	Household	Employment	Household	Employment	Household	Employment
Bellevue	49,032	120,673	76,377	192,373	56	59
Redmond	24,117	79,184	37,445	129,687	55	64
Sammamish	16,761	13,978	24,525	19,405	46	39
Kirkland	32,786	39,147	41,817	57,951	28	48
Issaquah	8,129	10,919	11,634	17,663	43	62
Rest of Region	1,261,403	1,496,302	1,738,880	2,025,759	38	35
Sum	1,392,228	1,760,203	1,930,678	2,442,838	39	39

By the year 2030, the Bellevue and Redmond employment forecast will account for about 13%, up from 11%, of the jobs in the four county Central Puget Sound region.

The zone structure in the PSRC model is larger compared to the Bellevue-Kirkland-Redmond (BKR) model. The land use data used in the SR 520 EIS model was compared with that of Bellevue and Redmond for a reasonableness check. The land use data in the model for this study was modified to reflect the jurisdiction's forecast in the Overlake area. Exhibit 4.6 shows the traffic analysis zones (TAZs) for the PSRC model and highlights the area where the jurisdiction's land use was used.

Overall both the number of households and employment would grow by about 39% regionally between the period of 2008 and 2030. The growth forecast is higher in the BKR area compared to the entire Central Puget Sound region. The number of households in Bellevue, Redmond and Kirkland is expected to grow by 56%, 55% and 28%, respectively; while employment in Bellevue, Redmond and Kirkland area would grow by 59%, 64% and 48%, respectively.

Exhibit 4.6: PSRC Model Traffic Analysis Zones in the Study Area



Base Year 2010 Conditions

2010 vehicular travel demand on SR 520 by direction for a.m. and p.m. peak hours are shown in Exhibit 4.7. and 4.8. High occupancy vehicle (HOV) volume is shown separately.

A few key points about the a.m. peak hour forecast include:

- In the a.m. peak hour, mainline traffic westbound is heavier than eastbound traffic between SR 202 and 148th Ave NE, while eastbound traffic is heavier than westbound traffic between I-405 and 148th Ave NE;
- In the p.m. peak hour, mainline travel demand in the eastbound direction is higher than the westbound direction between 148th Ave NE and SR 202, while westbound demand is higher than the eastbound direction between 148th Ave NE and I-405.

Exhibit 4.7: 2010 A.M. Peak Hour Traffic Volumes

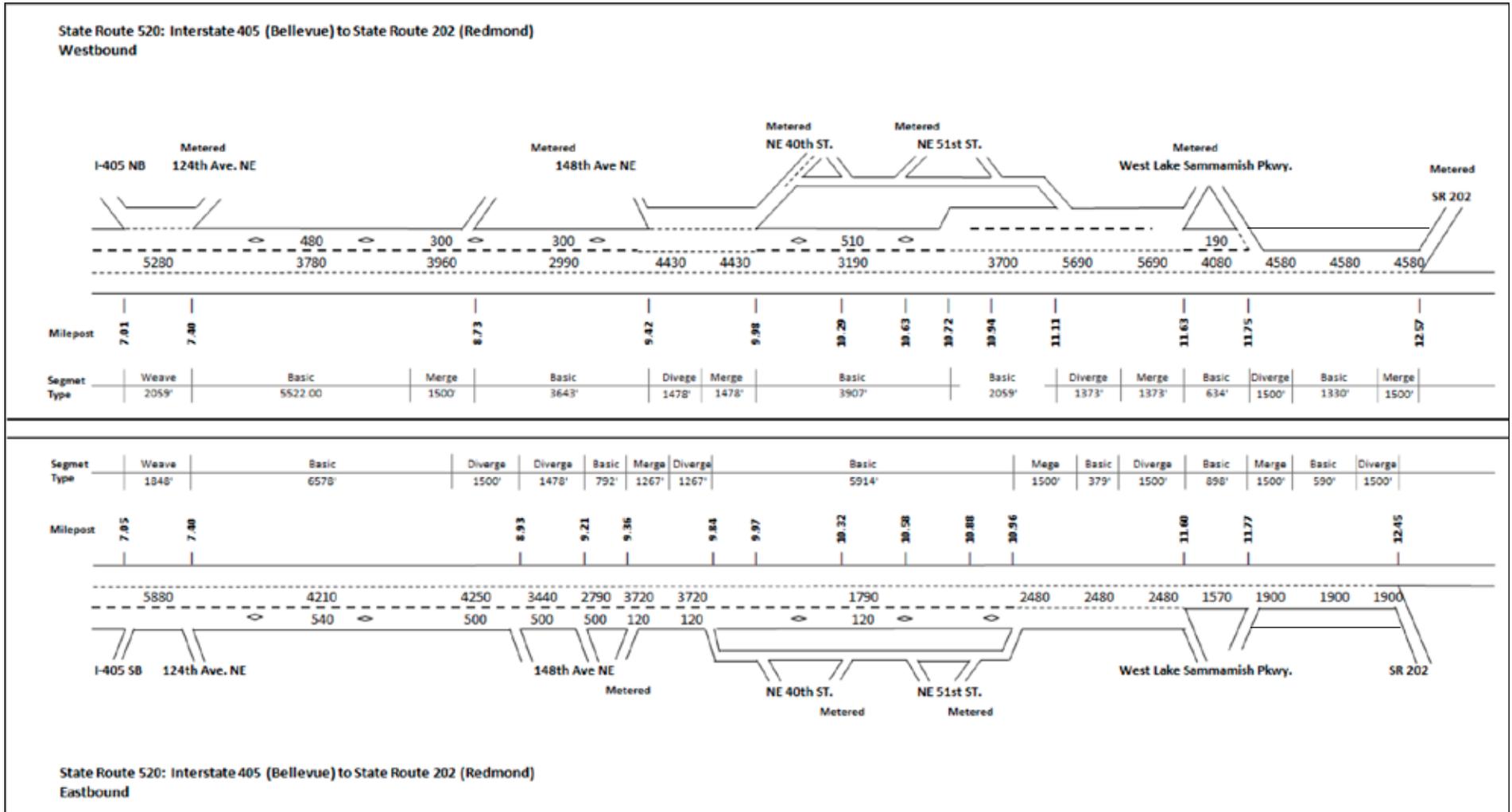
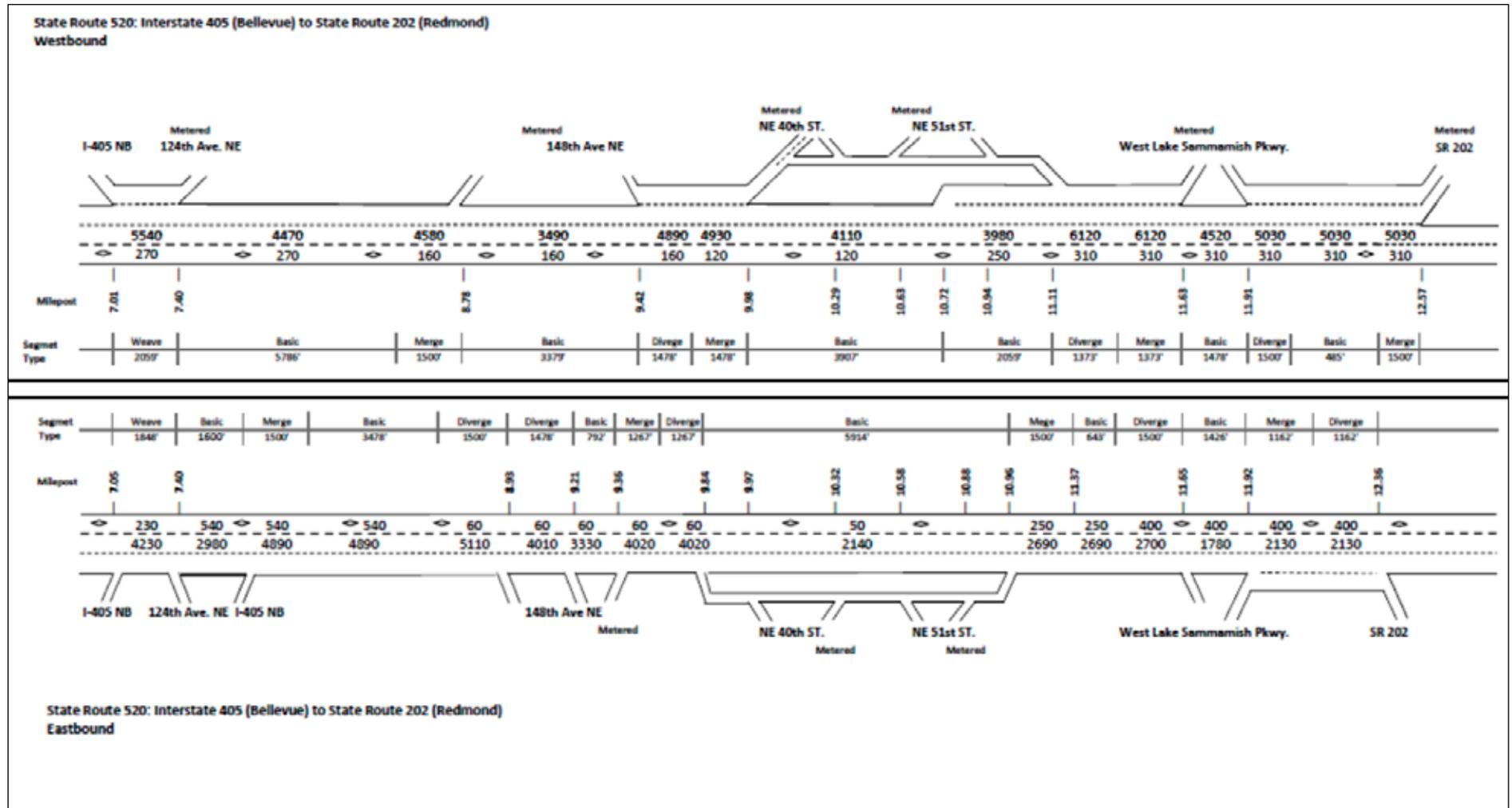


Exhibit 4.8: 2010 P.M. Peak Hour Traffic Volumes

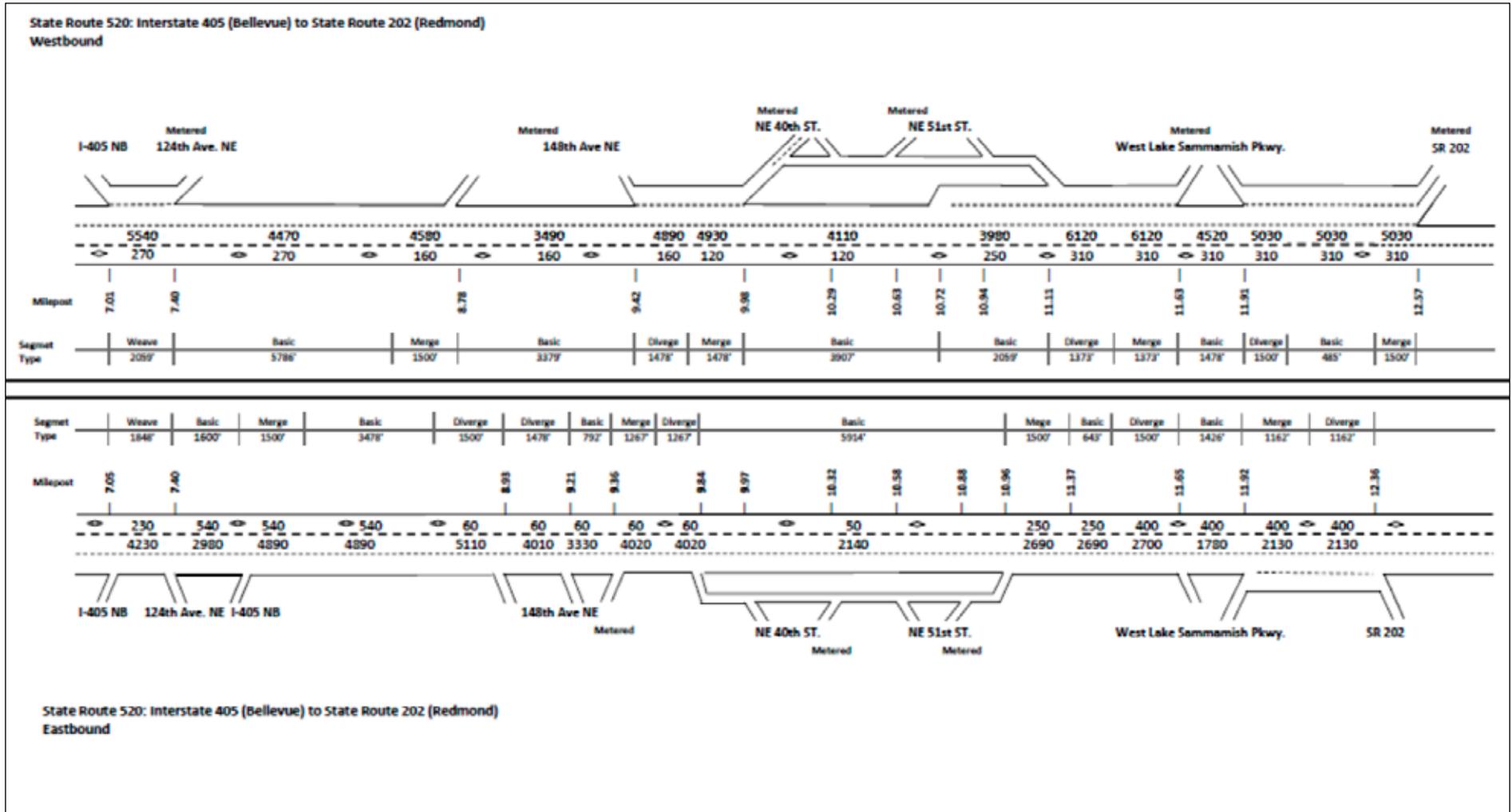


2030 Baseline A.M. Peak Hour Travel Demand Forecasts

A baseline conditions analysis for the SR 520 corridor was carried out for a.m. peak hour demand to identify mobility deficiencies along the corridor. This analysis included determining the level of service at ramp termini and nearby intersections; and determining operating speeds on the corridor segments. The corridor segments are shown in Exhibit 4.2.

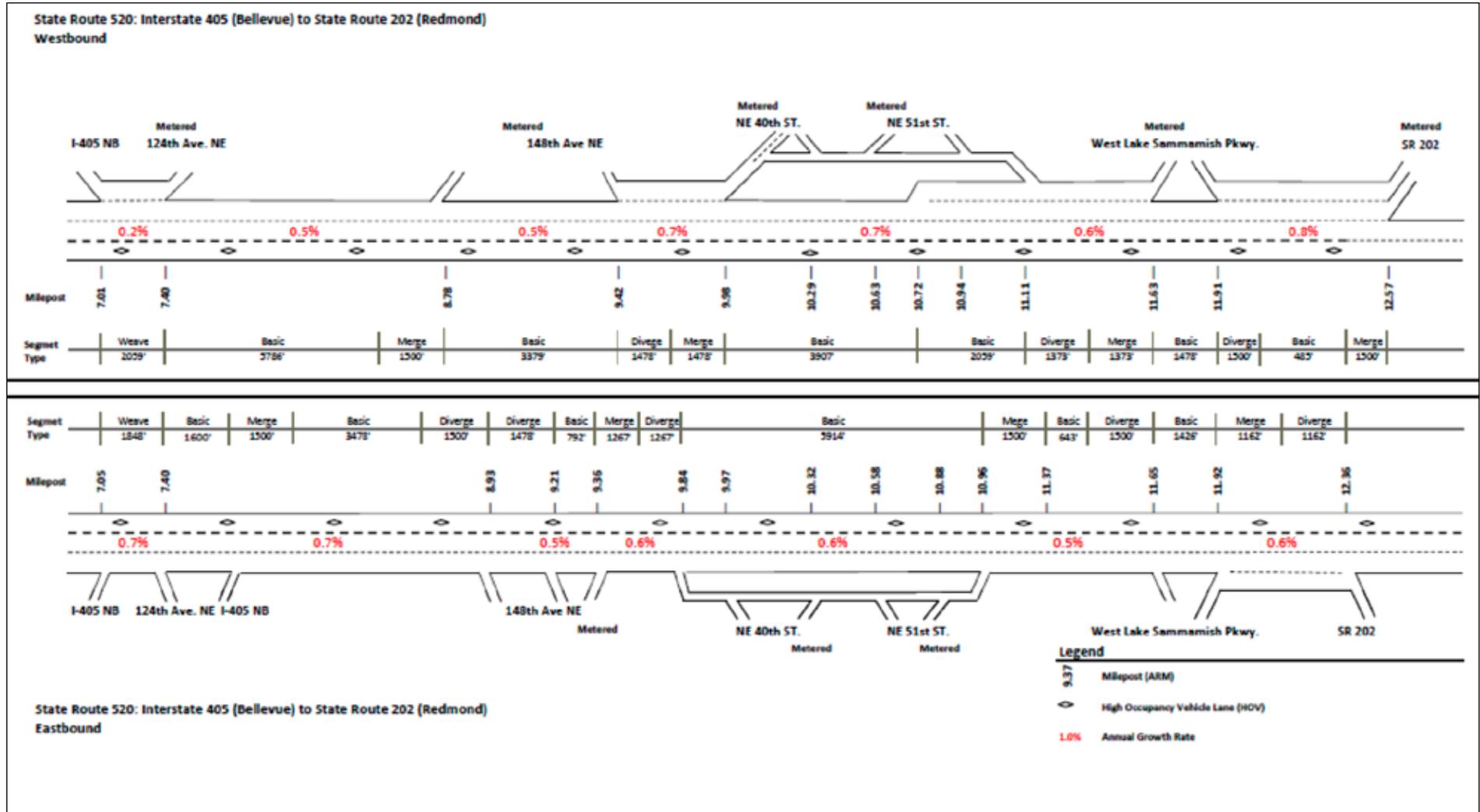
To develop 2030 baseline demand the study team reviewed the comprehensive plans and transportation improvement programs of the cities along the corridor and updated the road network in the model accordingly. The projected a.m. peak hour traffic volumes for the 2030 baseline condition is shown in Exhibit 4.9.

Exhibit 4.9: 2030 A.M. Peak Hour Traffic Volumes



During the a.m. peak hour of demand, mainline traffic would grow at modest rates (less than 1% annually). Growth rates for each segment and travel direction are shown in Exhibit 4.10 below.

Exhibit 4.10: Annual Growth Rates of Mainline Traffic between 2010 and 2030 (A.M. Peak Hour)



Key points about the a.m. peak hour forecast include:

- Mainline traffic on westbound direction is heavier than eastbound traffic between SR 202 and 148th Ave NE, while eastbound traffic is heavier than westbound between I-405 and 148th Ave NE;
- Between 2010 and 2030, mainline traffic would grow at a rate between 0.2% and 0.8% annually; and
- With the 2030 a.m. peak hour demand, eastbound SR 520 would operate at or above capacity between I-405 and 148th Ave NE.

2030 Baseline P.M. Peak Hour Travel Demand Forecasts

Traffic volumes in the 2030 baseline p.m. peak hours are shown in Exhibit 4.11. Exhibit 4.12 shows rates of p.m. peak hour traffic growth during the 20 years of analysis period between 2010 and 2030.

Exhibit 4.11: 2030 P.M. Peak Hour Traffic Volumes

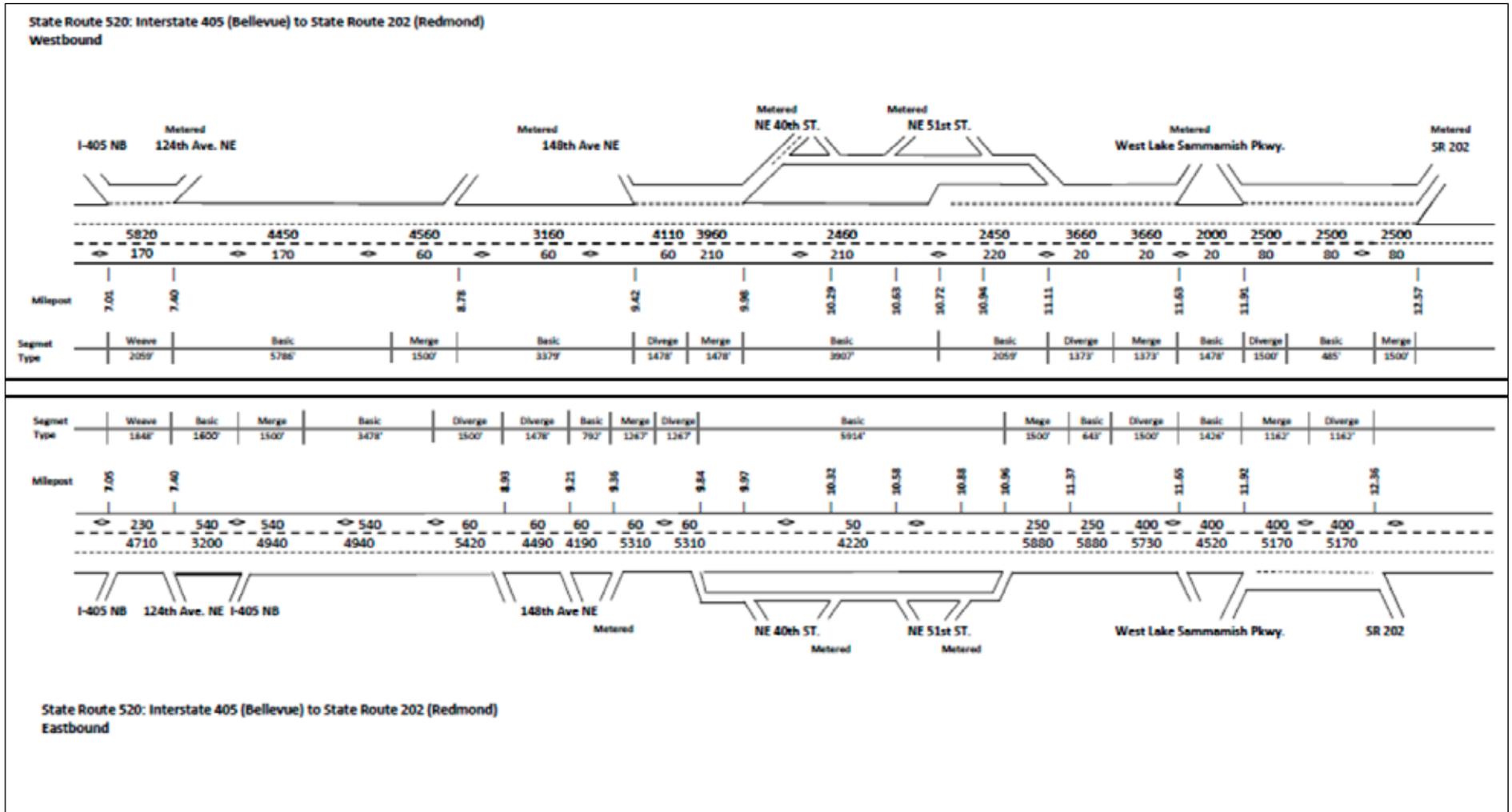
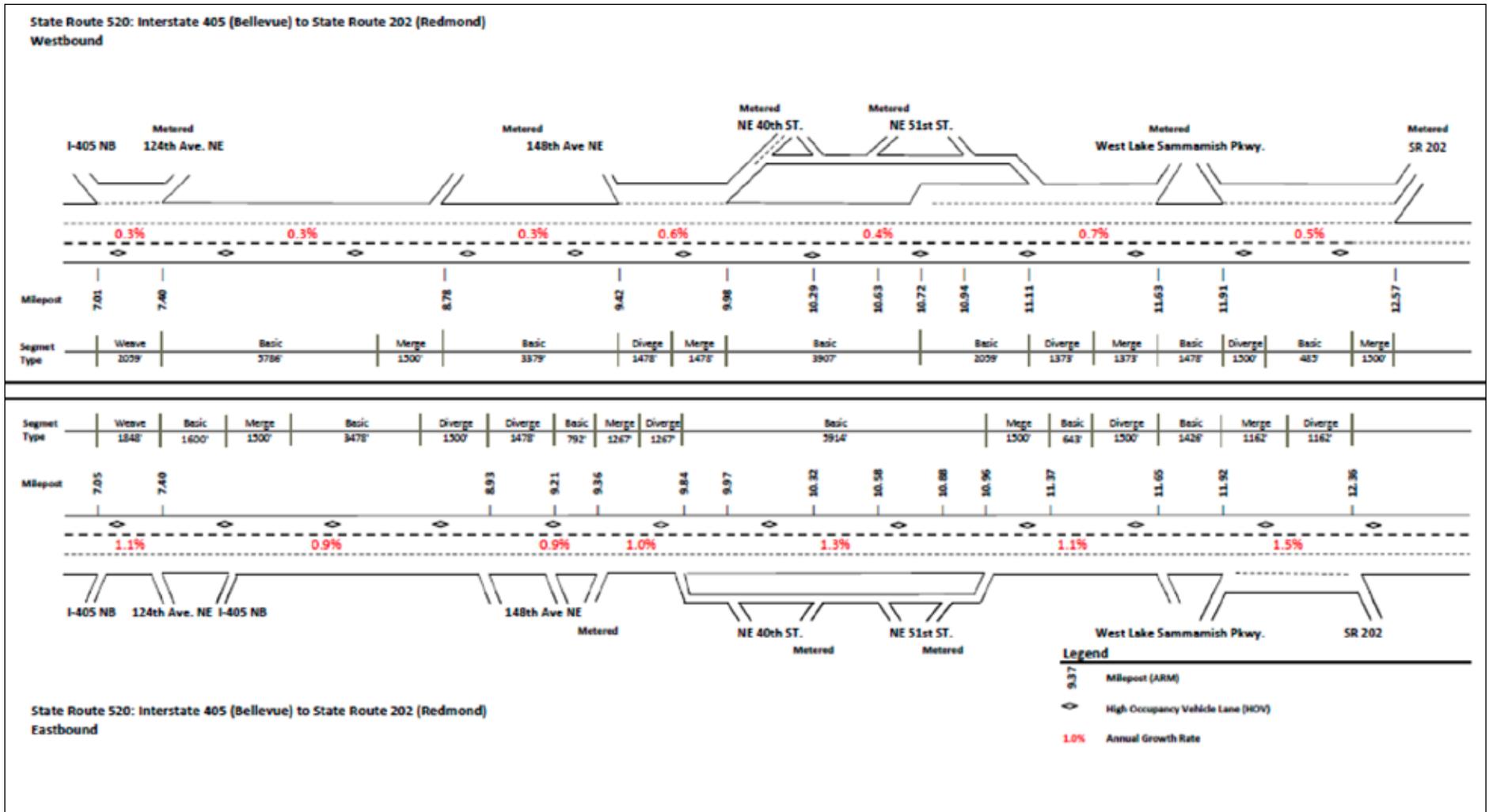


Exhibit 4.12: Annual Growth Rates of Mainline Traffic between 2010 and 2030 (P.M. Peak Hour)



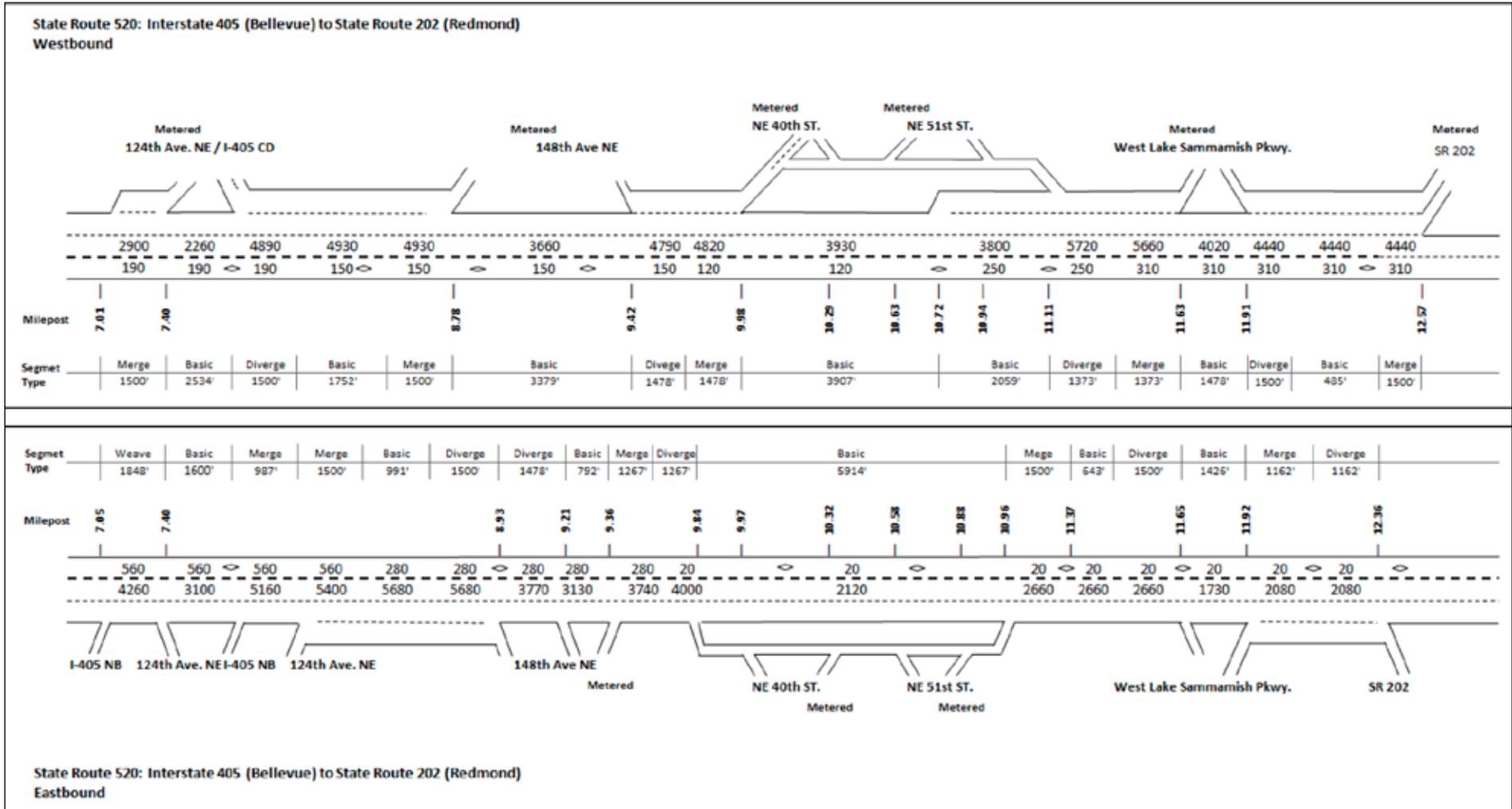
Key observations about the p.m. peak hour forecast include:

- In 2030, mainline travel demand in the eastbound direction is higher than the westbound direction
- Through 2030, mainline traffic would grow between 0.3% and 1.5% annually. Eastbound traffic demand is expected to grow relatively more than that of westbound direction; and
- With the 2030 p.m. peak hour demand, eastbound SR 520 would operate at or above capacity between I-405 and 148th Ave NE, and NE 51st Street and West Lake Sammamish Parkway.

Scenario 1: 2030 A.M. Peak Hour Travel Demand Forecasts

The a.m. peak hour projected traffic volumes for Scenario 1 are shown in Exhibit 4.13.

Exhibit 4.13: 2030 A.M. Peak Hour Traffic Volumes



Key observations from the 2030 a.m. peak hour forecast include:

- Mainline travel demand in the eastbound direction between I-405 and 148th Ave NE is higher than that of westbound direction, while westbound traffic is heavier than eastbound between 148th Ave NE and SR 202;
- Opening 124th Ave NE interchange connections to the east does increase demand on the segment between 124th Ave NE and 148th Ave NE; and
- Eastbound SR 520 would operate at or above capacity between I-405 and 148th Ave NE.
- Although the traffic increases between 148th Avenue NE and 124th Avenue NE, with the 124th Ave NE Full Interchange and SR 520 Overlake Access Ramp improvements in place, the traffic circulation in the study corridor was improved compared to the baseline scenario.

Exhibit 4.14 shows person trips throughput for two screenlines. The first one is west of 148th Avenue NE and the second one is south of NE 40th Street. These screenlines show auto and transit trips, the transit trips also.

Exhibit 4.14: Person Trips Comparison Between Base Year and 2030 Scenario 1 in the A.M. Peak Hour

West of 148th Avenue NE					
Base Year	Motorized	Bus	Light Rail	Ped/Bike	Total
Throughput	12,164	500	–		12,663
Capacity	15,930	2,229	–		18,159
V/C	0.76	0.22	–	–	0.70

2030 Scenario 1	Motorized	Bus	Light Rail	Ped/Bike	Total
Throughput	14,553	205	2,120		16,878
Capacity	17,955	2,351	4,440		24,746
V/C	0.81	0.09	0.48	–	0.68

South of NE 40th Street					
Base Year	Motorized	Bus	Light Rail	Ped/Bike	Total
Throughput	11,165	421	–		11,586
Capacity	18,765	1,794	–		20,559
V/C	0.59	0.23	–	–	0.56

2030 Scenario 1	Motorized	Bus	Light Rail	Ped/Bike	Total
Throughput	11,745	193	1,840		13,778
Capacity	18,765	2,096	4,440		25,301
V/C	0.63	0.09	0.41	–	0.54

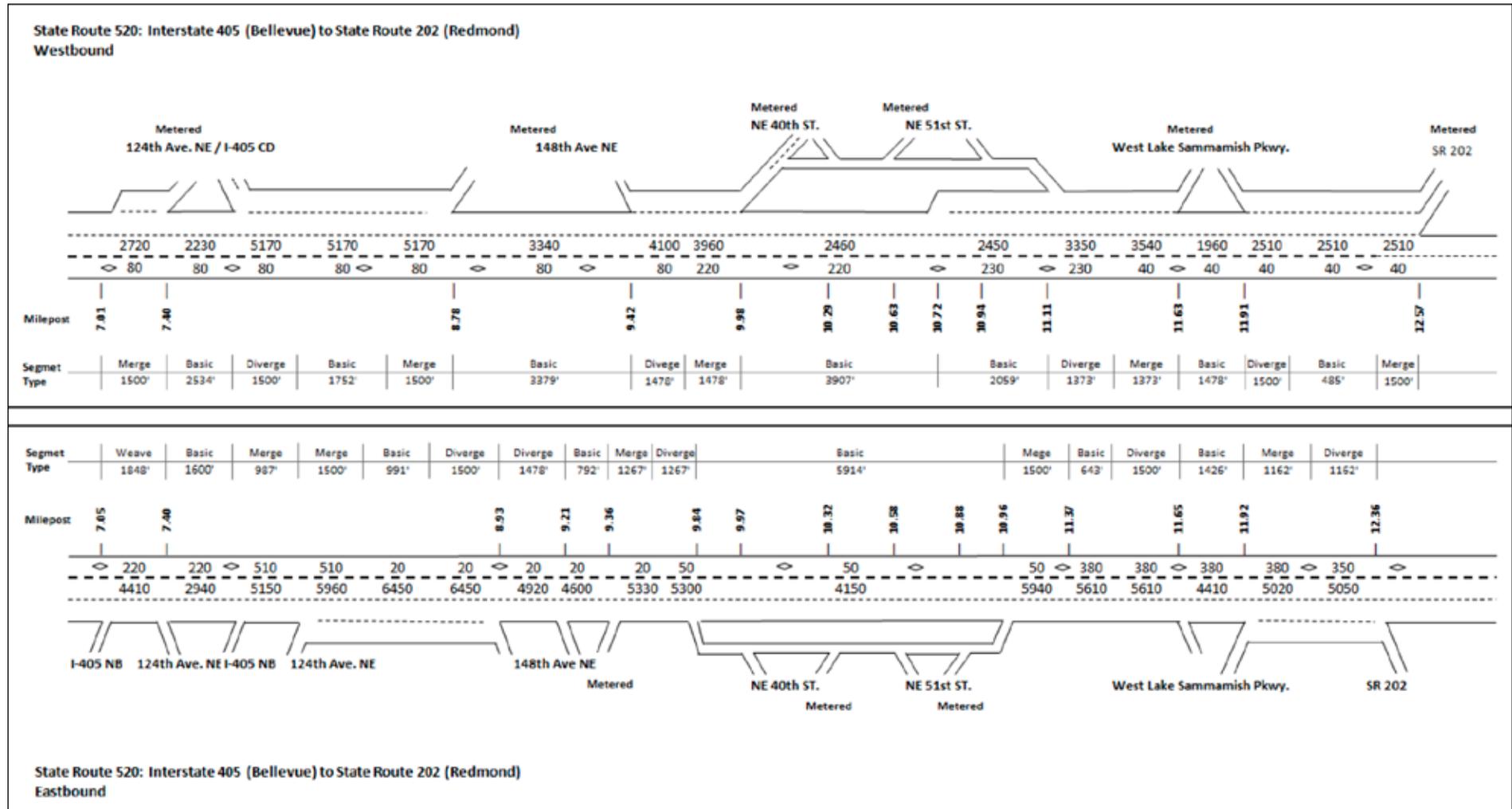
Note: The average vehicle occupancy is 1.35. The light rail throughput and capacity are provided by Sound Transit.

Scenario 1: 2030 P.M. Peak Hour Travel Demand Forecasts

The Scenario 1 projected traffic volumes for the p.m. peak hour are shown in Exhibit 4.15. Key observations from the 2030 a.m. peak hour forecast include:

- Mainline travel demand in the eastbound direction is higher than that of westbound direction for the entire stretch of the corridor within the study area
- Opening 124th Ave NE interchange connections to the east does increase demand on the segment between 124th Ave NE and 148th Ave NE; and
- Eastbound SR 520 would operate at or above capacity between I-405 and 124th Ave NE, and between NE 51st Street and West Lake Sammamish Parkway.

Exhibit 4.15: 2030 P.M. Peak Hour Traffic Volumes



The table below shows PM peak hour throughput for auto passengers, bus and light rail transit passengers.

Exhibit 4.16: Person Trips Comparison Between Base Year and 2030 Scenario 1 in the P.M. Peak Hour

West of 148th Avenue NE					
Base Year	Motorized	Bus	Light Rail	Ped/Bike	Total
Throughput	11,219	500	–		11,718
Capacity	15,930	2,229	–		18,159
V/C	0.70	0.22	–	–	0.65

2030 Scenario 1	Motorized	Bus	Light Rail	Ped/Bike	Total
Throughput	15,377	205	2,120		17,701
Capacity	17,955	2,351	4,440		24,746
V/C	0.86	0.09	0.48	–	0.72

South of NE 40th Street					
Base Year	Motorized	Bus	Light Rail	Ped/Bike	Total
Throughput	10,125	421	–		10,546
Capacity	18,765	1,794	–		20,559
V/C	0.54	0.23	–	–	0.51

2030 Scenario 1	Motorized	Bus	Light Rail	Ped/Bike	Total
Throughput	12,596	193	1,840		14,629
Capacity	18,765	2,096	4,440		25,301
V/C	0.67	0.09	0.41	–	0.58

Note: The average AVO is 1.35. The light rail throughput and capacity are provided by Sound Transit.

How is the SR 520 Mainline Currently Operating?

The operating speed is the average speed across all the general purpose lanes on SR 520 during the a.m. or p.m. peak hour. The existing operating speed was observed from Northwest Region's year 2010 loop data. The operating speed on the HOV lanes was not analyzed, since the volume is still below the capacity of the lane and the speed is close to the posted 60 miles per hour (mph.)

The corridor's peak hours are 7:00 to 8:00 a.m. and 5:00 to 6:00 p.m. Based on other project studies, it is known that some small areas may have different peak hours due to variations in work schedules of different companies in the vicinity. For example, the a.m. peak hour on NE 40th Street usually starts around 9:30 due to work trips coming into the Microsoft campus. Those local peak hour trips were not considered and analyzed in this study. The overall system peak hours along the study corridor was analyzed for the mainline and intersection terminal operations. The a.m. peak hour existing operating speeds (Exhibits 4.17 and 4.18) show that mainline segments in both directions operate above WSDOT's speed threshold of 70% of posted speed.

During the p.m. peak hour, westbound SR 520 does not show any congestion. However, two segments in the eastbound direction operate below WSDOT's speed threshold (Exhibits 4.19 and 4.20) during the p.m. peak hour. These segments are:

- NE 51st Street to West Lake Sammamish Parkway
- West Lake Sammamish Parkway to SR 202 (Redmond Way)

Based on the observation, the congestion on eastbound SR 520 approaching the SR 202 off-ramp is mainly caused by the congestion spilling back from the East Lake Sammamish Parkway/SR 202 intersection.

The speed reduction shown for westbound traffic near I-405 is caused by the congestion originating from the westbound SR 520 to southbound I-405 ramp. That 25 mph loop ramp operates over capacity during both the morning and evening peaks.

Exhibit 4.17: 2010 A.M. Peak Hour Operating Speeds - Diagram

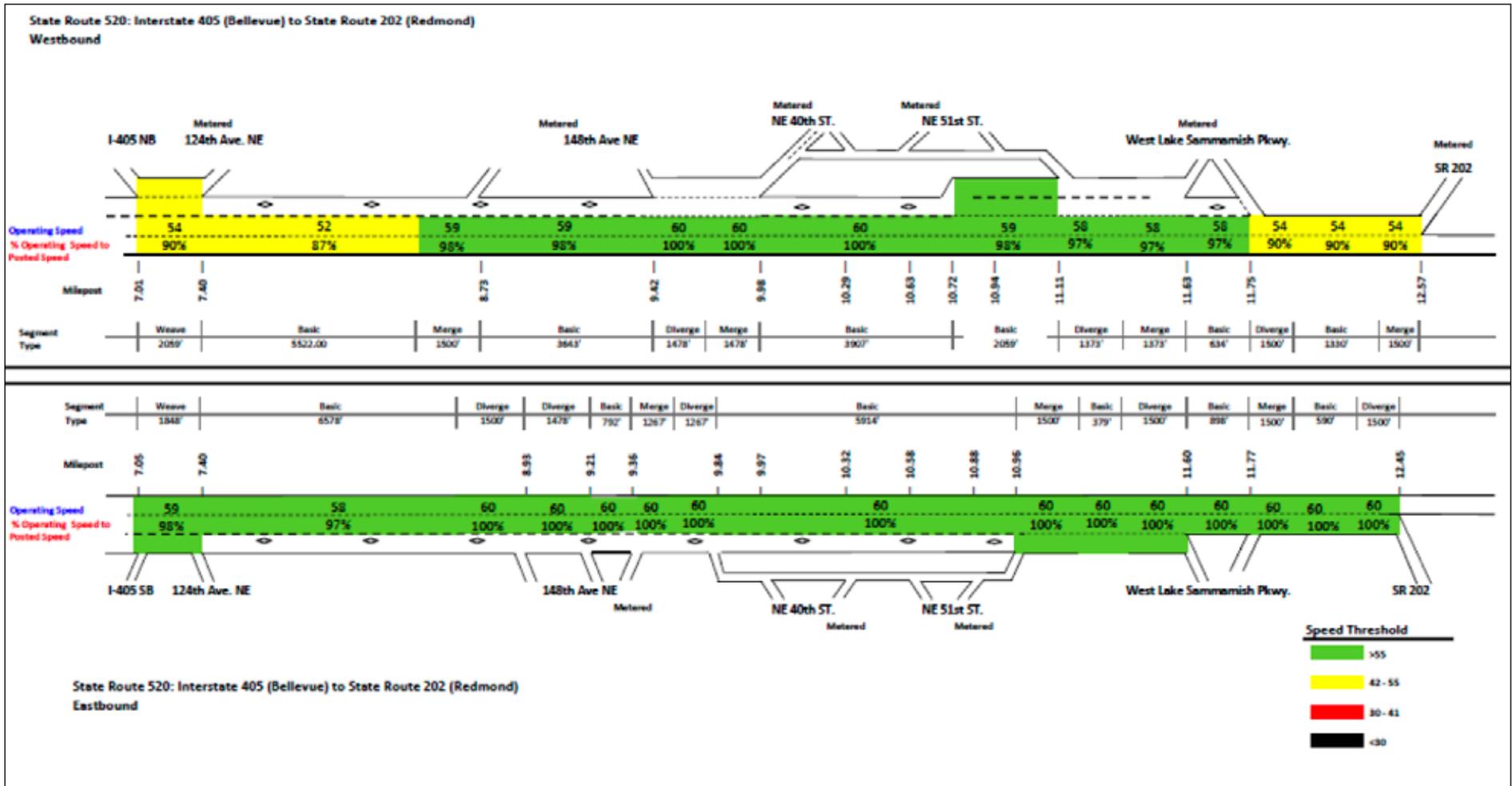


Exhibit 4.18: 2010 A.M. Peak Hour Operating Speeds - Map

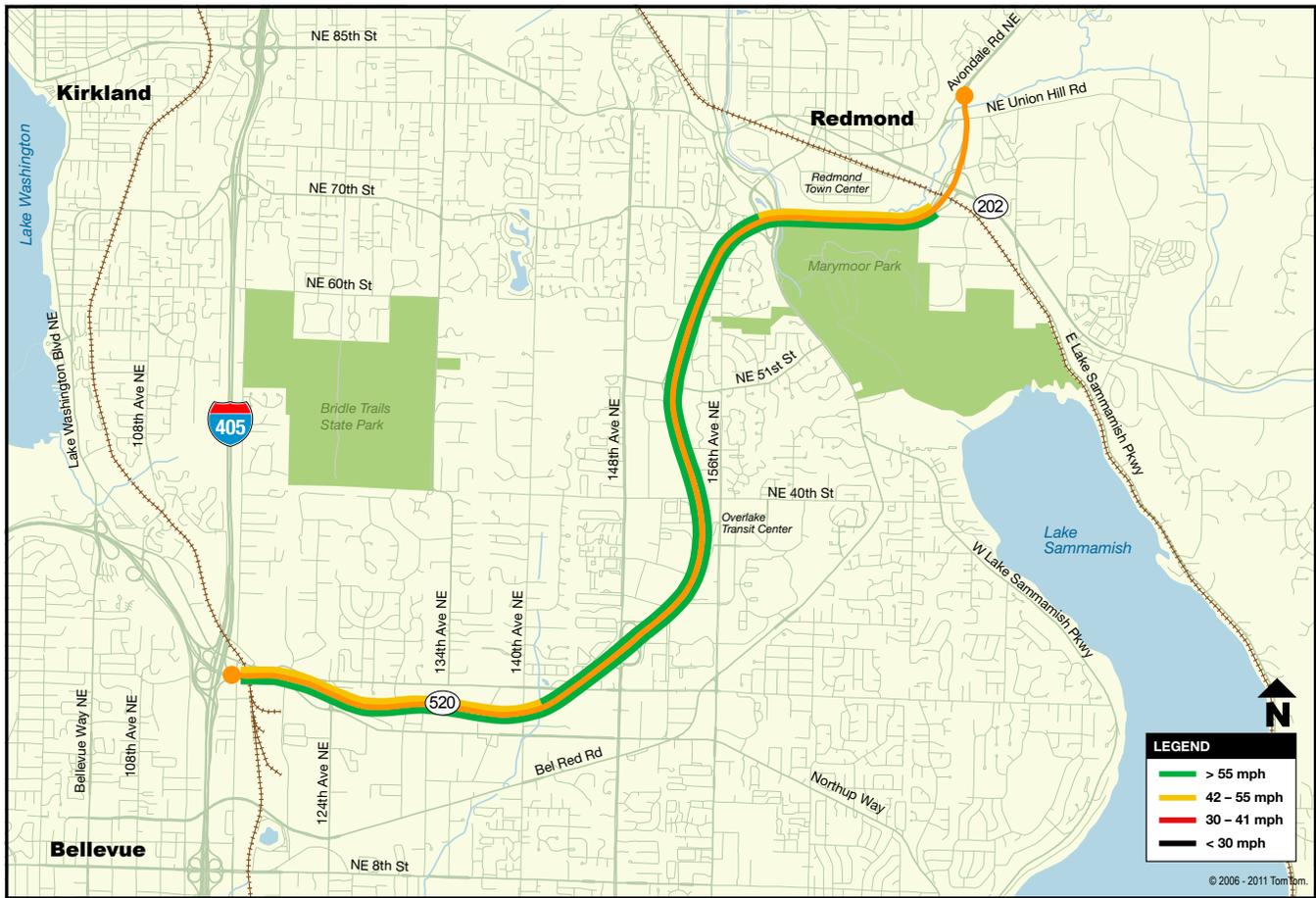


Exhibit 4.19: 2010 P.M. Peak Hour Operating Speeds - Diagram

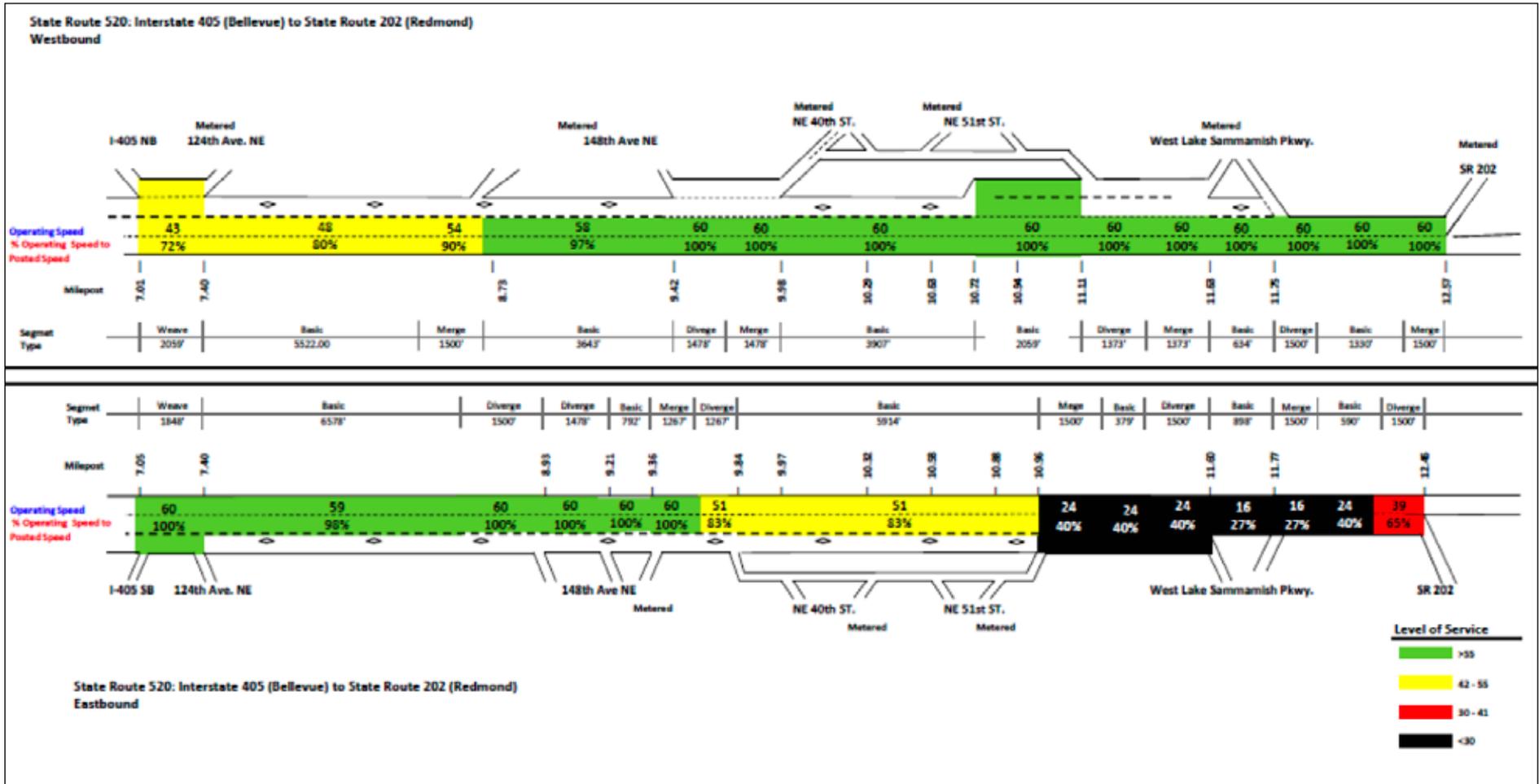


Exhibit 4.20: 2010 P.M. Peak Hour Operating Speeds - Map



How are the Analyzed Ramps and Intersections Currently Operating?

The “Level of Service” (LOS) is a rating used to measure congestion on a road or at an intersection. The call out box to the right explains the ratings.

During the 2010 a.m. peak hour, almost all analyzed ramp termini and intersections operate at LOS D or better except for the following four locations that operate at LOS E or LOS F (Exhibit 4.21.)

What is Level-of-Service?

Level-of-Service ratings indicate how well traffic functions on a given roadway or intersection.

- A: Free flow, low traffic volumes, no delays.
- B: Stable traffic flow, restricted speeds, minor delays.
- C: Stable traffic flow, speeds limited by higher volumes of traffic.
- D: Low speeds, noticeable delays, traffic volumes near capacity.
- E: Low speeds with “stop and go” traffic, considerable delays, traffic volumes at capacity.
- F: Very low speeds, traffic volumes exceed capacity, long delays.

Ramp termini operating at LOS E or LOS F:

- 5. SR 520 eastbound ramps & NE 40th Street (LOS E)
- 13. SR 520 & Union Hill Road (LOS F)

Intersections operating at LOS E or LOS F:

- 16. NE 24th Street & 148th Avenue NE (LOS E)
- 23. Redmond Way (SR 202) & East Lake Sammamish Parkway NE (LOS F)

Exhibit 4.21: 2010 A.M. Peak Hour Level of Service of Intersections and Ramp Termini



Ramp terminus #2 is a future project and not analyzed for current conditions.

In the 2010 p.m. peak hour condition, the following ramp termini and intersections operate at LOS E or LOS F (Exhibit 4.22):

Ramp termini operating at LOS E or LOS F:

- 4. SR 520 westbound off ramp & 148th Avenue NE (LOS F)
- 9. SR 520 eastbound ramps & West Lake Sammamish Parkway (LOS E)
- 10. SR 520 westbound ramps & West Lake Sammamish Parkway (LOS F)
- 11. SR 520 eastbound off-ramp & SR 202 (LOS E)
- 13. SR 520 & Union Hill Road (LOS F)

Intersections operating at LOS E or LOS F:

- 14. Bellevue-Redmond Road & 148th Avenue NE (LOS E)
- 15. NE 20th Street & 148th Avenue NE (LOS F)
- 16. NE 24th Street & 148th Avenue NE (LOS F)
- 20. NE 51st Street & 148th Avenue NE (LOS E)
- 22. NE 70th Street & Redmond Way (SR 202) (LOS F)
- 23. Redmond Way (SR 202) & East Lake Sammamish Parkway NE (LOS F)

Exhibit 4.22: 2010 P.M. Peak Hour Level of Service of Intersections and Ramp Termini



Ramp terminus #2 is a future project and not analyzed for current conditions.

How Will SR 520 Operate in the Future Baseline Condition?

The future baseline operating condition was analyzed based on the projected travel demand using the PSRC regional travel demand model and the base year demand estimates correspondent to the actual speed data. During the a.m. peak hour of the 2030 baseline condition, westbound SR 520 would operate below the 70% of posted speed of 60 miles per hour between the West Lake Sammamish Parkway off-ramp and the NE 51st Street off-ramp; and between the 148th Ave NE on-ramp and the I-405 northbound off-ramp (Exhibit 4.23 and 4.24). Eastbound SR 520 would operate below the 70% of posted speed threshold between the I-405 and 148th Ave NE off-ramp, excluding a short segment between 124th Ave NE off-ramp and the new on-ramp from northbound I-405. All other segments in both directions of travel would operate at or above the 70% of posted speed threshold.

Exhibit 4.23: 2030 Baseline A.M. Peak Hour Operating Speeds - Diagram

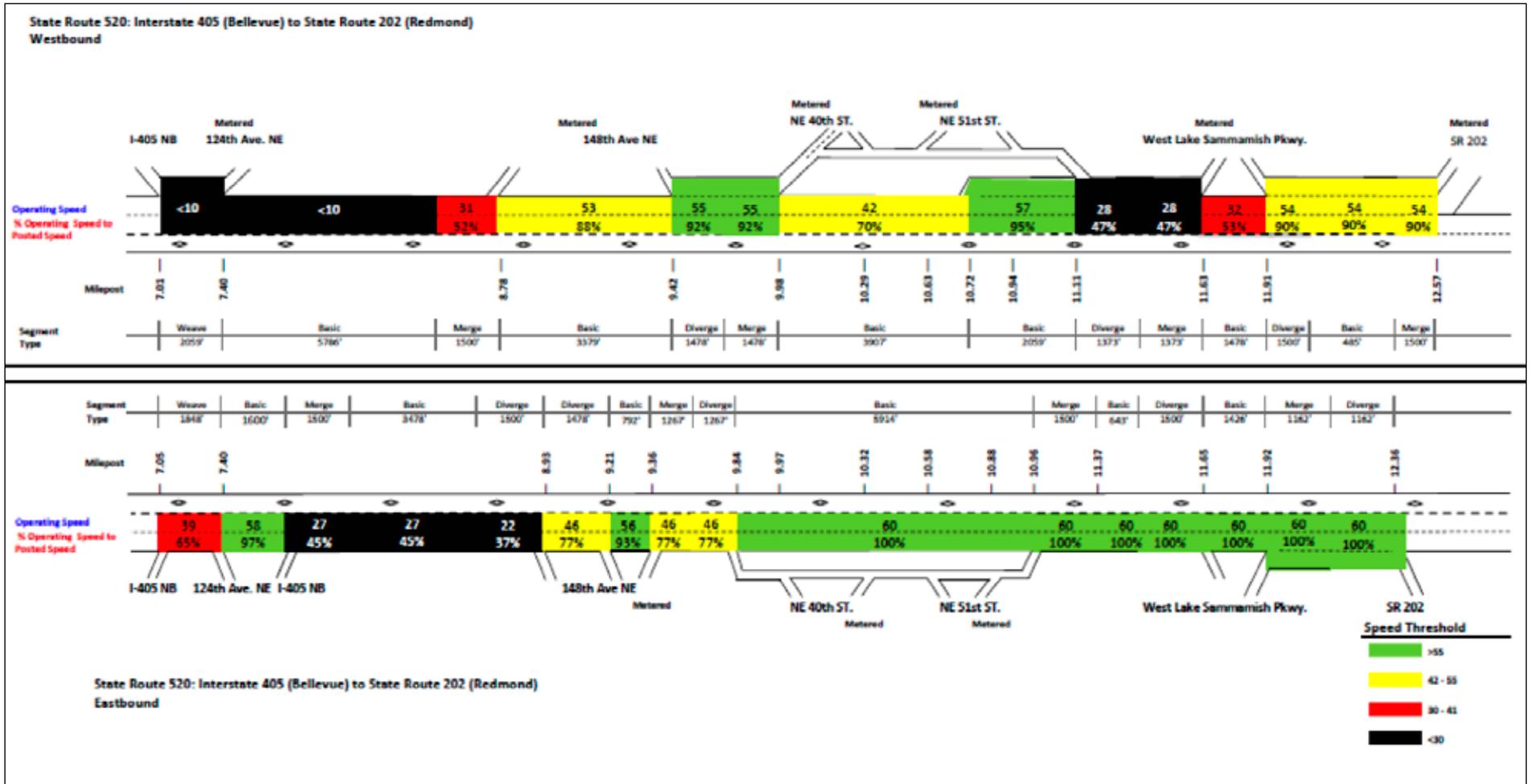


Exhibit 4.24: 2030 Baseline P.M. Peak Hour Operating Speeds - Map



During the 2030 p.m. peak hour, speeds decline and congestion extends over most of the corridor in the eastbound direction. This observation is shown by the increase in red and black areas in Exhibits 4.25 and 4.26. Westbound SR 520 between the 148th Ave NE on-ramp and I-405 northbound off-ramp would operate below the 70% of posted speed threshold during the p.m. peak hour. This condition is because of increased travel demand without any improvements assumed to the corridor.

Exhibit 4.25: 2030 Baseline P.M. Peak Hour Operating Speeds - Diagram

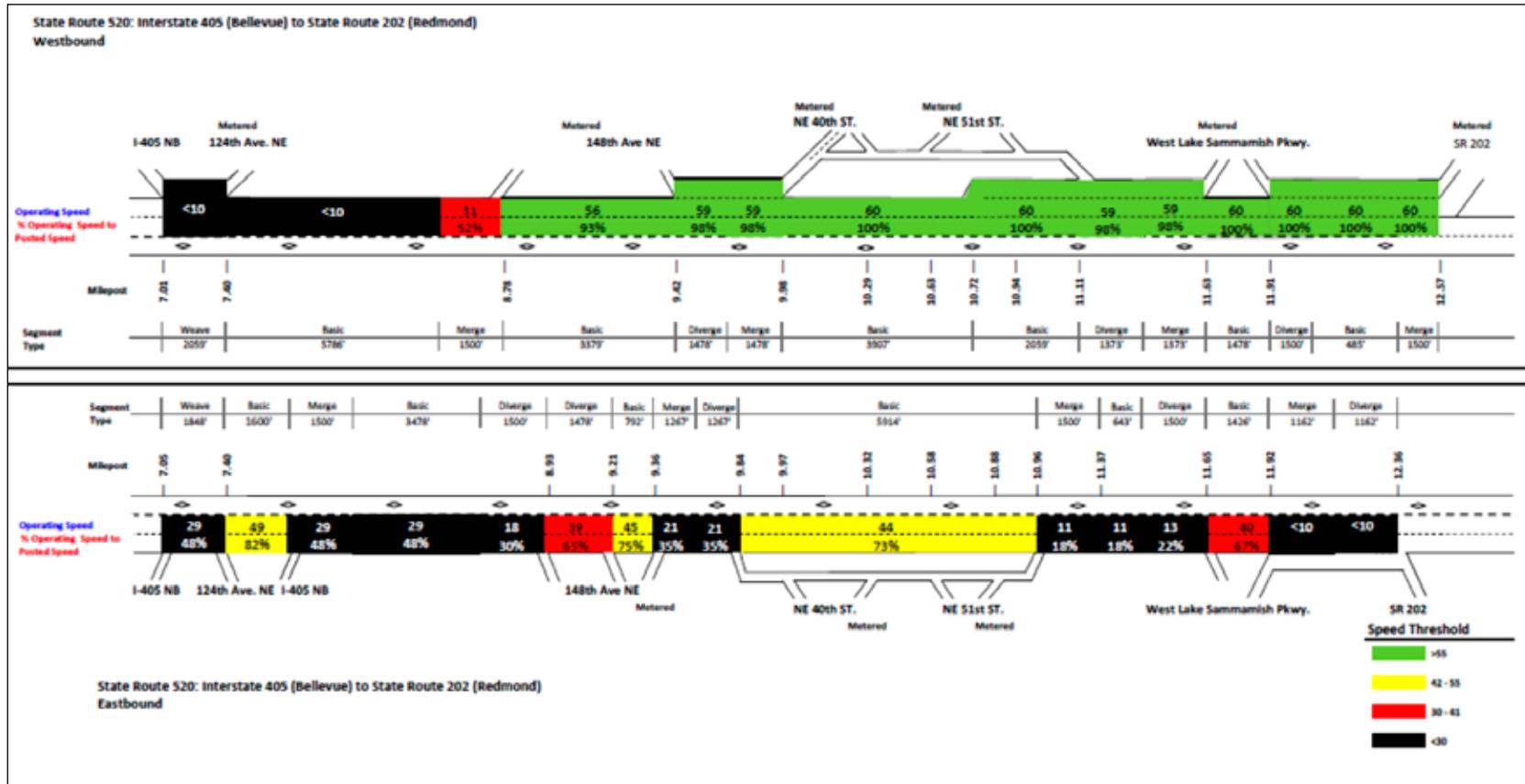


Exhibit 4.26: 2030 Baseline P.M. Peak Hour Operating Speeds - Map



The congestion on westbound SR 520 approaching the I-405 interchange is due to the capacity and ramp geometry constraints of the I-405 northbound and southbound ramps. In addition, traffic volumes are heavy coming from northbound I-405 to eastbound SR 520. The on-ramp demand is larger than what one lane ramp can handle. The congestion on eastbound SR 520 approaching SR 202 off-ramp is caused by the congestion spilling back from East Lake Sammamish Parkway/SR 202 intersection.

How Will SR 520 Operate in the Future If only the Improvements in Scenario 1 Are Implemented?

Similar to the 2030 baseline, the Scenario 1 operating condition was analyzed based on projected demand using the PSRC regional travel demand model and the base year demand estimates correspondent to the actual speed data. After considering operational efficiency (i.e., ramp metering) and transportation demand management strategies along with the 124th Avenue NE full interchange, 148th Avenue NE slip ramp, and the auxiliary lanes between 124th Avenue NE and 148th Avenue NE in place, two segments on westbound SR 520 would operate below the 70% of posted speed threshold during the a.m. peak hour. These segments are:

- West Lake Sammamish Parkway on-ramp to NE 51st Street off-ramp; and
- 148th Ave NE on-ramp to new 124th Avenue NE/I-405 off ramps because of a bottleneck at the westbound SR 520 to southbound I-405 ramp.

High demand (2200 and 2600 vehicles in a.m. and p.m. peak respectively) from the I-405 northbound ramps as well as the capacity and geometry constraints of the I-405 ramps cause the congestion to spill back on to the SR 520 mainline.

Eastbound SR 520 operates above the 70% of posted speed threshold except for two short segments between I-405 and 124th Avenue NE interchanges during the a.m. peak hour operation. These segments are:

- I-405 northbound on-ramp to 124th Ave NE off-ramp; and
- I-405 northbound new on-ramp to 124th Ave NE on-ramp.

See Exhibits 4.27 and 4.28 for the Scenario 1 a.m. peak hour operating conditions.

Exhibit 4.27: 2030 Scenario 1 - A.M. Peak Hour Operating Speeds - Diagram

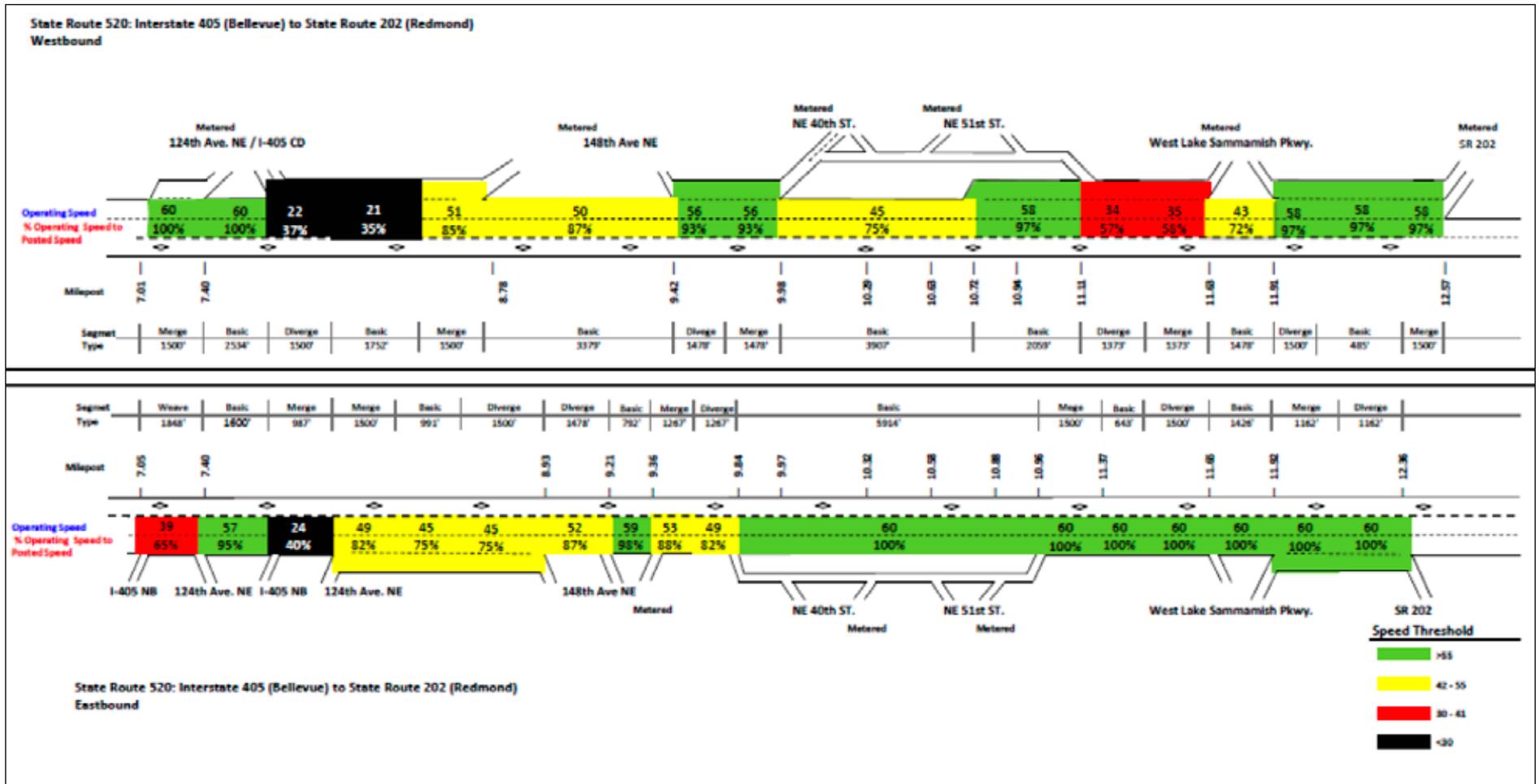
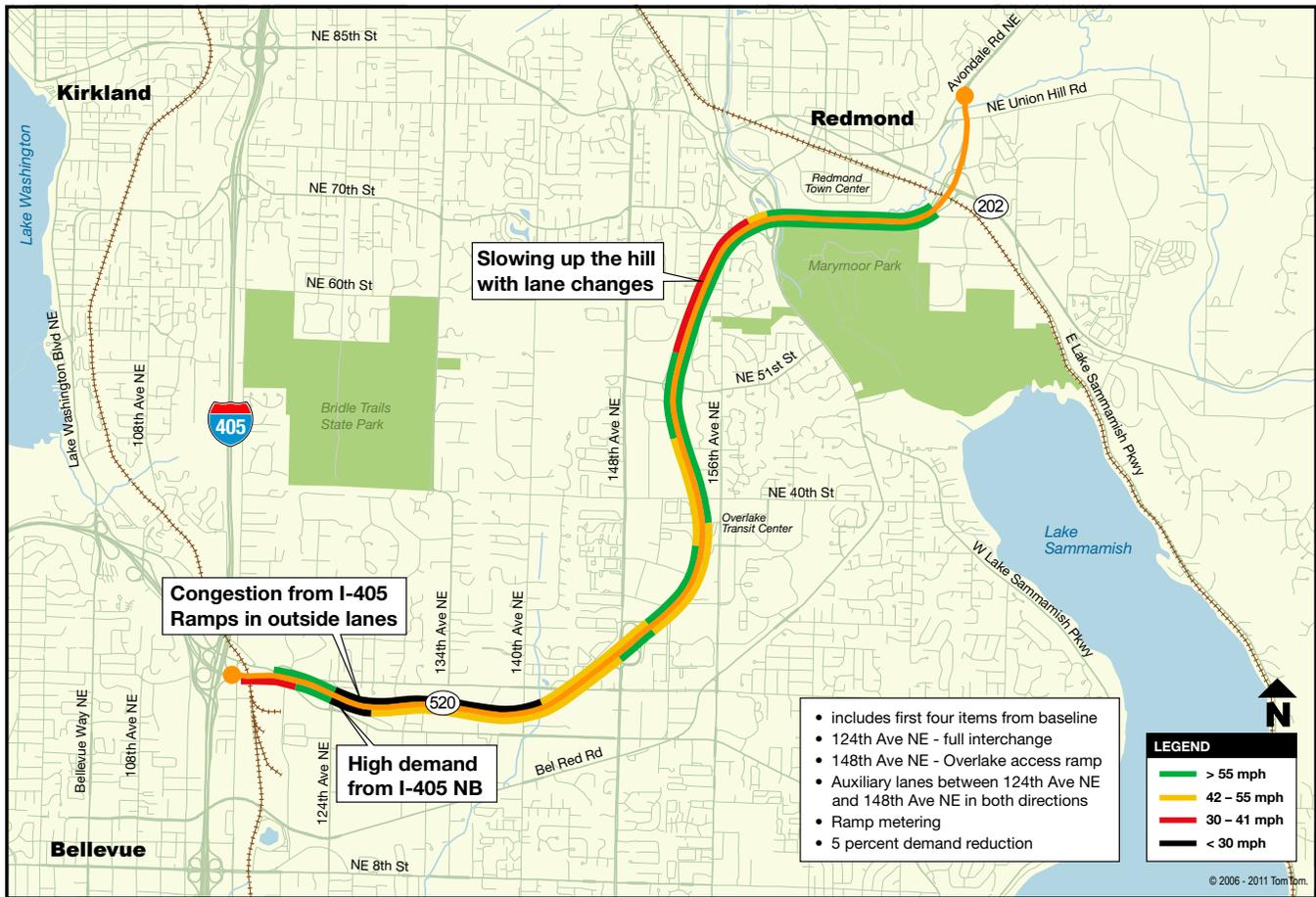


Exhibit 4.28: 2030 Scenario 1 - A.M. Peak Hour Operating Speeds - Map



In Scenario 1, speeds decline and congestion extends over most of the corridor in the eastbound direction during the 2030 p.m. peak hour. This observation is shown by the increase in red and black areas in Exhibits 4.29 and 4.30. The segment between 148th Ave NE on-ramp and the new 124th Avenue NE/I-405 off ramps on westbound SR 520 would operate below the 70% of posted speed threshold. One reason for congestion at this location is the bottleneck created by high traffic volumes from northbound I-405 to the eastbound SR 520 on-ramp. The on-ramp demand is larger than what the one-lane ramp can handle. Most of the eastbound SR 520 operates below the 70% speed threshold during the p.m. peak hour operation, except the segment between NE 40th Street and NE 51st Street.

Exhibit 4.29: 2030 Scenario 1 - P.M. Peak Hour Operating Speeds - Diagram

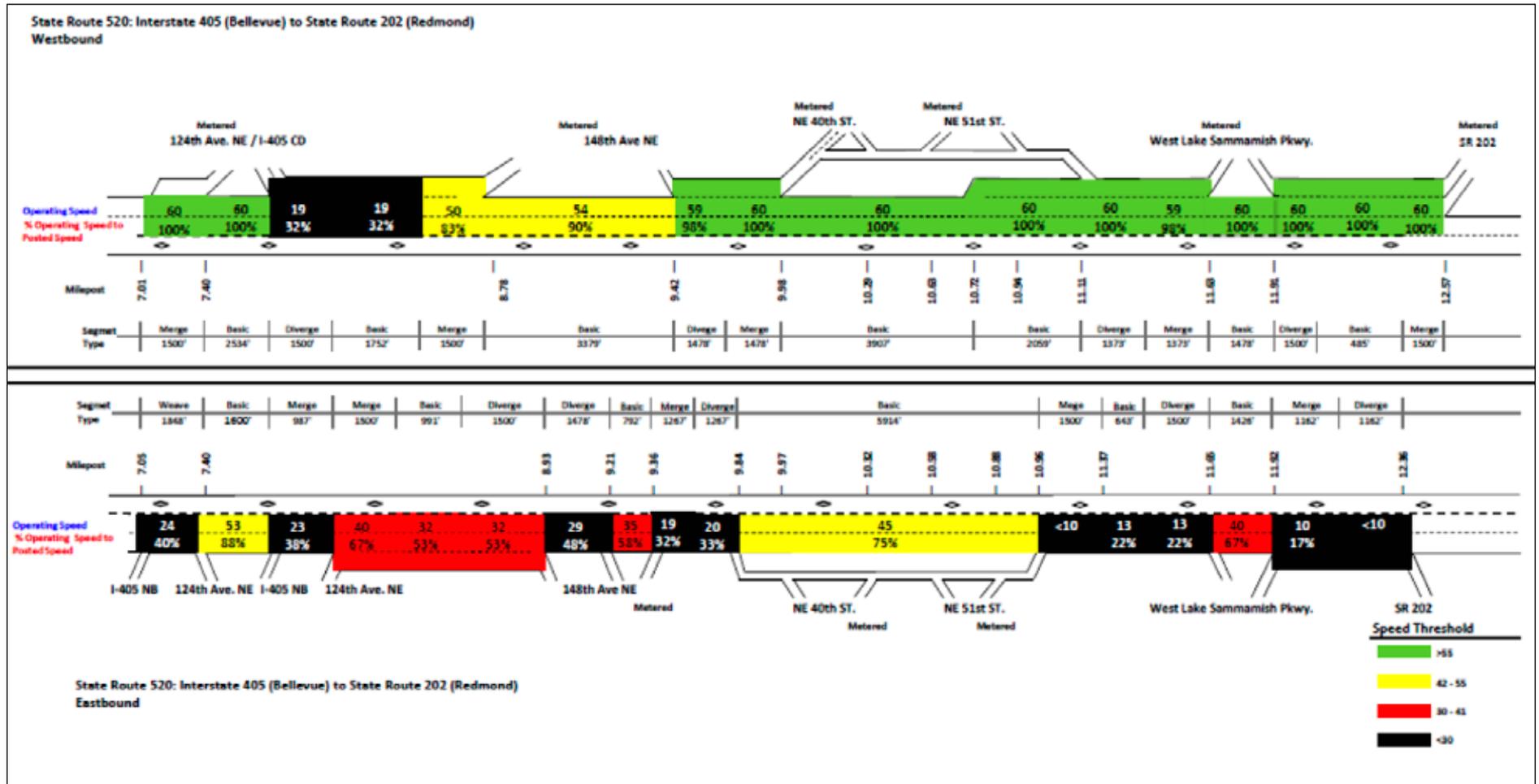
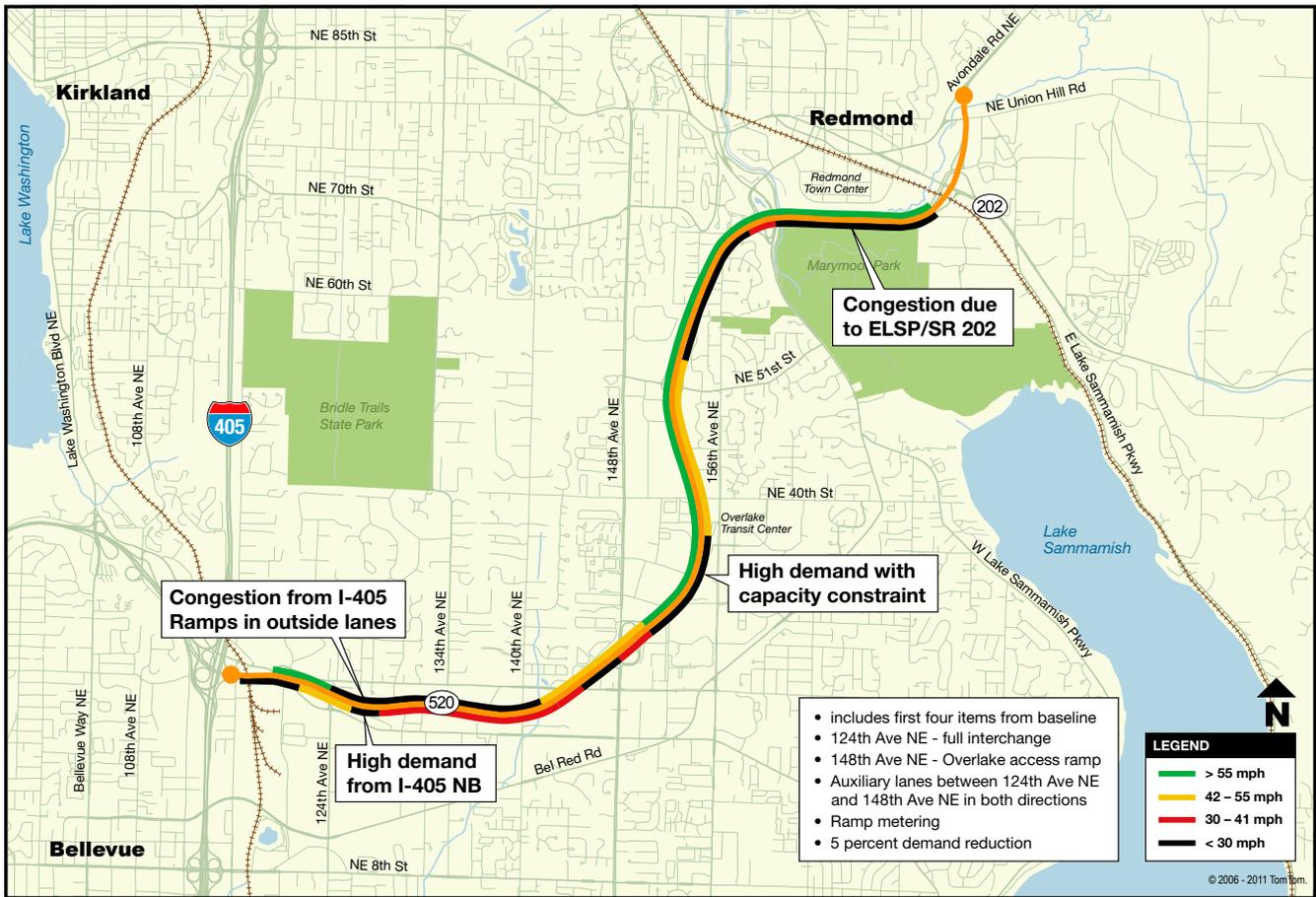


Exhibit 4.30: 2030 Scenario 1 - P.M. Peak Hour Operating Speeds - Map



With operational efficiencies (i.e., ramp metering) and a 5% trip reduction based on the Transportation Demand Management (TDM) strategies, the SR 520 mainline demand is still over capacity on several segments. Westbound SR 520 approaching the I-405 interchange remains congested, while traffic on the eastbound approaching the SR 202 off-ramp results from the congestion spilling back from the East Lake Sammamish Parkway/SR 202 intersection.

How will the Ramp Termini and nearby Intersections Operate in the Future If only the Improvements in Scenario 1 are Implemented?

If Scenario 1 improvements are implemented along with operational efficiencies and TDM strategies, the following ramp termini and intersections would operate at LOS E or LOS F in the 2030 a.m. peak hour (Exhibit 4.31).

Ramp Termini operating at LOS E or below:

- 2. SR 520 eastbound ramps & 124th Avenue NE (future ramp terminus) (LOS F if not signalized, LOS B if signalized)
- 10. SR 520 westbound ramps & West Lake Sammamish Parkway (LOS E)
- 13. SR 520 & Union Hill Road (LOS F)

Intersection operating at LOS E or below:

- 23. Redmond Way (SR 202) & East Lake Sammamish Parkway NE (LOS F)

Exhibit 4.31: 2030 Scenario 1 - A.M. Peak Hour LOS of Intersections



In the 2030 p.m. peak hour, more than half of the analyzed ramp termini and intersections will operate at LOS E or LOS F (Exhibit 4.32.) After considering operational efficiencies and TDM strategies along with Scenario 1 improvement, the intersection at the SR 520 eastbound ramps and 124th Avenue NE would improve to LOS B if it is operated as a signalized intersection.

Compared to the baseline condition, the LOS at some intersections would worsen because of the general growth of traffic and additional traffic brought in by the improvements assumed in Scenario 1.

Exhibit 4.32: 2030 Scenario 1 - P.M. Peak Hour LOS of Intersections and Ramp Termini



Ramp termini operating at LOS E or LOS F:

1. SR 520 ramps/Northrup Way & 124th Avenue NE (LOS E)
2. SR 520 eastbound ramps & 124th Avenue NE (future ramp terminus) (LOS F if not signalized, LOS B with signal)
9. SR 520 eastbound ramps & West Lake Sammamish Parkway (LOS F)
10. SR 520 westbound ramps & West Lake Sammamish Parkway (LOS F)
11. SR 520 eastbound off-ramp & SR 202 (LOS E)
13. SR 520 & Union Hill Road (LOS F)

Arterial intersections operating at LOS E or LOS F:

14. Bellevue-Redmond Road & 148th Avenue NE (LOS F)
15. NE 20th Street & 148th Avenue NE (LOS E)
16. NE 24th Street & 148th Avenue NE (LOS F)
18. NE 40th Street & 148th Avenue NE (LOS E)
19. NE 40th Street & 156th Avenue NE (LOS E)
20. NE 51st Street & 148th Avenue NE (LOS F)
21. NE 51st Street & 156th Avenue NE (LOS F)
22. NE 70th Street & Redmond Way (SR 202) (LOS F)
23. Redmond Way (SR 202) & East Lake Sammamish Parkway NE (LOS F)

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