Downtown Redmond Link Extension
SEPA Addendum

Appendix A
Transportation
Technical Report Addendum

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ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

ADA	Americans with Disabilities Act
AWSC	all-way stop controlled
CBD	Central Business District
CFR	Code of Federal Regulations
DART	Demand Area Response Transit
EB	eastbound
FAZ	Forecast Analysis Zone
FGTS	Freight Goods Transportation System
Final EIS	East Link Light Rail Transit Project Final Environmental Impact Statement
HOT	high-occupancy toll
I-405	Interstate 405
LOS	level of service
LUV	Land Use Vision
Metro	King County Metro Transit
MEV	million entering vehicles
MOE	measure of effectiveness
mph	miles per hour
NB	northbound
NEPA	National Environmental Policy Act
PSRC	Puget Sound Regional Council
RCW	Revised Code of Washington
ROD	Record of Decision
RPZ	residential parking zone
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SB	southbound
sec/veh	seconds per vehicle
SEPA	State Environmental Policy Act
Sound Transit	Central Puget Sound Regional Transit Authority
SR	State Route
ST3	Sound Transit 3
TWSC	two-way stop controlled
USC	United States Code
v/c	volume-to-capacity
WB	westbound
WSDOT	Washington State Department of Transportation

1 INTRODUCTION

The Downtown Redmond Link Extension Project will add 3.4 miles of light rail from the interim terminus at the Redmond Technology Center Station (formerly called the Overlake Transit Center Station) to downtown Redmond. Light rail will travel along State Route (SR) 520 with two new stations: the SE Redmond Station east of Marymoor Park, and the Downtown Redmond Station.

This Transportation Technical Report provides an updated evaluation of existing and future transportation impacts as well as potential mitigation associated with proposed refinements to the project selected by the Sound Transit Board in 2011 (2011 Project). The 2011 Project is the same as the Preferred Alternative in Segment E, Marymoor Alternative E2, considered in the 2011 East Link Final Environmental Impact Statement (Final EIS) and Record of Decision (ROD) (FTA et al. 2011; FTA 2011; FHWA 2011). The Downtown Redmond Link Extension corresponds to Segment E evaluated in the Final EIS and Appendix H1, Transportation Technical Report (FTA et al. 2011). The Sound Transit Board passed an additional resolution in April 2013, Resolution R2013-09, "Selecting the route, profiles, and station locations for the East Link Light Rail Project, and superseding Resolution No. R2011-10." The 2013 resolution maintains the same alignment in Segment E as presented in the 2011 resolution, Final EIS, and ROD. Sound Transit has identified project refinements to the 2011 Project in Segment E. These modifications are referred to as the Proposed Design Refinements. A summary of the information in this report is provided in Chapter 3, Transportation Impacts and Mitigation, of the Downtown Redmond Link Extension SEPA Addendum.

1.1 Project Baseline

The Project Baseline represents the existing conditions in 2017 and 2018, including the transportation system and built environment as they would exist without the 2011 Project. It also provides a baseline condition for comparing impacts of the Proposed Design Refinements. Since publication of the Final EIS, several conditions have changed that influenced development of the Project Baseline for this Transportation Technical Report. These include the following:

- *Passage of the Sound Transit 3 (ST3) ballot measure*. In 2016, voters within the Central Puget Sound Regional Transit Authority (Sound Transit) district approved the ST3 ballot measure. This ballot measure funded a series of high-capacity transit system expansions throughout the region. The ST3 program provided funding for the Downtown Redmond Link Extension evaluated in this report. It also will expand the Link light rail service funded by the Sound Move and ST2 ballot measures, with extensions to West Seattle, Ballard, and Tacoma. The ST3 program also included bus rapid transit service on Interstate 405 (I-405) and SR 522, which will be in operation by 2035.
- *Adoption of METRO CONNECTS*. The King County Metro Transit (Metro) Long Range Plan, METRO CONNECTS, describes the agency's vision for local and regional transit service through 2040, including service and capital investments. METRO CONNECTS identifies planned transit service within the study area, including service to the Link light rail stations. The planned bus network and service levels vary from those identified in the Final EIS. Development of the service network was a highly collaborative effort with Sound Transit and cities in King County, including the City of Redmond. The process to develop the network assumed an integration of bus rapid transit with the expanded Link light rail system, as envisioned through completion of the ST3 program, as well as the planned land uses throughout King County.

- *Adoption of the Redmond Transportation Master Plan in 2013*. The 2013 Transportation Master Plan which is part of the Redmond Comprehensive Plan identifies the strategic framework that guides transportation decisions and investments over an 18-year period in support of Redmond's long-term vision. It includes strategies to prepare for light rail, improve travel choices and mobility, and increase neighborhood connections.
- *Adoption of the Marymoor Subarea Plan in June 2017*. The vision for the Marymoor Subarea is to transition over time to be a walkable, denser subarea of southeast Redmond that features opportunities for living, employment, community gathering, education, shopping, and commuting to other Redmond and regional destinations. The Marymoor Subarea Plan is part of the Redmond Comprehensive Plan. The subarea will be distinct from downtown Redmond and Overlake because it will have its own identity informed by its unique context, and especially by the natural features in and around it, and it will be less dense than Redmond's urban centers.

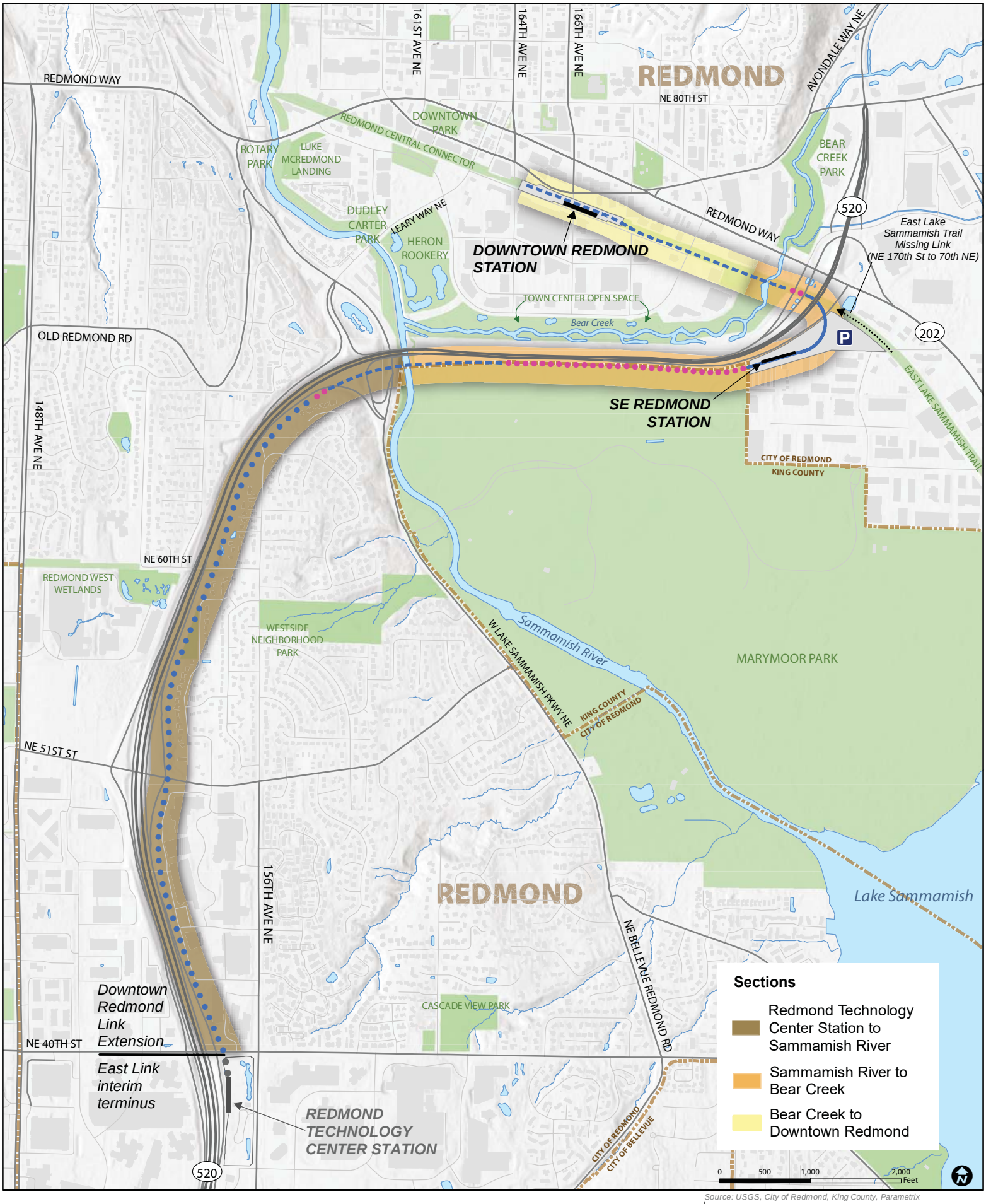
1.2 Proposed Design Refinements

The Downtown Redmond Link Extension starts at the East Link interim terminus near NE 40th Street, just past the Redmond Technology Center Station (formerly called Overlake Transit Center Station), and terminates just east of 164th Avenue NE. The Downtown Redmond Link Extension corridor was designated into three geographic sections: Redmond Technology Center Station to Sammamish River, Sammamish River to Bear Creek, and Bear Creek to Downtown Redmond. The Proposed Design Refinements are shown in Figure 1-1 and sections are described below. Because the East Link maintenance facility has been located in Bellevue, the Proposed Design Refinements do not include a maintenance facility location.

1.2.1 Redmond Technology Center Station to Sammamish River

In the section between the Redmond Technology Center Station and the Sammamish River, the light rail route runs parallel to the east side of SR 520. The alignment would generally be at-grade with SR 520 and use retained-cut sections to cut into the hillside and pass under existing overpasses at NE 40th Street, NE 51st Street, and NE 60th Street. As the alignment follows SR 520 and curves east, it transitions to an elevated structure crossing over the West Lake Sammamish Parkway NE interchange and the Sammamish River.

The alignment with the Proposed Design Refinements is similar to the 2011 Project, but has been modified in several locations to minimize impacts on adjacent roadways and to accommodate the Washington State Department of Transportation (WSDOT) planned improvements (WSDOT 2013). Between NE 40th Street and NE 51st Street, the alignment has been shifted up to 20 feet to maximize available WSDOT right-of-way and limit impacts on the adjacent property. The alignment has also been shifted up to 25 feet south of NE 60th Street and up to 30 feet near the West Lake Sammamish Parkway NE eastbound off-ramp.



Source: USGS, City of Redmond, King County, Parametrix

Figure 1-1
Alignment with Proposed Design Refinements
Downtown Redmond Link Extension

1.2.2 Sammamish River to Bear Creek

Between the Sammamish River and the SE Redmond Station, the Proposed Design Refinements are similar to the 2011 Project. The elevated guideway would be about 50 to 60 feet above the Sammamish River with the Proposed Design Refinements, which is approximately 15 to 20 feet lower than anticipated in the 2011 Project. The Proposed Design Refinements would transition from elevated to a retained-fill section as it crosses Marymoor Park, whereas the 2011 Project would transition from elevated to at-grade across the park. In the Proposed Design Refinements, the retained-fill section would be between 5 and 14 feet higher than the current ground level and would provide grade separation from Marymoor Park facilities. Similar to the 2011 Project, the Proposed Design Refinements alignment would transition to ground level as it enters the SE Redmond Station.

The major change in this section is related to the City of Redmond's plans allowing the Marymoor Subarea to develop around the SE Redmond Station as a transit-oriented neighborhood with mixed-use developments, including a revised street network and new trails connections. Station facilities for both the 2011 Project and the Proposed Design Refinements include a 1,400-stall parking garage in the same location just east of the SR 520 eastbound off-ramp as well as circulation for transit, passenger pick-up and drop-off, and connections to trails in the area. The Proposed Design Refinements would rebuild NE 70th Street, which is currently a dead-end street, to serve the station and surrounding land uses, and to connect to the SE Redmond street system consistent with City of Redmond plans.

From the SE Redmond Station, the alignment is similar to the 2011 Project, turning to the northwest, crossing underneath SR 520, and entering the former BNSF rail corridor. The Proposed Design Refinements would cross under SR 520 at-grade and require reconstruction of the SR 520 eastbound off-ramp and westbound on-ramp. The Proposed Design Refinements would slightly raise SR 202 (Redmond Way) and a short section of NE 76th Street to align with the reconstructed westbound on-ramp and its intersection, which would be modified. The Proposed Design Refinements and the 2011 Project alignment would rise to cross on a new bridge elevated about 3 to 6 feet over Bear Creek. The Proposed Design Refinements would also accommodate an at-grade trail connection between the East Lake Sammamish Trail and Redmond Central Connector Trail with a bridge over Bear Creek, which may be constructed by Sound Transit as part of the project with funding provided by King County, or funded and constructed by King County at a later time. This trail connection is a missing segment of King County's East Lake Sammamish Trail, and the Proposed Design Refinements' raising of the SR 520 ramps makes this at-grade connection possible.

The Bear Creek channel and its floodplain would be regraded and broadened to remove some past fill and constrictions in the floodplain from the existing bridge, which is no longer in use and would be removed. These improvements to the Bear Creek channel would complement restoration efforts completed downstream since 2011. The improvements were not contemplated and therefore not analyzed for the 2011 Project.

1.2.3 Bear Creek to Downtown Redmond

In the section between Bear Creek and downtown Redmond, the Proposed Design Refinements have the same general alignment but with some different features than the 2011 Project. After crossing over Bear Creek, the refined alignment would continue on an elevated structure, whereas the 2011 Project would return to grade. The alignment in downtown Redmond would shift slightly south of the 2011 Project alignment, and it would be shorter. The elevated Downtown Redmond Station and tail tracks would shift approximately 1,600 feet east compared to the 2011 Project. The Downtown Redmond Station would span 166th Avenue NE and remain in the existing rail corridor easement on the north side of NE 76th Street. Approximately 460 feet of tail tracks for train layover and turnback operations would continue west of the

station, terminating just east of 164th Avenue NE. Crossover tracks would be located just west of 170th Avenue NE in downtown Redmond, whereas the 2011 Project previously located the crossover track west of the SE Redmond Station.

1.3 Organization of this Technical Report

In addition to Chapter 1, Introduction, this report includes the following chapters:

- Chapter 2, Methods and Assumptions, summarizes the analysis methods used to assess the Proposed Design Refinements in this report.
- Chapter 3, Relevant Plans, Policies, and Coordination, provides information regarding guiding regulations, plans, and policies, including agency participation in the planning and analysis process.
- Chapter 4, Affected Environment, discusses the existing 2017 transportation conditions.
- Chapter 5, Environmental Impacts During Operation, describes long-term impacts on all modes of travel.
- Chapter 6, Potential Mitigation Measures, describes the measures that could be implemented to mitigate the potential effects of the project.
- Chapter 7, Construction Impacts and Mitigation Measures, discusses expected impacts due to project construction activities.

2 METHODS AND ASSUMPTIONS

The methodology and assumptions used to analyze the transportation impacts for the Proposed Design Refinements are discussed in detail in a Transportation Methodology and Assumptions Report (Parametrix 2017). The following information from that report is included in Attachment A:

- Summary of the transportation methodology, including study area selection, years of analysis, and study time period
- Description of data collected to establish the affected environment
- Description of travel demand forecasting assumptions and models used as well as assumptions used for future freight, transit, and nonmotorized volumes
- Summary of traffic operations analysis, including agency level of service thresholds, and analysis tools
- Identification of construction and operational impacts for arterials and local streets, freeways, freight, transit, nonmotorized facilities, parking, and safety

3 RELEVANT PLANS, POLICIES, AND COORDINATION

3.1 Guiding Regulations, Plans, and/or Policies

The transportation analysis will be guided by the following laws and regulations:

- National Environmental Policy Act (NEPA)
- State Environmental Policy Act (SEPA)
- Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), Public Law 109-59
- Code of Federal Regulations (CFR) 23 Part 450 (implementing United States Code [USC] 23, Section 111, which requires the U.S. Secretary of Transportation to approve access revisions to the Interstate System)
- CFR 23 Part 771 (Environmental Impact and Related Procedures)
- Washington State Growth Management Act (Revised Code of Washington [RCW] 36.70A.070)

In addition to the laws and regulations identified above, analysis of the local transportation impacts will be guided by the policy direction established in the numerous plans or policy documents adopted by jurisdictions within the project corridor. These include, but are not limited to:

- East Link Project Draft EIS, December 2008
- East Link Project Supplemental Draft EIS, November 2010
- East Link Project Final EIS, July 2011
- Record of Decision for Sound Transit's East Link Light Rail Transit Project, November 2011
- Sound Transit Board Resolution R2013-09, April 2013
- ST3, approved November 8, 2016
- King County METRO CONNECTS Long Range Plan, 2016
- Washington Transportation Plan 2007–2026 (WSDOT, November 14, 2006)
- WSDOT Design Manual
- WSDOT Development Service Manual (M.3007.00)
- Puget Sound Regional Council (PSRC) Transportation 2040: Toward a Sustainable Transportation System
- Comprehensive and/or Transportation Plans for the City of Redmond, as well as King County
- 6-Year Capital Improvement Program for the City of Redmond, as well as King County

3.2 Agency Coordination

The transportation planning and analysis process will involve local jurisdictions, state agencies, federal agencies, transit agencies, PSRC, and other interested parties.

3.2.1 Lead Agency

The Federal Transit Administration will be the NEPA lead agency, and Sound Transit is the SEPA lead agency for development of the Downtown Redmond Link Extension SEPA Addendum in accordance with NEPA regulations.

3.2.2 Cooperating and Partner Agencies

For development of this Transportation Technical Report, Sound Transit staff and consultants met with and/or provided opportunity for coordination with staff planners and engineers from the cooperating and participating agencies for this project:

- WSDOT
- City of Redmond
- King County Department of Transportation Metro Transit
- King County Department of Natural Resources and Parks
- King County Department of Permitting and Environmental Review

4 AFFECTED ENVIRONMENT

This chapter discusses the affected environment for the transportation analysis by defining the study area and describing the 2017 existing transportation conditions.

4.1 Selected Study Area

The study area, shown on Figure 4-1, was defined as the general area bounded by 148th Avenue NE to the west, NE 85th Street to the north, Sahalee Way NE to the east, and just south of NE 40th Street to the south. The boundaries of the study area were selected in consultation with WSDOT, King County, and the City of Redmond, and correspond to Segment E that was evaluated in the Final EIS.

4.2 Arterial and Local Street Operations

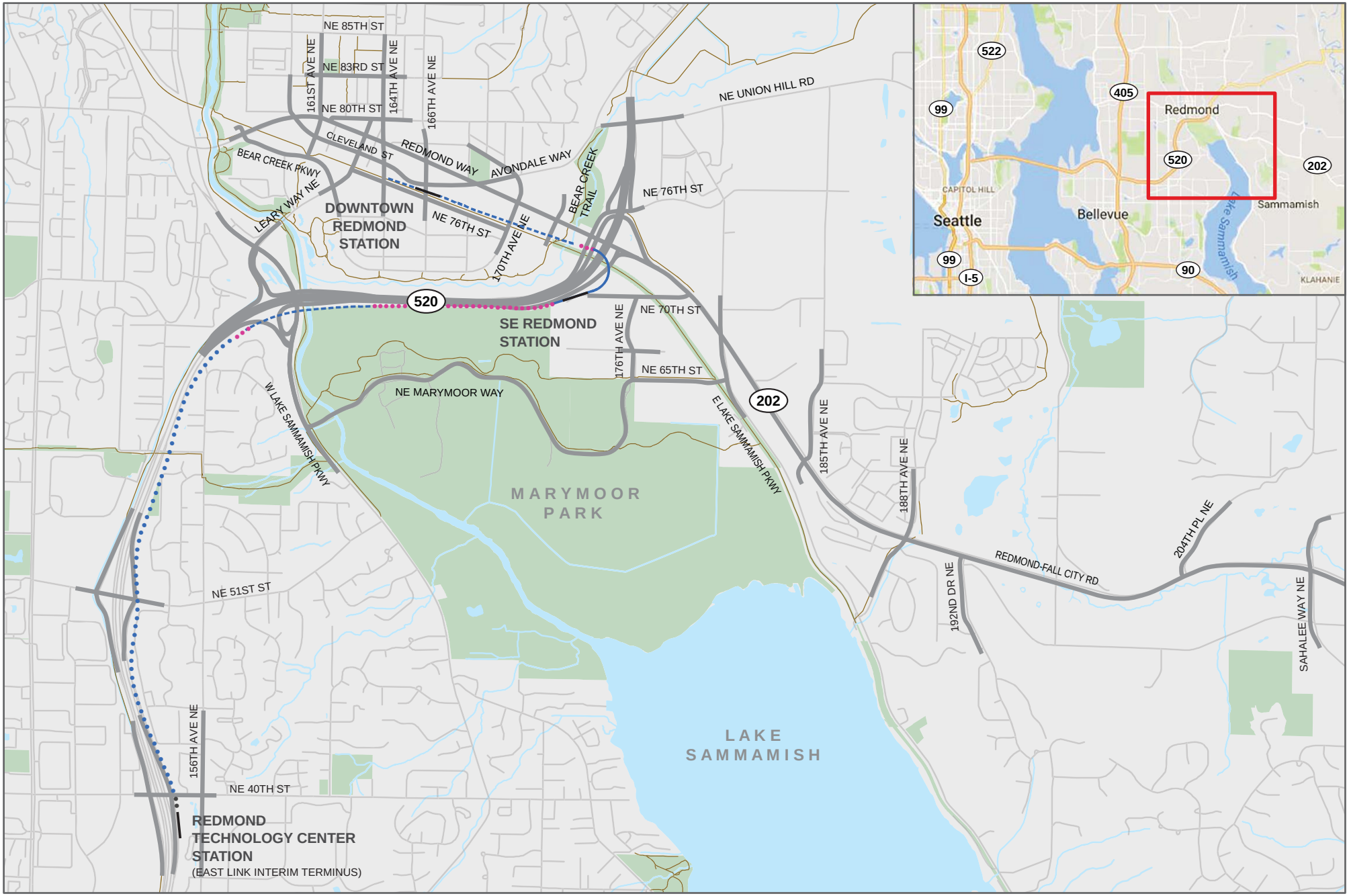
This section describes the existing transportation facilities, service types, and conditions in the study area including:

- Roadway Network
- Intersections
- Traffic Volumes and Operations
- Freight
- Transit
- Nonmotorized Facilities
- Parking
- Safety

Additional traffic data were collected in 2015 and 2016; however, 2017 still serves as the baseline year. The traffic data and transportation facilities are approximately the same in 2015 and 2016 as in 2017.

4.2.1 Roadway Network

The street network in the study area includes arterial, collector, and local streets, which are summarized in Table 4-1. Figure 4-2 shows the street network and classifications.



N

0 1,000 2,000

Feet

Roadway Study Area

Station Platform

At-Grade

Elevated

Retained Fill

Retained Cut

Figure 4-1

Study Area for Transportation Analysis

Downtown Redmond Link Extension

Table 4-1. Study Area Street Network Classifications

Roadway	Arterial Classification	Number of Lanes	Speed Limit (mph)
156th Avenue NE (NE 36th Street to NE 45th Street)	Minor Arterial	4	35
160th Avenue NE	Collector Arterial	2	30
161st Avenue NE	Collector Arterial	2	30
164th Avenue NE	Minor Arterial	2	30
166th Avenue NE	Collector Arterial	2	30
168th Avenue NE	Connector Street	2	25
170th Avenue NE (168th Avenue NE to Redmond Way)	Principal Arterial	3-5	30
170th Avenue NE (Redmond Way to Avondale Way)	Minor Arterial	2	25
176th Avenue NE (NE 65th Street to NE 70th Street)	Collector Arterial	2	25
176th Avenue NE (NE 70th Street to Redmond Way)	Connector Street	2	30
180th Avenue NE	Collector Arterial	2	35
185th Avenue NE	Collector Arterial	2	30
187th Avenue NE	Connector Street	2	25
188th Avenue NE	Minor Arterial	2	35
NE 40th Street (150th Avenue NE to 156th Avenue NE)	Minor Arterial	4	35
NE 51st Street (150th Avenue NE to 156th Avenue NE)	Minor Arterial	4	35
NE 65th Street	Collector Arterial	2	25
NE 67th Street (173rd Avenue NE to 177th Avenue NE)	Collector Arterial	2	25
NE 70th Street	Collector Arterial	2-4	30
NE 76th Street (Downtown)	Connector Street	2	25
NE 76th Street (SR 202 to 185th Avenue NE)	Collector Arterial	2	25
NE 80th Street	Collector Arterial	2	25
NE 83rd Street	Collector Arterial	2	25
Leary Way NE	Minor Arterial	2-4	25-30
West Lake Sammamish Parkway	Principal Arterial	4	35
Redmond Way (couplet)	Minor Arterial	3	30
Redmond Way (Avondale Way to SR 520)	Principal Arterial	6	30
Cleveland Street (couplet)	Collector Arterial	2	30
Avondale Road NE	Principal Arterial	4-5	40
Avondale Way NE	Minor Arterial	3	30
Bear Creek Parkway	Principal Arterial	3-5	30
East Lake Sammamish Parkway	Minor Arterial	2-4	35
NE Union Hill Road	Minor Arterial	4	30-35
SR 202	Principal Arterial	6	45
SR 520	State Highway	6	60

mph = miles per hour

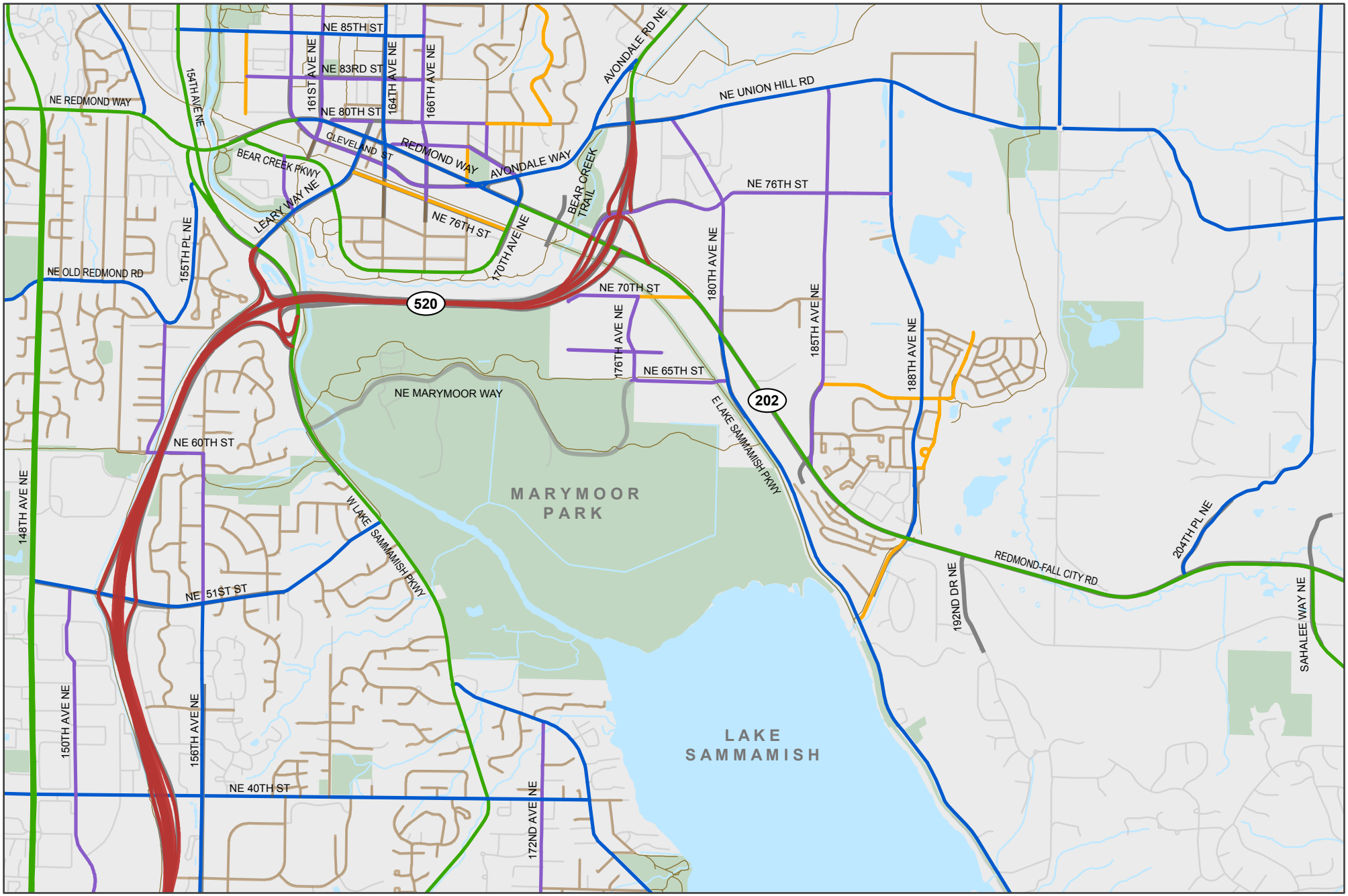


Figure 4-2
Study Area Street Network Classifications
Downtown Redmond Link Extension

4.2.2 Study Intersections

The transportation analysis was completed for 48 intersections in the study area, as shown on Figure 4-3. These intersections are listed in Table 4-2. The intersections that were analyzed were those directly affected, such as by a change in channelization, signal control, or station trips, as well as those indirectly affected by changes in volume due to trips accessing the system. These intersections were identified based on the Final EIS analysis in Segment E and were expanded to include additional intersections based on discussions with local agency staff.

Table 4-2. Study Area Intersections

ID[1]	Intersection Location	AM Peak Hour	PM Peak Hour
1	Redmond Way/Bear Creek Parkway		X
2	Redmond Way/160th Avenue NE/Cleveland Street[2]		X
3	Redmond Way/161st Avenue NE[2]		X
4	Redmond Way/NE 80th Street[2]		X
5	Redmond Way/Leary Way NE[2]		X
6	Redmond Way/164th Avenue NE[2]		X
7	Redmond Way/166th Avenue NE[2]		X
8	Redmond Way/168th Avenue NE/Cleveland Street[2]		X
9	Redmond Way/Avondale Way[2]		X
10	Redmond Way/170th Avenue NE	X	X
11	NE 83rd Street/161st Avenue NE		X
12	Cleveland Street/161st Avenue NE[2]		X
13	Bear Creek Parkway/161st Avenue NE		X
14	Cleveland Street/Leary Way NE[2]		X
15	NE 76th Street/Leary Way NE		X
16	Bear Creek Parkway/Leary Way NE		X
17	NE 83rd Street/164th Avenue NE		X
18	NE 80th Street/164th Avenue NE		X
19	Cleveland Street/164th Avenue NE[2]		X
20	NE 76th Street/164th Avenue NE		X
21	Cleveland Street/166th Avenue NE[2]		X
22	NE 76th Street/166th Avenue NE		X
23	NE 76th Street/170th Avenue NE		X
29	Redmond Way/Bear Creek Crossing	X	X
30	Redmond Way/SR 520 Westbound On-Ramp/NE 76th Street	X	X
31	Redmond Way/SR 520 Eastbound Off-Ramp	X	X
32	Redmond Way/NE 70th Street	X	X
33	Redmond Way/East Lake Sammamish Parkway NE	X	X
34	East Lake Sammamish Parkway NE/NE 65th Street	X	X
35	176th Avenue NE/NE 70th Street	X	X
36	176th Avenue NE/NE 67th Court	X	X
37	176th Avenue NE/NE 65th Street/NE Marymoor Way	X	X
38	NE 76th Street/SR 520 Westbound Off-Ramp	X	X
39	NE 76th Street/SR 520 Eastbound On-Ramp/Fred Meyer	X	X
40	SR 520/NE Union Hill Road/Avondale Road NE	X	X

Table 4-2. Study Area Intersections (continued)

ID[1]	Intersection Location	AM Peak Hour	PM Peak Hour
41	West Lake Sammamish Parkway NE/SR 520 Westbound On-Ramp/ Leary Way NE	X	X
42	West Lake Sammamish Parkway NE/SR 520 Eastbound On-Ramp	X	X
43	West Lake Sammamish Parkway NE/NE Marymoor Way	X	X
44	Redmond-Fall City Road/185th Avenue NE	X	X
45	Redmond-Fall City Road/188th Avenue NE	X	X
46	Redmond-Fall City Road/192nd Drive NE	X	X
47	Redmond-Fall City Road/204th Place N	X	X
48	Redmond-Fall City Road/Sahalee Way NE/NE 58th Street	X	X
51	NE 51st Street/SR 520 Westbound Off-Ramp and On-Ramp	X	X
52	NE 51st Street/SR 520 Eastbound Off-Ramp and On-Ramp	X	X
61	NE 40th Street/SR 520 Westbound Off-Ramp and On-Ramp	X	X
62	NE 40th Street/SR 520 Eastbound Off-Ramp and On-Ramp	X	X
63	NE 40th Street/156th Avenue NE	X	X

[1] The intersection numbering is not consecutive for traffic operations model organization purposes.

[2] Because of substantial construction activity occurring in 2017, intersections in the downtown Redmond area were not collected. Previous turn-movement counts collected in 2015 were used and were grown/balanced to match 2017 traffic volumes at study intersections in the vicinity.

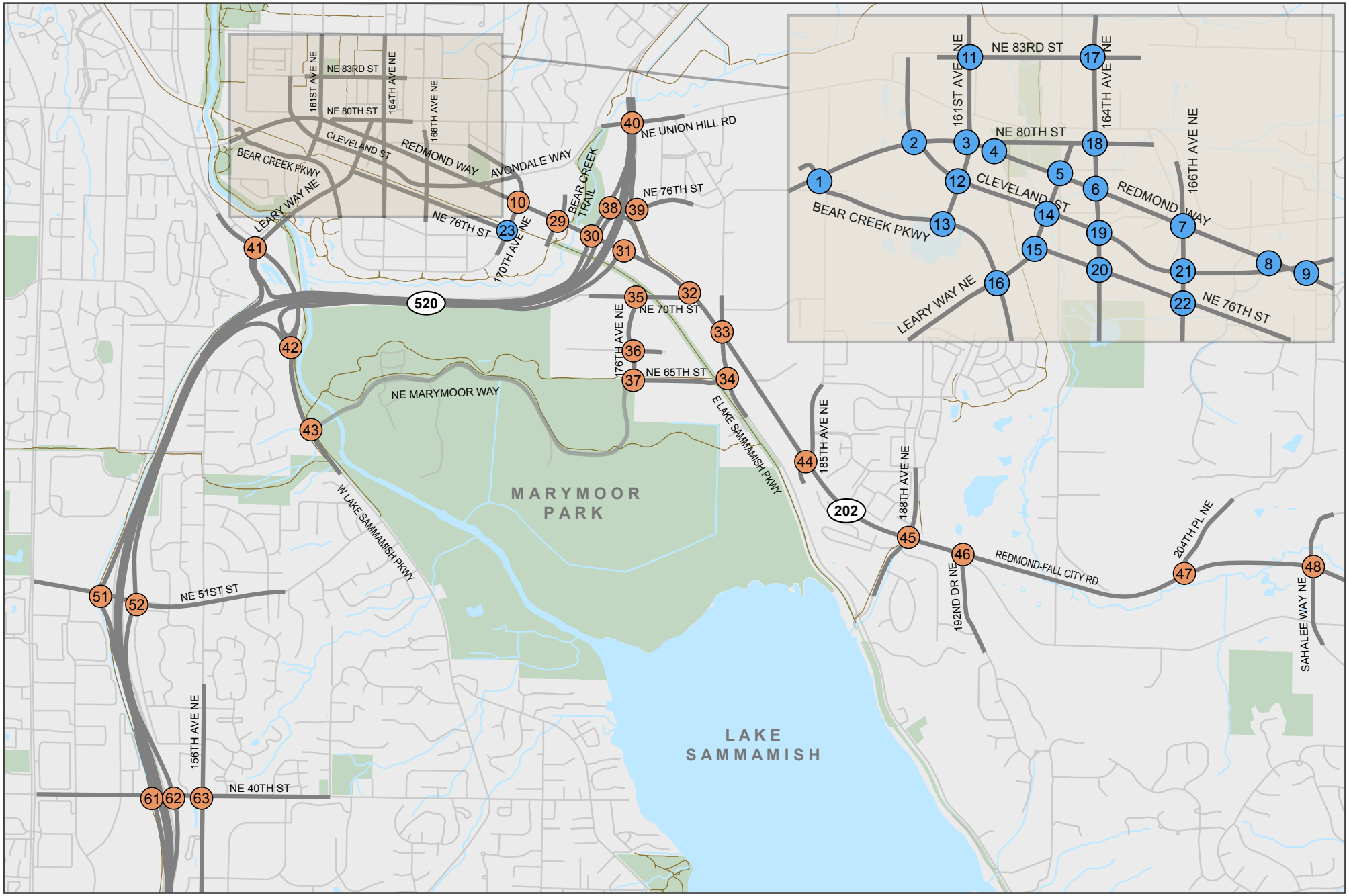
Intersection operations on major arterials and roadways in the vicinity of the Downtown Redmond Station (23 intersections) were analyzed for the PM peak hour only. Because the traffic patterns are anticipated to change significantly with the opening of stations with parking facilities, the intersection analysis was completed for major arterials and roadways in the vicinity of the SE Redmond Station and Redmond Technology Center (25 intersections) for both the AM peak hour and PM peak hour.

4.2.3 Traffic Volumes and Operations

Traffic Volumes

This section describes the existing AM and PM peak period weekday turning movement counts at intersections as well as daily counts. Weekday turning movement counts were collected over a 3-day period (June 6 to 8, 2017) in the AM peak period between 7 and 9 a.m. and in the PM peak period between 4 and 6 p.m. For roadways undergoing construction—Redmond Way and Cleveland Street between 160th Avenue NE and Avondale Way—new 2017 traffic counts were not collected; instead, historical 2015 traffic volumes were grown to 2017 volumes using a historical growth rate of 1 percent per year in the area. The volumes were then balanced to account for differences in count years. AM peak hour turning movement counts were collected at 25 study area intersections and PM peak hour turning movement counts were collected at 48 study area intersections, as indicated in Table 4-2. The turning movement counts included the total number of general-purpose vehicles, medium and large freight vehicles, pedestrians, and bicycles.

Figure 4-4 shows existing AM and PM peak hour turning movements at the study area intersections for the common peak hours of 8 to 9 a.m. and 4:45 to 5:45 p.m. All vehicle counts were averaged over the 3-day period and were rounded to the nearest five vehicles to account for daily fluctuations. For intersections that had between one and four vehicles recorded, the number was rounded to provide a conservative estimate of impacts.



0 1,000 2,000
Feet

X Intersection Analyzed in the AM & PM Peaks

X Intersection Analyzed in the PM Peak Only

Figure 4-3
Study Area Analysis Intersections
Downtown Redmond Link Extension

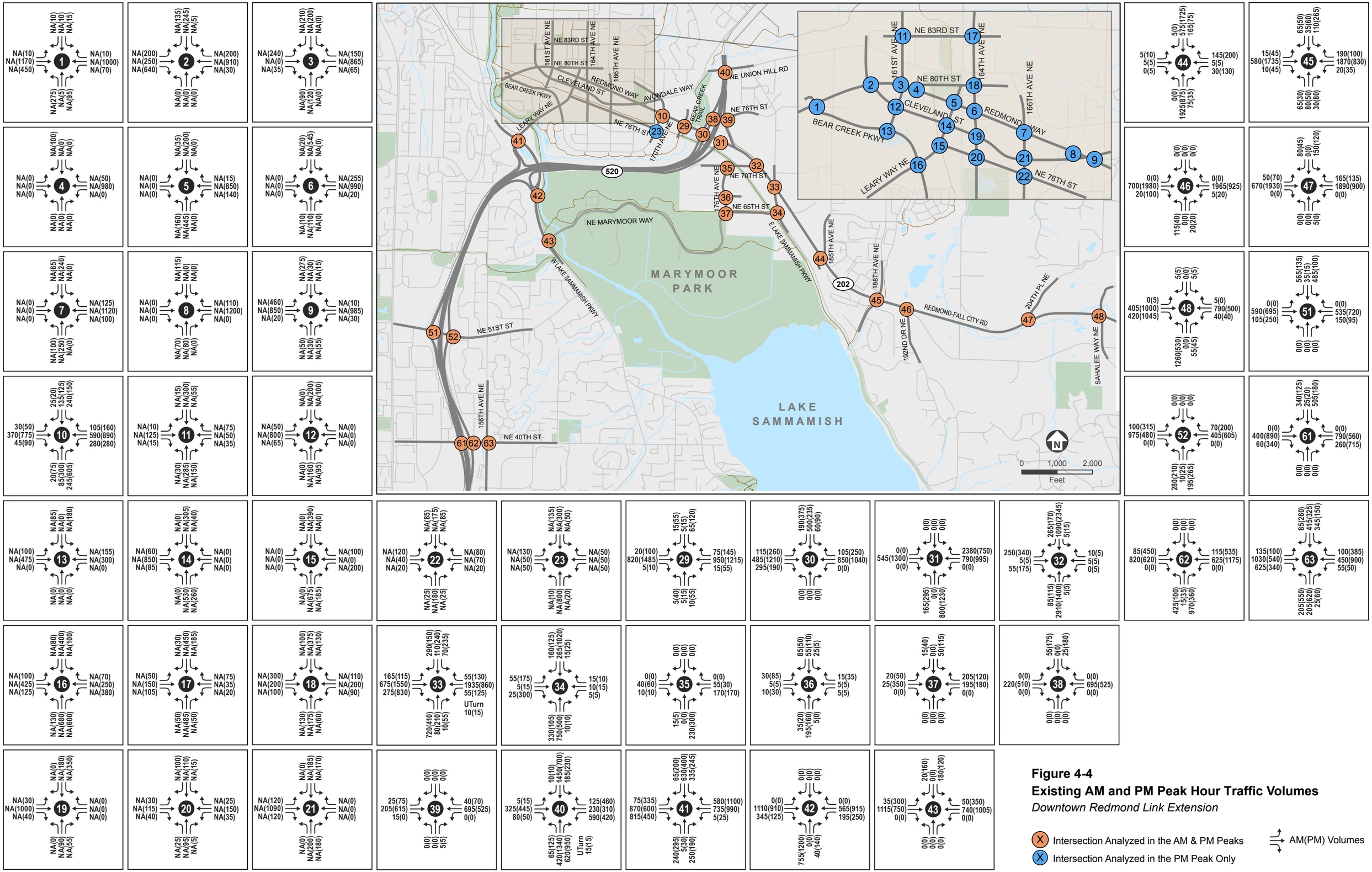


Figure 4-4
Existing AM and PM Peak Hour Traffic Volumes
Downtown Redmond Link Extension

X Intersection Analyzed in the AM & PM Peaks
X Intersection Analyzed in the PM Peak Only
AM(PM) Volumes

Daily (24-hour) traffic counts were collected over a 3-day period at three locations in the study area. Table 4-3 summarizes the average daily (24-hour) traffic volumes. This information assisted with tracking traffic trends over time and allowed for a comparison to the City of Redmond historical traffic counts in the study area.

Table 4-3. Average Daily Traffic Volumes

Location	Average Daily Traffic Volumes
Redmond Way between Bear Creek Parkway and 160th Avenue NE	22,600
Redmond Way west of NE 76th Street	34,000
Redmond Way north of NE 70th Street	55,000

Intersection Operations

The operations analysis for the study intersections used the software programs Synchro (version 9.1) for signalized and unsignalized intersections and SIDRA (version 6.1) for roundabout controlled intersections. Synchro is a macroscopic analysis and optimization software application that supports the Transportation Research Board Highway Capacity Manual's methodology (2000 and 2010 methods) for signalized and unsignalized intersections and creates optimized signal timing plans for intersections and corridors. Synchro analyzes intersections in isolation and does not take into account downstream congestion. Actual intersection operations may have more delay based on intersection interactions and queuing propagating upstream and downstream between intersections. SIDRA is an analytical traffic evaluation software application that uses lane-by-lane and vehicle path models to provide estimates of capacity. The roundabout analysis was consistent with WSDOT's SIDRA Policy and Settings[1]. Attachment A describes the software tools in more detail.

A common method of measuring traffic operations is level of service (LOS), defined in terms of average intersection delay on a scale ranging from A to F, depending on the delay conditions at the intersection. LOS A represents the best conditions with minimal delay, and LOS F represents the worst conditions with severe congestion. Two factors determine delay: (1) the capacity of the intersection as defined by the number of lanes, lane widths, pedestrian volumes, and other features; and (2) signal timing. Capacity, delay, and LOS are calculated for each traffic movement or group of traffic movements at an intersection. The weighted average delay across all traffic movements determines the overall LOS for a signalized intersection.

The LOS at unsignalized intersections that are stop-controlled on one or two approaches are also defined in terms of delay, but only for the worst stop-controlled approach, which is typically the minor street. For unsignalized intersections that are stop-controlled on each approach, the average intersection delay is reported. The delay thresholds are lowered for stop-controlled intersections because driver behavior considerations make delays at stop-controlled intersections more onerous. For example, at signalized intersections, drivers may relax during the red interval while waiting for the green interval, but drivers on the stopped approach of a stop-controlled intersection must remain attentive to identifying acceptable gaps in traffic. Table 4-4 summarizes the criteria used to define LOS.

The LOS criteria for roundabouts is the same as for signalized intersections but are supplemented by other measures of effectiveness (MOEs). The MOEs for roundabouts in order of importance are volume-to-capacity (v/c) ratios, percent stopped, queues, and then LOS. If v/c is equal to or more than

[1] http://www.wsdot.wa.gov/design/traffic/analysis/

0.9, microsimulation may be used to closely examine the volumes at the roundabout intersections. The v/c ratio evaluates the congestion of an intersection, approach, or movement based on the observed volume compared to the capacity of the intersection, approach, or movement. As shown in Table 4-5, LOS F is assigned to individual lanes in roundabouts regardless of the control delay if the v/c ratio exceeds 1.0. For overall intersection and approaches at roundabouts, LOS is measured solely against the control delay thresholds.

Table 4-4. Level of Service Criteria

LOS	Average Control Delay (seconds per vehicle [sec/veh])		Traffic Flow Characteristics
	Signalized/ Roundabout Intersections	Unsignalized Intersection	
A	< 10	< 10	Virtually free flow; completely unimpeded.
B	> 10 and < 20	> 10 and < 15	Stable flow with slight delays; less freedom to maneuver.
C	> 20 and < 35	> 15 and < 25	Stable flow with delays; less freedom to maneuver.
D	> 35 and < 55	> 25 and < 35	High density but stable flow.
E	> 55 and < 80	> 35 and < 50	Operating conditions at or near capacity; unstable flow.
F	> 80	> 50	Forced flow; breakdown conditions.

Note: The LOS criteria are based on control delay, which includes initial deceleration delay, final deceleration delay, stopped delay, and queue move-up time.
Source: Transportation Research Board Highway Capacity Manual, 2010

Table 4-5. Level of Service Thresholds for Roundabouts

Control Delay at Roundabouts (sec/veh)	LOS by Volume-to-Capacity Ratio	
	v/c < 1.0	v/c > 1.0
≤ 10	A	F
> 10 and ≤ 20	B	F
> 20 and ≤ 35	C	F
> 35 and ≤ 55	D	F
> 55 and ≤ 80	E	F
> 80	F	F

Note: For approaches and overall intersection assessment, LOS is defined solely by control delay.
Source: Transportation Research Board Highway Capacity Manual, 2010

An intersection analysis was prepared for the existing conditions and reviewed against LOS standards to determine whether the intersections operate at an acceptable LOS. For state highways of statewide significance, such as SR 520, the operating threshold in urban areas is LOS D, and this includes the ramp terminal intersections. For regionally significant state highways, such as SR 202 (Redmond Way and Redmond-Fall City Road), the operating threshold is LOS E/mitigated, meaning that congestion should be mitigated when the PM peak hour LOS falls below LOS E (i.e., LOS F).

The City of Redmond has adopted the following LOS standards for intersection operations:

1. If the intersection will operate at LOS D or better in the forecasted year with the proposed project, no mitigation is required.
2. If the intersection will operate at LOS E or F in the forecasted year with the proposed project and the addition of the project traffic decreases the LOS, mitigation may be required to alleviate project impacts.

Figures 4-5 and 4-6 show existing AM and PM peak hour operations at the study intersections.

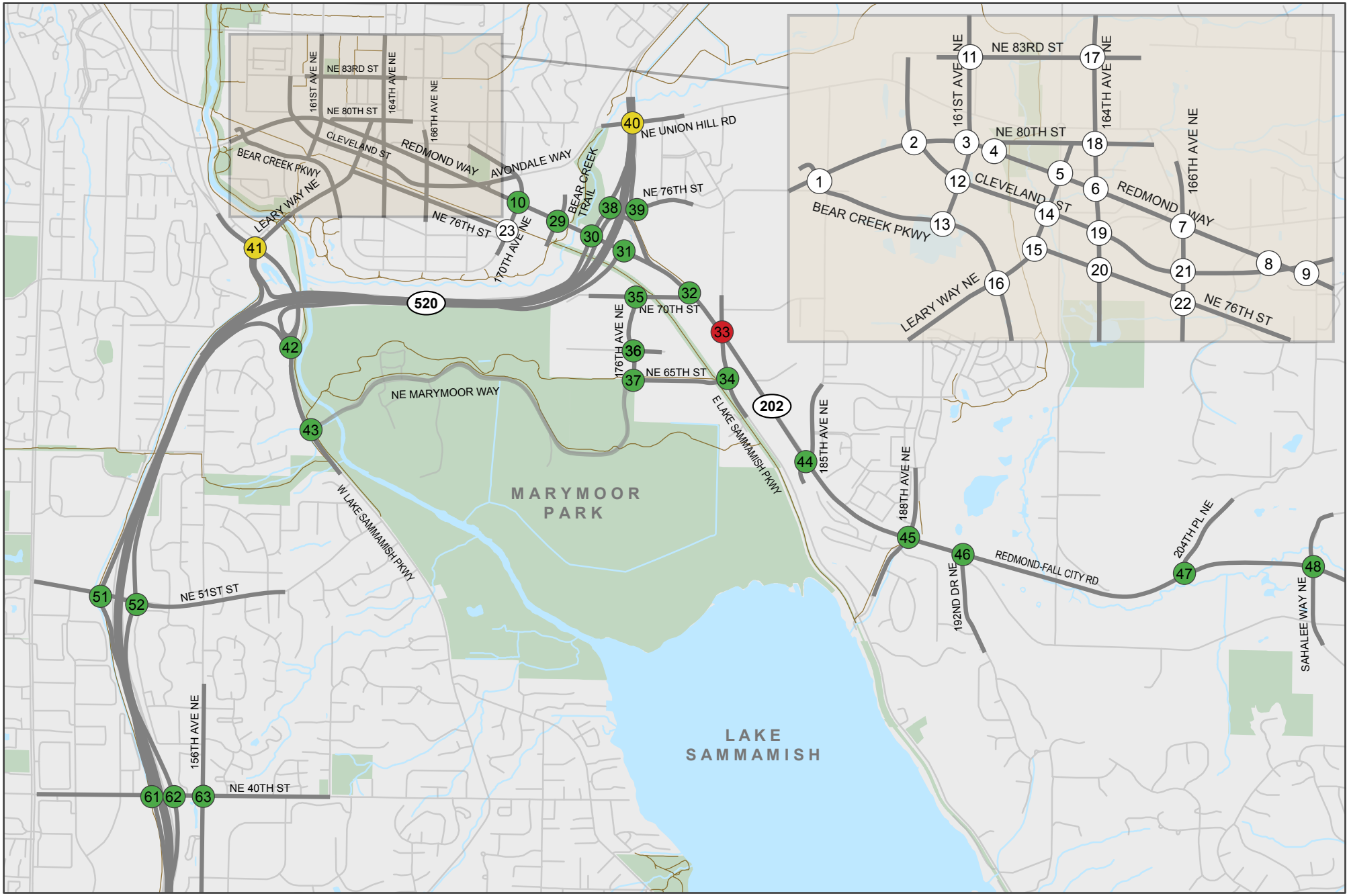
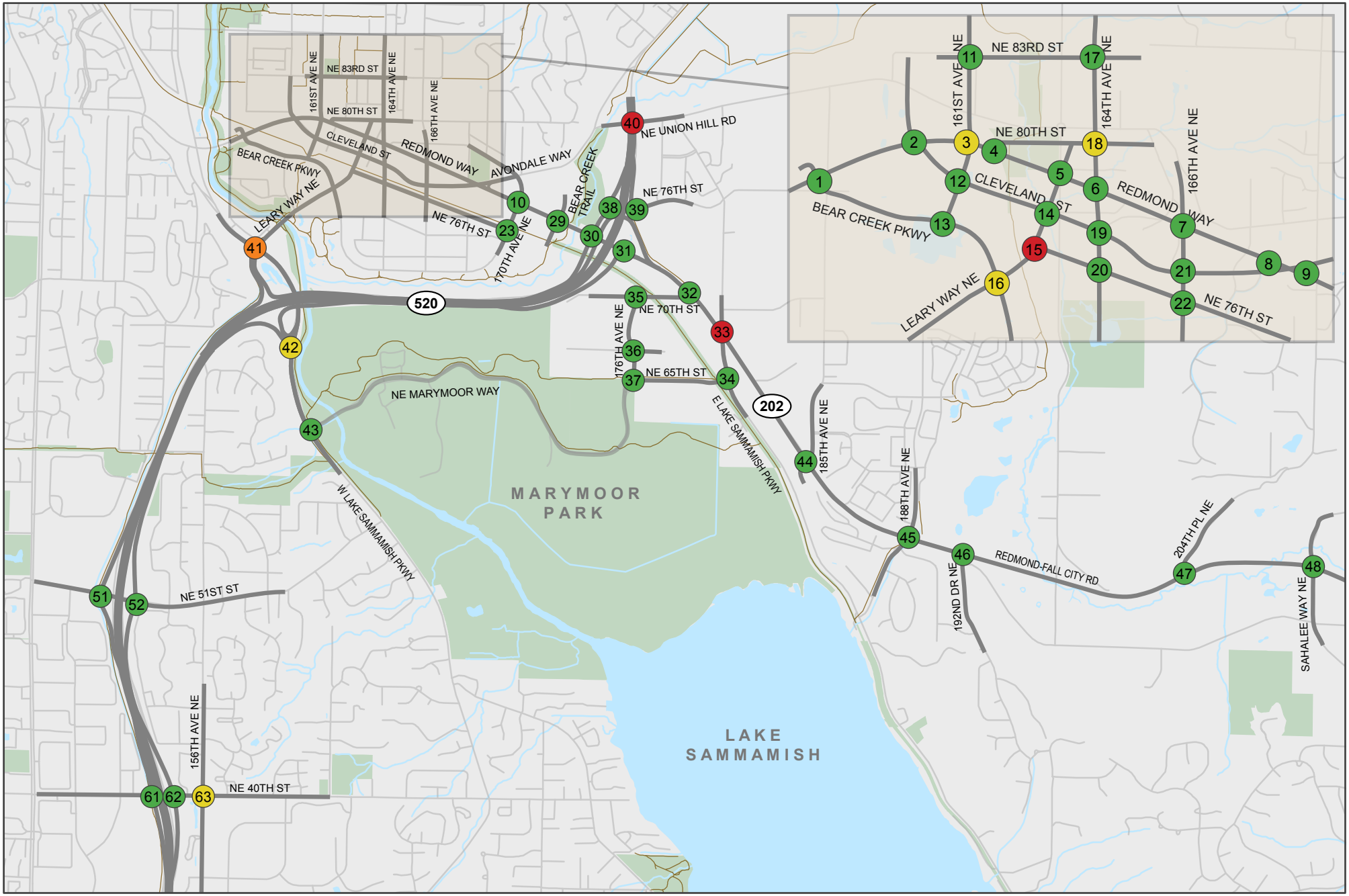


Figure 4-5
Existing Traffic Operations During AM Peak Hour
Downtown Redmond Link Extension



0 1,000 2,000
Feet

- LOS A-C
- LOS D
- LOS E
- LOS F
- No Analysis

Figure 4-6
Existing Traffic Operations During PM Peak Hour
Downtown Redmond Link Extension

AM Analysis

The existing AM peak hour LOS and delay for the study area intersections evaluated are shown in Table 4-6. All of the intersections in the study area operate at or better than the standard for the facility except Intersection #33 (Redmond Way and East Lake Sammamish Parkway/180th Avenue NE), which operates at LOS F in the AM peak hour.

Table 4-6. Existing AM Peak Hour Traffic Operations

				AM Peak[1]	
ID	Intersection	Control Type	Agency (Standard)	LOS	Delay (sec)
10	Redmond Way and 170th Avenue NE	Signal	City of Redmond (LOS D)	C	24
29	Redmond Way and Bear Creek Crossing	Signal	City of Redmond (LOS D)	A	7
30	Redmond Way and SR 520 Westbound On-Ramp/NE 76th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	33
31	Redmond Way and SR 520 Eastbound Ramp	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	14
32	Redmond Way and NE 70th Street	Signal	City of Redmond (LOS D)	B	15
33	Redmond Way and East Lake Sammamish Parkway/180th Avenue NE	Signal	City of Redmond (LOS D)	***F***	***91***
34	East Lake Sammamish Parkway and NE 65th Street	Signal	City of Redmond (LOS D)	A	7
35	176th Avenue NE and NE 70th Street	TWSC	City of Redmond (LOS D)	B	10
36	176th Avenue NE and NE 67th Street	TWSC	City of Redmond (LOS D)	B	12
37	176th Avenue NE and NE 65th Street	TWSC	City of Redmond (LOS D)	B	12
38	NE 76th Street and SR 520 Westbound Off-Ramp	TWSC	WSDOT Highways of Statewide Significance (LOS D)	C	16
39	NE 76th Street and SR 520 Eastbound On-Ramp/Fred Meyer	TWSC	WSDOT Highways of Statewide Significance (LOS D)	B	10
40	SR 520 and NE Union Hill Road/Avondale Road	Signal	City of Redmond (LOS D)	D	42
41	SR 520 Westbound Ramps and West Lake Sammamish Parkway/ Leary Way NE	Signal	WSDOT Highways of Statewide Significance (LOS D)	D	37
42	SR 520 Eastbound Ramp and West Lake Sammamish Parkway	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	26
43	West Lake Sammamish Parkway and NE Marymoor Way	Signal	City of Redmond (LOS D)	B	15
44	Redmond-Fall City Road and 185th Avenue NE	Signal	City of Redmond (LOS D)	B	13
45	Redmond-Fall City Road and 187th Avenue NE/188th Avenue NE	Signal	City of Redmond (LOS D)	B	10
46	Redmond-Fall City Road and 192nd Drive NE	Signal	WSDOT Regionally Significant Highway (LOS E)	A	5
47	Redmond-Fall City Road and 204th Place NE	Signal	WSDOT Regionally Significant Highway (LOS E)	B	14

Table 4-6. Existing AM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	AM Peak[1] LOS	AM Peak[1] Delay (sec)
48	Redmond-Fall City Road and Sahalee Way NE/NE 58th Street	Signal	WSDOT Regionally Significant Highway (LOS E)	C	31
51	SR 520 Westbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	30
52	SR 520 Eastbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	16
61	SR 520 Westbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	31
62	SR 520 Eastbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	29
63	NE 40th Street and 156th Avenue NE	Signal	City of Redmond (LOS D)	C	35

[1] Synchro analyzes intersections in isolation and does not take into account downstream congestion. Actual intersection operations may have more delay based on intersection interactions and queuing propagating upstream and downstream between intersections.

Cells highlighted in ***grey bold and italicized*** identify intersections that operate below the LOS standard for the facility.

Intersections were analyzed using the Synchro outputs for signalized intersections and 2010 Highway Capacity Manual outputs for unsignalized intersections.

TWSC = two-way stop controlled

PM analysis

The existing PM peak hour LOS and delay for the study area intersections evaluated are shown in Table 4-7.

The following four intersections operate below standard in the PM peak hour:

- Intersection #15: Leary Way and NE 76th Street
- Intersection #33: Redmond Way and East Lake Sammamish Parkway/180th Avenue NE
- Intersection #40: SR 520 and NE Union Hill Road/Avondale Road NE
- Intersection #41: SR 520 Westbound Ramps at West Lake Sammamish Parkway/Leary Way NE

Table 4-7. Existing PM Peak Hour Traffic Operations

ID	Intersection	Control Type	Agency (Standard)	PM Peak[1] LOS	PM Peak[1] Delay (sec)
1	Redmond Way and Bear Creek Parkway	Signal	City of Redmond (LOS D)	C	22
2	Redmond Way and Cleveland Street/160th Avenue NE	Signal	City of Redmond (LOS D)	B	18
3	Redmond Way and 161st Avenue NE	Signal	City of Redmond (LOS D)	D	38
4	Redmond Way and NE 80th Street	TWSC	City of Redmond (LOS D)	C	18
5	Redmond Way and Leary Way	Signal	City of Redmond (LOS D)	A	8
6	Redmond Way and 164th Avenue NE	Signal	City of Redmond (LOS D)	B	15

Table 4-7. Existing PM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	PM Peak[1]	
				LOS	Delay (sec)
7	Redmond Way and 166th Avenue NE	Signal	City of Redmond (LOS D)	B	14
8	Redmond Way and 168th Ave NE	Signal	City of Redmond (LOS D)	A	6
9	Redmond Way and Avondale Way	Signal	City of Redmond (LOS D)	C	24
10	Redmond Way and 170th Avenue NE	Signal	City of Redmond (LOS D)	C	31
11	161st Avenue NE and NE 83rd Street	Signal	City of Redmond (LOS D)	B	13
12	161st Avenue NE and Cleveland Street	Signal	City of Redmond (LOS D)	B	20
13	161st Avenue NE and Bear Creek Parkway	Signal	City of Redmond (LOS D)	B	14
14	Leary Way and Cleveland Street	Signal	City of Redmond (LOS D)	C	22
15	Leary Way and NE 76th Street	TWSC	City of Redmond (LOS D)	***F***	***87***
16	Leary Way and Bear Creek Parkway	Signal	City of Redmond (LOS D)	D	39
17	164th Avenue NE and NE 83rd Street	Signal	City of Redmond (LOS D)	C	21
18	164th Avenue NE and NE 80th Street	Signal	City of Redmond (LOS D)	D	38
19	164th Avenue NE and Cleveland Street	Signal	City of Redmond (LOS D)	B	13
20	164th Avenue NE and NE 76th Street	Roundabout	City of Redmond (LOS D)	A	0.27[2]
21	166th Avenue NE and Cleveland Street	Signal	City of Redmond (LOS D)	B	13
22	166th Avenue NE and NE 76th Street	AWSC	City of Redmond (LOS D)	B	13
23	170th Avenue NE and NE 76th Street/Bartell's	Signal	City of Redmond (LOS D)	B	17
29	Redmond Way and Bear Creek Crossing	Signal	City of Redmond (LOS D)	B	14
30	Redmond Way and SR 520 Westbound On-Ramp/NE 76th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	33
31	Redmond Way and SR 520 Eastbound Ramp	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	24
32	Redmond Way and NE 70th Street	Signal	City of Redmond (LOS D)	C	25
33	Redmond Way and East Lake Sammamish Parkway/180th Avenue NE	Signal	City of Redmond (LOS D)	***F***	***115***
34	East Lake Sammamish Parkway and NE 65th Street	Signal	City of Redmond (LOS D)	B	15
35	176th Avenue NE and NE 70th Street	TWSC	City of Redmond (LOS D)	B	11
36	176th Avenue NE and NE 67th Street	TWSC	City of Redmond (LOS D)	B	13
37	176th Avenue NE and NE 65th Street	TWSC	City of Redmond (LOS D)	C	20

Table 4-7. Existing PM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	PM Peak[1]	
				LOS	Delay (sec)
38	NE 76th Street and SR 520 Westbound Off-Ramp	TWSC	WSDOT Highways of Statewide Significance (LOS D)	C	22
39	NE 76th Street and SR 520 Eastbound On-Ramp/Fred Meyer	TWSC	WSDOT Highways of Statewide Significance (LOS D)	B	13
40	SR 520 and NE Union Hill Road/Avondale Road	Signal	City of Redmond (LOS D)	***F***	***90***
41	SR 520 Westbound Ramps and West Lake Sammamish Parkway/Leary Way NE	Signal	WSDOT Highways of Statewide Significance (LOS D)	***E***	***77***
42	SR 520 Eastbound Ramp and West Lake Sammamish Parkway	Signal	WSDOT Highways of Statewide Significance (LOS D)	D	40
43	West Lake Sammamish Parkway and NE Marymoor Way	Signal	City of Redmond (LOS D)	C	32
44	Redmond-Fall City Road and 185th Avenue NE	Signal	City of Redmond (LOS D)	B	12
45	Redmond-Fall City Road and 187th Avenue NE/188th Avenue NE	Signal	City of Redmond (LOS D)	B	18
46	Redmond-Fall City Road and 192nd Drive NE	Signal	WSDOT Regionally Significant Highway (LOS E)	A	4
47	Redmond-Fall City Road and 204th Place NE	Signal	WSDOT Regionally Significant Highway (LOS E)	B	12
48	Redmond-Fall City Road and Sahalee Way NE/ NE 58th Street	Signal	WSDOT Regionally Significant Highway (LOS E)	C	25
51	SR 520 Westbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	A	9
52	SR 520 Eastbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	15
61	SR 520 Westbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	22
62	SR 520 Eastbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	20
63	NE 40th Street and 156th Avenue NE	Signal	City of Redmond (LOS D)	D	40

[1] Synchro analyzes intersections in isolation and does not take into account downstream congestion. Actual intersection operations may have more delay based on intersection interactions and queuing propagating upstream and downstream between intersections.

[2] Operation of the roundabout is represented as a v/c ratio rather than a time delay.

Cells highlighted in ***grey bold and italicized*** identify intersections that operate below the LOS standard for the facility.

Intersections were analyzed using the Synchro outputs for signalized intersections and 2010 Highway Capacity Manual outputs for unsignalized intersections.

TWSC = two-way stop controlled

AWSC = all-way stop controlled

4.3 Freight

This section describes the existing conditions for freight in the study area. Freeways, arterials, and local streets are important to moving freight and goods in the study area. Freight is only transported via the roadway network in the study area; no other transportation modes provide freight movement.

Redmond has a two-tier freight route system that consists of primary truck streets and truck access streets. Primary truck streets accommodate through truck traffic in Redmond; these streets are arterials that directly connect with regional roadways, such as SR 520, or arterials that currently have high volumes of trucks and will continue to have high volumes in the future. Truck access streets connect the major industrial and commercial areas in the southeast Redmond neighborhood with primary truck streets.

The primary freight access routes in the study area include (shown on Figure 4-7):

- SR 520
- 154th Avenue NE/West Lake Sammamish Parkway
- Avondale Road NE
- Union Hill Road
- East Lake Sammamish Parkway (east of SR 520)

The truck access streets in the study area include:

- NE 76th Street
- 178th Place NE

WSDOT has also designated roadways as freight routes that are classified based on the amount of annual tonnage that is transported along a road in a particular year. This classification system is called the Freight Goods Transportation System (FGTS). The classifications range from roadways that carry more than 20,000 tons in 60 days to more than 10 million tons annually, as summarized in Table 4-8.

In the study area, there are several FGTS-designated freight routes, which include:

- State Route Classifications:
  - SR 520: T-2 route
  - SR 202: T-2 or T-3 route
- City Street Classifications:
  - Avondale Road between NE Union Hill Road and the northern city limits: T-2 route
  - NE Union Hill Road between Avondale Road and the eastern city limits: T-2 route
  - Redmond Way between the western city limits and 154th Avenue NE: T-2 route
  - West Lake Sammamish Parkway NE between Bel-Red Road and Leary Way: T-2 route

Table 4-8. Freight Goods Transportation System Classification System

FGTS Classification	Annual Gross Tonnage
T-1	Over 10,000,000
T-2	4,000,000 to 10,000,000
T-3	300,000 to 4,000,000
T-4	100,000 to 300,000
T-5	Over 20,000 in 60 days

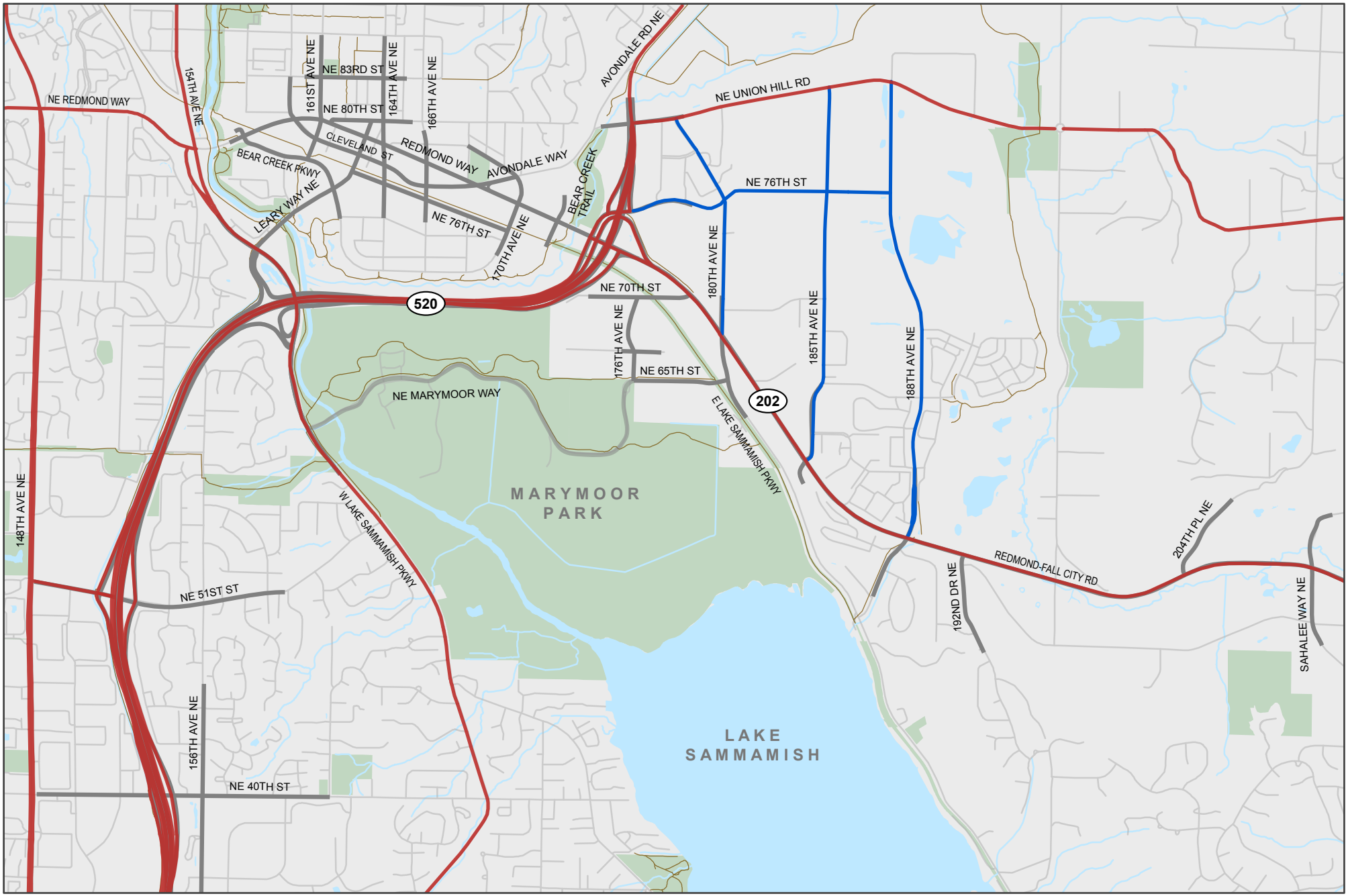


Figure 4-7
Existing Freight Access Routes
Downtown Redmond Link Extension

4.4 Transit

This section inventories and evaluates existing transit service within the study area. Metro and Sound Transit provide existing transit service in the study area with regional and local bus fixed route service to transit centers, park-and-rides, and bus stops.

Seventeen bus routes serve the study area. Table 4-9 summarizes the route number, service provider, service type, and routing. Figure 4-8 shows the fixed route transit services provided in the study area. In addition to fixed route bus service, Metro also provides paratransit (Access) Demand Area Response Transit (DART), and various rideshare services such as vanpool, ride matching, and iCarpool services.

Table 4-9. Study Area Transit Service

Service Provider	Route	Weekday Frequency	Routing
King County Metro Transit	RapidRide B Line	10-15 minutes all day	Bellevue Transit Center to Redmond Transit Center
	216	30-40 minutes during the AM peak period and every 20-30 minutes during the PM peak periods	Bear Creek Park-and-Ride to Issaquah to Downtown Seattle
	219	20-30 minutes during the AM peak period and every 6-30 minutes during the PM peak periods	Redmond to Issaquah to Downtown Seattle
	221	30 minutes all day	Education Hill to Redmond Transit Center to Crossroads to Eastgate Park-and-Ride
	224	90-120 minutes all day	Duvall to Redmond Transit Center
	232	30-40 minutes during the AM and PM peak periods; includes reverse peak trips between Redmond Transit Center and Bellevue Transit Center	Duvall to Redmond Transit Center to Overlake Transit Center to Bellevue Transit Center
	243	30 minutes during the AM and PM peak periods	Overlake Transit Center to Kenmore Park-and-Ride
	244	30 minutes during the AM and PM peak periods	Kenmore Park-and-Ride to Overlake Transit Center
	245	15 minutes all day	Kirkland Transit Center to Crossroads to Factoria
	248	30 minutes all day	Avondale to Redmond Transit Center to Kirkland Transit Center
	249	60 minutes all day	Overlake Transit Center to South Bellevue
	268	30-40 minutes during the AM and PM peak periods	Redmond to Downtown Seattle
	269	20-30 minutes all day	Issaquah Transit Center to Overlake Park-and-Ride
	930	30 minutes during the AM and PM peak periods	Kingsgate Park-and-Ride to Redmond Town Center
	931	30 minutes during extended AM and PM peak periods	University of Washington/Cascadia Campus to Redmond Transit Center
	982	Single trip during the AM and PM peak periods	Bear Creek Park-and-Ride to Overlake Transit Center to Lakeside School
Sound Transit	541	15 minutes during AM and PM peak periods	Overlake Park-and-Ride to Overlake Transit Center to University District
	542	15-30 minutes all day	Redmond Transit Center to Overlake Transit Center to University District to Green Lake
	545	10-15 minutes all day	Bear Creek Park-and-Ride to Redmond Transit Center to Overlake Transit Center to Seattle
	566	30 minutes during extended AM and PM peak periods	Auburn Station to Renton Transit Center to Overlake Transit Center
	567	20-30 minutes during the AM and PM peak periods	Kent Station to Bellevue Transit Center to Overlake Transit Center

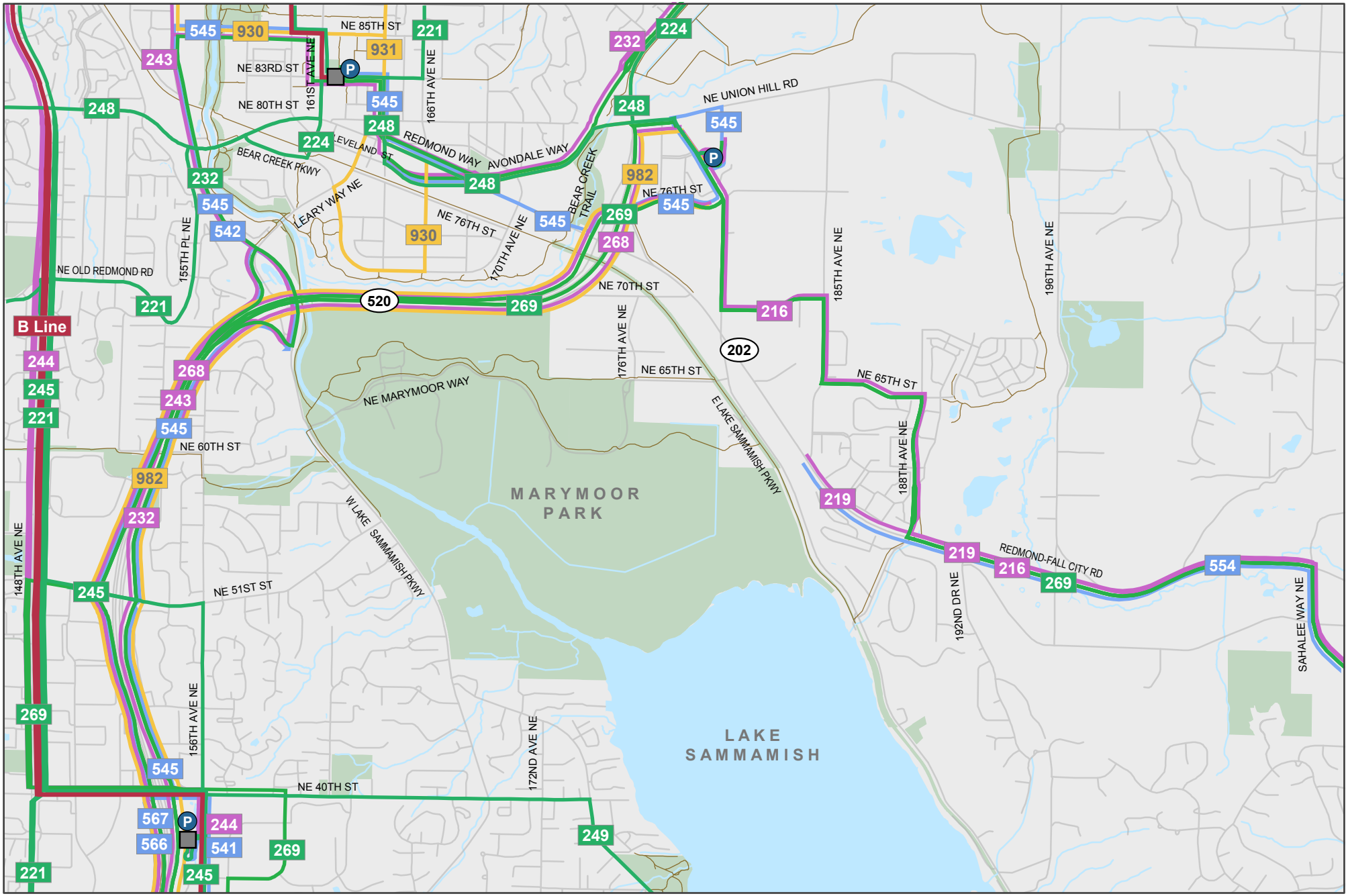


Figure 4-8
Existing Transit Network
Downtown Redmond Link Extension

The City of Redmond designates streets that are important to providing transit services using the following classifications:

- High Demand Transit Modal Corridor: These corridors include the major arterials and the SR 520 freeway, connecting Redmond's urban centers and major neighborhood activity centers.
- Medium Demand Transit Modal Corridor: These corridors will have lower levels of service investment and ridership than high demand corridors but are important parts of the overall transit network. These corridors support active transit patronage and provide important coverage and local access functions throughout the city by providing convenient access to Redmond's urban centers and the regional transit spine.

The Overlake Transit Center and Park-and-Ride, the Redmond Transit Center and Park-and-Ride, and the Bear Creek Park-and-Ride are located within the study area. The Overlake Transit Center will be converted to a light rail station and will include an expanded park-and-ride facility as part of the East Link Project and will be renamed the Redmond Technology Center Station. Table 4-10 describes the existing transit centers and park-and-rides in the study area, including park-and-ride utilization.

Table 4-10. Study Area Transit Centers and Park-and-Rides

Transit Facility	Type of Facility	Rider Amenities	Served by Routes	Park-and-Ride Stalls	Utilization[1]
Bear Creek Park-and-Ride	Park-and-Ride	Bicycle Lockers	King County Metro 216, 248, 268, 269, 982 Sound Transit 545	283	99%
Overlake Transit Center and Park-and-Ride (to be renamed Redmond Technology Center Station with the opening of the East Link Extension)	Transit center and park-and-ride	Bicycle Lockers and Racks	King County Metro B Line, 232, 243, 244, 245, 249, 268, 269, 982, 992 Sound Transit 541, 542, 545, 566, 567	0 (closed May 1, 2017)[2]	Not applicable
Redmond Transit Center	Transit center and park-and-ride	Bicycle Lockers and Racks	King County Metro B Line, 221, 224, 232, 243, 248, 930, 931, Sound Transit 542, 545	377	99%

[1] King County Metro Transit, Park and Ride Utilization Report, Fourth Quarter 2016

[2] The Overlake Transit Center and Park-and Ride was closed to facilitate construction of the Redmond Technology Center Station as part of the East Link Extension. The park-and-ride originally had 233 stalls with a utilization rate of 104 percent in the fourth quarter of 2016. The Redmond Technology Center Station, scheduled to open in 2023, will include an expanded park-and-ride facility to accommodate approximately 300 vehicles.

4.5 Nonmotorized Facilities

This section inventories existing nonmotorized facilities within the study area, including sidewalks on arterial streets within a half-mile of proposed station areas, on-street bicycle facilities within 1 mile of proposed station areas, and shared use paths within the study area.

Along with the 2017 weekday turning movement counts, bicycle and pedestrian counts were collected for the same 3-day period in the AM and PM peak period. For the roadway undergoing construction—Redmond Way and Cleveland Street between 160th Avenue NE and Avondale Way—new 2017 traffic counts were not collected; instead, historical 2015 traffic counts were used for the nonmotorized volumes. Tables 4-11 and 4-12 show the existing AM and PM peak hour bicycle and pedestrian counts at the study area intersections for the common peak hours of 8 to 9 a.m. and 4:45 to 5:45 p.m. All bicycle and pedestrian counts were averaged over the 3-day period.

As shown in the tables, the highest peak hour bicycle volumes through study area intersections are at Intersections #37 and #43, both in the AM and PM peak hour. Similarly, the highest pedestrian volumes

are at Intersections #41, #61, #62, and #63 in the AM and PM peak hour. In addition, Intersection #51 also experiences a substantial amount of pedestrian activity in the PM peak hour.

Table 4-11. Existing AM Peak Hour Pedestrian and Bicycle Volumes

		Bicycle				Pedestrian			
	Intersection	EB	WB	NB	SB	East	West	North	South
1	Redmond Way and Bear Creek Parkway	3	1	2	0	6	13	20	6
10	Redmond Way and 170th Avenue	0	0	0	2	5	2	3	5
16	Leary Way and Bear Creek Parkway	0	1	1	1	3	3	7	6
29	Redmond Way and Bridle Crest Trail	0	1	1	5	16	1	3	3
30	Redmond Way and SR 520 WB On-Ramp/ 76th Street	2	0	0	1	0	3	3	10
31	Redmond Way and SR 520 EB Off-Ramp/ Flyover On-Ramp	0	0	0	0	1	0	0	10
32	Redmond Way and 70th Street	0	0	0	2	13	4	0	13
33	Redmond Way and East Lake Sammamish Parkway/180th Avenue	1	1	3	0	0	0	1	3
34	East Lake Sammamish Parkway and 65th Street	3	0	2	1	1	4	5	5
35	176th Avenue and 70th Street	0	1	0	0	0	1	0	4
36	176th Avenue and 67th Court	0	0	0	0	1	5	1	0
37	176th Avenue and 65th Street/Marymoor Way	5	3	0	0	0	0	2	0
38	76th Street and SR 520 WB Off-Ramp	1	1	0	0	0	0	5	0
39	76th Street and SR 520 EB On-Ramp/ Fred Meyer	1	1	0	0	0	0	4	1
40	Union Hill Road and SR 520/Avondale Road	3	3	1	0	1	1	3	7
41	West Lake Sammamish Parkway and SR 520 WB On-Ramp and Off-Ramp/Leary Way	0	0	0	1	7	0	126	0
42	West Lake Sammamish Parkway and SR 520 EB On-Ramp and Off-Ramp	0	0	0	1	0	0	0	0
43	West Lake Sammamish Parkway and Marymoor Way	0	12	3	2	24	0	0	12
44	Redmond-Fall City Road and 185th Avenue	0	0	1	1	3	2	3	3
45	Redmond-Fall City Road and 188th Avenue	1	1	1	1	5	2	1	4
46	Redmond-Fall City Road and 192nd Drive	0	0	0	0	0	0	0	0
47	Redmond-Fall City Road and 204th Place	0	0	0	0	0	0	0	0
48	Redmond-Fall City Road and Sahalee Way	0	0	0	0	0	0	0	0
51	51st Street and SR 520 WB On-Ramp/Off-Ramp	3	2	0	3	0	166	66	40
52	51st Street and SR 520 EB On-Ramp/Off-Ramp	4	2	0	1	30	0	35	40
61	40th Street and SR 520 WB On-Ramp/Off-Ramp	0	1	0	0	0	119	19	288
62	40th Street and SR 520 EB On-Ramp/Off-Ramp	0	1	0	0	0	0	21	296
63	40th Street and 156th Avenue	1	2	2	2	59	110	25	77

EB = eastbound, WB = westbound, NB = northbound, SB = southbound

Table 4-12. Existing PM Peak Hour Pedestrian and Bicycle Volumes

	Intersection	Bicycle				Pedestrian			
		EB	WB	NB	SB	East	West	North	South
1	Redmond Way and Bear Creek Parkway	5	1	3	1	19	23	45	23
2	Redmond Way and 160th Avenue and Cleveland Street	0	0	0	0	9	36	2	5
3	Redmond Way and 161st Avenue	0	0	2	0	21	2	11	3
4	Redmond Way and NE 80th Street	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	Redmond Way and Leary Way	0	1	1	0	9	13	18	14
6	Redmond Way and 164th Avenue	0	1	0	0	18	1	7	18
7	Redmond Way and 166th Avenue	0	0	0	0	14	14	17	15
8	Redmond Way and 168th Avenue/Cleveland Street	0	0	0	1	0	15	14	0
9	Redmond Way and Avondale Way	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10	Redmond Way and 170th Avenue	0	0	1	0	22	13	11	15
11	161st Avenue and NE 83rd Avenue	0	0	1	1	33	12	23	34
12	161st Avenue and Cleveland Street	1	0	2	0	17	18	10	36
13	161st Avenue and Bear Creek Parkway	0	0	0	0	21	13	15	0
14	Leary Way and Cleveland Street	1	0	0	0	18	14	26	39
15	Leary Way and NE 76th Street	0	0	1	0	1	0	16	0
16	Leary Way and Bear Creek Parkway	2	0	0	1	8	9	12	7
17	164th Avenue and NE 83rd Street	0	0	0	1	26	5	22	23
18	164th Avenue and NE 80th Street	3	2	2	1	14	4	6	13
19	164th Avenue and Cleveland Street	0	0	0	0	22	15	14	11
20	164th Avenue and NE 76th Street	1	1	2	0	0	0	12	1
21	166th Avenue and Cleveland Street	0	0	0	0	8	29	5	6
22	166th Avenue and NE 76th Street	0	0	0	0	14	25	24	13
23	170th Avenue and NE 76th Street	0	0	0	0	2	1	10	1
29	Redmond Way and Bridle Crest Trail	0	1	2	2	29	3	7	6
30	Redmond Way and SR 520 WB On-Ramp/ 76th Street	1	0	0	2	0	5	14	10
31	Redmond Way and SR 520 EB Off-Ramp/ Flyover On-Ramp	1	0	0	0	3	0	1	4
32	Redmond Way and 70th Street	0	0	0	2	13	7	0	14
33	Redmond Way and East Lake Sammamish Parkway/180th Avenue	1	1	2	1	0	1	9	6
34	East Lake Sammamish Parkway and 65th Street	3	1	3	2	6	2	4	5
35	176th Avenue and 70th Street	0	1	1	0	1	3	0	2
36	176th Avenue and 67th Court	1	0	1	1	0	2	1	0

Table 4-12. Existing PM Peak Hour Pedestrian and Bicycle Volumes (continued)

	Intersection	Bicycle				Pedestrian			
		EB	WB	NB	SB	East	West	North	South
37	176th Avenue and 65th Street/Marymoor Way	4	5	0	1	3	4	6	0
38	76th Street and SR 520 WB Off-Ramp	1	3	0	1	0	0	8	0
39	76th Street and SR 520 EB On-Ramp/Fred Meyer	1	3	0	0	0	0	6	11
40	Union Hill Road and SR 520/Avondale Road	1	3	0	0	10	3	5	10
41	West Lake Sammamish Parkway and SR 520 WB On-Ramp and Off-Ramp/Leary Way	0	0	1	1	6	0	131	0
42	West Lake Sammamish Parkway and SR 520 EB On-Ramp and Off-Ramp	0	0	2	1	0	0	0	0
43	West Lake Sammamish Parkway and Marymoor Way	0	6	7	1	46	0	0	11
44	Redmond-Fall City Road and 185th Avenue	0	1	1	2	5	5	0	6
45	Redmond-Fall City Road and 188th Avenue	1	1	3	2	3	5	3	3
46	Redmond-Fall City Road and 192nd Drive	4	1	0	0	0	0	0	0
47	Redmond-Fall City Road and 204th Place	1	0	0	0	0	0	1	0
48	Redmond-Fall City Road and Sahalee Way	0	0	0	0	0	0	0	0
51	51st Street and SR 520 WB On-Ramp and Off-Ramp	1	0	0	0	0	135	30	55
52	51st Street and SR 520 EB On-Ramp and Off-Ramp	2	3	1	0	11	0	29	54
61	40th Street and SR 520 WB On-Ramp and Off-Ramp	1	0	0	0	0	156	36	261
62	40th Street and SR 520 EB On-Ramp and Off-Ramp	1	1	1	0	0	0	37	262
63	40th Street and 156th Avenue	1	0	1	2	56	157	40	43

EB = eastbound, WB = westbound, NB = northbound, SB = southbound
N/A = not available

In addition to the intersection counts, King County Metro Parks provided nonmotorized trail counts at East Lake Sammamish Trail near NE 70th Street. The nonmotorized volumes ranged from 20 to 55 during the AM peak hour and 55 to 230 during the PM peak hour on weekdays. The nonmotorized volumes ranged from 10 to 155 during the AM peak hour and 55 to 235 during the PM peak hour on weekends.

4.5.1 Pedestrian Facilities

In the study area, sidewalks are provided on most arterial streets within a half-mile of the proposed station areas. Because the stations are located within downtown Redmond and the newly planned Marymoor Village, pedestrian activity is important. Marked crosswalks are provided at most signalized intersections in the study area. Marymoor Park is also a popular pedestrian destination. Currently, SR 520 presents a barrier for pedestrian connectivity between Marymoor Park and downtown

Redmond. Pedestrians can use shared use paths (described below) to connect between Marymoor Park and downtown Redmond.

4.5.2 Bicycle Facilities

On-street bicycle facilities are provided on several streets within 1 mile of the proposed station areas. As shown on Figure 4-9, bicycle lanes are provided on East Lake Sammamish Parkway, Redmond Way east of SR 520, 180th Avenue NE, NE 76th Street, Avondale Way east of NE 79th Street, 166th Avenue NE, 161st Avenue NE, and NE 85th Street. Several streets near the proposed station areas are also bicycle friendly streets, some of which include sharrows. Although there are no marked bicycle lanes on these streets, lower traffic speeds, roadway widths, or traffic volumes promote shared use of the roadway with bicyclists.

4.5.3 Shared Use Paths

There are a number of shared use paths within the study area. The SR 520 Bike Trail is a major regional trail facility that connects downtown Redmond with Seattle. Other shared use paths in the study area include the Bear Creek Trail, the Redmond Central Connector, the East Lake Sammamish Trail, the Marymoor Connector Trail, and the Sammamish River Trail, as shown in Figure 4-9.

4.6 Parking

Multi-family residential units and commercial and retail businesses surround the Downtown Redmond Station. On-street parking is time restricted from 9 a.m. to 5 p.m., Monday through Friday. Time restrictions range from 15 minutes to 3 hours. One public parking lot, adjacent to the Redmond Central Connector, is available for use during the daytime hours. Up to the first 4 hours of use at this lot are free and payment is required after that period. The downtown parking restrictions help to manage demand by ensuring that there is a regular turnover of parking spaces during core weekday hours. Residents and commuters can purchase daily or monthly parking permits as well. Several off-street private parking lots are available for use by employees and business patrons.

In 2015, the City of Redmond adopted the Redmond Downtown Park Master Plan and Assessment of the Downtown Parks Network. This study included a summary of 2014 parking utilization in downtown Redmond from 8:00 a.m. to 8:00 p.m. Utilization ranged from a low of 30 percent at 8:00 p.m. to a high of 52.2 percent at 12:00 p.m.

The SE Redmond Station location is surrounded by light industry. Unrestricted on-street parking spaces are available in the vicinity of the station. Several off-street private parking lots are available for use by employees and business patrons.

4.7 Safety

Collision data (2012 to 2016) were collected from WSDOT for the previous 5 full years. Historical collision data were reviewed to identify if any of the study area intersections had existing safety concerns that could be exacerbated by the Proposed Design Refinements.

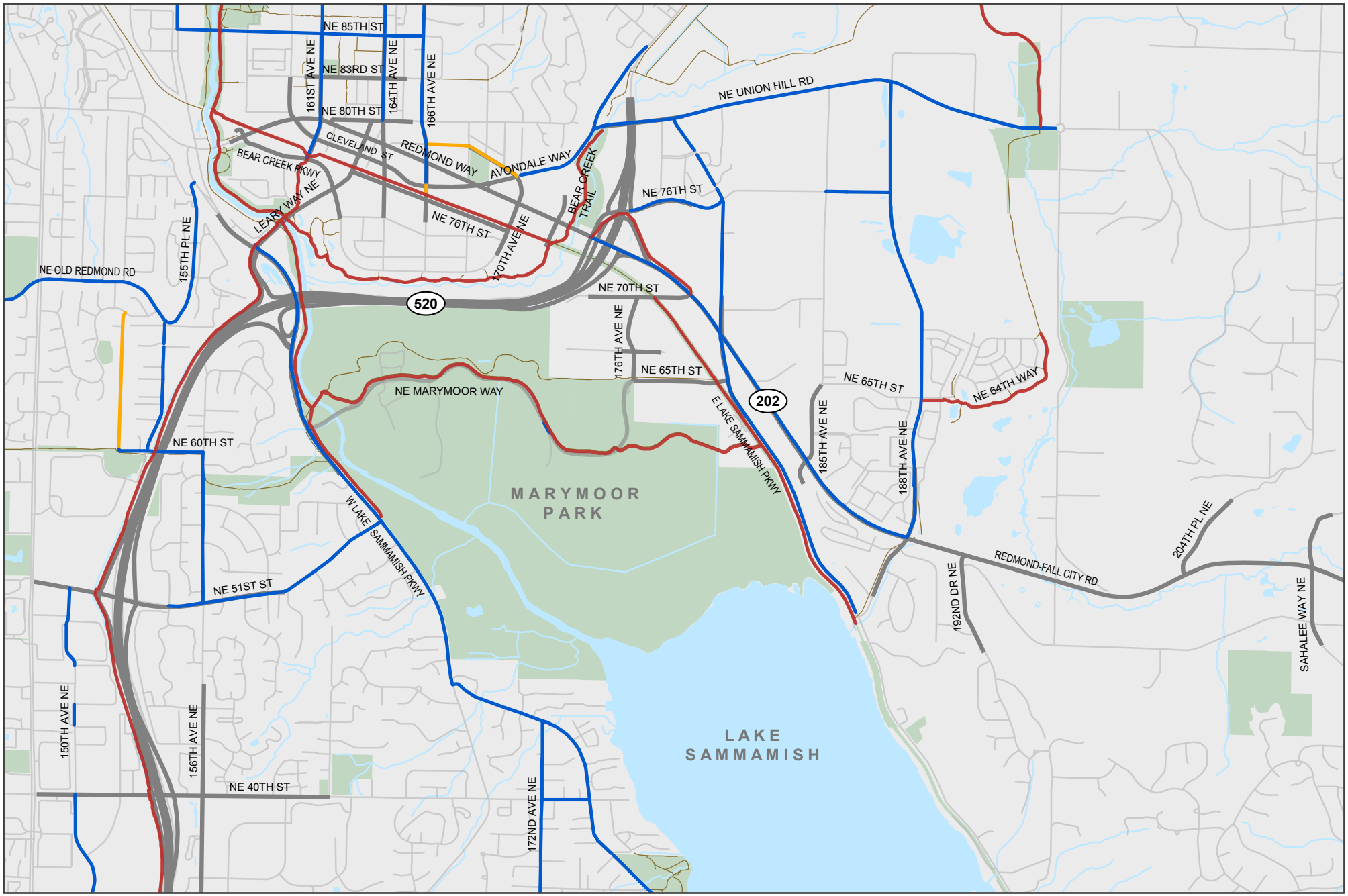


Figure 4-9
Existing Bicycle Facilities and Shared Use Paths
Downtown Redmond Link Extension

4.7.1 Collisions by Severity

Table 4-13 summarizes collisions by severity and includes total collisions over the specified 5-year period as well as the intersection collision rate per million entering vehicles (MEV).

As shown in Table 4-13, the majority of collisions at the study intersections resulted in property damage only (approximately 75 percent). The remaining collisions resulted in an injury or was unknown. Across the entire study area, one fatality collision was noted at Union Hill Road and SR 520/Avondale Road (Intersection #40) in 2015. This was a rear-end collision involving one vehicle exceeding the stated speed limit.

Generally, WSDOT considers intersections above 1.0 collision per MEV as needing further review. Specifically, six intersections had collisions rates above 1.0 collision per MEV: Redmond Way and Leary Way (Intersection #5), Redmond Way and Avondale Way (Intersection #9), Redmond Way and 170th Avenue NE (Intersection #10), Redmond Way and SR 520 Eastbound Off-Ramp/Flyover On-Ramp (Intersection #31), Redmond Way and East Lake Sammamish Parkway/180th Avenue NE (Intersection #33), and West Lake Sammamish Parkway and SR 520 Westbound On-Ramp and Off-Ramp/Leary Way (Intersection #41). With the exception of West Lake Sammamish Parkway and SR 520 Westbound On-Ramp and Off-Ramp/Leary Way (Intersection #41), all of the intersections noted above are along Redmond Way, which experience congestion during the PM peak hour. Those intersections noted collision rates ranging from 1.01 to 1.67 per MEV. Property damage-only collisions consisted of more than 60 percent of all collisions at intersections with a collision rate above 1.0 per MEV, which is lower than the percentage of all collisions at all intersections.

Table 4-13. Existing Collisions by Severity (January 2012 to December 2016)

Intersection			Collision Severity					Intersection Collision Rate (collisions/ MEV)
No.	Name	Average Daily Traffic	Fatality	Injury	Property Damage Only	Other	Total	
1	Redmond Way and Bear Creek Parkway	31,200	0	7	32	0	39	0.68
2	Redmond Way and 160th Avenue NE and Cleveland Street	26,150	0	6	29	0	35	0.73
3	Redmond Way and 161st Avenue NE	19,750	0	7	13	0	20	0.55
4	Redmond Way and NE 80th Street	11,300	0	0	3	0	3	0.15
5	Redmond Way and Leary Way	18,450	0	13	23	1	37	1.10
6	Redmond Way and 164th Avenue NE	19,500	0	0	4	0	4	0.11
7	Redmond Way and 166th Avenue NE	20,000	0	13	13	0	26	0.71
8	Redmond Way and 168th Avenue NE and Cleveland Street	15,750	0	8	16	0	24	0.83
9	Redmond Way and Avondale Way	28,100	0	14	38	0	52	1.01
10	Redmond Way and 170th Avenue NE	35,200	0	15	59	0	74	1.15
11	161st Avenue NE and NE 83rd Street	11,450	0	4	5	0	9	0.43
12	161st Avenue NE and Cleveland Street	14,700	0	4	13	0	17	0.63
13	161st Avenue NE and Bear Creek Parkway	12,950	0	1	1	0	2	0.08
14	Leary Way and Cleveland Street	21,300	0	3	19	0	22	0.57

Table 4-13. Existing Collisions by Severity (January 2012 to December 2016) (continued)

Intersection			Collision Severity					Intersection Collision Rate (collisions/ MEV)
No.	Name	Average Daily Traffic	Fatality	Injury	Property Damage Only	Other	Total	
15	Leary Way and NE 76th Street	15,500	0	1	6	0	7	0.25
16	Leary Way and Bear Creek Parkway	33,400	0	5	22	0	27	0.44
17	164th Avenue NE and NE 83rd Street	16,850	0	5	12	1	18	0.59
18	164th Avenue NE and NE 80th Street	19,700	0	6	11	0	17	0.47
19	164th Avenue NE and Cleveland Street	17,450	0	2	15	0	17	0.53
20	164th Avenue NE and NE 76th Street	7,450	0	0	1	0	1	0.07
21	166th Avenue NE and Cleveland Street	20,650	0	7	24	0	31	0.82
22	166th Avenue NE and NE 76th Street	9,250	0	3	3	0	6	0.36
23	170th Avenue NE and NE 76th Street	16,950	0	1	4	0	5	0.16
29	Redmond Way and Bear Creek Trail	33,100	0	0	2	0	2	0.03
30	Redmond Way and SR 520 Westbound On-Ramp/ NE 76th Street	36,500	0	9	36	0	45	0.68
31	Redmond Way and SR 520 Eastbound Off-Ramp/ Flyover On-Ramp	45,700	0	34	104	1	139	1.67
32	Redmond Way and NE 70th Street	45,850	0	9	27	0	36	0.43
33	Redmond Way and East Lake Sammamish Parkway/ 180th Avenue NE	49,250	0	15	76	1	92	1.02
34	East Lake Sammamish Parkway and NE 65th Street	23,050	0	3	11	0	14	0.33
35	176th Avenue NE and NE 70th Street	5,750	0	0	0	0	0	0.00
36	176th Avenue NE and NE 67th Street	5,100	0	0	1	0	1	0.11
37	176th Avenue NE and NE 67th Street/Marymoor Way	8,550	0	0	0	0	0	0.00
38	NE 76th Street and SR 520 Westbound Off-Ramp	13,900	0	1	1	0	2	0.08
39	NE 76th Street and SR 520 Eastbound On-Ramp/ Fred Meyer	12,900	0	1	1	0	2	0.08
40	Union Hill Road and SR 520/ Avondale Road	50,700	1	12	31	0	44	0.48
41	West Lake Sammamish Parkway and SR 520 Westbound On-Ramp and Off-Ramp/Leary Way	48,600	0	25	69	0	94	1.06
42	West Lake Sammamish Parkway and SR 520 Eastbound On-Ramp and Off-Ramp	35,400	0	2	23	0	25	0.39
43	West Lake Sammamish Parkway and Marymoor Way	26,850	0	7	5	0	12	0.24

Table 4-13. Existing Collisions by Severity (January 2012 to December 2016) (continued)

Intersection			Collision Severity					Intersection Collision Rate (collisions/ MEV)
No.	Name	Average Daily Traffic	Fatality	Injury	Property Damage Only	Other	Total	
44	Redmond-Fall City Road and 185th Avenue NE	30,650	0	4	23	1	28	0.50
45	Redmond-Fall City Road and 188th Avenue NE	33,250	0	8	19	2	29	0.48
46	Redmond-Fall City Road and 192nd Drive	30,850	0	8	10	0	18	0.32
47	Redmond-Fall City Road and 204th Place	32,000	0	2	10	0	12	0.21
48	Redmond-Fall City Road and Sahalee Way	31,750	0	8	24	0	32	0.55
51	NE 51st Street and SR 520 Westbound On-Ramp and Off-Ramp	20,100	0	5	11	0	16	0.44
52	NE 51st Street and SR 520 Eastbound On-Ramp and Off-Ramp	21,000	0	2	9	0	11	0.29
61	NE 40th Street and SR 520 Westbound On-Ramp and Off-Ramp	28,300	0	7	21	0	28	0.54
62	NE 40th Street and SR 520 Eastbound On-Ramp and Off-Ramp	32,750	0	6	30	1	37	0.62
63	NE 40th Street and 156th Avenue NE	42,800	0	7	27	0	34	0.44

Source: WSDOT Transportation Data and GIS Office

Disclaimer:
Under 23 U.S. Code § 409, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

4.7.2 Collisions by Type

In addition to summarizing the collision data by severity, study area intersection collisions were summarized by type in Table 4-14. The most common type of collision in the study area were rear-end collisions, which are common in congested locations and accounted for nearly half of all collisions in the study area. Angle and side-swipe collisions combine to make up over 30 percent of collisions in the study area and are most common in areas with multiple mid-block retail driveways and high turn volumes. Specifically, angle collisions often occur when vehicles try to turn in front of oncoming traffic even if the gap does not provide sufficient space to make a left or right turn. Other prevalent collision types included angle (T-bone), head-on, and fixed-object. Over the last 5 years, 29 collisions (2 percent) involved bicyclists and 19 collisions (2 percent) involved pedestrians. West Lake Sammamish Parkway and SR 520 Westbound On-Ramp and Off-Ramp/Leary Way (Intersection #41) was the only intersection with more than 3 collisions that involved bicyclists or pedestrians during the 5-year period.

As noted previously, six intersections experienced collision rates above 1.0 collision per MEV. At five of the six intersections, rear-end and side-swipe collisions comprised the majority of collisions and are indicative of noted congestion along either Redmond Way or West Lake Sammamish Parkway. The intersection of Redmond Way and Leary Way (Intersection #35), however, experienced 37 total collisions,

of which 21 were angle collisions. The northbound left turn is permitted/protected at this intersection and likely contributes to the high number of angle collisions.

Table 4-14. Existing Collisions by Type (January 2012 to December 2016)

No.	Intersection Name	Angle	Rear-end	Sideswipe	Angle (T-Bone)	All Others	Head-On	Fixed Object	Pedal-cyclist	Pedestrian	Total
1	Redmond Way and Bear Creek Parkway	13	19	5	0	0	0	0	0	2	39
2	Redmond Way and 160th Avenue NE and Cleveland Street	4	7	19	4	1	0	0	0	0	35
3	Redmond Way and 161st Avenue NE	5	6	4	0	2	0	1	1	1	20
4	Redmond Way and NE 80th Street	2	1	0	0	0	0	0	0	0	3
5	Redmond Way and Leary Way	5	2	8	16	2	0	1	0	3	37
6	Redmond Way and 164th Avenue NE	0	2	2	0	0	0	0	0	0	4
7	Redmond Way and 166th Avenue NE	12	1	3	7	0	0	0	0	3	26
8	Redmond Way and 168th Avenue NE and Cleveland Street	14	3	3	1	0	0	2	1	0	24
9	Redmond Way and Avondale Way	8	26	14	2	0	0	0	2	0	52
10	Redmond Way and 170th Avenue NE	16	31	19	3	1	0	0	3	1	74
11	161st Avenue NE and NE 83rd Street	2	2	0	4	0	0	0	0	1	9
12	161st Avenue NE and Cleveland Street	2	5	4	4	1	0	0	0	1	17
13	161st Avenue NE and Bear Creek Parkway	1	0	0	0	0	0	0	0	1	2
14	Leary Way and Cleveland Street	2	5	4	9	1	0	1	0	0	22
15	Leary Way and NE 76th Street	2	3	0	2	0	0	0	0	0	7
16	Leary Way and Bear Creek Parkway	11	7	5	2	0	0	1	1	0	27
17	164th Avenue NE and NE 83rd Street	4	10	0	3	0	0	1	0	0	18
18	164th Avenue NE and NE 80th Street	4	2	0	10	0	0	0	1	0	17
19	164th Avenue NE and Cleveland Street	2	4	9	2	0	0	0	0	0	17
20	164th Avenue NE and NE 76th Street	0	1	0	0	0	0	0	0	0	1
21	166th Avenue NE and Cleveland Street	8	5	5	12	1	0	0	0	0	31
22	166th Avenue NE and NE 76th Street	2	0	0	3	0	0	0	0	1	6
23	170th Avenue NE and NE 76th Street	2	1	0	2	0	0	0	0	0	5
29	Redmond Way and Bear Creek Trail	0	0	2	0	0	0	0	0	0	2
30	Redmond Way and SR 520 Westbound On-Ramp/NE 76th Street	13	22	7	1	0	0	1	0	1	45
31	Redmond Way and SR 520 Eastbound Off-Ramp/Flyover On-Ramp	5	129	2	0	0	0	0	3	0	139
32	Redmond Way and NE 70th Street	2	24	7	0	2	0	1	0	0	36
33	Redmond Way and East Lake Sammamish Parkway/180th Avenue NE	16	47	19	1	3	0	5	1	0	92
34	East Lake Sammamish Parkway and NE 65th Street	5	4	3	0	1	0	0	1	0	14
35	176th Avenue NE and NE 70th Street	0	0	0	0	0	0	0	0	0	0

Table 4-14. Existing Collisions by Type (January 2012 to December 2016) (continued)

No.	Intersection Name	Angle	Rear-end	Sideswipe	Angle (T-Bone)	All Others	Head-On	Fixed Object	Pedal-cyclist	Pedestrian	Total
36	176th Avenue NE and NE 67th Street	0	0	0	1	0	0	0	0	0	1
37	176th Avenue NE and NE 67th Street and Marymoor Way	0	0	0	0	0	0	0	0	0	0
38	NE 76th Street and SR 520 Westbound Off-Ramp	1	0	0	0	0	0	0	0	1	2
39	NE 76th Street and SR 520 Eastbound On-Ramp/Fred Meyer	2	0	0	0	0	0	0	0	0	2
40	Union Hill Road and SR 520/ Avondale Road	9	20	6	5	4	0	0	0	0	44
41	West Lake Sammamish Parkway and SR 520 Westbound On-Ramp and Off-Ramp/Leary Way	4	64	10	3	4	0	1	8	0	94
42	West Lake Sammamish Parkway and SR 520 Eastbound On-Ramp and Off-Ramp	2	12	6	0	1	0	4	0	0	25
43	West Lake Sammamish Parkway and Marymoor Way	1	3	3	0	0	0	1	3	1	12
44	Redmond-Fall City Road and 185th Avenue NE	1	20	1	2	1	0	3	0	0	28
45	Redmond-Fall City Road and 188th Avenue NE	3	21	3	0	1	0	1	0	0	29
46	Redmond-Fall City Road and 192nd Drive	1	14	1	0	2	0	0	0	0	18
47	Redmond-Fall City Road and 204th Place	1	8	2	0	0	0	1	0	0	12
48	Redmond-Fall City Road and Sahalee Way	8	14	3	2	1	1	3	0	0	32
51	NE 51st Street and SR 520 Westbound On-Ramp and Off-Ramp	10	4	0	0	0	0	1	1	0	16
52	NE 51st Street and SR 520 Eastbound On-Ramp and Off-Ramp	7	4	0	0	0	0	0	0	0	11
61	NE 40th Street and SR 520 Westbound On-Ramp and Off-Ramp	13	7	4	0	1	0	1	0	2	28
62	NE 40th Street and SR 520 Eastbound On-Ramp and Off-Ramp	9	14	8	2	0	0	2	2	0	37
63	NE 40th Street and 156th Avenue NE	1	18	9	2	1	0	2	1	0	34

Source: WSDOT Transportation Data and GIS Office

Disclaimer:
Under 23 U.S. Code § 409, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

5 ENVIRONMENTAL IMPACTS DURING OPERATION

This chapter discusses impacts for the future forecast year of 2035 for the Project Baseline and Proposed Design Refinements. Attachment B provides a forecast of arterial and street operations associated with the planned growth envisioned in the Marymoor Subarea Plan as a sensitivity analysis for comparison of potential impacts associated with the light rail project and changes in operations due to implementation of the subarea plan.

5.1 Project Baseline

The Project Baseline represents the transportation system and environment as they would exist without the Project. It provides a baseline condition for comparing impacts of the Proposed Design Refinements. Since publication of the Final EIS, several conditions have changed that influenced development of the Project Baseline, including the passage of ST3 and the adoption of METRO CONNECTS. The Project Baseline also includes roadway, intersection, and transit improvement projects that are under construction or planned to be implemented based on approval and committed funding.

This section analyzes the operational impacts of the Project Baseline within the study area for the 2035 forecast year.

5.1.1 Arterial and Local Street Operations

Roadway Network and Intersection Modifications

The roadway network and several intersections in the study area would change for the Project Baseline. In downtown Redmond, Cleveland Street and Redmond Way operated as a one-way couplet with traffic operating eastbound on Cleveland Street and westbound on Redmond Way in early 2017 when counts were conducted to represent existing conditions. In the Project Baseline, these two streets are planned to be converted to two-way operations with Redmond Way providing one through lane and a left-turn pocket in both directions at intersections, and Cleveland Street providing one lane in each direction.

Other roadway and intersection improvements that are planned at study area intersections by 2035 include:

- Intersections #6 to #8: Add a second westbound lane and parking on the north side of Redmond Way between 168th Avenue NE and 164th Avenue NE. This second westbound lane transitions to a right-turn lane at 164th Avenue NE. This project would include one travel lane, on-street parking, and sidewalk improvements.
- Intersection #30: Reconfigure the Redmond Way Bridge to add a second eastbound left-turn lane by removing the sidewalk on the south side of the bridge, and widen NE 76th Street to accept the dual left turns from Redmond Way. This project would include adding a separate pedestrian-bicycle bridge over Bear Creek. The pedestrian-bicycle bridge would provide a dual function by replacing the existing narrow walkway and accommodating a future connection between Bear Creek Trail and East Lake Sammamish Trail on the south side of SR 520.
- Intersection #32: Construct a new street connection on NE 70th Street between Redmond Way and 180th Avenue NE. This adds the fourth leg to the intersection and includes the new westbound approach to SR 202, with a left-turn lane, a through lane and a right lane. This improvement would divert traffic from SR 202 (Redmond Way) to this new street between intersections #32 and #33.

- Intersection #33: Increase capacity by modifying the intersection's geometric configuration and signal phasing to:
  - Physically separate eastbound right turns from westbound left turns
  - Convert the northbound triple left turn (on East Lake Sammamish Parkway) to two left turns and one through lane so that northbound and southbound left turns would operate concurrently
  - Revise the pedestrian crossing to provide one crossing at each leg of the intersection
- Intersection #40: Conduct needed intersection improvements; however, final design solutions are still under consideration by WSDOT and therefore no geometric changes have been included in future analysis.
- Intersection #41: Widen the existing intersection at SR 520, West Lake Sammamish Parkway, and Leary Way; provide added channelization; add an additional left-turn lane from West Lake Sammamish Parkway to Leary Way; and add an additional receiving lane on Leary Way from West Lake Sammamish Parkway over the bridge spanning the Sammamish River. Another alternative solution at this intersection would be a multi-lane roundabout at the ramp terminal intersection although it was not included in the analysis.
- Intersection #42: Construct an exclusive right-turn lane on the eastbound off-ramp. This would modify the ramp from a left-turn lane and left-right turn lane to two left-turn lanes and an exclusive right-turn lane. Another alternative solution at this intersection would be a multi-lane roundabout at the ramp terminal intersection although it was not included in the analysis.
- Intersections #51 and #62: Split the eastbound SR 520 combined ramp at NE 40th Street and NE 51st Street into two separate off-ramps. This project would include associated pedestrian and bicycle safety improvements at the ramp terminals.

Other roadway and intersection improvements that are planned within the study area by 2035 that do not occur at study area intersections include:

- Add a second right-turn lane from westbound NE 51st Street to northbound 148th Avenue NE.
- Add a north leg to the intersection of 150th Avenue NE and NE 51st Street and signalize this intersection. North leg improvements would include two southbound left-turn lanes, one through lane in each direction, bicycle lanes, and sidewalks. The eastbound transit stop would be relocated to the far side of the new intersection.
- Improve NE 51st Street to add center-turn lanes and bicycle facilities in both directions.
- Construct an eastbound shoulder lane for bus use on the outside of the freeway from NE 51st Street to West Lake Sammamish Parkway on SR 520.
- Add eastbound and westbound lanes with full shoulders on SR 520 from the NE 51st Street on-ramp to the West Lake Sammamish Parkway off-ramp.

Several roadway and intersection projects listed above include specific nonmotorized projects, which are summarized in Section 5.1.4.

Funding for some of these projects has yet to be determined and may be through a partnership involving multiple agencies.

Traffic Volumes

Two regional travel demand models were used to support assessment of future conditions, including development of transit ridership forecasts and future traffic volumes. The Sound Transit Ridership Model was used to produce transit ridership forecasts, while the PSRC Regional Model: WSDOT Project Version was used to calculate growth rates in vehicular traffic volumes to support the future traffic volume development.

The PSRC Regional Model: WSDOT Project Version was developed for the SR 520 EIS, I-405 expansion, and WSDOT Express Lanes Pre-Design Studies (including I-5 high-occupancy toll [HOT] lane assessment). For the most recent update, the PSRC model was refined to reflect necessary network modification specific to the project corridor, as well as the latest PSRC land use forecasts (i.e., LUV.1).

Traffic volumes for the Project Baseline were forecasted using a growth rate of 1 percent per year throughout the study area, except in Bear Creek, where the growth rate was forecast at 1.5 percent per year, and Union Hill, where the growth rate was forecast at 0.5 percent per year (Figure 5-1).

The initial step in future volume development included converting the 2017 volumes in downtown Redmond from the one-way couplet roadway network to a two-way street network. This included reviewing initial future forecasts provided by the City and then balancing volumes between intersections. After converting the volumes from the one-way street network to the two-way street network, the traffic growth rates were applied by area to develop 2035 traffic volumes for the detailed peak-hour traffic operations analysis. Traffic volumes are forecast to increase throughout the study area during the 2035 AM and PM peak hours. Figure 5-2 shows the forecasted 2035 AM and PM peak hour turning movements under the Project Baseline.

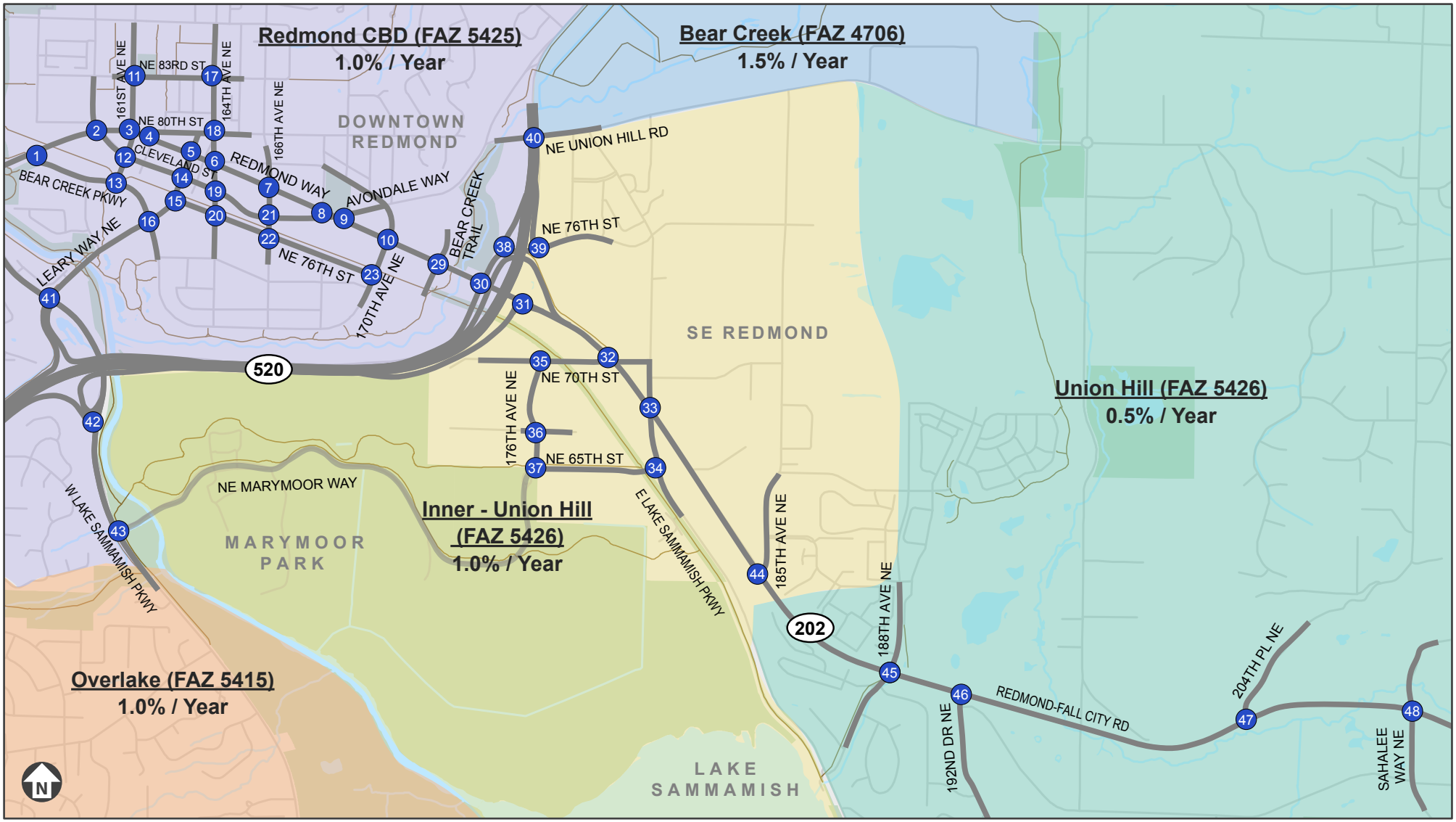
Intersection Operations

The traffic operations analysis compares the Project Baseline at the same study intersections analyzed under existing conditions. The existing and Project Baseline AM and PM peak hour LOS and delay for the study area intersections evaluated are shown in Tables 5-1 and 5-2, respectively. Figures 5-3 and 5-4 show 2035 AM and PM peak hour operations at the study intersections under the Project Baseline.

2035 AM Analysis

As shown in Table 5-1, three of the study area intersections are forecast to operate below the LOS standard for the facility during the 2035 AM peak hour for the Project Baseline due to increased congestion in 2035 compared to existing 2017 conditions. These three intersections are:

- Intersection #32: Redmond Way and NE 70th Street
- Intersection #33: Redmond Way and East Lake Sammamish Parkway/180th Avenue NE
- Intersection #40: SR 520 and NE Union Hill Road/Avondale Road



X Analysis Intersections - Typical

Figure 5-1
PSRC Forecast Analysis Zone (FAZ) Map Baseline Growth Rates
Downtown Redmond Link Extension

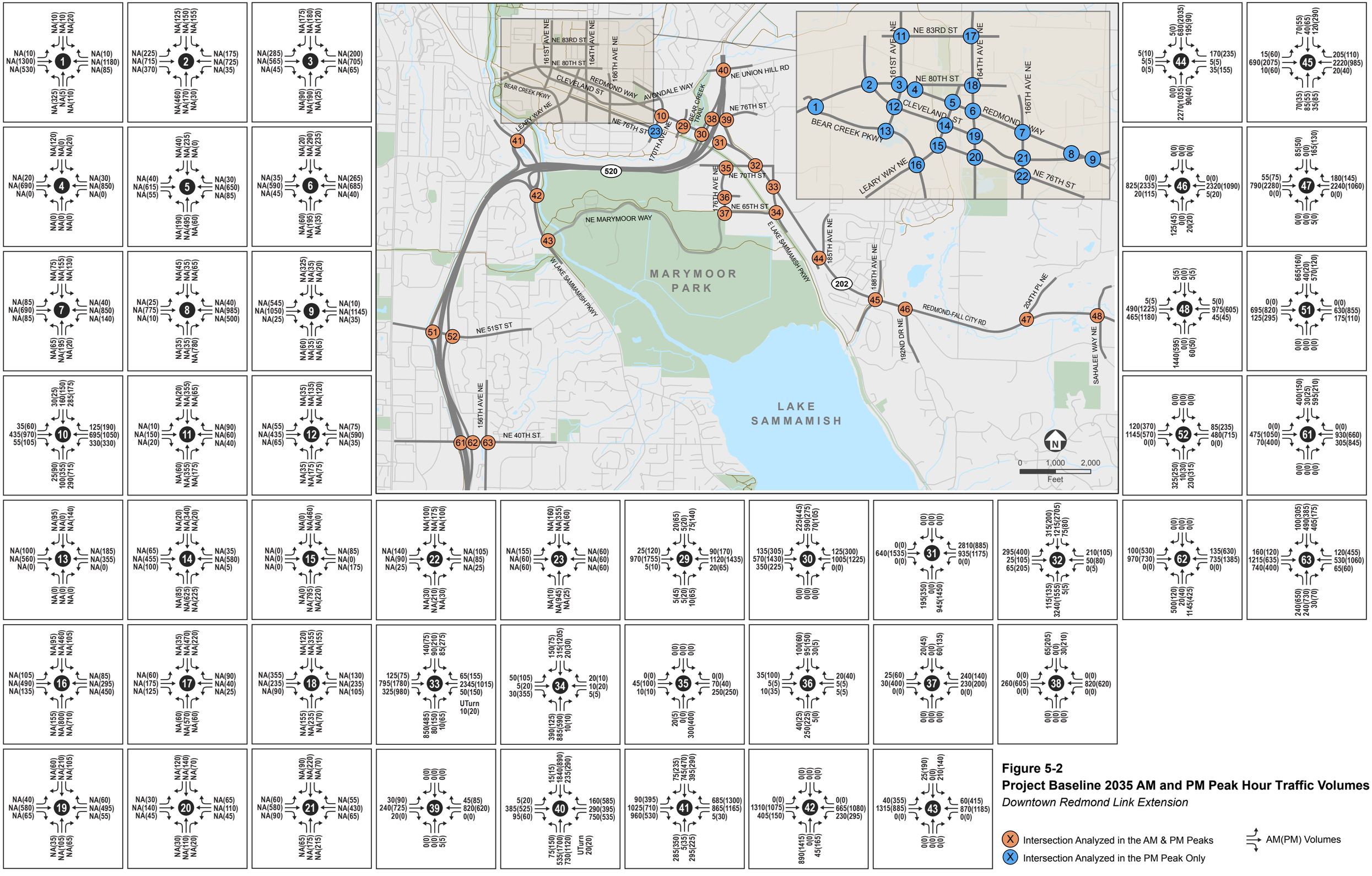
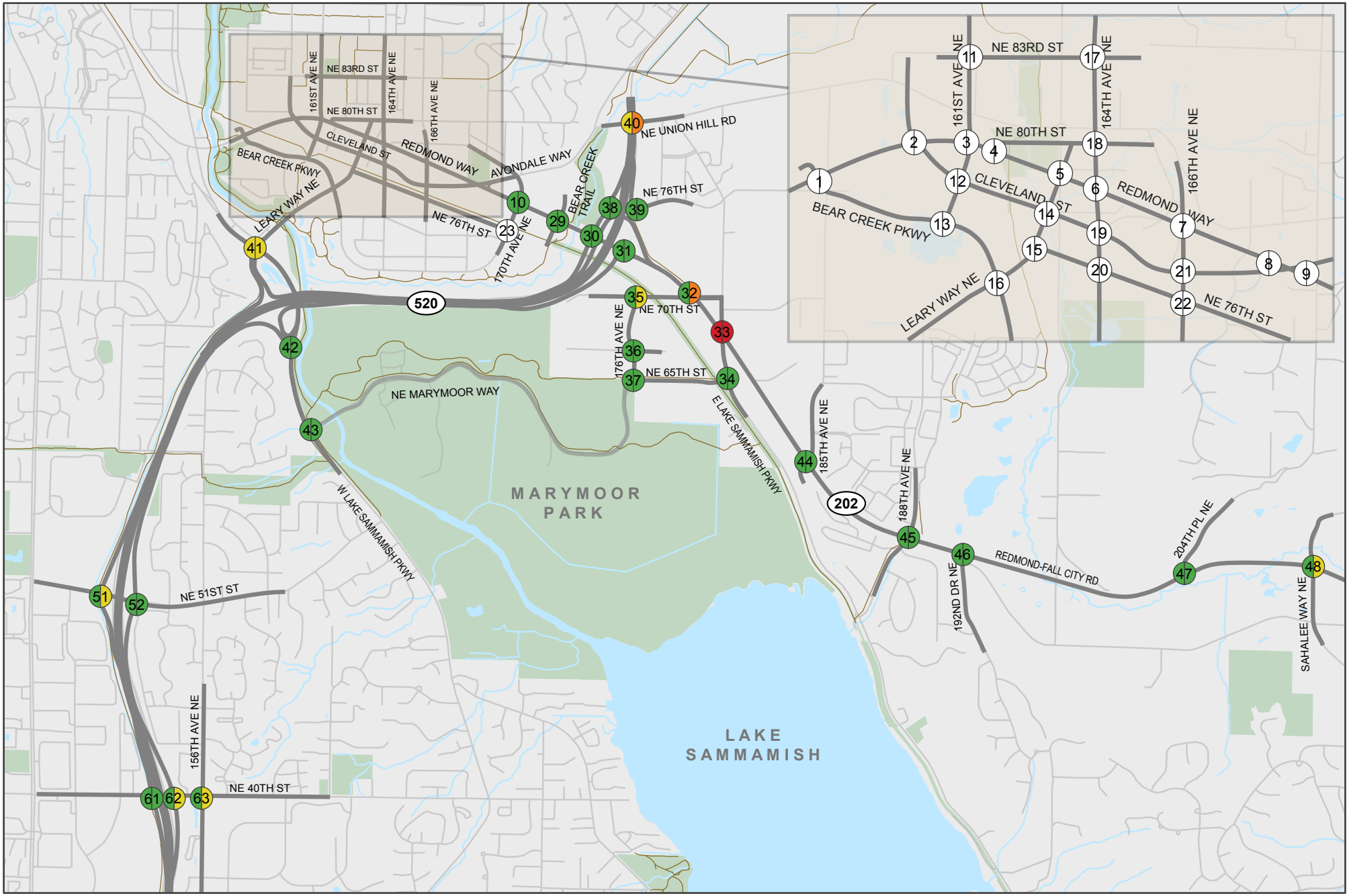


Figure 5-2
Project Baseline 2035 AM and PM Peak Hour Traffic Volumes
Downtown Redmond Link Extension

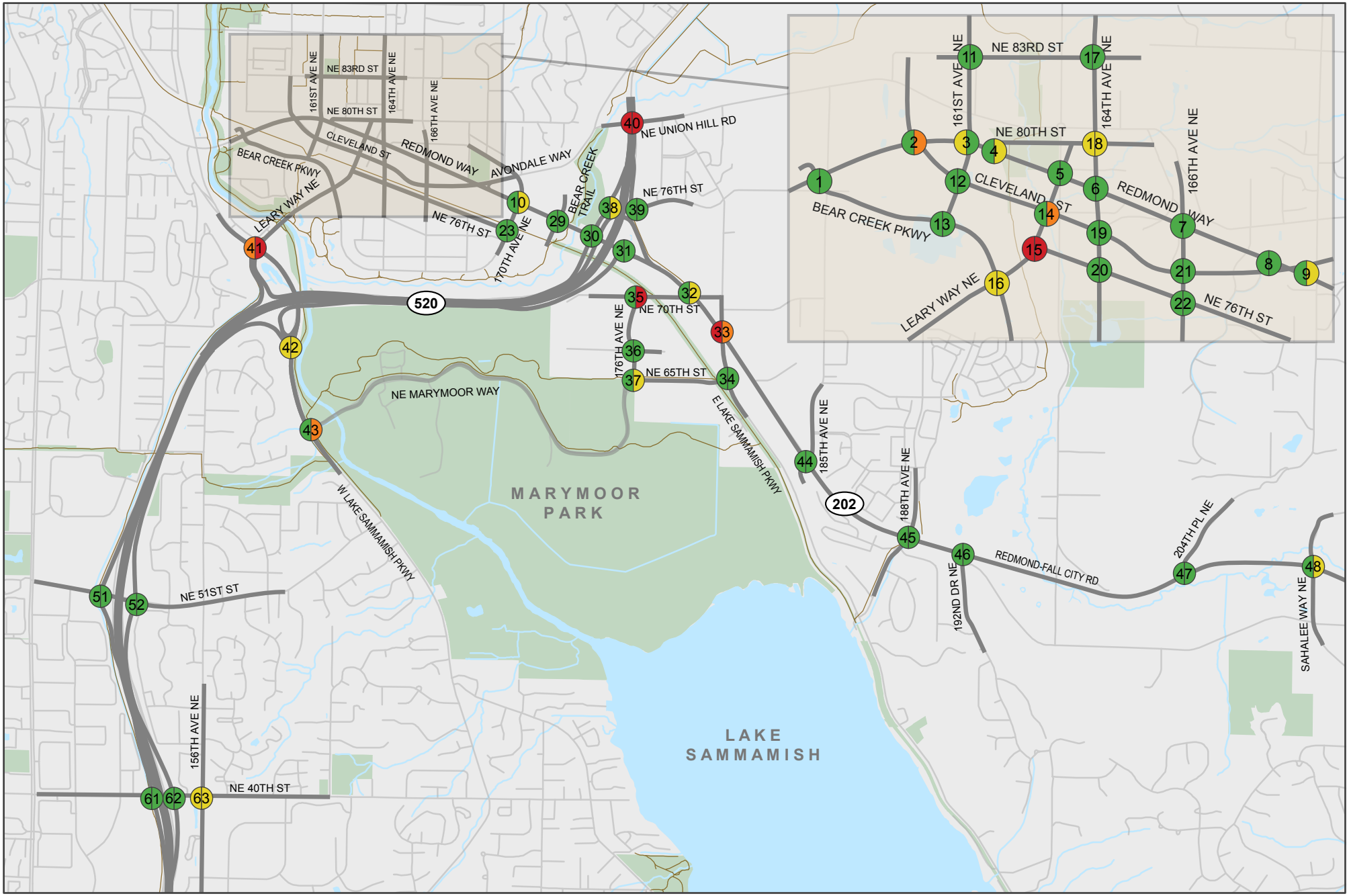


0 1,000 2,000
Feet

- LOS A-C
- LOS D
- LOS E
- LOS F
- No Analysis

Existing / Project Baseline

Figure 5-3
2035 Project Baseline
Traffic Operations During AM Peak Hour
Downtown Redmond Link Extension



0 1,000 2,000
Feet

- LOS A-C
- LOS D
- LOS E
- LOS F
- No Analysis

Existing / Project Baseline

Figure 5-4
2035 Project Baseline
Traffic Operations During PM Peak Hour
Downtown Redmond Link Extension

Table 5-1. Project Baseline 2035 AM Peak Hour Traffic Operations

ID	Intersection	Control Type	Agency (Standard)	Existing[1]		Project Baseline[1]	
				LOS	Delay (sec)	LOS	Delay (sec)
10	Redmond Way and 170th Avenue NE	Signal	City of Redmond (LOS D)	C	24	C	24
29	Redmond Way and Bear Creek Crossing	Signal	City of Redmond (LOS D)	A	7	A	8
30	Redmond Way and SR 520 Westbound On-Ramp/NE 76th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	33	C	20
31	Redmond Way and SR 520 Eastbound Ramp	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	14	B	16
32	Redmond Way and NE 70th Street	Signal	City of Redmond (LOS D)	B	15	***E***	***67***
33	Redmond Way and East Lake Sammamish Parkway/ 180th Avenue NE	Signal	City of Redmond (LOS D)	***F***	***91***	***F***	***111***
34	East Lake Sammamish Parkway and NE 65th Street	Signal	City of Redmond (LOS D)	A	7	A	7
35	176th Avenue NE and NE 70th Street	TWSC	City of Redmond (LOS D)	B	10	D	27
36	176th Avenue NE and NE 67th Street	TWSC	City of Redmond (LOS D)	B	12	B	15
37	176th Avenue NE and NE 65th Street	TWSC	City of Redmond (LOS D)	B	12	B	13
38	NE 76th Street and SR 520 Westbound Off-Ramp	TWSC	WSDOT Highways of Statewide Significance (LOS D)	C	16	C	18
39	NE 76th Street and SR 520 Eastbound On-Ramp/Fred Meyer	TWSC	WSDOT Highways of Statewide Significance (LOS D)	B	10	B	10
40	SR 520 and NE Union Hill Road/Avondale Road	Signal	City of Redmond (LOS D)	D	42	***E***	***75***
41	SR 520 Westbound Ramps and West Lake Sammamish Parkway/ Leary Way NE	Signal	WSDOT Highways of Statewide Significance (LOS D)	D	37	D	51
42	SR 520 Eastbound Ramp and West Lake Sammamish Parkway	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	26	C	29
43	West Lake Sammamish Parkway and NE Marymoor Way	Signal	City of Redmond (LOS D)	B	15	B	18
44	Redmond-Fall City Road and 185th Avenue NE	Signal	City of Redmond (LOS D)	B	13	C	21
45	Redmond-Fall City Road and 187th Avenue NE/ 188th Avenue NE	Signal	City of Redmond (LOS D)	B	10	B	15
46	Redmond-Fall City Road and 192nd Drive NE	Signal	WSDOT Regionally Significant Highway (LOS E)	A	5	A	8
47	Redmond-Fall City Road and 204th Place NE	Signal	WSDOT Regionally Significant Highway (LOS E)	B	14	C	21
48	Redmond-Fall City Road and Sahalee Way NE/NE 58th Street	Signal	WSDOT Regionally Significant Highway (LOS E)	C	31	D	43
51	SR 520 Westbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	30	D	47
52	SR 520 Eastbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	16	B	18

Table 5-1. Project Baseline 2035 AM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	Existing[1]		Project Baseline[1]	
				LOS	Delay (sec)	LOS	Delay (sec)
61	SR 520 Westbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	31	C	34
62	SR 520 Eastbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	29	D	40
63	NE 40th Street and 156th Avenue NE	Signal	City of Redmond (LOS D)	D	35	C	46

[1] Synchro analyzes intersections in isolation and does not take into account downstream congestion. Actual intersection operations may have more delay based on intersection interactions and queuing propagating upstream and downstream between intersections.

Cells highlighted in ***grey bold and italicized*** identify intersections that operate below the LOS standard for the facility.

Intersections were analyzed using the Synchro outputs for signalized intersections and 2010 Highway Capacity Manual outputs for unsignalized intersections.

TWSC = two-way stop controlled

Intersection #32 would experience the greatest change from existing conditions, with delay increasing from 15 seconds to 67 seconds. Intersections #33 and #40 would experience an increase in delay of 20 and 33 seconds, respectively. The delays at these three intersections can be attributed to the expected population and employment growth in Redmond and surrounding cities.

2035 PM analysis

During the 2035 PM peak hour, eight of the study area intersections are forecast to operate below the LOS standard for the facility. As described for the 2035 AM peak hour, the Project Baseline would experience more congestion in 2035 than under existing 2017 conditions. As shown in Table 5-2, the intersections that are forecast to operate below the LOS standard are:

- Intersection #2: Redmond Way and Cleveland Street/160th Avenue NE
- Intersection #14: Leary Way and Cleveland Street
- Intersection #15: Leary Way and NE 76th Street
- Intersection #33: Redmond Way and East Lake Sammamish Parkway/180th Avenue NE
- Intersection #35: 176th Avenue NE and NE 70th Street
- Intersection #40: SR 520 and NE Union Hill Road/Avondale Road
- Intersection #41: SR 520 Westbound Ramps and West Lake Sammamish Parkway/Leary Way NE
- Intersection #43: West Lake Sammamish Parkway and NE Marymoor Way

Delays at these intersections can be attributed to expected population and employment growth in Redmond as well as other nearby communities. Intersections #15, #33, #40, and #41 operate at LOS F under existing conditions and delays are forecast to increase in the future. While Intersection #33 operates below standard under the Project Baseline, delay is reduced from the existing conditions due to signal phasing changes and the geometric changes described previously.

Table 5-2. Project Baseline 2035 PM Peak Hour Traffic Operations

ID	Intersection	Control Type	Agency (Standard)	Existing[1]		Project Baseline[1]	
				LOS	Delay (sec)	LOS	Delay (sec)
1	Redmond Way and Bear Creek Parkway	Signal	City of Redmond (LOS D)	C	22	B	18
2	Redmond Way and Cleveland Street/160th Avenue NE	Signal	City of Redmond (LOS D)	B	18	***E***	***67***
3	Redmond Way and 161st Avenue NE	Signal	City of Redmond (LOS D)	D	38	C	33
4	Redmond Way and NE 80th Street	TWSC	City of Redmond (LOS D)	C	18	D	25
5	Redmond Way and Leary Way	Signal	City of Redmond (LOS D)	A	8	C	21
6	Redmond Way and 164th Avenue NE	Signal	City of Redmond (LOS D)	B	15	C	31
7	Redmond Way and 166th Avenue NE	Signal	City of Redmond (LOS D)	B	14	B	11
8	Redmond Way and 168th Avenue NE	Signal	City of Redmond (LOS D)	A	6	C	25
9	Redmond Way and Avondale Way	Signal	City of Redmond (LOS D)	C	24	D	39
10	Redmond Way and 170th Avenue NE	Signal	City of Redmond (LOS D)	C	31	D	37
11	161st Avenue NE and NE 83rd Street	Signal	City of Redmond (LOS D)	B	13	B	17
12	161st Avenue NE and Cleveland Street	Signal	City of Redmond (LOS D)	C	20	B	19
13	161st Avenue NE and Bear Creek Parkway	Signal	City of Redmond (LOS D)	B	14	B	10
14	Leary Way and Cleveland Street	Signal	City of Redmond (LOS D)	C	22	***E***	***71***
15	Leary Way and NE 76th Street	TWSC	City of Redmond (LOS D)	***F***	***87***	***F***	***139***
16	Leary Way and Bear Creek Parkway	Signal	City of Redmond (LOS D)	D	39	D	50
17	164th Avenue NE and NE 83rd Street	Signal	City of Redmond (LOS D)	C	21	C	24
18	164th Avenue NE and NE 80th Street	Signal	City of Redmond (LOS D)	D	38	D	44
19	164th Avenue NE and Cleveland Street	Signal	City of Redmond (LOS D)	B	13	C	29
20	164th Avenue NE and NE 76th Street	Roundabout	City of Redmond (LOS D)	A	0.27[2]	A	0.39[2]
21	166th Avenue NE and Cleveland Street	Signal	City of Redmond (LOS D)	B	13	B	18
22	166th Avenue NE and NE 76th Street	AWSC	City of Redmond (LOS D)	B	13	B	16
23	170th Avenue NE and NE 76th Street/Bartell's	Signal	City of Redmond (LOS D)	B	17	B	15
29	Redmond Way and Bear Creek Crossing	Signal	City of Redmond (LOS D)	B	14	C	25
30	Redmond Way and SR 520 Westbound On-Ramp/ NE 76th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	33	B	16
31	Redmond Way and SR 520 Eastbound Ramp	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	24	C	30

Table 5-2. Project Baseline 2035 PM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	Existing[1]		Project Baseline[1]	
				LOS	Delay (sec)	LOS	Delay (sec)
32	Redmond Way and NE 70th Street	Signal	City of Redmond (LOS D)	C	25	D	47
33	Redmond Way and East Lake Sammamish Parkway/ 180th Avenue NE	Signal	City of Redmond (LOS D)	***F***	***115***	***E***	***76***
34	East Lake Sammamish Parkway and NE 65th Street	Signal	City of Redmond (LOS D)	B	15	B	18
35	176th Avenue NE and NE 70th Street	TWSC	City of Redmond (LOS D)	B	11	***F***	***54***
36	176th Avenue NE and NE 67th Street	TWSC	City of Redmond (LOS D)	B	13	C	16
37	176th Avenue NE and NE 65th Street	TWSC	City of Redmond (LOS D)	C	20	D	28
38	NE 76th Street and SR 520 Westbound Off-Ramp	TWSC	WSDOT Highways of Statewide Significance (LOS D)	C	22	D	26
39	NE 76th Street and SR 520 Eastbound On-Ramp/ Fred Meyer	TWSC	WSDOT Highways of Statewide Significance (LOS D)	B	13	B	15
40	SR 520 and NE Union Hill Road/Avondale Road	Signal	City of Redmond (LOS D)	***F***	***90***	***F***	***157***
41	SR 520 Westbound Ramps and West Lake Sammamish Parkway/Leary Way NE	Signal	WSDOT Highways of Statewide Significance (LOS D)	***E***	***77***	***F***	***93***
42	SR 520 Eastbound Ramp and West Lake Sammamish Parkway	Signal	WSDOT Highways of Statewide Significance (LOS D)	D	40	D	48
43	West Lake Sammamish Parkway and NE Marymoor Way	Signal	City of Redmond (LOS D)	C	32	***E***	***74***
44	Redmond-Fall City Road and 185th Avenue NE	Signal	City of Redmond (LOS D)	B	12	B	16
45	Redmond-Fall City Road and 187th Avenue NE/188th Avenue NE	Signal	City of Redmond (LOS D)	B	18	C	29
46	Redmond-Fall City Road and 192nd Drive NE	Signal	WSDOT Regionally Significant Highway (LOS E)	A	4	A	6
47	Redmond-Fall City Road and 204th Place NE	Signal	WSDOT Regionally Significant Highway (LOS E)	B	12	B	12
48	Redmond-Fall City Road and Sahalee Way NE/ NE 58th Street	Signal	WSDOT Regionally Significant Highway (LOS E)	C	25	D	47
51	SR 520 Westbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	A	9	B	10
52	SR 520 Eastbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	15	C	20
61	SR 520 Westbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	22	C	25

Table 5-2. Project Baseline 2035 PM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	Existing[1]		Project Baseline[1]	
				LOS	Delay (sec)	LOS	Delay (sec)
62	SR 520 Eastbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	20	C	24
63	NE 40th Street and 156th Avenue NE	Signal	City of Redmond (LOS D)	D	40	D	44

[1] Synchro analyzes intersections in isolation and does not take into account downstream congestion. Actual intersection operations may have more delay based on intersection interactions and queuing propagating upstream and downstream between intersections.

[2] Operation of the roundabout is represented as a v/c ratio rather than a time delay.

Cells highlighted in ***grey bold and italicized*** identify intersections that operate below the LOS standard for the facility.

Intersections were analyzed using the Synchro outputs for signalized intersections and 2010 Highway Capacity Manual outputs for unsignalized intersections.

TWSC = two-way stop controlled

AWSC = all-way stop controlled

5.1.2 Freight

Under the Project Baseline, freight traffic is expected to be affected similar to general purpose traffic. Freight would experience the same levels of delay as general purpose traffic on roadways and at intersections with increased congestion.

5.1.3 Transit

In the Project Baseline, Link light rail service will extend to Overlake, downtown Seattle, West Seattle, Ballard, University District, Northgate, Lynnwood, and Tacoma.

Metro's future bus service assumptions for the Project Baseline are based upon the 2040 bus service network included in Metro's Long Range Plan, METRO CONNECTS. Sound Transit identified bus service assumptions associated with planned frequencies and destinations in the year of opening (2024). The final routes associated with bus service revisions will be subject to more detailed planning and public outreach and are subject to approval by the King County Council and Sound Transit Board for Metro and Sound Transit, respectively. Service levels will be subject to more detailed planning and refinement. Service provisions will also be subject to budget availability.

METRO CONNECTS identifies three types of bus service: Frequent (which includes RapidRide), Express, and Local. Sound Transit anticipates providing bus service via Sound Transit Express bus routes. Table 5-3 summarizes the planned bus service frequencies for each service type for both agencies.

Table 5-3. Types of Bus Service

Service Provider	Service Type	Peak Period		Off-Peak Period	
		Service Frequency	Buses per Hour per Direction	Service Frequency	Buses per Hour per Direction
Metro	Frequent/RapidRide	10 minutes	6	15 minutes	4
	Express	15 minutes	4	30 minutes	2
	Local	15-30 minutes	2-4	30 minutes	2
Sound Transit	ST Express	10-15 minutes	4-6	30 minutes	2

Figure 5-5 shows the planned bus routes in the study area for the Project Baseline. Metro's future bus network would be substantially similar to what is included in METRO CONNECTS. Service levels would be the same; however, buses may operate on different streets within the downtown Redmond area. In place of Route 1999 shown in METRO CONNECTS, it is likely the RapidRide B Line would not be modified from its current configuration. With light rail service extending to the Overlake Transit Center, Route 541 would be eliminated. Routes 542 and 545 would see a reduction in service levels. Route 542 would terminate in the University District rather than Green Lake, and Route 545 would begin serving the Overlake Transit Center at the freeway station stops at NE 40th Street. Routes 566 and 567 would terminate at the Bellevue Transit Center rather than at the Overlake Transit Center.

Demand for parking spaces at the Redmond Technology Center Station, Redmond Transit Center, and the Bear Creek Park-and-Ride lots would likely increase in response to congestion, changes in bus service, and as transit riders take buses to other light rail stations.

Table 5-4 summarizes the planned bus service in the study area, including forecast trips per hour. Buses would provide service throughout the study area, including the Redmond Technology Center Station, the Bear Creek Park-and-Ride, and the Redmond Transit Center.

Table 5-4. Planned Bus Service for the Project Baseline

Service Provider	Route[1]	Type	Trips per Hour per Direction		Description
			Peak	Off Peak	
Metro	B Line	RapidRide	6	4	Bellevue Transit Center to Redmond Transit Center
	1025	RapidRide	6	4	Overlake to Kenmore
	1026	RapidRide	6	4	East Redmond to Kirkland
	1030	RapidRide	6	4	Overlake to Renton
	1037	Frequent			Kirkland to Eastgate
	1511	Frequent	6	4	Avondale to Redmond Central Business District (CBD)
	2203	Express	4	2	Duvall to Redmond CBD
	2205	Express	4	2	North Bend to Redmond
	2206	Express	4	2	Mercer Island to Redmond
	2518	Express	4	2	Edmonds to Redmond CBD
	3090	Local	2	2	Woodinville to Sammamish
	3091	Local	4	2	English Hill to Overlake
	3092	Local	4	2	Overlake to South Kirkland
	3096	Local	4	2	Overlake to Eastgate
	3114	Local	2	2	Redmond to Kenmore
	3225	Local	2	2	Issaquah to Redmond CBD
	3994	Local	2	2	Carnation to Redmond CBD
Sound Transit	542	ST Express	4-6	2	Redmond Transit Center to University District
	545	ST Express	4-6	2	Bear Creek Park-and-Ride to Redmond Transit Center to Seattle
	566	ST Express	2 per hour during extended AM and PM peak periods	--	Auburn Station to Renton Transit Center to Overlake Transit Center
	567	ST Express	2-3 per hour during the AM and PM peak periods	--	Kent Station to Overlake Transit Center

[1] Metro route numbers correspond to those used in the service networks included in METRO CONNECTS.

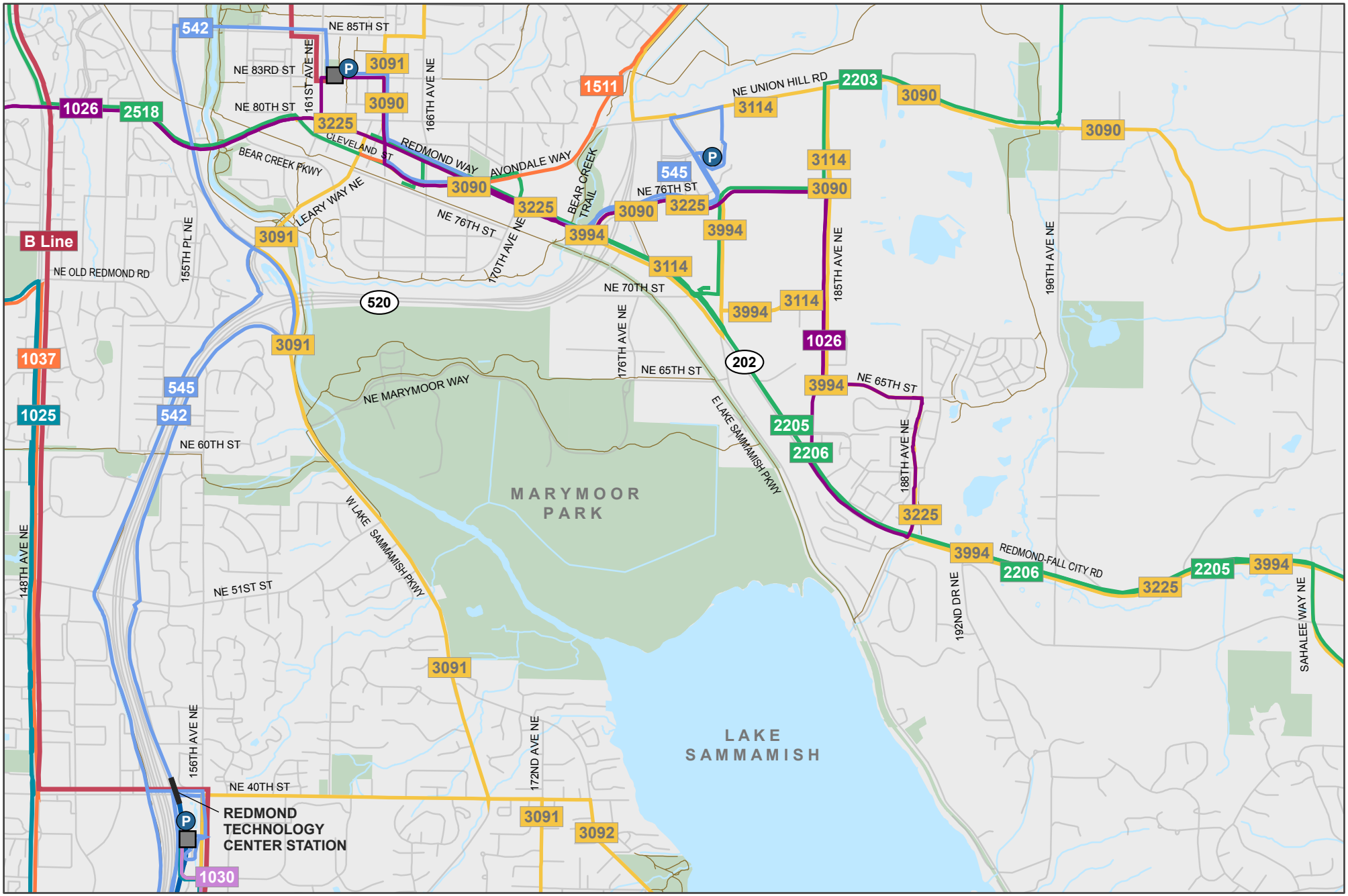


Figure 5-5
Project Baseline Transit Network
Downtown Redmond Link Extension

Bus stops would be located on-street throughout the study area in accordance with Metro and Sound Transit's stop spacing guidelines. Overlake, downtown Redmond, and southeast Redmond near the SR 520/SR 202 interchange areas, as well as the Bear Creek Park-and-Ride, would be areas with high concentrations of bus activity and would have several route termination points. Table 5-5 summarizes the active bay and layover needs for these areas[2]. Layover and active bays could be accommodated on-street or off-street. The Redmond Transit Center has five on-street active bays, one off-street active bay, and one off-street layover area with space for six buses. Layover and active bay needs can be accommodated on-street near the SR 520/SR 202 interchange. The Bear Creek Park-and-Ride has one active bay located on a bus-only roadway and two off-street layover areas. Additional details associated with development of active bays and layover areas are provided in Attachment C.

Table 5-5. Active Bay and Layover Needs for the Project Baseline

Service Provider	Downtown Redmond/Redmond Transit Center		SE Redmond (Near SR 520/SR 202 Interchange)		Bear Creek Park-and-Ride	
	Layover	Active Bays	Layover	Active Bays	Layover	Active Bays
Metro	8	7	5	2	0	2
Sound Transit	3		0		3	
Total	**11**	**7**	**5**	**2**	**3**	**2**

5.1.4 Nonmotorized Facilities

In the Project Baseline, pedestrian and bicycle facilities would be improved in accordance with adopted local plans. Nonmotorized volumes are expected to increase throughout the study area as a result of land use regulations that encourage mixed uses and higher residential densities. Additional nonmotorized facility projects that will be constructed in the study area by 2035 include:

- A grade-separated pedestrian and bike tunnel for the SR 520 regional shared use path under the NE 40th Street and SR 520 westbound ramp terminal intersection
- A new NE 80th Street trail from 185th Avenue NE to 188th Avenue NE
- A shared use path on the south side of NE 40th Street between 156th Avenue NE and 163rd Avenue NE
- Pedestrian connections between the Redmond Central Connector trail and Willows Road at approximately the 8400 block, and between the Redmond Central Connector and 168th Avenue NE; and a pedestrian crossing across Willows Road between the Redmond Central Connector and NE 87th Street
- Completion of the sidewalk on 176th Avenue NE between NE 65th and NE 70th Streets
- Construct nonmotorized tunnel under NE 51st Street on the west side of the interchange
- A nonmotorized overpass at West Lake Sammamish Parkway that connects the end of the SR 520 Regional Trail to the Sammamish River Regional Trail
- A potential improvement in the study area subject to funding is a new bicycle and pedestrian bridge over SR 520, connecting the southern landing at the East Link Redmond Technology

[2] Assessment of active bays and layovers required at the Redmond Technology Center Station was completed as part of the East Link Extension.

Center Station and Overlake Regional Growth Center with the northern landing at the SR 520 Regional Trail and employment area

Funding for some of these projects has yet to be determined and may be through a partnership involving multiple agencies. Figure 5-6 shows the nonmotorized facility projects along the study area by 2035.

Several roadway and intersection projects noted in Section 5.1.1 include nonmotorized facilities, such as sidewalks.

5.1.5 Parking

In the Project Baseline, on-street parking and park-and-ride facilities would not be modified. The City of Redmond might choose to modify existing parking allowances or restrictions for on-street spaces. Additional on-street parking in the Marymoor Village neighborhood could be provided in conjunction with changes to the roadway network. The City of Redmond may choose to implement time restrictions in this neighborhood, similar to downtown Redmond.

5.1.6 Safety

Traffic and nonmotorized volumes in the study area are expected to increase by 2035. This could increase collision frequencies for both motor vehicle and nonmotorized users in the study area. Planned roadway and intersection projects could improve safety through rechannelization, improved sight lines, or the addition of turn lanes. The construction of new bicycle and pedestrian facilities would improve safety for nonmotorized users and motor vehicles in the study area. Dedicated pedestrian and bicycle facilities would improve predictability at conflict points between motor vehicles and cyclists and reduce the likelihood of collisions, because potential conflict points would be clearly identifiable by both motor vehicle drivers and trail users.

5.2 Proposed Design Refinements

The Proposed Design Refinements will add 3.4 miles of light rail from the interim terminus at the Redmond Technology Center Station to downtown Redmond. The light rail alignment would travel along SR 520, beginning at the Redmond Technology Center and continuing across Marymoor Park to a new station at southeast Redmond. From the SE Redmond Station, the refined alignment would turn northwest and cross at-grade underneath SR 520 before rising to cross over Bear Creek. The SR 520 eastbound off-ramp and westbound on-ramp would be reconstructed over the light rail guideway. The alignment would enter the former BNSF Railway corridor as it crosses under the SR 520/SR 202 interchange. The alignment would accommodate an at-grade trail connection between the East Lake Sammamish Trail and Redmond Central Connector. In the downtown section, the alignment would run along the south edge of the rail corridor's easement and would have an elevated profile from Bear Creek through downtown Redmond, with the light rail alignment terminating just east of 164th Avenue NE.

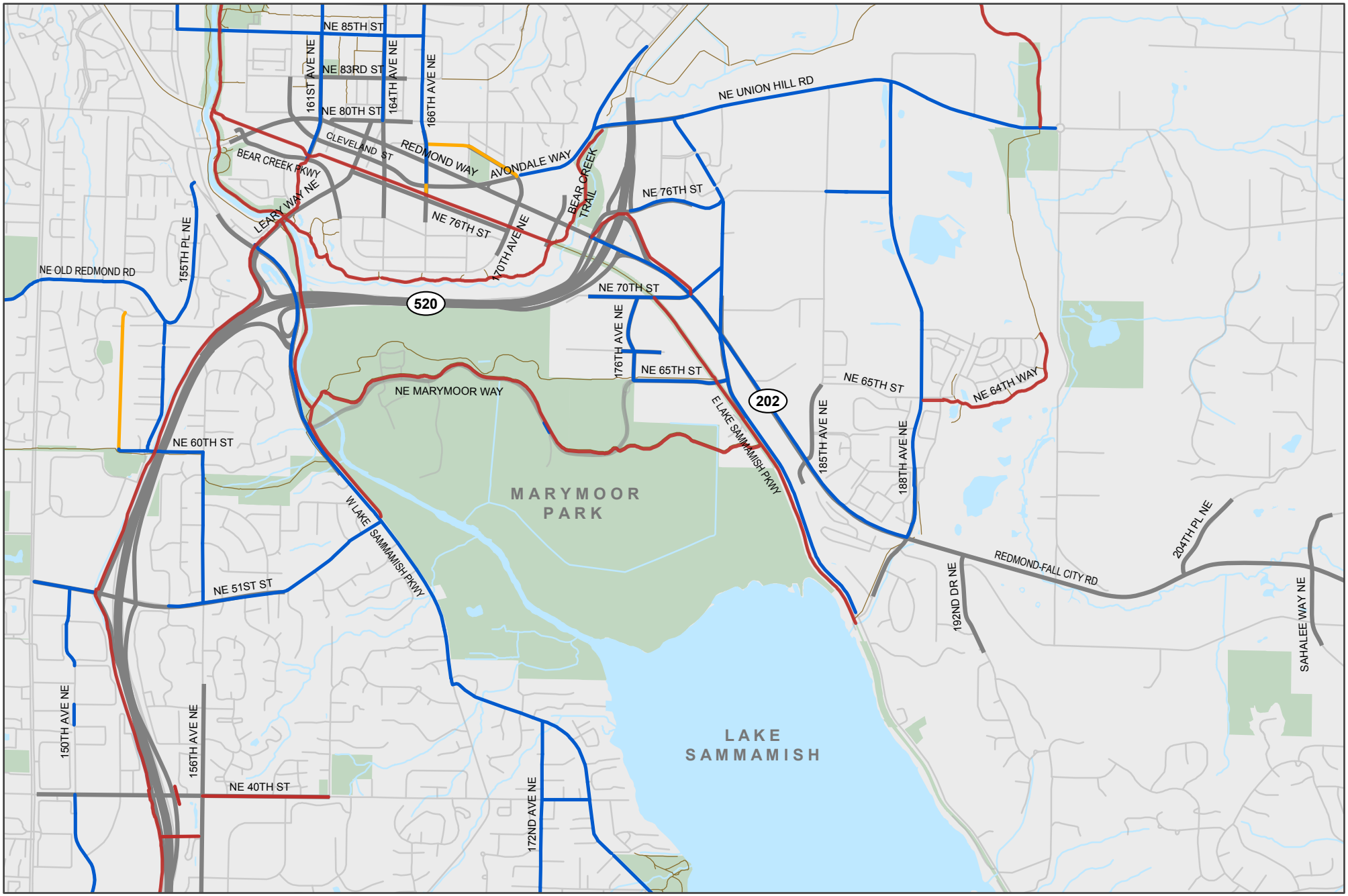


Figure 5-6
Project Baseline Bicycle Facilities and Shared Use Paths
Downtown Redmond Link Extension

The Proposed Design Refinements would include two new stations. The first, SE Redmond Station, would be located in southeast Redmond, east of Marymoor Park. The primary mode of access to this station is expected to be by automobile. It would include one 1,400-stall parking garage as well as circulation for transit, passenger pick-up and drop-off, and connections to trails in the area. The second station, Downtown Redmond Station, would be located in downtown Redmond. The Redmond Transit Center and Park-and-Ride, located on NE 83rd Street, would remain open. The Downtown Redmond Station is expected to be accessed via bus, walking, cycling, or automobile because the park-and-ride is also located near the station.

Bus service would be modified from the current network to provide service to and from the light rail stations between neighborhoods within the city of Redmond as well as surrounding communities. Metro would continue to provide local service and increase service frequency through downtown Redmond. Sound Transit's Express bus service would be modified to provide service to the light rail stations and then continue to the University District and South Lake Union. Given the increase in bus service and associated connections to light rail, it is anticipated that the two light rail stations would serve as transit centers, facilitating multimodal transit connections.

The roadway, intersection, and nonmotorized transportation improvements included in the Project Baseline would also be included in the Proposed Design Refinements.

5.2.1 Arterial and Local Street Operations

This section analyzes the operational impacts of the Proposed Design Refinements within the study area for the 2035 forecast year.

Roadway Network and Intersection Modifications

With the Proposed Design Refinements, the roadway network and intersections would be the same as the Project Baseline, except Intersection #31. The eastbound off-ramp at this intersection would be changed from a single left-turn lane and double right-turn lane to a double left-turn lane and double right-turn lane.

The light rail alignment follows a general route that parallels SR 520 for a large portion of its length and uses a substantial portion of existing former BNSF Railway right-of-way between SR 520 and the Downtown Redmond Station; as a result, property access and circulation issues would generally be minimal to none.

Traffic Volumes

For the Proposed Design Refinements, trips generated by light rail station usage were calculated for each station and added to the Project Baseline's estimated volumes for 2035. Trip generation for each station comprises automobile trips to and from park-and-ride lots, passenger drop-off/pick-up trips, new bus trips, and nonmotorized trips.

As discussed previously, two regional travel demand models were used in the development of transit ridership forecasts and future traffic volumes. The Sound Transit Ridership Model was used to produce transit ridership forecasts. This model had been developed using analytical ridership forecasting procedures developed over two decades of incremental methods applications. Sound Transit updated the model in 2015 in support of the ST3 Regional High-Capacity Transit System Plan. The model relies on the current PSRC's Land Use Vision (LUV.1) Forecast (released in January 2016).

For the Proposed Design Refinements, the proposed stations would generate additional traffic by all travel modes. The Sound Transit Ridership Model provided estimates of transit patrons accessing stations by

mode of travel, which is based on observed transit travel patterns. The methodology used in estimating the mode of access ridership is documented in the Transit Ridership Forecasting Methodology Report (Sound Transit 2015). Table 5-6 summarizes the forecast light rail ridership and mode of access at the Downtown Redmond Station and SE Redmond Station during the 2035 PM peak period.

Table 5-6. 3-Hour 2035 PM Peak Period Light Rail Ridership

	Ons[1]			Offs				
Station Name	Walk and Bike	Bus	Total	Walk and Bike	Bus	Auto[2]	Total	Daily Boardings
Downtown Redmond	186	231	**417**	188	843	400	**1,431**	2,900
SE Redmond	119	222	**341**	71	296	1,400	**1,767**	3,000

[1] For station access, the Sound Transit Ridership Model focuses on analysis of PM peak transit trips. This model does not estimate PM auto access for originating transit trips. The incidence of auto access for these trips is typically very low and involves drop-offs near stations. These trips do not necessarily use the parking capacity or the rider pick-up queueing space. Because the incidence of these PM drop-offs is very low, there is insufficient data to support modeling it in the Sound Transit Ridership Model.

[2] Auto includes single-occupancy vehicles, carpools, and drop-off/pick-ups.

The Proposed Design Refinements would include construction of one 1,400-stall parking garage at the SE Redmond Station. No new parking would be provided at the Downtown Redmond Station. The existing Redmond Transit Center Park-and-Ride, located near the Downtown Redmond Station, will not add any additional parking spaces and is currently 99 percent occupied.

The Sound Transit Ridership Model was used to assign ridership to various modes of travel based on data from the 2008 BART Station Profile Study (BART Marketing and Research Development 2008) and recent data collected from other Sound Transit light rail stations with parking facilities. For the proposed park-and-ride garage at the SE Redmond Station, it was assumed that the number of new vehicle trips generated during a 3-hour peak period would be equal to the total park-and-ride stalls provided. This includes single-occupancy vehicles, carpools, and drop-off/pick-up activity at the proportions and percentages described below. For the existing park-and-ride lot at Redmond Transit Center, no new auto park-and-ride trips were assumed because the park-and-ride is already operating at capacity. No new parking facilities are included as part of the Downtown Redmond Station.

For the traffic analysis, it was assumed that 0.40 trips per occupied space would be generated during the peak hour of the 3-hour AM and PM peak periods. These rates are consistent with survey data from Sound Transit's existing light rail stations and trip generation from light rail transit park-and-ride lots in other rail systems in the United States.

Vehicle trips generated by passenger drop-off/pick-up activity are not constrained by the number of parking spaces at the park-and-ride garage; instead, they are more directly related to station ridership and mode of access. Recent studies from Sound Transit indicate 17 percent of the total AM and PM peak period auto ridership are passenger drop-off/pick-up volumes. Therefore, 17 percent of the total 2035 AM and PM peak period auto ridership at each proposed station are forecast to be passenger drop-off/pick-up.

The forecast auto volumes at the Downtown Redmond Station and SE Redmond Station during the 2035 AM and PM peak hour under the Proposed Design Refinements are shown in Tables 5-7 and 5-8, respectively.

Table 5-7. Forecast Auto Volumes for the Proposed Design Refinements 2035 AM Peak Hour

Station Name	Inbound	Outbound
Downtown Redmond	70	70
SE Redmond	800	240

Table 5-8. Forecast Auto Volumes for the Proposed Design Refinements 2035 PM Peak Hour

Station Name	Inbound	Outbound
Downtown Redmond	70	70
SE Redmond	240	800

The peak hour vehicle trips generated at each proposed station area were assigned to study area roadways and intersections based on travel patterns from the PSRC model and are summarized in Figure 5-7.

Traffic volumes are forecast to increase throughout the study area during both the 2035 AM and PM peak hours. Figure 5-8 shows the forecasted 2035 AM and PM peak hour turning movements under the Proposed Design Refinements.

As part of this analysis, traffic volumes were forecast on Marymoor Way through Marymoor Park. The analysis found that negligible additional traffic was forecast on Marymoor Way resulting from the Proposed Design Refinements. Operations at intersections on both sides of the park are described in the following section.

Intersection Operations

The forecasted Project Baseline and Proposed Design Refinements for the 2035 AM and PM peak hour LOS as well as delay for the study area intersections evaluated are discussed below.

2035 AM analysis

Under the Proposed Design Refinements, five intersections are forecast to operate below the LOS standard for the facility. As shown in Table 5-9, these include Intersections #35 and #36, as well as the same three intersections (#32, #33, and #40) that are forecast to operate below the LOS standard under the Project Baseline. The additional delay identified for Intersections #32, #33, #35, and #36 compared to the Project Baseline can be attributed to passengers traveling to the SE Redmond Station via automobile, nonmotorized, and transit modes, with NE 70th Street serving as their primary access route. The difference in delay at Intersection #40 is due to proximity to stations and other major transportation facilities including SR 520. Figure 5-9 shows the 2035 AM peak hour operations at the study intersections.

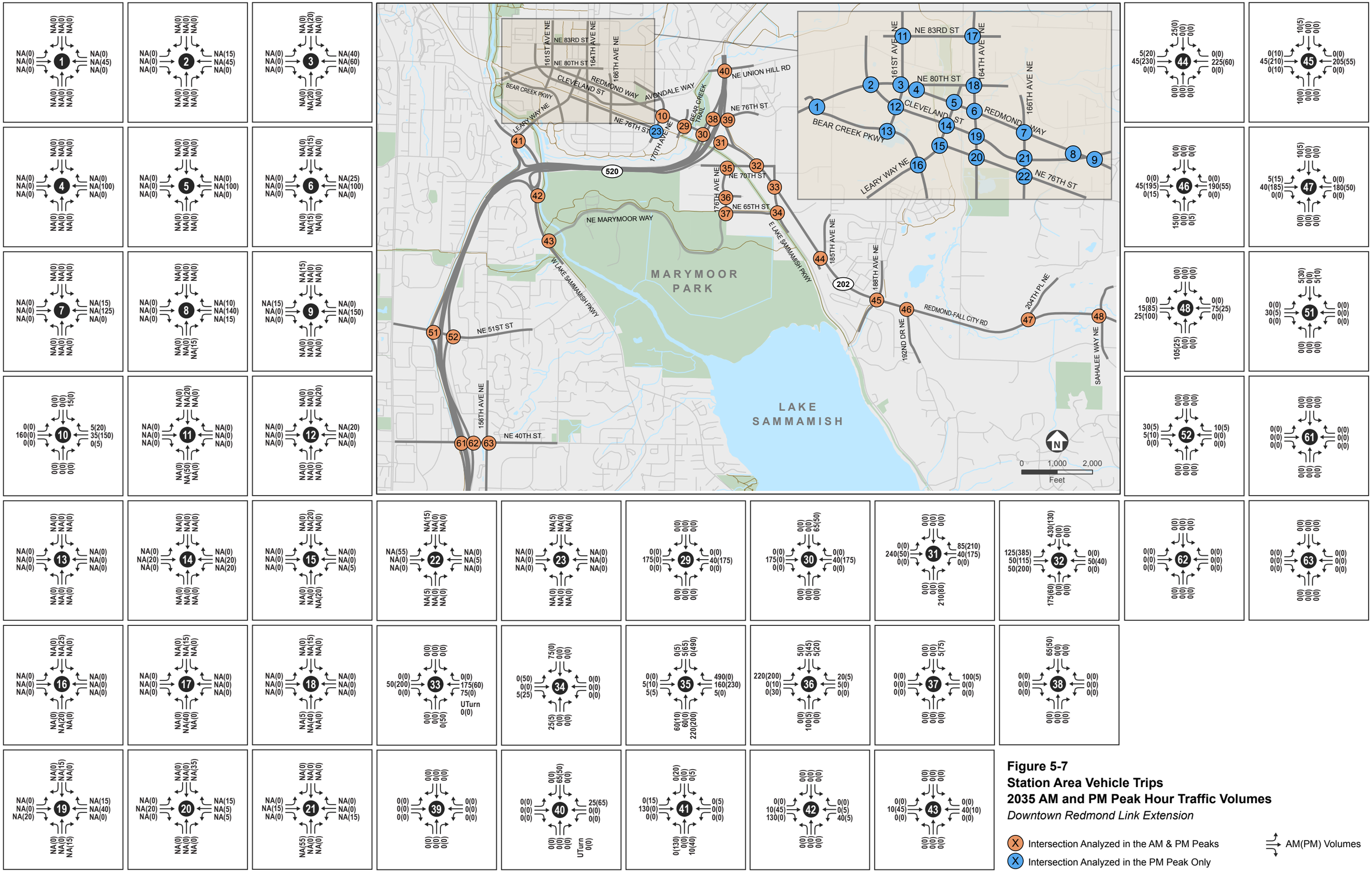


Figure 5-7
Station Area Vehicle Trips
2035 AM and PM Peak Hour Traffic Volumes
Downtown Redmond Link Extension

X Intersection Analyzed in the AM & PM Peaks
X Intersection Analyzed in the PM Peak Only
AM(PM) Volumes

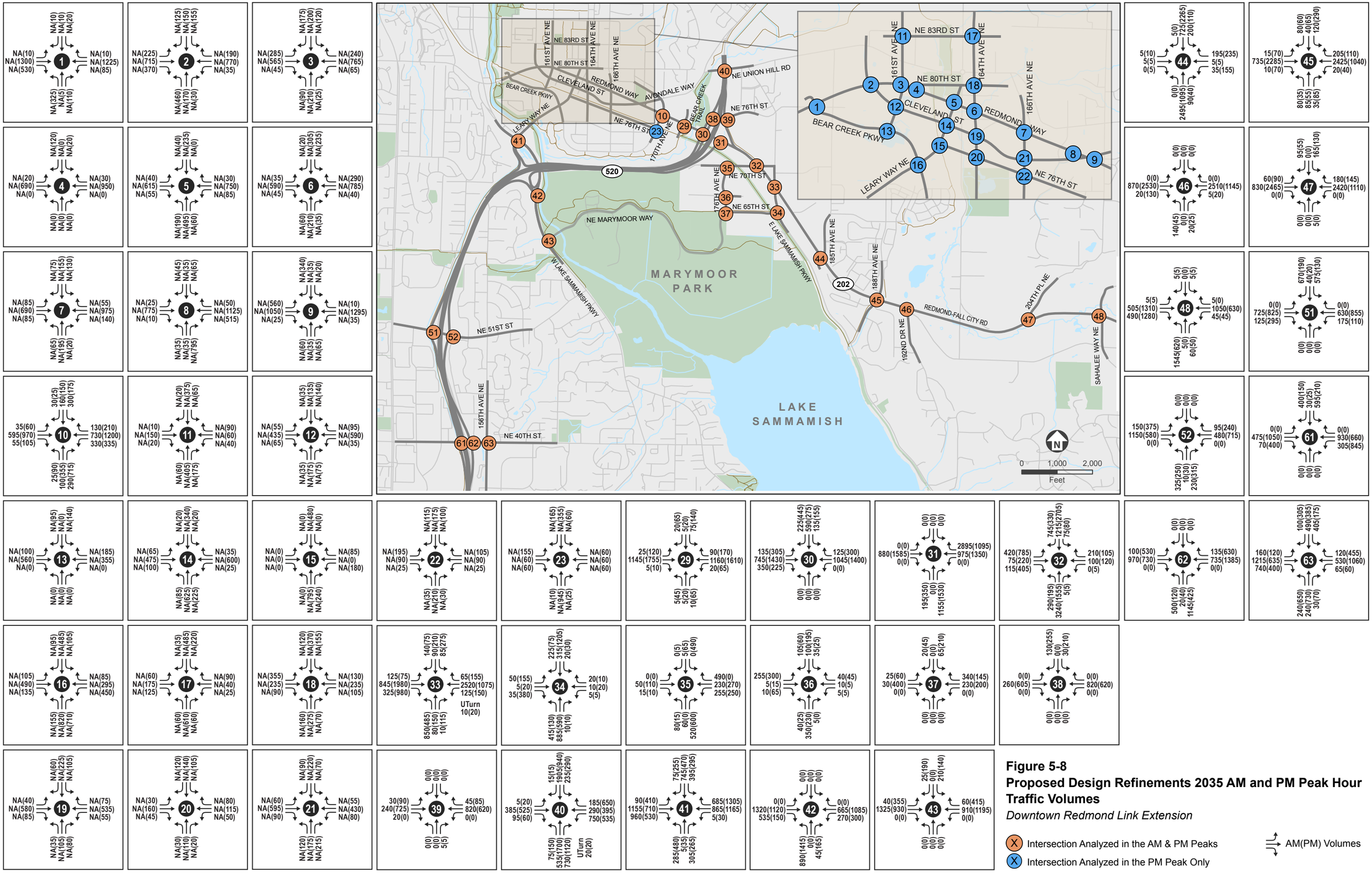


Figure 5-8
Proposed Design Refinements 2035 AM and PM Peak Hour Traffic Volumes
Downtown Redmond Link Extension

X Intersection Analyzed in the AM & PM Peaks
X Intersection Analyzed in the PM Peak Only
AM(PM) Volumes

Table 5-9. Proposed Design Refinements 2035 AM Peak Hour Traffic Operations

ID	Intersection	Control Type	Agency (Standard)	Project Baseline[1]		Proposed Design Refinements[1]	
				LOS	Delay (sec)	LOS	Delay (sec)
10	Redmond Way and 170th Avenue NE	Signal	City of Redmond (LOS D)	C	24	C	25
29	Redmond Way and Bear Creek Crossing	Signal	City of Redmond (LOS D)	A	8	A	8
30	Redmond Way and SR 520 Westbound On-Ramp/NE 76th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	20	C	20
31	Redmond Way and SR 520 Eastbound Ramp	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	16	B	19
32	Redmond Way and NE 70th Street	Signal	City of Redmond (LOS D)	***E***	***67***	***E***	***69***
33	Redmond Way and East Lake Sammamish Parkway/180th Avenue NE	Signal	City of Redmond (LOS D)	***F***	***111***	***F***	***116***
34	East Lake Sammamish Parkway and NE 65th Street	Signal	City of Redmond (LOS D)	A	7	A	6
35	176th Avenue NE and NE 70th Street	TWSC	City of Redmond (LOS D)	D	27	***F***	***>300***
36	176th Avenue NE and NE 67th Street	TWSC	City of Redmond (LOS D)	B	15	***F***	***94***
37	176th Avenue NE and NE 65th Street	TWSC	City of Redmond (LOS D)	B	13	B	14
38	NE 76th Street and SR 520 Westbound Off-Ramp	TWSC	WSDOT Highways of Statewide Significance (LOS D)	C	18	C	23
39	NE 76th Street and SR 520 Eastbound On-Ramp/Fred Meyer	TWSC	WSDOT Highways of Statewide Significance (LOS D)	B	10	B	10
40	SR 520 and NE Union Hill Road/Avondale Road	Signal	City of Redmond (LOS D)	***E***	***75***	***F***	***81***
41	SR 520 Westbound Ramps and West Lake Sammamish Parkway/Leary Way NE	Signal	WSDOT Highways of Statewide Significance (LOS D)	D	51	D	53
42	SR 520 Eastbound Ramp and West Lake Sammamish Parkway	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	29	C	32
43	West Lake Sammamish Parkway and NE Marymoor Way	Signal	City of Redmond (LOS D)	B	18	B	18
44	Redmond-Fall City Road and 185th Avenue NE	Signal	City of Redmond (LOS D)	C	21	D	38
45	Redmond-Fall City Road and 187th Avenue NE/188th Avenue NE	Signal	City of Redmond (LOS D)	B	15	C	32
46	Redmond-Fall City Road and 192nd Drive NE	Signal	WSDOT Regionally Significant Highway (LOS E)	A	8	A	9
47	Redmond-Fall City Road and 204th Place NE	Signal	WSDOT Regionally Significant Highway (LOS E)	C	21	D	37
48	Redmond-Fall City Road and Sahalee Way NE/NE 58th Street	Signal	WSDOT Regionally Significant Highway (LOS E)	D	43	D	49
51	SR 520 Westbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	D	47	D	49

Table 5-9. Proposed Design Refinements 2035 AM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	Project Baseline[1]		Proposed Design Refinements[1]	
				LOS	Delay (sec)	LOS	Delay (sec)
52	SR 520 Eastbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	18	B	18
61	SR 520 Westbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	34	C	34
62	SR 520 Eastbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	D	40	D	40
63	NE 40th Street and 156th Avenue NE	Signal	City of Redmond (LOS D)	D	46	D	46

[1] Synchro analyzes intersections in isolation and does not take into account downstream congestion. Actual intersection operations may have more delay based on intersection interactions and queuing propagating upstream and downstream between intersections.

Cells highlighted in ***grey bold and italicized*** identify intersections that operate below the LOS standard for the facility.

Intersections were analyzed using the Synchro outputs for signalized intersections and 2010 Highway Capacity Manual outputs for unsignalized intersections.

TWSC = two-way stop controlled

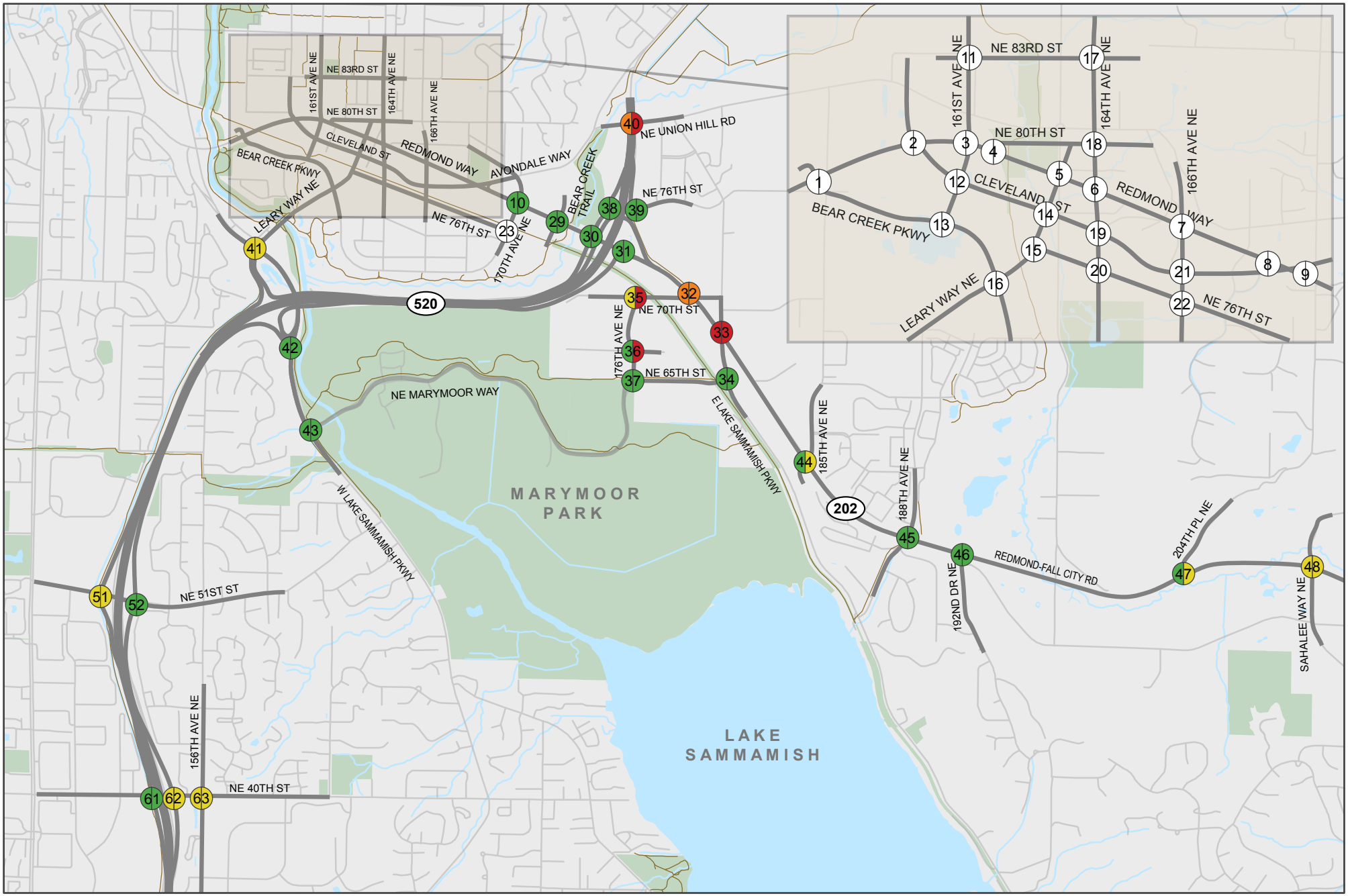


Figure 5-9
2035 Proposed Design Refinements
Traffic Operations During AM Peak Hour
Downtown Redmond Link Extension

2035 PM analysis

As shown in Table 5-10, 11 of the study area intersections are forecast to operate below the LOS standard for the facility during the 2035 PM peak hour under the Proposed Design Refinements. These include Intersections #32, #36, and #37 as well as the eight intersections (#2, #14, #15, #33, #35, #40, #41, and #43) forecast to operate below standard under the Project Baseline. Figure 5-10 shows the 2035 PM peak hour operations at the study intersections under the Proposed Design Refinements.

The increase in delay at Intersections #32, #33, #35, #36, and #37, as compared to the Project Baseline, can be attributed to passengers traveling to the SE Redmond Station via automobile, nonmotorized, and transit modes. The increase in delay at Intersections #2, #14, and #15 can be attributed to passengers traveling to or from the Downtown Redmond Station via automobile, nonmotorized, and transit modes. The difference in delay at Intersections #40, #41, and #43 is due to proximity to stations and other major transportation facilities including SR 520.

Table 5-10. Proposed Design Refinements 2035 PM Peak Hour Traffic Operations

				Project Baseline[1]		Proposed Design Refinements[1]	
ID	Intersection	Control Type	Agency (Standard)	LOS	Delay (sec)	LOS	Delay (sec)
1	Redmond Way and Bear Creek Parkway	Signal	City of Redmond (LOS D)	B	18	B	18
2	Redmond Way and Cleveland Street/ 160th Avenue NE	Signal	City of Redmond (LOS D)	***E***	***67***	***E***	***73***
3	Redmond Way and 161st Avenue NE	Signal	City of Redmond (LOS D)	C	33	D	36
4	Redmond Way and NE 80th Street	TWSC	City of Redmond (LOS D)	D	25	D	31
5	Redmond Way and Leary Way	Signal	City of Redmond (LOS D)	C	21	C	25
6	Redmond Way and 164th Avenue NE	Signal	City of Redmond (LOS D)	C	31	D	41
7	Redmond Way and 166th Avenue NE	Signal	City of Redmond (LOS D)	B	11	B	12
8	Redmond Way and 168th Avenue NE	Signal	City of Redmond (LOS D)	C	25	C	31
9	Redmond Way and Avondale Way	Signal	City of Redmond (LOS D)	D	39	D	41
10	Redmond Way and 170th Avenue NE	Signal	City of Redmond (LOS D)	D	37	D	39
11	161st Avenue NE and NE 83rd Street	Signal	City of Redmond (LOS D)	B	17	B	18
12	161st Avenue NE and Cleveland Street	Signal	City of Redmond (LOS D)	B	19	C	20
13	161st Avenue NE and Bear Creek Parkway	Signal	City of Redmond (LOS D)	B	10	B	10
14	Leary Way and Cleveland Street	Signal	City of Redmond (LOS D)	***E***	***71***	***E***	***80***
15	Leary Way and NE 76th Street	TWSC	City of Redmond (LOS D)	***F***	***139***	***F***	***161***
16	Leary Way and Bear Creek Parkway	Signal	City of Redmond (LOS D)	D	50	D	50
17	164th Avenue NE and NE 83rd Street	Signal	City of Redmond (LOS D)	C	24	C	26
18	164th Avenue NE and NE 80th Street	Signal	City of Redmond (LOS D)	D	44	D	46

Table 5-10. Proposed Design Refinements 2035 PM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	Project Baseline[1]		Proposed Design Refinements[1]	
				LOS	Delay (sec)	LOS	Delay (sec)
19	164th Avenue NE and Cleveland Street	Signal	City of Redmond (LOS D)	C	29	D	39
20	164th Avenue NE and NE 76th Street	Roundabout	City of Redmond (LOS D)	A	0.39[2]	A	0.43[2]
21	166th Avenue NE and Cleveland Street	Signal	City of Redmond (LOS D)	B	18	C	29
22	166th Avenue NE and NE 76th Street	AWSC	City of Redmond (LOS D)	B	16	B	18
23	170th Avenue NE and NE 76th Street/Bartell's	Signal	City of Redmond (LOS D)	B	15	B	15
29	Redmond Way and Bear Creek Crossing	Signal	City of Redmond (LOS D)	C	25	C	30
30	Redmond Way and SR 520 Westbound On-Ramp/ NE 76th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	16	B	18
31	Redmond Way and SR 520 Eastbound Ramp	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	30	D	42
32	Redmond Way and NE 70th Street	Signal	City of Redmond (LOS D)	D	47	***F***	***137***
33	Redmond Way and East Lake Sammamish Parkway/180th Avenue NE	Signal	City of Redmond (LOS D)	***E***	***76***	***F***	***100***
34	East Lake Sammamish Parkway and NE 65th Street	Signal	City of Redmond (LOS D)	B	18	B	19
35	176th Avenue NE and NE 70th Street	TWSC	City of Redmond (LOS D)	***F***	***54***	***F***	***210***
36	176th Avenue NE and NE 67th Street	TWSC	City of Redmond (LOS D)	C	16	***F***	***97***
37	176th Avenue NE and NE 65th Street	TWSC	City of Redmond (LOS D)	D	28	***F***	***53***
38	NE 76th Street and SR 520 Westbound Off-Ramp	TWSC	WSDOT Highways of Statewide Significance (LOS D)	D	26	D	28
39	NE 76th Street and SR 520 Eastbound On-Ramp/ Fred Meyer	TWSC	WSDOT Highways of Statewide Significance (LOS D)	B	15	B	15
40	SR 520 and NE Union Hill Road/Avondale Road	Signal	City of Redmond (LOS D)	***F***	***157***	***F***	***155***
41	SR 520 Westbound Ramps and West Lake Sammamish Parkway/Leary Way NE	Signal	WSDOT Highways of Statewide Significance (LOS D)	***F***	***93***	***F***	***103***
42	SR 520 Eastbound Ramp and West Lake Sammamish Parkway	Signal	WSDOT Highways of Statewide Significance (LOS D)	D	48	D	54
43	West Lake Sammamish Parkway and NE Marymoor Way	Signal	City of Redmond (LOS D)	***E***	***74***	***E***	***74***
44	Redmond-Fall City Road and 185th Avenue NE	Signal	City of Redmond (LOS D)	B	16	B	17
45	Redmond-Fall City Road and 187th Avenue NE/ 188th Avenue NE	Signal	City of Redmond (LOS D)	C	29	D	50

Table 5-10. Proposed Design Refinements 2035 PM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	Project Baseline[1]		Proposed Design Refinements[1]	
				LOS	Delay (sec)	LOS	Delay (sec)
46	Redmond-Fall City Road and 192nd Drive NE	Signal	WSDOT Regionally Significant Highway (LOS E)	A	6	A	8
47	Redmond-Fall City Road and 204th Place NE	Signal	WSDOT Regionally Significant Highway (LOS E)	B	12	B	18
48	Redmond-Fall City Road and Sahalee Way NE/NE 58th Street	Signal	WSDOT Regionally Significant Highway (LOS E)	D	47	E	61
51	SR 520 Westbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	10	B	11
52	SR 520 Eastbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	20	C	20
61	SR 520 Westbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	25	C	25
62	SR 520 Eastbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	24	C	24
63	NE 40th Street and 156th Avenue NE	Signal	City of Redmond (LOS D)	D	44	D	44

[1] Synchro analyzes intersections in isolation and does not take into account downstream congestion. Actual intersection operations may have more delay based on intersection interactions and queuing propagating upstream and downstream between intersections.

[2] Operation of the roundabout is represented as a v/c ratio rather than a time delay.

Cells highlighted in ***grey bold and italicized*** identify intersections that operate below the LOS standard for the facility.

Intersections were analyzed using the Synchro outputs for signalized intersections and 2010 Highway Capacity Manual outputs for unsignalized intersections.

TWSC = two-way stop controlled

AWSC = all-way stop controlled

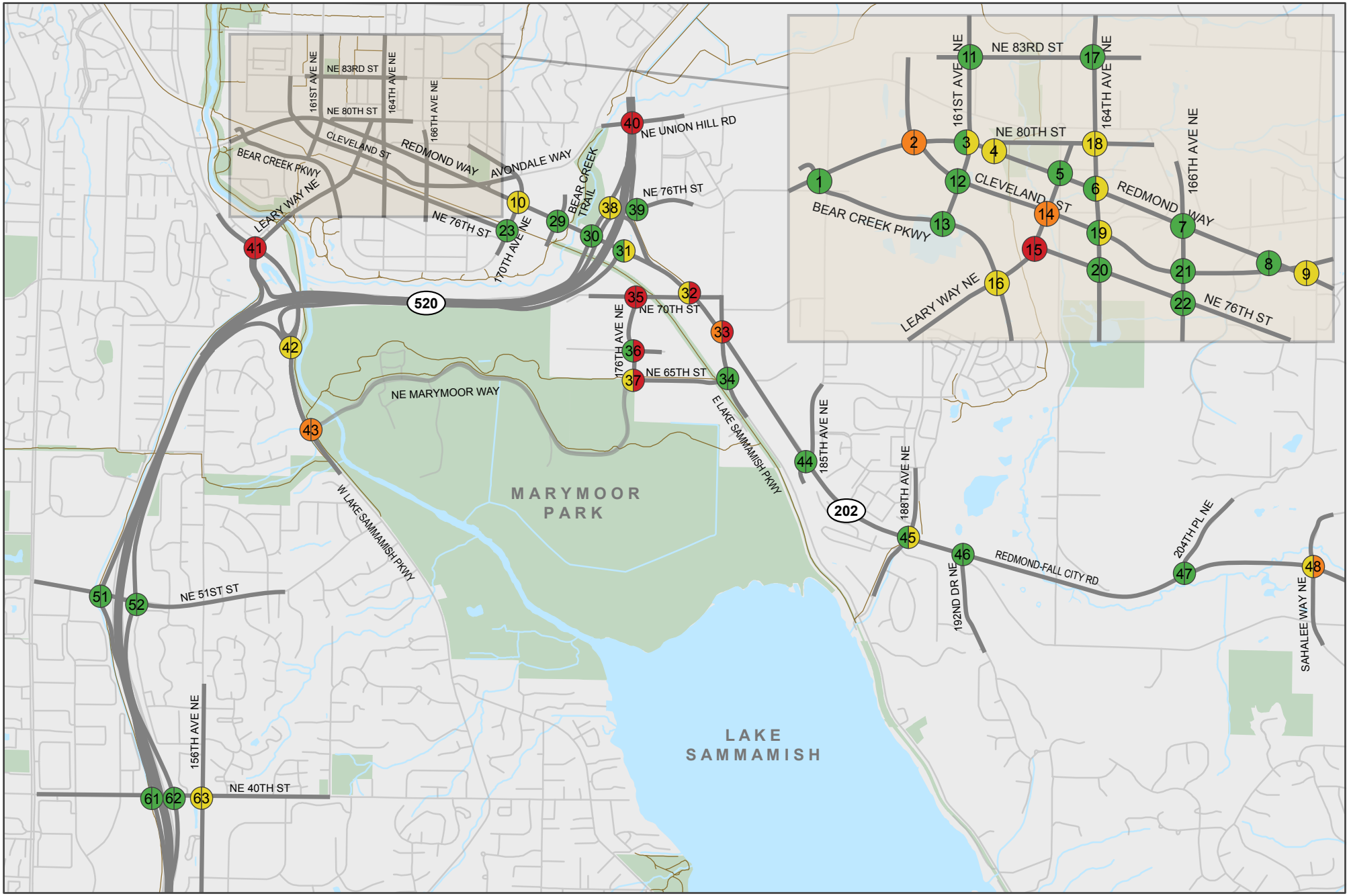


Figure 5-10
2035 Proposed Design Refinements
Traffic Operations During PM Peak Hour
Downtown Redmond Link Extension

Comparison to the Final EIS

The Final EIS analyzed 2030 as the design year but the design year for this report is 2035. Since publication of the Final EIS, several conditions in the study area and the region have changed, subsequently influencing development of the analysis and results for the Proposed Design Refinements. They include passage of the ST3 ballot measure, adoption of amendments to the City of Redmond Comprehensive Plan, adoption of METRO CONNECTS, adoption of the Redmond Transportation Master Plan, and adoption of the Marymoor Subarea Plan.

Geometric Changes

The major geometric difference is that the light rail alignment through downtown Redmond is elevated for the Proposed Design Refinements versus at-grade for the East Link Project.

Study Intersections

The Final EIS assumed modifications to Cleveland Street and Redmond Way, as described for the Project Baseline and the Proposed Design Refinements. The intersections and number of intersections analyzed for the Downtown Redmond Link Extension in this report are different from those included in the Final EIS. As part of the Downtown Redmond Link Extension analysis, the study intersections were expanded to include additional intersections along SR 520, downtown Redmond intersections, and several intersections along the SR 202/Redmond-Fall City Road east of downtown Redmond. The more expansive look was determined through coordination with the City of Redmond and WSDOT staff for the study area. The following intersections were evaluated in this report in addition to those evaluated in the Final EIS:

- SR 520 ramps at NE 76th Street (#38 and #39), West Lake Sammamish Parkway (#42), and NE 51st Street (#51 and #52)
- West Lake Sammamish Parkway and NE Marymoor Way (#43)
- Several intersections in downtown Redmond (#1, #2, #4, #5, #8, #9, #10, #13, #14, and #17)
- Redmond Way and Bear Creek Crossing (#29)
- 176th Avenue NE and NE 67th Street (#36)
- 176th Avenue NE and NE 65th Street (#37)
- Several intersections on SR 202/Redmond-Fall City Road (#44, #45, #46, #47, and #48)

The Final EIS included analysis of some intersections that were not evaluated in this report. The intersections not evaluated are located in proximity to other intersections evaluated in this report. The analysis of the nearby intersections demonstrates the impacts of the Proposed Design Refinements on the roadway network. Intersections not evaluated in this report include:

- Leary Way and 159th Place NE
- 161st Avenue NE and NE 85th Street
- 164th Avenue NE and NE 85th Street
- 166th Avenue NE and NE 80th Street
- NE Union Hill Road and 178th Place NE

As with the Proposed Design Refinements, the Final EIS did not identify any impacts to property access and circulation.

Time Periods for Analysis

The Final EIS did not analyze intersection volumes or operations during the AM peak period.

Ridership

The Final EIS assumed peak period train frequency every 7 minutes rather than every 6 minutes, and projected 2,000 future daily boardings at each light rail station. Under the Proposed Design Refinements, 2,900 daily boardings at the Downtown Redmond Station and 3,000 daily boardings at the SE Redmond Station are forecast.

Operational Results

Differences in the operational results presented in the Final EIS are described below. All results reflect the operations analysis during the 2035 PM peak period.

- Similar to the Proposed Design Refinements, Intersections #32, #33, #35, #40, and #41 are forecast to operate below LOS standard under the Project.
- Intersection #15 is forecast to operate below LOS standard under the Proposed Design Refinements but operates acceptably under the Project.
- Intersections #23 and #63 are forecast to operate below LOS standard under the Project but not under the Proposed Design Refinements.
- Intersections #2, #14, #15, #36, #37, and #43 are forecast to operate below LOS standard under the Proposed Design Refinements; these intersections were not analyzed in the Final EIS.

5.2.2 Freight

The Proposed Design Refinements are not anticipated to negatively affect truck circulation or truck routes on the local street network in the study area. There are no at-grade light rail profiles that would result in additional crossings or delays for trucks. Additional vehicle volumes at intersections adjacent to the SE Redmond Station, which includes a new parking facility, may cause increases in travel times for trucks. Freight would experience the same levels of delay as general purpose traffic on roadways and at intersections throughout the study area.

Comparison to the Final EIS

Unlike the Proposed Design Refinements, the Final EIS anticipated that light rail in downtown Redmond would be developed at-grade. Therefore, local truck routes would cross or travel alongside of light rail at-grade profiles and many of the identified impacts reflect that feature. It concluded that the intersection conditions with the Project would be similar to the No Build Alternative examined in the Final EIS and that some intersection operations may improve through mitigation for the Project. It also identified that many of the at-grade alternatives that travel through intersections would be accommodated within the existing traffic signal operations; thus, disturbances caused by the light rail would be minimized, although slight delays could occur on the side streets when light rail travels through the intersection. The Final EIS concluded that the Project was not anticipated to negatively affect truck circulation or routes on the local street network.

5.2.3 Transit

With the Proposed Design Refinements, Link light rail riders would have direct light rail connections from downtown Redmond and southeast Redmond to Bellevue, downtown Seattle, West Seattle, Ballard, University District, Northgate, Lynnwood, and Tacoma. During the 2035 AM and PM peak periods, train frequency would be every 6 minutes. Train frequency would be every 10 minutes during the midday and evening, and every 15 minutes in the early morning and evening late-night periods. Transit travel times between these stations would decrease and trips would become more reliable, because light rail would operate in a dedicated right-of-way and avoid delays associated with increased

traffic congestion. Metro and Sound Transit plan to provide bus service in the study area. Under the Proposed Design Refinements, 2,900 daily boardings at the Downtown Redmond Station and 3,000 daily boardings at the SE Redmond Station are forecast.

The bus service network under the Proposed Design Refinements would focus on integration with light rail service in Redmond at the two new stations to expand rider opportunities to access the regional high-capacity transit system. Metro's service network would be the same as the Project Baseline with one exception. The RapidRide B Line route would be revised and would no longer serve the study area; it would be replaced by Route 1999, as shown in METRO CONNECTS. Sound Transit's Express bus service would be revised to no longer serve downtown Seattle, because light rail would now provide that connection. The service would be similar to the Project Baseline; however, Route 542 would begin at the SE Redmond Station rather than the Redmond Transit Center. It would serve the Downtown Redmond Station as well as the Redmond Transit Center before continuing to the University District. Route 545 would serve South Lake Union rather than downtown Seattle.

Figure 5-11 shows the planned transit routes in the study area under the Proposed Design Refinements. The final routes associated with bus service revisions will be subject to more detailed planning and public outreach, as well as approval by the King County Council and Sound Transit Board for Metro and Sound Transit, respectively. Service levels will be subject to more detailed planning and refinement. Service provisions will also be subject to budget availability.

The Link light rail stations would be designed to accommodate anticipated bus volumes, including active bus bays and layover areas. Layover could be accommodated on-street or off-street. Peak period bus volumes are anticipated to provide the greatest number of bus trips, resulting in the highest number of active bays and layover areas to accommodate operations. Several routes would provide "pass through" service to a Link station and terminate elsewhere.

Because the bus activity would be substantially similar to the Project Baseline, the active bays and layover needs would be the same in the Proposed Design Refinements. However, the change to Route 542 would relocate the need for layover space associated with this route from the Redmond Transit Center to the SE Redmond Station. Table 5-11 summarizes the active bay and layover needs for the SE Redmond Station and Downtown Redmond Station as well as the Bear Creek Park-and-Ride. At the Downtown Redmond Station, layover could be accommodated on-street or off-street. As with the Project Baseline, some active bays and layover needs could be accommodated at the Redmond Transit Center. At the SE Redmond Station, the active bays and layover would be accommodated off-street in the parking structure. There would be no changes to the active bays and layover needs at the Bear Creek Park-and-Ride.

Table 5-11. Active Bays and Layover Needs for the Proposed Design Refinements

	Downtown Redmond Station		SE Redmond Station		Bear Creek Park-and-Ride	
	Layover	**Active Bays**	**Layover**	**Active Bays**	**Layover**	**Active Bays**
Metro	8	7	5	2	0	2
Sound Transit	0		3		3	
Total	**8**	**7**	**8**	**2**	**3**	**2**

Figure 5-11
Proposed Design Refinements Transit Network
Downtown Redmond Link Extension

Comparison to the Final EIS

The Final EIS assumed peak period train frequency every 7 minutes rather than every 6 minutes, and projected 2,000 future daily boardings at each light rail station. Under the Proposed Design Refinements, 2,900 daily boardings at the Downtown Redmond Station and 3,000 daily boardings at the SE Redmond Station are forecast.

The Final EIS analyzed transit operations within the study area based primarily on the existing service network, with a focus on those routes that are most likely to have their ridership influenced by the East Link Project. It evaluated transit service across several screenlines based on the following categories:

- Coverage and circulation
- Transit LOS performance
  - Service frequency LOS
  - Hours of service LOS
  - Passenger load LOS
- Transit travel time
- Transit transfers
- Light rail ridership

Transit LOS performance measures were evaluated on an A to F scale, similar to traffic operations.

For this report, the transit impact analysis under the Proposed Design Refinements included a qualitative review of transit service alignments, service frequency, ridership, stop locations, and travel delay in the study area, including the potential for the Proposed Design Refinements to alter transit operations. It also evaluated the bus active bay and layover needs at the light rail stations included in the Proposed Design Refinements, but did not include an analysis of LOS for any performance measures.

The Final EIS did not consider the service network envisioned in METRO CONNECTS, because it had not been adopted by King County at that time. Similarly, the Final EIS did not consider the expanded high-capacity transit network included in ST3, because it had not been passed at the time. The network envisioned in METRO CONNECTS identifies planned bus service within the study area that is different from the current network. This network assumes a high degree of integration with the light rail system. With the passage of ST3, the Proposed Design Refinements would allow for greater transit mobility throughout the region via high-capacity transit service.

As with the Proposed Design Refinements, the Final EIS assumed a single 1,400-stall parking garage at the SE Redmond Station.

5.2.4 Nonmotorized Facilities

Pedestrian and bicycle volumes are forecast to increase near the stations due to new developments, new pedestrian and bicycle facilities, and/or a mode shift to walking and bicycling. The Downtown Redmond Link Extension would increase the number of nonmotorized users around stations. The highest volumes would occur during the PM peak period when trains serve stations every 6 minutes. At the Downtown Redmond Station, nonmotorized users would use station area facilities to directly access the station. They would also use facilities to move between the station and bus stops and the passenger pick-up/drop-off area. At the SE Redmond Station, most pedestrians would use station area facilities to move between the station and the park-and-ride, passenger pick-up/drop-off area, and bus stops. Table 5-12 shows estimates of 2035 PM peak-period pedestrian and bicycle trips generated by each station.

Table 5-12. Forecasted 2035 Pedestrian and Bicycle Trips During the PM Peak

Station	2035 Pedestrian and Bicycle Trips During the PM Peak
Downtown Redmond	374
SE Redmond Station	190

As with the Project Baseline, circulation and connectivity within the study area would be improved with development projects or planned city capital improvements. As part of the Downtown Redmond Link Extension, Sound Transit would construct new sidewalks along the frontage of each station as well as a one-way cycle track along NE 70th Street.

If funding is provided by King County, the missing link of the County's East Lake Sammamish Trail would be built by Sound Transit when the light rail extension is constructed. This link would begin from the SE Redmond Station area, pass under the SR 520 interchange, cross Bear Creek on a bridge, and connect into the Bear Creek Trail and Redmond Central Connector corridors. In addition, improvements in the station area include a pedestrian and bicycle connection from the SE Redmond Station to Marymoor Park.

Comparison to the Final EIS

Portions of the alignment and all stations are at-grade in the Final EIS, whereas the alignment between southeast Redmond and downtown Redmond would be elevated in the Proposed Design Refinements. Therefore, the refined alignment would result in fewer conflicts between rail users and nonmotorized travelers. The Final EIS forecasted similar bicycle and pedestrian volumes at the Downtown Redmond Station; however, it forecasted lower bicycle and pedestrian volumes at the SE Redmond Station. With the Proposed Design Refinements, the change in bicycle and pedestrian volumes at the SE Redmond Station can be attributed in large part to an increase in the forecasted ridership at the station as well as new development and growth anticipated in southeast Redmond. The Final EIS did not include construction of King County's pedestrian/bicycle trail connection.

5.2.5 Parking

In downtown Redmond, the Proposed Design Refinements could result in the removal of 75 off-street and 15 on-street parking spaces near the Downtown Redmond Station. Off-street parking would be removed in order to accommodate the station and associated amenities. The majority of this off-street parking is located within the BNSF right-of-way or would be associated with parcel acquisitions. On-street parking would be removed primarily to accommodate buses serving the station. A park-and-ride facility is not proposed at this station, but on-street parking is available surrounding the station. The City of Redmond has a restricted (time-limited) parking policy in the downtown area, which includes allowances for purchase of monthly parking permits. There is potential for hide-and-ride activities near the Downtown Redmond Station because the forecasted volume of automobiles is higher than the available parking near the station and the station does not provide additional parking (Tables 5-7 and 5-8). Hide-and-ride is the term used for parking near transit stations outside of parking provided for transit users. The time-limited parking zones in downtown Redmond would reduce the potential for hide-and-ride activity at the Downtown Redmond Station.

Hide-and-ride parking could also occur in the neighboring retail center, but with the current security enforcement and time-limited parking, the potential for hide-and-ride activities in this development would be minimized. Owners of other private parking lots near the stations could implement measures such as security enforcement or time-limited parking that would minimize the potential for hide-and-ride activities in their parking lots. Development of the SE Redmond Station would include construction of a 1,400-stall parking garage. The planned parking facility at the SE Redmond Station would reduce the

potential for hide-and-ride activities at this station. On-street parking currently exists in the station vicinity and is not time-limited; therefore, the potential for hide-and-ride activities is present. However, the potential is low due to the relatively large supply of stalls proposed at the park-and-ride facility. On-street parking would be regulated by the City of Redmond.

Comparison to the Final EIS

The Final EIS anticipated removal of 20 off-street parking spaces and zero on-street parking spaces in downtown Redmond associated with the Project. It indicated that on-street parking may be removed on NE 76th Street if it is reconstructed. The Final EIS did not expect removal of parking spaces near the SE Redmond Station.

The Final EIS expected a high potential for hide-and-ride activity at the Downtown Redmond Station due to the amount of available on-street parking and the absence of a new parking facility at this station. Since publication of the Final EIS, the City of Redmond has expanded the downtown time-limited parking enforcement zone boundaries to encompass a larger area near the Downtown Redmond Station, which would reduce the potential for hide-and-ride activity.

The Final EIS assumed a low potential for spillover parking at the SE Redmond Station, because the forecasted auto volumes were anticipated to be less than the available parking.

5.2.6 Safety

The Proposed Design Refinements do not include any at-grade rail crossings, which would markedly limit the potential for rail-automobile conflicts that existed in the Final EIS. As with the Project Baseline, traffic and nonmotorized volumes in the study area are forecasted to increase by 2035, which could increase collision frequencies for both motor vehicles and nonmotorized users in the study area. The roadway, intersection, and nonmotorized improvements identified under the Project Baseline would similarly improve safety for motor vehicles and nonmotorized users in the study area under the Proposed Design Refinements. If funding is provided by King County, the missing link of the County's East Lake Sammamish Trail would be built by Sound Transit when the light rail extension is constructed, . This link would begin from the SE Redmond Station area, pass under the SR 520 interchange, cross Bear Creek on a bridge, and connect into the Bear Creek Trail and Redmond Central Connector corridors.

Comparison to the Final EIS

The Project alignment in the Final EIS included at-grade crossings in downtown Redmond, which differs from the Proposed Design Refinements. The Final EIS concluded that accident frequency with the Project would be minimal with no substantial change in the number of accidents, because the Project would mostly operate outside the right-of-way and would include the use of gated crossings.

6 POTENTIAL MITIGATION MEASURES

This chapter discusses potential mitigation measures for transportation mobility impacts caused by the Proposed Design Refinements. It also describes measures that Sound Transit proposes to take but which require agreement of other parties. For instance, Sound Transit has identified certain intersection improvements, traffic management, safety, and parking strategies to mitigate project-related impacts, but the agency does not have the sole authority to make those improvements when the facilities are owned and managed by others. Others may also have alternative plans or projects to address future conditions with or without the Proposed Design Refinements. In these cases, Sound Transit would coordinate with these other agencies to further define and implement improvements to mitigate the impacts of these projects.

Key observations and findings include the following:

- Transit—The transit integration plans developed by Metro, as described in METRO CONNECTS, and Sound Transit would provide coordinated bus service with the light rail system. No additional transit mitigation is required.
- Freeway—Minimal impacts are forecasted along the SR 520 mainline; thus, no mitigation would be necessary.
- Arterials and Local Street Operations—For impacts on arterials and local streets, mitigation would be required for intersections with the Proposed Design Refinements that do not meet the LOS standard where the Project Baseline conditions would otherwise meet standards. Sound Transit would provide these improvements or other improvements as agreed to by the local jurisdiction. For intersections where the Project Baseline would already be below standard and the Proposed Design Refinements would degrade operations compared to the Project Baseline, impacts would occur in accordance with the thresholds described in Section 6.1. At these intersections, Sound Transit could provide the identified mitigation or contribute a proportionate share to the jurisdiction's project to improve intersection performance as agreed to with the local jurisdiction.
- Nonmotorized Facilities—The Proposed Design Refinements would have no impact on nonmotorized facilities; therefore, no mitigation would be required.
- Freight Mobility and Access—The Proposed Design Refinements would not require mitigation during operation to improve freight mobility and access because LOS along truck routes would comply with acceptable standards or improvements made to intersections to maintain the required LOS.
- Parking—Mitigation may be required at the Downtown Redmond and SE Redmond stations to mitigate hide-and-ride activities should they occur.

6.1 Arterials and Local Streets

Traffic impacts were determined for arterials and local streets by comparing the overall intersection LOS for the Project Baseline and Proposed Design Refinements. Impacts would occur if the Proposed Design Refinements would increase traffic operations to LOS E or F when the roadway segment would operate at LOS D or better under the Project Baseline. Impacts may also occur if the traffic operations increase delay by more than 10 seconds at an intersection that operates unacceptably (LOS E or F) in the Project Baseline.

Impacts for state highways of statewide significance (SR 520 and ramp terminal intersections) would occur if the roadway segment in the Proposed Design Refinements would increase traffic operations to a LOS E condition when the roadway segment would operate at LOS D or better under the Project

Baseline. Impacts would also occur if the traffic operations increase delay by more than 10 seconds at an intersection that operates unacceptably (LOS E or F) in the Project Baseline.

For regionally significant highways (SR 202), impacts would occur if the roadway segment in the Proposed Design Refinements would increase traffic operations to a LOS F condition when the roadway segment would operate at LOS E or better under the Project Baseline. Impacts would also occur if the traffic operations increase delay by more than 10 seconds at an intersection that operates unacceptably (LOS F) in the Project Baseline.

To mitigate the impacts to intersection operations resulting from the Proposed Design Refinements, Sound Transit would provide the proposed improvements identified below or other improvements as agreed to with the City of Redmond and WSDOT. In lieu of constructing the improvements identified, Sound Transit would contribute proportionate funding to a City project to improve intersection performance where the Project Baseline would already be below standard, as agreed to with the City. Final mitigation for all traffic impacts, including the potential for degraded intersection operations, would be determined in conjunction with the City.

The proposed mitigation for intersections include:

- Intersection #32: Redmond Way and NE 70th Street—Provide a southbound right-turn pocket and a second northbound left-turn lane.
- Intersection #35: 176th Avenue NE and NE 70th Street—Install a traffic signal and provide a northbound right-turn pocket, westbound left-turn and right-turn pockets, a southbound approach that includes a double left-turn lane and a through-right lane, and an eastbound left-turn pocket. Traffic signal will also include north-south split phasing and a pedestrian scramble phase.
- Intersection #36: 176th Avenue NE and NE 67th Street—Convert from two-way stop control to all-way stop control.
- Intersection #37: 176th Avenue NE and NE 65th Street—Convert from two-way stop control to all-way stop control.

In addition, NE 70th Street will be widened from a 3-lane cross-section to a 5-lane cross-section with two travel lanes in each direction between Redmond Way and 176th Avenue NE in order to support the operations at Intersections #32 and #35.

No mitigation is proposed at the following intersections because the intersection would function below LOS standard under the Project Baseline in addition to other factors detailed below.

- Intersection #15: Leary Way and NE 76th Street—The intersection fails today and is forecast to continue to fail with or without the Downtown Redmond Link Extension. In addition, the project-related trips added to this intersection during the peak hours is less than 20 vehicles per approach.
- Intersection #33: Redmond Way and East Lake Sammamish Parkway/180th Avenue NE—The intersection operates at LOS E/F under the Project Baseline. The Proposed Design Refinements would result in an increase in delay (5 seconds in the 2035 AM peak hour and 24 seconds in the 2035 PM peak hour). Substantial improvements would be required to return operations to an acceptable LOS standard beyond those required to mitigate the Downtown Redmond Link Extension's impacts.

The operational results of the proposed mitigation are shown in Table 6-1.

Table 6-1. Intersections with Impacts Under Proposed Design Refinements with Mitigation

ID	Intersection	Control Type	Project Baseline		Proposed Design Refinements		Proposed Design Refinements with Mitigation		Proposed Mitigation
			LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	
	2035 AM Peak Hour								
35	176th Avenue NE and NE 70th Street	TWSC	D	27	***F***	***>300***	B	19	Install a traffic signal; provide northbound and westbound right-turn pockets and westbound and eastbound left-turn pockets; provide a southbound approach that includes a double left-turn lane and a through-right lane; split phase northbound and southbound signal timing; and a pedestrian scramble phase. This helps address potential nonmotorized impacts to the East Lake Sammamish Trail crossing.
36	176th Avenue NE and NE 67th Street	TWSC	B	15	***F***	***94***	C	15	Convert from two-way stop control to all-way stop control.
	2035 PM Peak Hour								
15	Leary Way and NE 76th Street	TWSC	***F***	***139***	***F***	***161***	No mitigation proposed		No mitigation proposed because the intersection fails today and is forecast to continue to fail with or without the Proposed Design Refinements. In addition, the project-related trips added to this intersection during the peak hour are less than 20 vehicles per approach.
32	Redmond Way and NE 70th Street	Signal	D	47	***F***	***137***	***F***	***85***	Provide a southbound right-turn pocket and a second northbound left-turn lane[1].
33	Redmond Way and East Lake Sammamish Parkway/ 180th Avenue NE	Signal	***E***	***76***	***F***	***100***	No mitigation proposed		No mitigation proposed because the intersection operates below standard with or without the Proposed Design Refinements. Redmond has included planned improvements at this intersection in the City's 6-year Transportation Improvement Program.
35	176th Avenue NE and NE 70th Street	TWSC	***F***	***54***	***F***	***210***	D	38	Install a traffic signal; provide northbound and westbound right-turn pockets and westbound and eastbound left-turn pockets; provide a southbound approach that includes a double left-turn lane and a through-right lane; split phase northbound and southbound signal timing; and a pedestrian scramble phase. This helps address potential nonmotorized impacts to the East Lake Sammamish Trail crossing.

Table 6-1. Intersections with Impacts Under Proposed Design Refinements with Mitigation (continued)

ID	Intersection	Control Type	Project Baseline		Proposed Design Refinements		Proposed Design Refinements with Mitigation		Proposed Mitigation
			LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	
36	176th Avenue NE and NE 67th Street	TWSC	C	16	***F***	***97***	C	16	Convert from two-way stop control to all-way stop control.
37	176th Avenue NE and NE 65th Street	TWSC	D	28	***F***	***53***	C	19	Convert from two-way stop control to all-way stop control.

Cells highlighted in ***grey bold and italicized*** identify intersections that operate below the LOS standard for the facility.

TWSC = two-way stop controlled

[1] The City of Redmond has agreed that this would result in acceptable conditions given the future additional network improvements to be implemented as part of the Marymoor Subarea Plan.

Comparison to the Final EIS

The Final EIS identified the following mitigation for the 2011 Project in Segment E:

- Intersection #23: 170th Avenue and NE 76th Street—Install a traffic signal. This traffic signal has already been installed.
- Intersection #32: Redmond Way and NE 70th Street—Provide a southbound right-turn pocket.
- Intersection #33: Redmond Way and East Lake Sammamish Parkway/180th Avenue NE—Rechannelize to provide an additional southbound through lane. Redmond has included planned improvements at this intersection in the City' 6-year Transportation Improvement Program, which differ from what was proposed in the Final EIS.
- Intersection #35: 176th Avenue and NE 70th Street—Install a traffic signal.

The Final EIS did not identify mitigation for Intersections #15, #36, and #37.

No mitigation for impacts to SR 520 were identified. Additionally, no impacts were identified to property access and circulation.

6.2 Freight

The freight movement analysis of the Proposed Design Refinements included a qualitative assessment of truck movements and truck routing impacts. The assessment of truck concerns focused on impacts on major truck routes (including SR 520 and SR 202), truck service areas, and access to truck depots or intermodal yards. The Proposed Design Refinements do not require freight mitigation beyond the mitigation identified at the intersections above along SR 520 and SR 202.

Comparison to the Final EIS

The Final EIS did not identify any mitigation for impacts to freight.

6.3 Transit

Mitigation for transit service would not be required for the Proposed Design Refinements, because the light rail extension would improve the regional transit system. The expanded light rail network with the Proposed Design Refinements would have a beneficial impact on transit service, including reduced transit travel times and improved transit reliability to regional destinations. Additionally, Metro's future transit network, as envisioned in METRO CONNECTS and Sound Transit's transit integration plan, would provide coordinated bus service with the light rail system. The Downtown Redmond Link Extension Project would include construction of 1,400 additional park-and-ride spaces at the SE Redmond Station, which would allow improved access to the transit system. The development of additional pedestrian and bicycle facilities that provide connections to the stations would also improve access to the transit system.

Comparison to the Final EIS

Similar to the Proposed Design Refinements, the East Link Project was determined to have a beneficial impact on transit service. The Final EIS did not identify additional transit mitigation in the study area.

6.4 Nonmotorized Facilities

Impacts on nonmotorized facilities included a qualitative assessment of the potential for the Proposed Design Refinements to alter operations of pedestrian and bicycle facilities in the study area. The Downtown Redmond Link Extension Project would include construction of new bicycle and pedestrian facilities at or above local jurisdictional standards and Americans with Disabilities Act (ADA) accessibility. Sidewalk widths would exceed standards where warranted by pedestrian volumes. There would be no impacts on nonmotorized facilities; therefore, no mitigation would be required.

Comparison to the Final EIS

The Final EIS did not identify any mitigation for impacts to nonmotorized facilities.

6.5 Parking

The loss of on-street parking near the Downtown Redmond Station associated with the Proposed Design Refinements is likely to result in minimal impacts, because the area would be used to accommodate bus operations. The modifications to the bus network would provide alternatives for many riders to reach the light rail station as well as downtown Redmond. The majority of the off-street parking that would be lost is located within the BNSF right-of-way or would be associated with parcel acquisitions.

The time-limited parking zones in downtown Redmond would reduce the potential for hide-and-ride activity at the Downtown Redmond Station. There is also potential for hide-and-ride activities near the SE Redmond Station.

Mitigation for parking impacts would be specific to each station. Sound Transit would evaluate hide-and-ride impacts at the stations within 1 year of project operations. Prior to implementing any parking mitigation measures, Sound Transit would inventory on-street parking around each station up to 1 year before the start of light rail revenue service. These inventories would document the current on-street parking supply within a quarter-mile radius of the stations. If impacts are determined based on the inventory results, Sound Transit and the local jurisdiction would work with the affected stakeholders to identify and implement appropriate mitigation measures.

Parking control measures could consist of parking meters, restricted parking signage, passenger and truck load zones, and residential parking zone (RPZ) signage. Other parking mitigation strategies could include promotion of alternative transportation services (e.g., encourage the use of buses, vanpool or carpool services, walking, or bicycle riding). For parking controls agreed to with the local jurisdiction and community, Sound Transit would be responsible for the cost of installing the signage or other parking controls and any expansion of the parking controls for 1 year after opening the light rail system. The City of Redmond would be responsible for monitoring the parking controls and providing all enforcement and maintenance of the parking controls. The local residents would be responsible for any RPZ-related costs imposed by the local jurisdiction.

Comparison to the Final EIS

The Final EIS discussed general parking impacts associated with the Project, including the potential for hide-and-ride activities near stations. It forecast stations other than the Downtown Redmond Station and SE Redmond Station would experience the greatest parking impacts. It described the same general measures to mitigate parking impacts as identified in this report. However, it did not identify specific mitigation measures to address parking impacts at the Downtown Redmond Station and SE Redmond Station.

7 CONSTRUCTION IMPACTS AND MITIGATION MEASURES

Transportation mobility impacts are possible due to construction of the Downtown Redmond Link Extension. Activities include construction of a retained cut-and-fill guideway, elevated structures, stations (including park-and-ride, station platforms, transit center, and substations), and roadway reconstruction. Each construction activity would vary in duration. Staging at stations would occur throughout the duration of the construction.

The construction approach will be refined during the final design effort to establish the limits and parameters for various construction phases, construction contracts, and active work zones.

The Final EIS identified impacts associated with construction of the Project for all modes. Impacts associated with construction of the Proposed Design Refinements would be the same.

7.1 Potential Mitigation Measures During Construction

7.1.1 General Construction

Mitigation measures would comply with local regulations governing construction traffic control and construction truck routing. Sound Transit would finalize detailed construction mitigation plans in coordination with local jurisdictions, WSDOT, Metro, and other affected agencies and organizations. Coordination would take place as part of final engineering and permitting so that streets and highways with adequate signage and any necessary traffic control measures would be installed.

A work-specific construction approach would be developed during the final design effort to establish the limits for the various construction phases and construction contracts, their estimated schedule and duration, and appropriate sequencing. Where possible, construction activities would be coordinated with other capital improvement projects to help minimize construction impacts.

The Final EIS identified potential mitigation measures during construction of the Project for all modes. The same mitigation measures would be applicable during construction of the Proposed Design Refinements.

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Attachment A

Transportation Methodology and Assumptions Report

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ACRONYMS AND ABBREVIATIONS

BKR model	Bellevue-Kirkland-Redmond Travel Demand Model
EIS	Environmental Impact Statement
FTA	Federal Transit Administration
HOT	high-occupancy toll
LOS	level of service
LUV	Land Use Vision
MOE	measure of effectiveness
PSRC	Puget Sound Regional Council
PSRC model	PSRC Regional Travel Forecasting Model
SR	State Route
v/c	volume-to-capacity
WSDOT	Washington State Department of Transportation

1 OVERVIEW OF TRANSPORTATION ANALYSIS

This transportation methodology and assumptions report updates the methods and assumptions for analyzing the local transportation impacts associated with Sound Transit's Downtown Redmond Link Extension Project (the project). This analysis will evaluate the project impacts and develops proposed measures to mitigate impacts, where warranted. In carrying out this methodology, project analysts took or will take the following steps:

- Define the boundaries of the study area and intersections to be analyzed (see Section 2)
- Identify the analysis years and time period to be studied (see Sections 3 and 4)
- Gather data about existing conditions to establish the affected environment for the roadway system and the modes of travel used in the study area (see Section 5)
- Develop forecasts of how traffic volumes are likely to change in the future by using computerized travel demand models that take into account changes in land use (including population and employment changes) and transportation improvements expected to be in place by 2035, the Downtown Redmond Link Extension design year (see Section 6)
- Develop qualitative forecasts of future demand for other modes of transportation (see Section 6)
- Input the forecasted traffic volumes into traffic operations models and run those models to predict how traffic would operate on specific streets or intersections in 2035 with and without the project improvements (see Section 7)
- Identify potential operational impacts for the Project Baseline and Proposed Design Refinements. Mitigation measures for the Proposed Design Refinements will be identified (see Section 8)
- Identify potential construction impacts and mitigation measures for the Proposed Design Refinements (see Section 9)
- Summarize the documentation of the technical analysis described in this report (see Section 10)

These methods are provided for review and comment by participating and cooperating agencies for the Downtown Redmond Link Extension Project.

2 SELECTION OF THE STUDY AREA

Project analysts defined the study area boundaries to encompass the areas in which the function of transportation modes within the project footprint could be affected by project construction or operation. The boundaries of the study area were selected in consultation with the Washington State Department of Transportation (WSDOT), King County, and the City of Redmond, and correspond to Segment E (Preferred Marymoor Alternative E2) that was evaluated in the 2011 East Link Project Final Environmental Impact Statement (EIS) (Sound Transit 2011). The study area, shown on **Figure 1**, was defined as the area bounded by 148th Avenue NE to the west, NE 85th Street to the north, Sahalee Way NE to the east, and just south of NE 40th Street to the south.

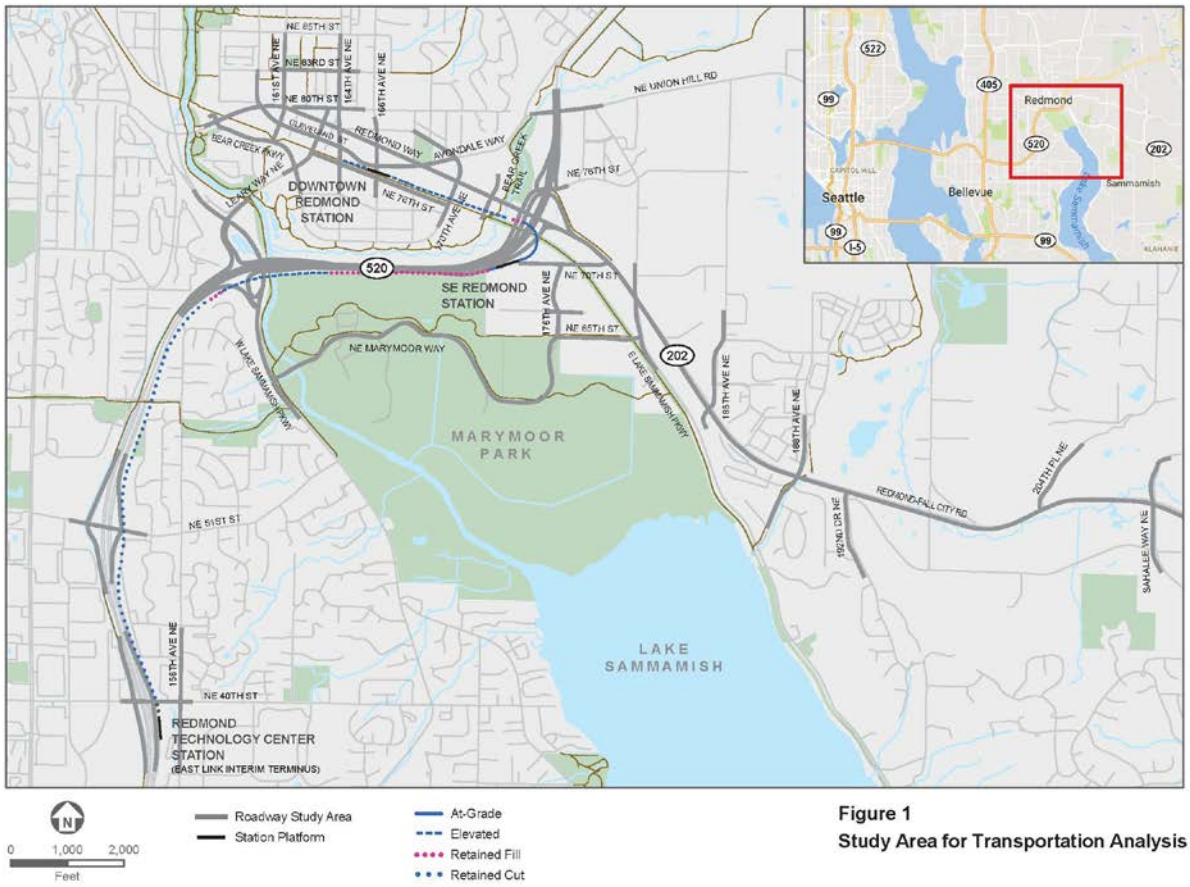


Figure 1
Study Area for Transportation Analysis

2.1 Intersections to be Studied

The intersections that will be analyzed are those expected to be directly affected by the project, such as by a change in channelization or signal control, as well as those expected to be indirectly affected by changes in volume due to trips accessing the system. These latter locations will include intersections surrounding transit stations with proposed increases in park-and-ride lot capacity and passenger pick-up and drop-off activity.

A preliminary list of intersection locations, provided below, has been identified for analysis based on the 2011 East Link Final EIS analysis, and expanded to include additional intersections in the study area based on discussions with local agency staff. Additional intersections may be added during the analysis process if necessary. **Figure 2** shows the study area intersections selected for analysis.

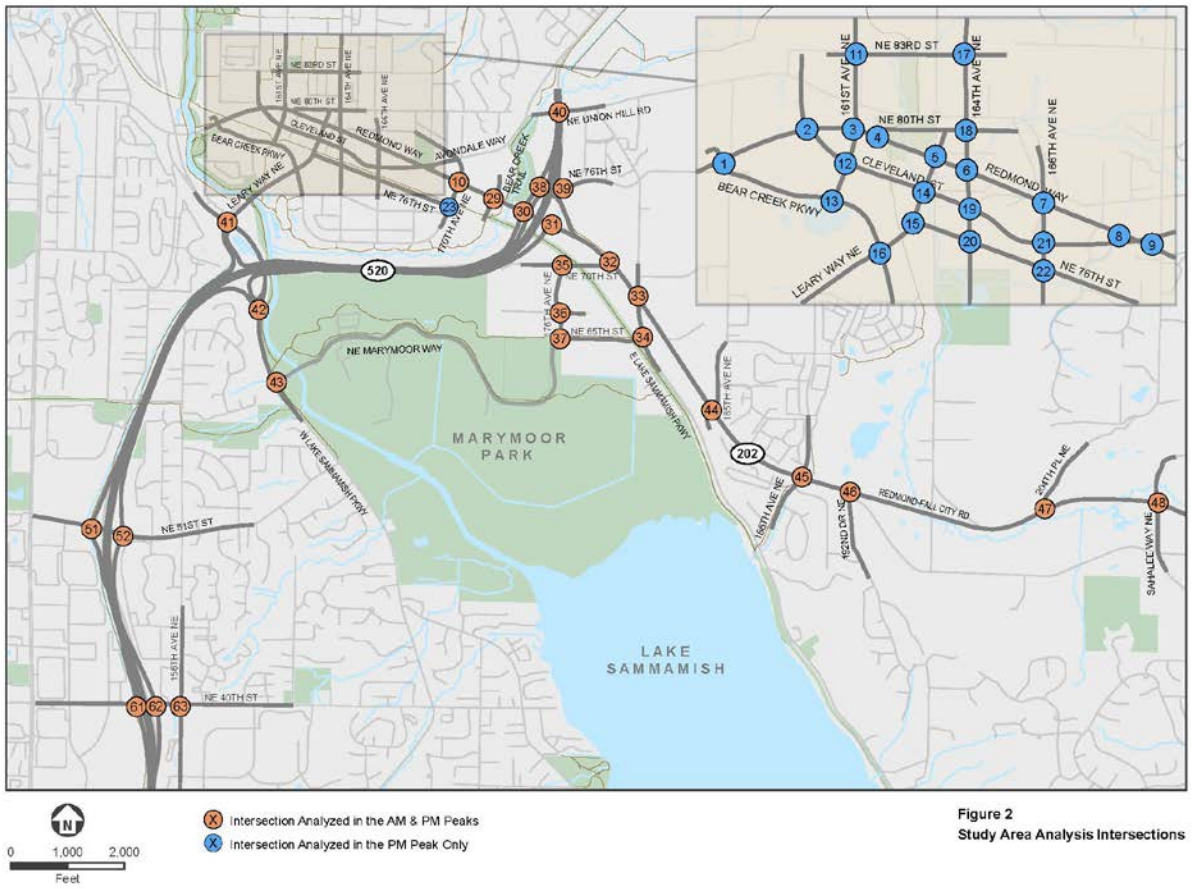


Figure 2
Study Area Analysis Intersections

1. Redmond Way / Bear Creek Parkway
2. Redmond Way / 160th Avenue NE / Cleveland Street
3. Redmond Way / 161st Avenue NE
4. Redmond Way / NE 80th Street
5. Redmond Way / Leary Way NE
6. Redmond Way / 164th Avenue NE
7. Redmond Way / 166th Avenue NE
8. Redmond Way / 168th Avenue NE / Cleveland Street
9. Redmond Way / Avondale Way
10. Redmond Way / 170th Avenue NE
11. NE 83rd Street / 161st Avenue NE
12. Cleveland Street / 161st Avenue NE
13. Bear Creek Parkway / 161st Avenue NE
14. Cleveland Street / Leary Way NE
15. NE 76th Street / Leary Way NE
16. Bear Creek Parkway / Leary Way NE
17. NE 83rd Street / 164th Avenue NE

18. NE 80th Street / 164th Avenue NE
19. Cleveland Street / 164th Avenue NE
20. NE 76th Street / 164th Avenue NE
21. Cleveland Street / 166th Avenue NE
22. NE 76th Street / 166th Avenue NE
23. NE 76th Street / 170th Avenue NE
29. Redmond Way / Bear Creek Crossing
30. Redmond Way / SR 520 Westbound On-Ramp / NE 76th Street
31. Redmond Way / SR 520 Eastbound Off-Ramp
32. Redmond Way / NE 70th Street
33. Redmond Way / East Lake Sammamish Parkway NE
34. East Lake Sammamish Parkway NE / NE 65th Street
35. 176th Avenue NE / NE 70th Street
36. 176th Avenue NE / NE 67th Court
37. 176th Avenue NE / NE 65th Street / NE Marymoor Way
38. NE 76th Street / SR 520 Westbound Off-Ramp
39. NE 76th Street / SR 520 Eastbound On-Ramp / Fred Meyer
40. SR 520 / NE Union Hill Road / Avondale Road NE
41. West Lake Sammamish Parkway NE / SR 520 Westbound On-Ramp / Leary Way NE
42. West Lake Sammamish Parkway NE / SR 520 Eastbound On-Ramp
43. West Lake Sammamish Parkway NE / NE Marymoor Way
44. Redmond-Fall City Road / 185th Avenue NE
45. Redmond-Fall City Road / 188th Avenue NE
46. Redmond-Fall City Road / 192nd Drive NE
47. Redmond-Fall City Road / 204th Place NE
48. Redmond-Fall City Road / Sahalee Way NE / NE 58th Street
51. NE 51st Street / SR 520 Westbound Off-Ramp and On-Ramp
52. NE 51st Street / SR 520 Eastbound Off-Ramp and On-Ramp
61. NE 40th Street / SR 520 Westbound Off-Ramp and On-Ramp
62. NE 40th Street / SR 520 Eastbound Off-Ramp and On-Ramp
63. NE 40th Street / 156th Avenue NE

Note: The intersection numbering above is not consecutive for model organization purposes.

3 ANALYSIS YEARS

Based on the project's schedule and available traffic forecasting data, the transportation analysis will focus on two distinct periods:

- Existing Year—2017
- Design Year—2035

4 STUDY TIME PERIOD

Weekday turning movement counts at the study area intersections and other transportation facilities will be collected in the AM peak hour between 7 and 9 a.m. and in the PM peak hour between 4 and 6 p.m., which is when traffic volumes are at their highest. Intersection operations on major arterials and roadways near the Downtown Redmond Station will be completed for the PM peak hour only. Because the traffic patterns are anticipated to change significantly with the opening of stations with parking facilities, intersection analysis on major arterials and roadways near the SE Redmond Station and Redmond Technology Center Station will be completed for both the AM peak hour and PM peak hour.

5 AFFECTED ENVIRONMENT DATA COLLECTION

Various types of data will be collected and categorized to analyze the transportation environment under 2017 existing conditions. Project analysts will gather the following types of data to define the affected environment:

- Roadway Characteristics: Functional use, lane geometry, traffic signal timing and phasing patterns, and other parameters necessary to conduct traffic operations analysis (such as the proximity of bus stops, speed limits, presence of on-street parking, etc.).
- General-Purpose Traffic: AM and PM peak hour traffic counts and turning movement data to be collected at study area intersections and assembled from local and state agencies. For roadways undergoing construction—Redmond Way and Cleveland Street between 160th Avenue NE and Avondale Way—new 2017 traffic counts will not be taken; instead, historical 2015 traffic volumes will be grown to 2017 volumes using historical growth rates of one percent per year in the area. The traffic counts will include automobiles, trucks, pedestrians, and bicyclists.
- Freight: Freight volumes will be collected as part of the turning movement counts at study area intersections.
- Transit: Transit service operating in the study area, including routing, service areas, and hours of service (including schedule/frequency).
- Nonmotorized: Pedestrian and bicycle volumes and facilities within an approximate half-mile of each station area for pedestrian facilities, and 1 mile for bicycle facilities, including barriers to nonmotorized travel.
- Parking: Park-and-ride supply and demand data at proposed stations, and public parking within a quarter-mile walking distance of each station.

The quantitative traffic analysis will be based on traffic conditions during the PM peak hour for all locations, and AM peak hour for the locations where AM peak hour operations are determined to be as critical or more critical than PM peak hour operations.

6 FUTURE TRAVEL DEMAND FORECASTS

6.1 Travel Demand Forecast Assumptions

As noted previously, project analysts will forecast the travel demand for the study area for 2035, the project design year for both the AM and PM peak hours. The analysts will review and summarize local, regional, and state agency Six-Year Transportation Improvement Plans, Capital Improvement Programs, or Transportation Facilities Plans, as well as other planned improvements in proximity to the light rail alignment or station area for inclusion in the forecasting model. This effort will include identification of all "committed" improvements assumed for the Project Baseline and Proposed Design Refinements.

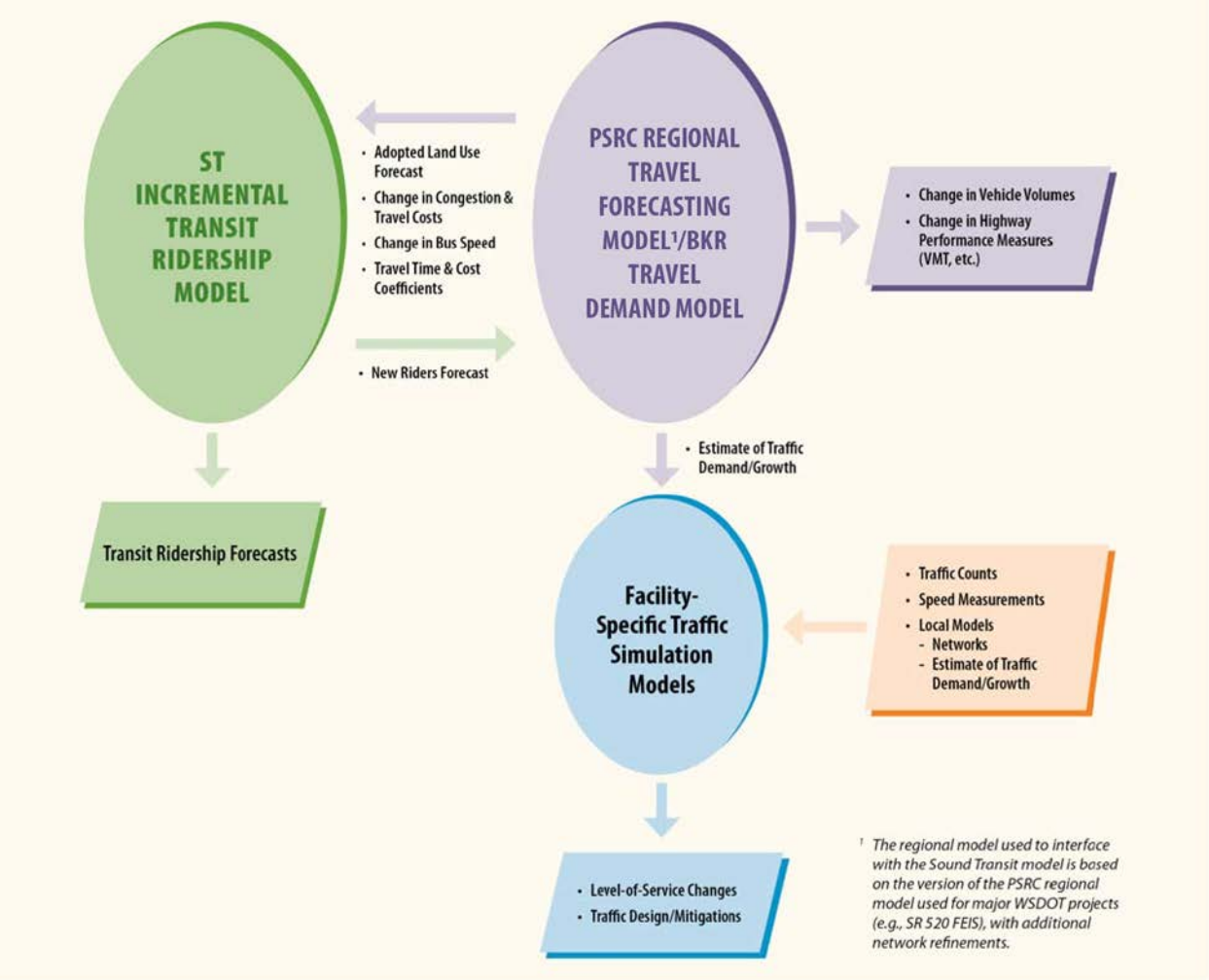
Two regional travel demand models will be used to support assessment of future conditions, including development of transit ridership forecasts and future traffic volumes. The Sound Transit Incremental Transit Ridership Model will be used to produce transit ridership forecasts, while the Puget Sound Regional Council (PSRC) Regional Travel Forecasting Model: WSDOT Project Version will be used to calculate growth rates in vehicular traffic volumes to support the future traffic volume development.

The PSRC model was developed for the State Route (SR) 520 EIS, I-405 expansion, and WSDOT Express Lanes Pre-Design Studies (including I-5 high-occupancy toll [HOT] lane assessment). For the most recent update, the PSRC model was refined to reflect necessary network modification specific to the project corridor, as well as the latest PSRC land use forecasts (i.e., LUV.1).

Since publication of the 2011 East Link Final EIS, the City of Redmond adopted the Marymoor Subarea Plan. This plan identifies a vision for the neighborhood (Marymoor Village) surrounding the SE Redmond Station, which includes a transition from light industrial uses to a mix of residential, employment, education, and commercial uses. As part of the plan, the street grid would be revised and new development would be housed in mixed-use and residential buildings. These modifications were developed in anticipation of construction of the SE Redmond Station, with the expectation that the subarea would serve a substantial number of regional commuters as well as local travelers. The land use changes planned for the Marymoor Subarea would be accompanied by associated increases in automobile, bicycle, pedestrian, and transit activity. These increases would affect the operation of the transportation network, including several intersections within or near the subarea. A "sensitivity test" will be completed to distinguish the impacts associated with the planned land use changes from those resulting from the Proposed Design Refinements.

For evaluating the sensitivity test associated with the project and planned land use changes, the Bellevue-Kirkland-Redmond (BKR) Travel Demand Model will be used to calculate growth rates in vehicular traffic volumes in the Marymoor Subarea. The BKR model is calibrated to the latest changes to the Redmond roadway network and future land use forecasts, including the planned improvements in the Marymoor Subarea Plan. Travel demand forecasts for 2035 will be developed based on a comparison of the growth rates calculated by the PSRC model and BKR model because the PSRC model is more of a regional model, and the BKR model is calibrated more for the local network and associated changes occurring within Redmond.

Figure 3 illustrates the relationships between the demand models.



Source: Modified from Sound Transit Ridership Forecasting Methodology Report (September 2016), prepared for ST3.

Figure 3. Relationships among Sound Transit Incremental Transit Ridership Model, PSRC Regional Travel Forecasting Model, and Bellevue-Kirkland-Redmond (BKR) Travel Demand Model

6.1.1 Sound Transit Incremental Transit Ridership Model

The Sound Transit ridership model was developed using analytical ridership forecasting procedures developed over two decades of incremental methods applications. During this period, the methods have been subjected to substantial external review, including two independent Expert Review Panels, and two cycles of review by the Federal Transit Administration (FTA) over the course of New Starts grant applications for Link light rail projects. After its original development in 1986, the forecasting analysis was updated in the early 1990s, 2003, and mid-2000s in support of the Sound Transit Phase 2 expansion program, and subsequently in 2012 for the EIS phases of the Lynnwood Link Extension. In 2015, the forecasting analysis was updated yet again in support of the ST3 Regional High-Capacity Transit System Plan (Sound Transit 2015a). The 2015 version of the Sound Transit ridership model will be used to produce ridership forecasting in support of the Downtown Redmond Link Extension Project. It relies on the current PSRC's Land Use Vision (LUV.1) Forecast (released in January 2016). For more detailed information about the Sound Transit ridership model, see the Transit Ridership Forecasting Methodology Report (Sound Transit 2015b).

The Sound Transit ridership model provides estimates of transit patrons accessing stations by mode of travel, which are based on observed transit travel patterns. The automobile modes include parked automobiles, drop-off/pick-up, taxi, and private van services. The methodology used in estimating the mode of access ridership is documented in the Transit Ridership Forecasting Methodology Report (Sound Transit 2015b). The demand for automobile access at transit facilities for the Downtown Redmond Link Extension will be estimated using the Sound Transit ridership model. Subsequently, the access mode will be converted to demand for parking spaces by using a factor derived from a recent study of automobile access at BART transit stations in East Bay, San Francisco. This factor was calculated to be 0.73, and reflects all types of automobile access including single- and multiple-occupant vehicles, drop-off/pick-up, taxi, ride sharing, and private van services.

6.1.2 PSRC Regional Travel Forecasting Model

The PSRC model was developed for the SR 520 EIS, I-405 expansion, and WSDOT Express Lanes Pre-Design Studies (including I-5 HOT-lane assessment). For the most recent update, the PSRC model was refined to reflect necessary network modification specific to the project corridor, as well as the latest PSRC land use forecasts (i.e., LUV.1). Transit ridership forecast results from the Sound Transit ridership model will be incorporated into the PSRC model to reflect effects from changes in transit ridership on traffic levels at the screenline and/or regional systemwide level. Traffic forecast results from the PSRC model will form the basis upon which traffic impacts of the project are assessed. Growth rates derived from the PSRC model will be applied to actual traffic volume counts to develop estimated peak-hour forecasts for detailed traffic operations analysis.

6.1.3 Bellevue-Kirkland-Redmond (BKR) Travel Demand Model

The BKR Travel Demand Model enables the cities of Bellevue, Kirkland, and Redmond to project travel demand within the vicinity, known as the planning area. It integrates elements of the regional model developed by PSRC and is directly tied to each jurisdiction's land use within the planning area. It is used by the three jurisdictions to support traffic impact reviews for local development as well as mid- and long-range transportation planning. The BKR model is calibrated to the latest changes to the Redmond roadway network and future land use forecasts, including the planned improvements in the Marymoor Subarea Plan.

6.2 Freight

The analysts will assume heavy (freight) vehicles comprise the same percentage of vehicles in the study area as under 2017 existing conditions.

6.3 Transit

Future public transportation volumes in the study area will be provided by King County Metro Transit and Sound Transit and will be included in the traffic operations model. Changes to public transportation routing as a result of the Downtown Redmond Link Extension will be qualitatively analyzed to evaluate impacts on public transportation.

6.4 Nonmotorized

The number of pedestrians and bicyclists in the study area is anticipated to increase with improved access and amenities. However, travel demand models do not forecast these "nonmotorized" transportation modes with a high confidence level. Pedestrian and bicycle counts from 2017 will be used as a basis for evaluating future pedestrian and bicycle volumes at key locations in the study area.

7 TRAFFIC OPERATIONS ANALYSIS

Analysts will use the following common metrics to evaluate study area traffic operations. Level of service (LOS) will be used to rate traffic operations in the study area. LOS is measured on a scale ranging from A to F, in which A represents freely flowing traffic and F represents severe congestion. LOS ratings are based on the ratio of actual traffic volumes to the traffic capacity of the roadway or intersection being studied; LOS deteriorates as facilities approach or exceed their capacity.

The LOS at the signalized intersections will be defined in terms of average intersection delay. Delay is dependent on two factors: (1) the capacity of the intersection as defined by the number of lanes, lane widths, pedestrian volumes, and other features; and (2) signal timing. Capacity, delay, and LOS are calculated for each traffic movement or group of traffic movements at an intersection. The weighted average delay across all traffic movements determines the overall LOS for a signalized intersection.

The LOS at unsignalized intersections that are stop-controlled on one or two approaches are also defined in terms of delay, but only for the worst stop-controlled approach, which is typically the minor street. For unsignalized intersections that are stop-controlled on each approach, the average intersection delay is reported. For roundabout intersections the LOS is the same as signalized intersections; however, these intersections require a mix of measures of effectiveness (MOEs). The delay thresholds are lowered for stop-controlled intersections because driver behavior considerations make delays at stop-controlled intersections more onerous. For example, at signalized intersections, drivers may relax during the red interval while waiting for the green interval, but drivers on the stopped approach of a stop-controlled intersection must remain attentive to the task of identifying acceptable gaps in traffic. **Table 1** summarizes the criteria used to define LOS.

The LOS criteria for roundabouts are supplemented by other MOEs. The MOEs for roundabouts in order of importance are volume-to-capacity (v/c), percent stopped, queues, and then LOS. If v/c is equal to or more than 0.9, the analysts will consider microsimulation to closely examine the volumes at the roundabout intersections. The v/c ratio evaluates the congestion of an intersection, approach, or movement based on the observed volume compared to the capacity of the intersection, approach, or movement. As shown in **Table 2**, LOS F is assigned to individual lanes in roundabouts regardless of the control delay if the v/c ratio exceeds 1.0. For overall intersection and approaches at roundabouts, LOS is measured solely against the control delay thresholds.

Table 1. Level of Service Criteria

	Average Control Delay (seconds per vehicle)		
LOS	Signalized/ Roundabout Intersections	Unsignalized Intersection	Traffic Flow Characteristics
A	≤ 10	≤ 10	Virtually free flow; completely unimpeded.
B	> 10 and ≤ 20	> 10 and ≤ 15	Stable flow with slight delays; less freedom to maneuver.
C	> 20 and ≤ 35	> 15 and ≤ 25	Stable flow with delays; less freedom to maneuver.
D	> 35 and ≤ 55	> 25 and ≤ 35	High density but stable flow.
E	> 55 and ≤ 80	> 35 and ≤ 50	Operating conditions at or near capacity; unstable flow.
F	> 80	> 50	Forced flow; breakdown conditions.

Note: The LOS criteria are based on control delay, which includes initial deceleration delay, final deceleration delay, stopped delay, and queue move-up time.

Source: Highway Capacity Manual 2010 (Transportation Research Board 2010).

Table 2. Level of Service Thresholds for Roundabouts

	LOS by Volume-to-Capacity Ratio	
Control Delay at Roundabouts (sec/veh)	**v/c < 1.0**	**v/c > 1.0**
≤ 10	A	F
> 10 and ≤ 20	B	F
> 20 and ≤ 35	C	F
> 35 and ≤ 55	D	F
> 55 and ≤ 80	E	F
> 80	F	F

Note: For approaches and overall intersection assessment, LOS is defined solely by control delay.
Source: Highway Capacity Manual 2010 (Transportation Research Board 2010)

7.1 Agency Thresholds

For state highways of statewide significance, such as SR 520, the operating threshold in urban areas is LOS D, which includes the ramp terminal intersections. For regionally significant state highways, such as SR 202 (Redmond Way and Redmond-Fall City Road), the operating threshold is LOS E/mitigated, meaning that congestion should be mitigated when the PM peak hour LOS falls below LOS E (i.e., LOS F).

The City of Redmond has adopted the following LOS standards for intersection operations, which will be applied to this evaluation:

1. If the intersection will operate at LOS D or better in the forecasted year with the proposed project, no mitigation is required.
2. If the intersection will operate at LOS E or F in the forecasted year with the proposed project and the addition of the project traffic decreases the LOS, mitigation may be required to alleviate project impacts.

7.2 Analysis Tools

7.2.1 Synchro/SimTraffic

Synchro (version 9.1), a macroscopic simulation tool, will be used for intersection LOS, delay, and v/c ratios for isolated intersections, including development of optimized intersection signal timing plans for the study area. Synchro also estimates average and maximum queue lengths. This tool relies on a fixed set of input calculations to develop LOS ratings consistent with the methodology found in the Highway Capacity Manual 2010 (Transportation Research Board 2010). This manual is the standard national traffic engineering guidance for quantifying the level of traffic congestion on streets and intersections. Default values for the analysis will be developed for intersections where actual values are not available. These will include assumptions regarding saturation flow rates, geometry, traffic, and signalization conditions. **Table 3** provides preliminary assumptions for existing input values where data have not been collected. For future input values, also listed in **Table 3**, assumptions are also typically made in terms of how traffic patterns change and traffic signals operate.

Table 3. Default Synchro Parameters and Assumptions

	Condition	
Arterial Intersection Parameters	**Existing Year 2017**	**Design Year 2035**
Lane Utilization	Default software assumptions unless data or engineering judgment suggests otherwise	Same as existing
Intersection Signal Phasing and Coordination	From agency signal phasing sheets or their existing analysis files	Same as existing.
Intersection Signal Timing Optimization Limits	Not applicable	Between 60 to 160 seconds
50th and 95th Percentile Vehicle Queues	Based on 25 feet per vehicle	Same as existing

Note: Delay-based LOS results will be reported from Synchro's HCM Reports.

7.2.2 VISSIM

If modifications are completed along SR 520, freeway operations analysis will be completed using VISSIM (Version 7.0). VISSIM is a microscopic simulation software for modeling and analyzing multimodal transportation systems. VISSIM models individual vehicles on the transportation network. Each vehicle interacts with the vehicles around it and with network elements (such as signals and stop signs) as it travels through the network. The SR 520 freeway operations analysis will include freeway merge, diverge, and weaving operations between West Lake Sammamish Parkway and NE Union Hill Road; the key metrics will be density and LOS. Similar to signalized and unsignalized intersections, LOS is a measure that characterizes the operating conditions for highways and freeway segments based on quantitative measures such as traffic density, average speeds, or average vehicle delay. LOS for either freeway segments or multi-lane highway segments are derived from traffic density and classified according to the ranges shown in **Table 4**. Note that intersection LOS at ramp termini will be categorized using intersection-based LOS measurements.

Table 4. Level of Service Designations for Freeways or Multi-Lane Highways

LOS (Freeway/Highway Segments)	Density Range (pcpmpl)
A	0–11
B	> 11–18
C	> 18–26
D	> 26–35
E	> 35–45
F	> 45

pcpmpl = passenger car equivalents per mile per lane

Source: Highway Capacity Manual 2010 (Transportation Research Board 2010)

The network coding within the VISSIM software will be built based on as-built plan sheets or arterial photographs. Any design changes associated with the Proposed Design Refinements will be coded into the network to satisfy the design requirements of the state, and will be consistent with the latest WSDOT Design Manual. VISSIM outputs will produce mainline and ramp junction LOS, including selected travel times and speeds.

7.2.3 SIDRA

SIDRA (Version 6.1) will be used to analyze roundabout intersection operations. SIDRA is an analytical traffic evaluation software application that uses lane-by-lane and vehicle path models to provide estimates of capacity. Roundabouts will be analyzed consistent with WSDOT's SIDRA Policy and settings[1].

[1] http://www.wsdot.wa.gov/design/traffic/analysis/

8 IDENTIFICATION OF OPERATIONAL IMPACTS

8.1 Identification of Impacts

The criteria discussed in the following subsections will be used to identify impacts caused by the implementation of the Proposed Design Refinements. For vehicular traffic, impacts will be determined by comparing LOS for the Project Baseline and Proposed Design Refinements during PM peak hour and, where applicable, during the AM peak hour. For other travel modes, impacts will be assessed qualitatively by evaluating conditions with and without the Proposed Design Refinements.

8.1.1 Arterials and Local Street Operations

Traffic impacts will be determined for arterials and local streets by comparing the overall intersection LOS for the Project Baseline and Proposed Design Refinements. Impacts would occur if the Proposed Design Refinements increase traffic operations on local or arterial streets that operate acceptably (LOS D or better) under the Project Baseline to unacceptable intersection operations. Impacts may also occur if the traffic operations increase delay at an intersection that operates unacceptably (LOS E or F) under the Project Baseline.

Impacts for state highways of statewide significance would occur if the roadway segment in the Proposed Design Refinements would increase traffic operations to unacceptable intersection operations at an intersection that operates acceptably (LOS D or better) under the Project Baseline. Impacts would also occur if the traffic operations increase delay by more than 10 seconds at an intersection that operates unacceptably (LOS E or F) under the Project Baseline.

For regionally significant highways, impacts would occur if the roadway segment in the Proposed Design Refinements would increase traffic operations to a LOS F condition when that roadway segment would otherwise operate at LOS E or better under the Project Baseline. Impacts would also occur if the traffic operations increase delay by more than 10 seconds at an intersection that operates unacceptably (LOS F) under the Project Baseline.

8.1.2 Freight

Analysts will qualitatively assess impacts of the Proposed Design Refinements on freight movements by reviewing truck movements and truck routing impacts. The assessment of truck issues will focus on impacts on major truck routes (including SR 520 and SR 202), truck service areas, and access to truck depots or intermodal yards.

8.1.3 Transit

Analysts will qualitatively evaluate impacts on public transportation by reviewing transit service alignments, service frequency, ridership, stop locations, and travel delay in the study area, including the potential for the Proposed Design Refinements to alter transit operations. The assessment will also evaluate the active bus bay and layover needs at the light rail stations included in the Proposed Design Refinements.

8.1.4 Nonmotorized Facilities

Analysts will qualitatively assess the potential for the Proposed Design Refinements to modify operations of pedestrian and bicycle facilities in the study area. Impacts on nonmotorized facilities and users will consider:

- Pedestrian access and circulation in the vicinity of the proposed station using forecasted ridership
- Identification of nonmotorized facilities present at stations
- Identification of direct (physical) effects on pedestrian and bicycle facilities
- Barriers created to nonmotorized (pedestrian and bicycle) traffic movement
- Intersection crossing issues associated with station layout and connections to major pedestrian routes and destinations
- Missing sidewalk sections for arterial classified streets within a half-mile radius of the proposed light rail stations
- Impacts to nonmotorized circulation within 1 mile of proposed station locations from deficiencies in regional bicycle paths and nonmotorized routes (existing and future funded), and a general qualification of how major multi-use trails and paths are used (i.e., by commuters or recreational users)

8.1.5 Parking

Analysts will evaluate the impacts of the Proposed Design Refinements on parking using the following methods:

- A comparison of the total number of public parking spaces near each station under the Project Baseline and Proposed Design Refinements
- An assessment of the parking supply at park-and-rides in the study area under the Proposed Design Refinements in relation to the Project Baseline occupancy

8.2 Identification of Avoidance, Minimization, and Mitigation Measures

Potential mitigation measures will be identified to avoid, minimize, or mitigate potential transportation impacts associated with the Proposed Design Refinements for all travel modes. Operational mitigation measures are likely to involve adjustments to roadway and/or intersection control to maintain satisfactory operation of the transportation environment.

9 IDENTIFICATION OF CONSTRUCTION IMPACTS AND AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

9.1 Identification of Impacts

Construction impacts will be assessed through a qualitative analysis of how construction of the Proposed Design Refinements is forecast to affect traffic throughout the study area, as well as other travel modes and facilities including freight, pedestrians, bicyclists, and public transportation.

9.2 Identification of Avoidance, Minimization, and Mitigation Measures

Where the potential for construction impacts are recognized, potential measures will be identified to avoid, minimize, or mitigate those impacts.

10 DOCUMENTATION

A Transportation Technical Report will be prepared to document the technical analysis discussed in this report. A summary of the Transportation Technical Report will be incorporated into the chapter on transportation as well as any additional relevant sections of the project's Environmental Review.

11 REFERENCES

Sound Transit (Central Puget Sound Regional Transit Authority). 2011. East Link Light Rail Transit Project, Seattle, Washington Final Environmental Impact Statement. Prepared by Sound Transit, Washington State Department of Transportation (WSDOT), and the Federal Transit Administration (FTA). Seattle, Washington. July 2011.

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Attachment B

Marymoor Subarea Plan—Sensitivity Analysis

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1. INTRODUCTION

Since publication of the 2011 East Link Final Environmental Impact Statement (EIS), the City of Redmond adopted the Marymoor Subarea Plan. This plan identifies a vision for the neighborhood (Marymoor Village) surrounding the SE Redmond Station, which includes a transition from light industrial uses to a mix of residential, employment, education, and commercial uses. As part of the plan, the street grid would be revised and new development would be housed in mixed-use and residential buildings. These modifications were developed in anticipation of construction of the SE Redmond Station, with the expectation that the subarea would serve a substantial number of regional commuters as well as local travelers. The land use changes planned for the Marymoor Subarea would be accompanied by associated increases in automobile, bicycle, pedestrian, and transit activity. These increases would affect the operation of the transportation network, including several intersections within or near the subarea.

This section analyzes the impacts of this growth with the Project Baseline as well as the Proposed Design Refinements. The results serve as a "sensitivity test" that help to distinguish the impacts associated with the planned land use changes from those resulting from the Proposed Design Refinements. This analysis also illustrates the "big picture" associated with the collective transportation impacts from the growth planned by the City of Redmond, including the Marymoor Subarea, and the Proposed Design Refinements.

2. PROJECT BASELINE WITH MARYMOOR SUBAREA PLAN

The Project Baseline with Marymoor Subarea Plan represents the Project Baseline, as described in Section 5.1 of the Transportation Technical Report, combined with the land use and transportation network changes envisioned in the Marymoor Subarea Plan. This section analyzes the operational impacts of the Project Baseline with the Marymoor Subarea Plan for the 2035 forecast year and compares them to the Project Baseline.

2.1 Arterial and Local Street Operations

Roadway Network and Intersection Modifications

The roadway network and several intersections in the study area would be modified for the Project Baseline with Marymoor Subarea Plan. In addition to the network described in the Project Baseline, the Marymoor Subarea Plan includes several modifications to the roadway network near the SE Redmond Station. These modifications would result in revisions to some of the intersections assessed as part of the Project Baseline analysis. The changes would provide more of a grid network in the subarea, which would better accommodate anticipated traffic volumes and facilitate multimodal access. Each street within the subarea is assigned a street type that reflects its intended character, transportation function, and adjacent land uses. The street types are:

- Type I streets provide primary circulation within the subarea for all modes of transportation.
- Type II streets provide secondary circulation within the subarea and property access. Dedicated bicycle facilities and transit vehicles are not intended on Type II streets.
- Type III streets provide property and service access. They are intended primarily for nonmotorized uses. Several Type III streets provide pedestrians and bicyclists with direct connections between the Marymoor Subarea and Marymoor Park.
- Multi-purpose trails provide bicycle and pedestrian connections to local and regional facilities.

Figure 2-1 and Table 2-1 describe the future street network in the subarea assumed as part of this analysis.

Most of the new intersections in the subarea would be stop-controlled. The configuration of several existing intersections evaluated as part of this study would be revised, as indicated in Table 2-1. Two new intersections (#64 and #65) would be added and were evaluated.

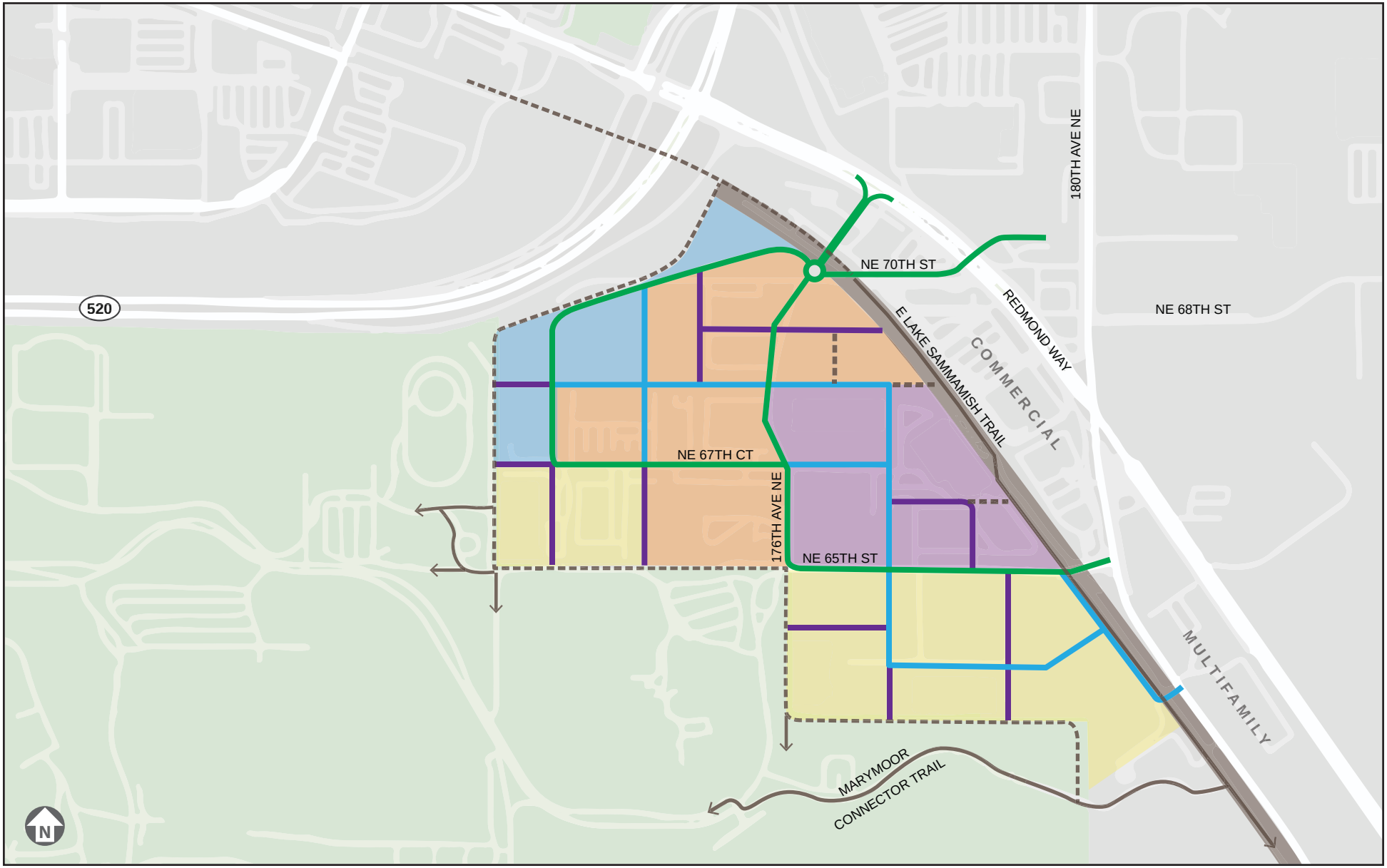


Figure 2-1
Marymoor Subarea Street Network
Downtown Redmond Link Extension

Table 2-1. Marymoor Subarea Intersection Modifications

ID	Intersection	Existing Control Type	Marymoor Subarea Plan Proposed Control Type	Sound Transit Revised Control Type	Approach	Intersection Configuration			Notes
						Existing Geometry	Marymoor Subarea Plan Proposed Geometry	Sound Transit Proposed Geometry	
32	Redmond Way and NE 70th Street	Signal	Signal	Signal	Eastbound	2L, TR	2L, T, R	2L, T, R	Adding an exclusive eastbound right-turn lane on NE 70th Street.
					Westbound	LTR (driveway)	L, T, R	L, T, R	
					Northbound	L, 2T, TR	-	-	
					Southbound	L, 2T, TR	L, 3T, TR	-	
33	Redmond Way and East Lake Sammamish Parkway/ 180th Avenue NE	Signal	Signal	Signal	Eastbound	L, 2T, R	-	-	Reconfiguration of East Lake Sammamish Parkway and 180th Avenue NE to allow concurrent northbound and southbound left turns.
					Westbound	L, 2T, TR	L, 3T, TR	-	
					Northbound	2L, LTR	2L, TR	2L, TR	
					Southbound	L, LT, R	L, T, R	L, T, R	
34	East Lake Sammamish Parkway and NE 65th Street	Signal	Signal	Signal	Eastbound	LT, R	L, LT, R	L, LT, R	Adding an exclusive eastbound left-turn lane on NE 65th Street.
					Westbound	LTR (driveway)	-	-	
					Northbound	L, T, TR	-	-	
					Southbound	L, T, TR	-	-	
35	176th Avenue NE and NE 70th Street	TWSC	Round-about	Signal	Eastbound	TR	LT, R	L, T, TR	Fourth leg of this intersection is access to park-and-ride.
					Westbound	LT	LT, TR	L, T, R	
					Northbound	LR	LTR, R	LT, R	
					Southbound	N/A	LT, R	L, LTR	
36	176th Avenue NE and NE 67th Street	TWSC	Two-Way Stop	AWSC	Eastbound	LTR	-	L, TR	Changed traffic control from two-way stop-controlled intersection to all-way-stop intersection. Turn pockets were added to improve intersection operations as much as possible without signalization or major street widening.
					Westbound	LTR	-	LT, R	
					Northbound	LTR	-	L, TR	
					Southbound	LTR	-	LT, R	

Table 2-1. Marymoor Subarea Intersection Modifications (continued)

ID	Intersection	Existing Control Type	Marymoor Subarea Plan Proposed Control Type	Sound Transit Revised Control Type		Intersection Configuration			Notes
					Approach	Existing Geometry	Marymoor Subarea Plan Proposed Geometry	Sound Transit Proposed Geometry	
37	176th Avenue NE and NE 65th Street	TWSC	N/A	AWSC	Eastbound	LT	N/A	L, T	Turn pockets were added to improve intersection operations as much as possible without signalization or major street widening.
					Westbound	TR	N/A	T, R	
					Southbound	LR	N/A	L, R	
64	Redmond Way and 176th Avenue NE	N/A	N/A	TWSC	Eastbound	N/A	N/A	2T, TR	Adding a new right-in-right-out access between Redmond Way and NE 70th Street.
					Westbound			T, TR, R	
					Northbound			R	
65	East Lake Sammamish Parkway and NE 63rd Street	N/A	One-Way Stop	TWSC	Eastbound	N/A	LR	LR	Adding a new access to East Lake Sammamish Parkway.
					Northbound		L, T	L, T	
					Southbound		T, TR	T, TR	

Geometry notes:

L = Left turn

T = Through

R = Right turn

- = no change from Existing Geometry

Traffic Volumes

As was done for the Project Baseline and Proposed Design Refinements, the Sound Transit Ridership Model and the PSRC Regional Model: WSDOT Project Version were used to support assessment of future conditions, including development of transit ridership forecasts and future traffic volumes. For the Project Baseline with Marymoor Subarea Plan, the Bellevue-Kirkland-Redmond (BKR) Travel Demand Model was used to calculate growth rates in vehicular traffic volumes in the Marymoor Subarea. The BKR model was calibrated to the latest changes to the Redmond roadway network and future land use forecasts, including the Marymoor Subarea Plan. Travel demand forecasts for 2035 were developed based on a comparison of the PSRC and BKR travel demand model growth rates, because the PSRC model is more of a regional model, and the BKR model is calibrated more for the local network and associated changes occurring within Redmond.

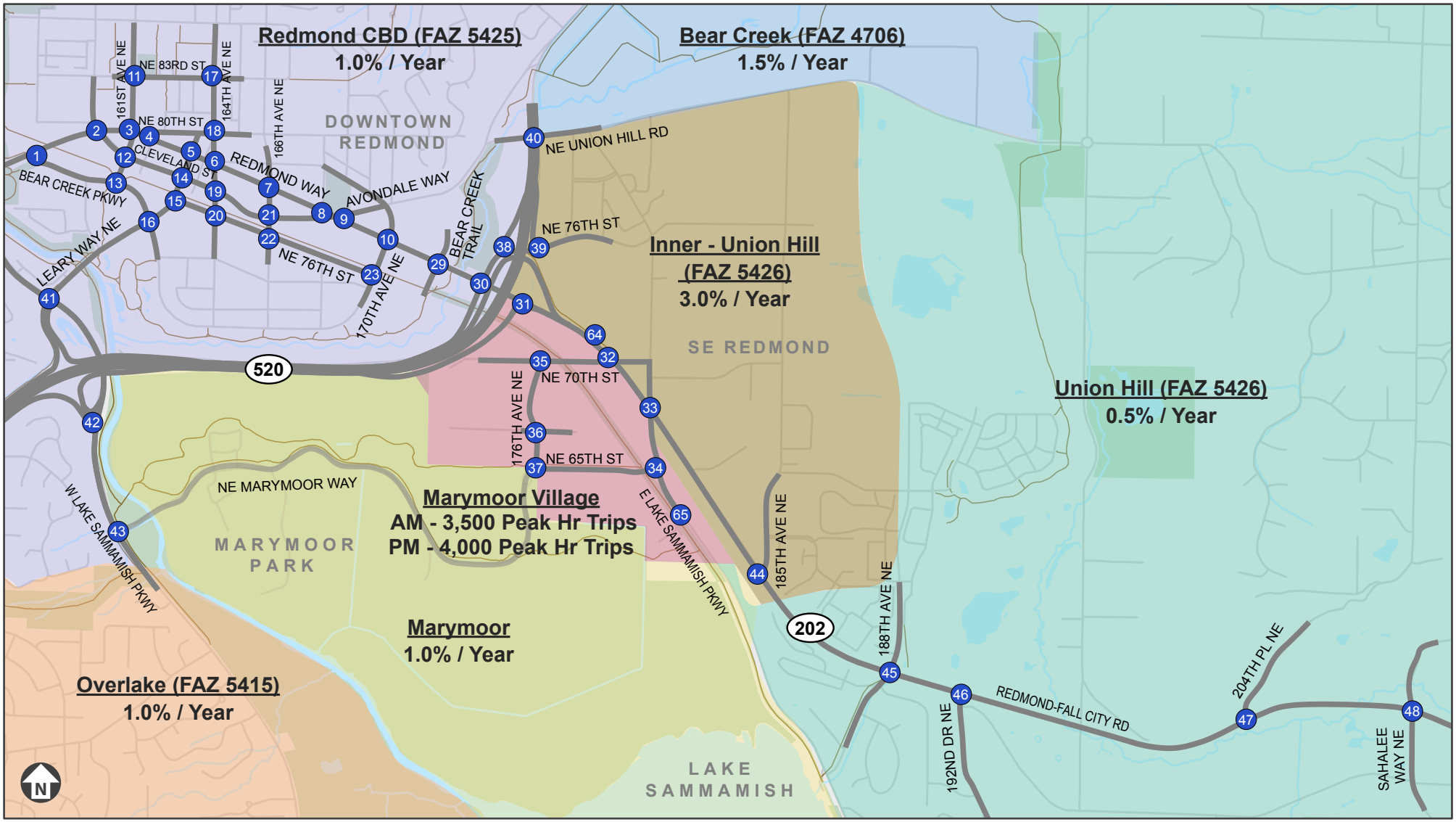
Traffic volumes for 2035 for the Project Baseline with Marymoor Subarea Plan were forecasted using growth rates that correspond approximately with the planned land use changes in the study area. The City of Redmond is planning for substantial growth in the Marymoor Subarea, whereas other areas are anticipated to grow at a slower rate. To reflect the different levels of growth planned in the city, the following traffic volume growth rates were applied in various locations within the study area (Figure 2-2):

- 0.5 percent per year-Union Hill
- 1 percent per year—Overlake, Marymoor, and Redmond Central Business District
- 1.5 percent per year—Bear Creek
- 3 percent per year—Inner Union Hill
- 10 percent per year—Marymoor Subarea; this equates to a total of 3,500 entering/exiting trips in the 2035 AM peak hour and 4,000 entering/exiting trips in the 2035 PM peak hour

These traffic growth rates were applied to actual traffic volume counts to develop 2035 traffic volumes for analyzing the peak hour traffic operations. Traffic volumes are forecast to increase throughout the study area during both the 2035 AM and PM peak hours. Figure 2-3 shows the forecasted 2035 AM and PM peak hour turning movements under the Project Baseline with Marymoor Subarea Plan.

Intersection Operations

The traffic operations analysis compares the Project Baseline with Marymoor Subarea Plan at the same study intersections analyzed under the Project Baseline, as well as two additional intersections. The two additional intersections include new access points into the Marymoor Village neighborhood. The first intersection (Intersection #64) is a new right-in-right-out intersection located along SR 202 between intersections #31 and #32. The second intersection (Intersection #65) is East Lake Sammamish Parkway and NE 63rd Street, which would access Marymoor Village on the south side of the development. The 2035 AM and PM peak hour LOS and delay for the evaluated intersections, with the Project Baseline and with the Project Baseline with Marymoor Subarea Plan, are shown in Tables 2-2 and 2-3, respectively. Figures 2-4 and 2-5 show 2035 AM and PM peak hour operations under the Project Baseline with Marymoor Subarea Plan.



X Analysis Intersections

Figure 2-2
PSRC Forecast Analysis Zone (FAZ) Map of Marymoor Subarea Growth Rates
Downtown Redmond Link Extension

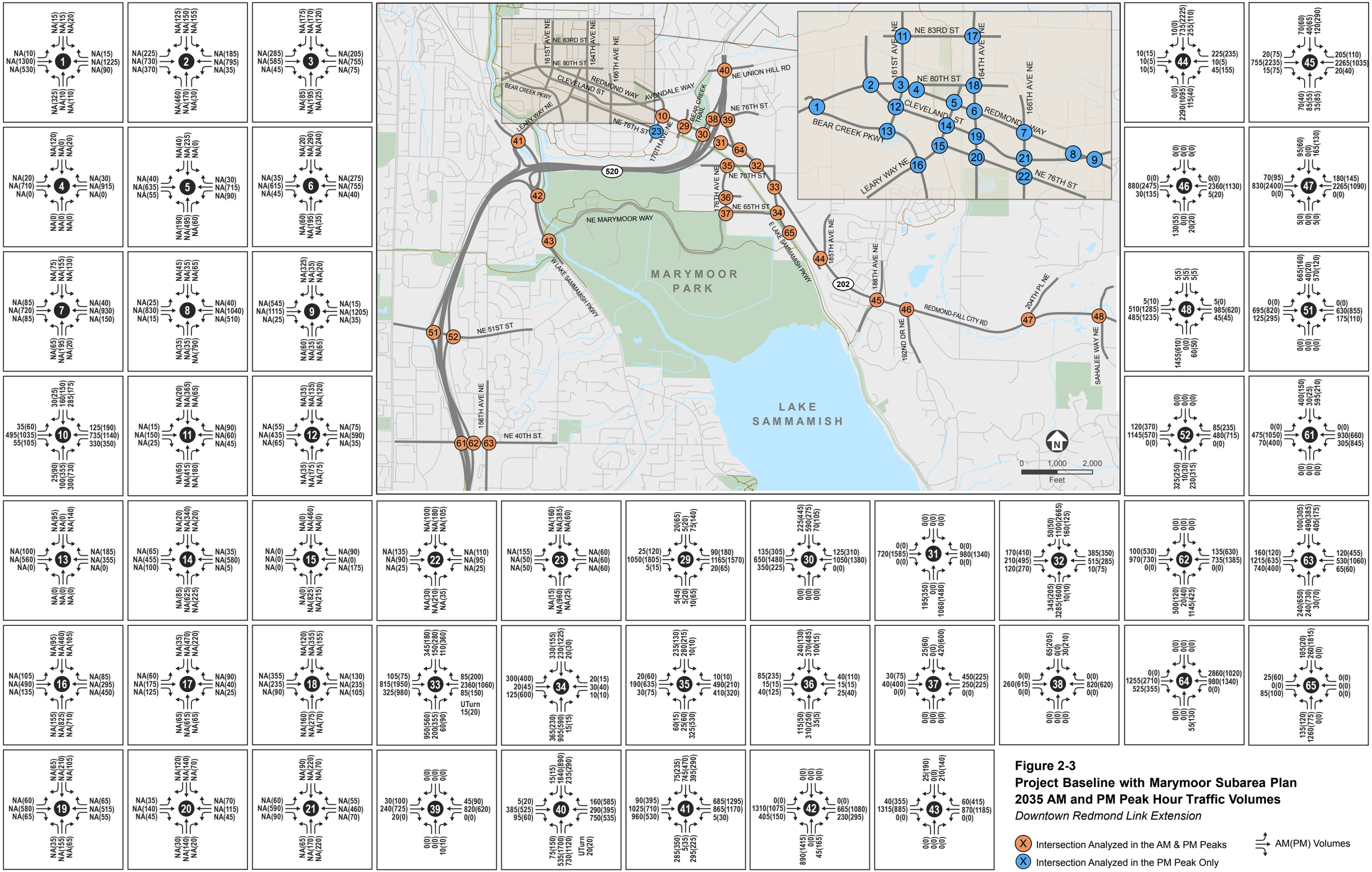
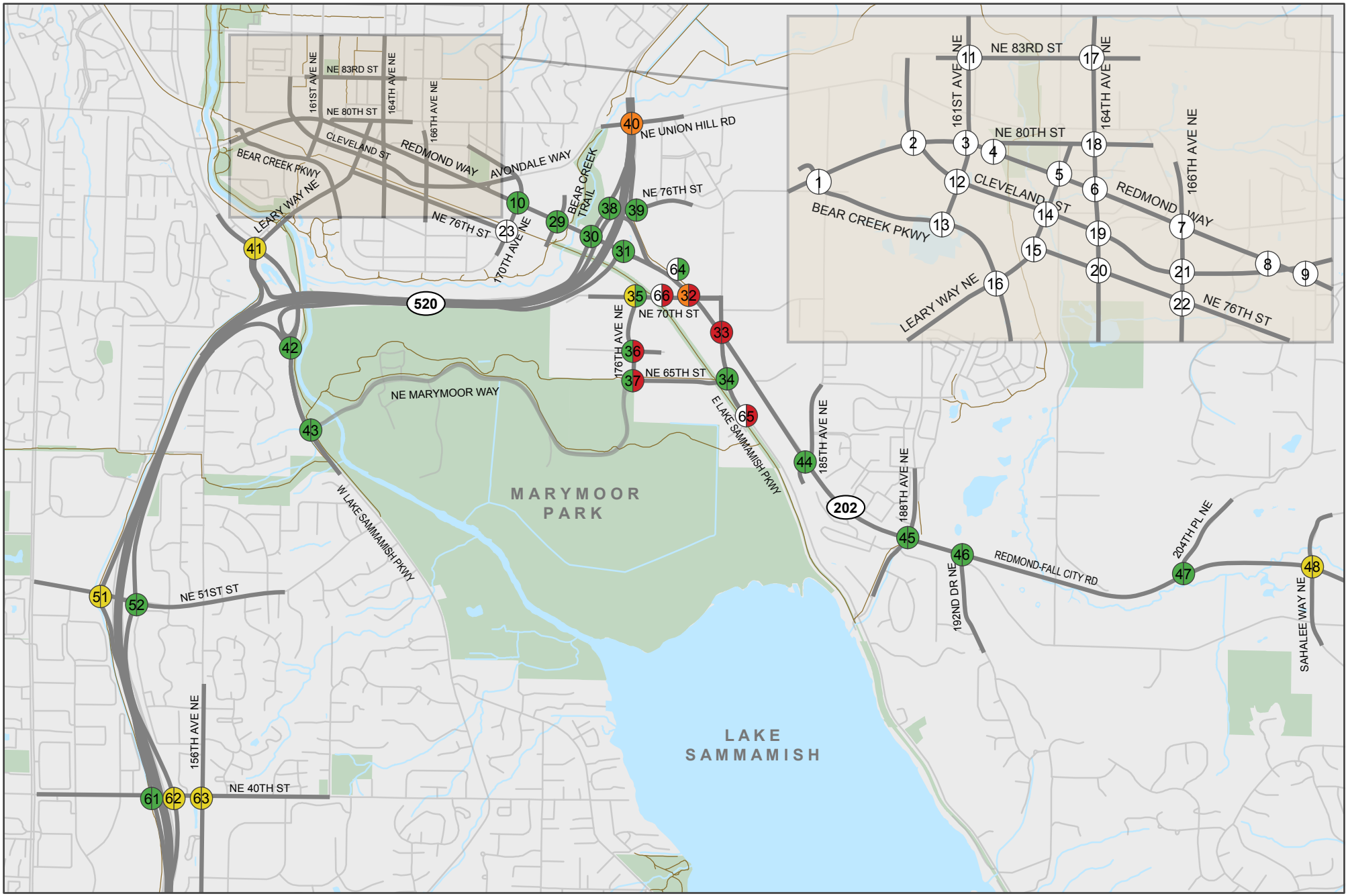


Figure 2-3
Project Baseline with Marymoor Subarea Plan
2035 AM and PM Peak Hour Traffic Volumes
Downtown Redmond Link Extension

X Intersection Analyzed in the AM & PM Peaks
X Intersection Analyzed in the PM Peak Only
AM(PM) Volumes



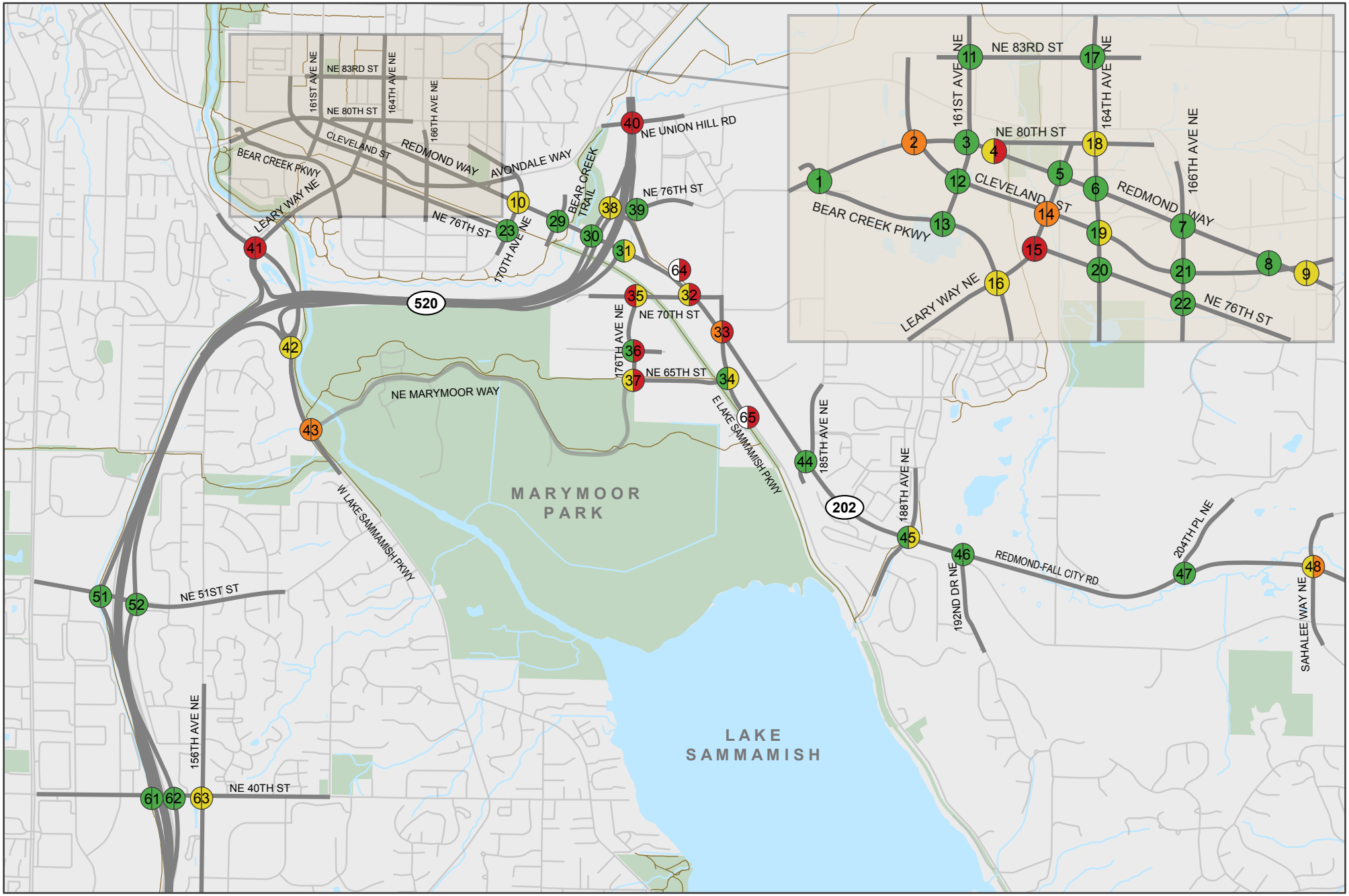
0 1,000 2,000
Feet

- LOS A-C
- LOS D
- LOS E
- LOS F
- No Analysis

Project Baseline

Project Baseline with Marymoor Subarea Plan

Figure 2-4
2035 Project Baseline with Marymoor Subarea Plan
Traffic Operations During AM Peak Hour
Downtown Redmond Link Extension



0 1,000 2,000
Feet

- LOS A-C
- LOS D
- LOS E
- LOS F
- No Analysis

Project Baseline
Project Baseline with Marymoor Subarea Plan

Figure 2-5
2035 Project Baseline with Marymoor Subarea Plan
Traffic Operations During PM Peak Hour
Downtown Redmond Link Extension

2035 AM Analysis

As shown in Table 2-2, six of the study area intersections are forecast to operate below the LOS standard for the project during the 2035 AM peak hour with the Project Baseline with the Marymoor Subarea Plan. Of these, four of the five intersections that exist in both scenarios would experience more congestion than the Project Baseline, primarily due to the increased household and employment planned in the Marymoor Subarea Plan including:

- Intersection #32: Redmond Way and NE 70th Street
- Intersection #33: Redmond Way and East Lake Sammamish Parkway/180th Avenue NE
- Intersection #36: 176th Avenue NE and NE 67th Street Intersection #37: 176th Avenue NE and NE 65th Street

Of the six intersections operating below the LOS standard for the agency, intersections #32, #33, and #40 are forecast to operate below the LOS standard under the Project Baseline. Delay at these intersections can be attributed to the expected population and employment growth in Redmond as well as surrounding cities. Intersection #65 would not be present under the Project Baseline.

Table 2-2. Project Baseline with Marymoor Subarea Plan 2035 AM Peak Hour Traffic Operations

				Project Baseline[1]		Project Baseline with Marymoor Subarea Plan[1]	
ID	Intersection	Control Type	Agency (Standard)	LOS	Delay (sec)	LOS	Delay (sec)
10	Redmond Way and 170th Avenue NE	Signal	City of Redmond (LOS D)	C	24	C	24
29	Redmond Way and Bear Creek Crossing	Signal	City of Redmond (LOS D)	A	8	A	8
30	Redmond Way and SR 520 Westbound On-Ramp/NE 76th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	20	C	20
31	Redmond Way and SR 520 Eastbound Ramp	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	16	B	18
32	Redmond Way and NE 70th Street	Signal	City of Redmond (LOS D)	***E***	***67***	***F***	***132***
33	Redmond Way and East Lake Sammamish Parkway/ 180th Avenue NE	Signal	City of Redmond (LOS D)	***F***	***111***	***F***	***120***
34	East Lake Sammamish Parkway and NE 65th Street	Signal	City of Redmond (LOS D)	A	7	B	13
35	176th Avenue NE and NE 70th Street	TWSC/Signal[2]	City of Redmond (LOS D)	D	27	C	21
36	176th Avenue NE and NE 67th Street	TWSC/AWSC[3]	City of Redmond (LOS D)	B	15	***F***	***71***
37	176th Avenue NE and NE 65th Street	TWSC/AWSC[3]	City of Redmond (LOS D)	B	13	***F***	***67***
38	NE 76th Street and SR 520 Westbound Off-Ramp	TWSC	WSDOT Highways of Statewide Significance (LOS D)	C	18	C	18
39	NE 76th Street and SR 520 Eastbound On-Ramp/ Fred Meyer	TWSC	WSDOT Highways of Statewide Significance (LOS D)	B	10	B	10
40	SR 520 and NE Union Hill Road/Avondale Road	Signal	City of Redmond (LOS D)	***E***	***75***	***E***	***75***

Table 2-2. Project Baseline with Marymoor Subarea Plan 2035 AM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	Project Baseline[1]		Project Baseline with Marymoor Subarea Plan[1]	
				LOS	Delay (sec)	LOS	Delay (sec)
41	SR 520 Westbound Ramps and West Lake Sammamish Parkway/Leary Way NE	Signal	WSDOT Highways of Statewide Significance (LOS D)	D	51	D	51
42	SR 520 Eastbound Ramp and West Lake Sammamish Parkway	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	29	C	29
43	West Lake Sammamish Parkway and NE Marymoor Way	Signal	City of Redmond (LOS D)	B	18	B	18
44	Redmond-Fall City Road and 185th Avenue NE	Signal	City of Redmond (LOS D)	C	21	C	31
45	Redmond-Fall City Road and 187th Avenue NE/ 188th Avenue NE	Signal	City of Redmond (LOS D)	B	15	B	15
46	Redmond-Fall City Road and 192nd Drive NE	Signal	WSDOT Regionally Significant Highway (LOS E)	A	8	A	9
47	Redmond-Fall City Road and 204th Place NE	Signal	WSDOT Regionally Significant Highway (LOS E)	C	21	C	27
48	Redmond-Fall City Road and Sahalee Way NE/NE 58th Street	Signal	WSDOT Regionally Significant Highway (LOS E)	D	43	D	46
51	SR 520 Westbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	D	47	D	47
52	SR 520 Eastbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	18	B	18
61	SR 520 Westbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	34	C	34
62	SR 520 Eastbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	D	40	D	40
63	NE 40th Street and 156th Avenue NE	Signal	City of Redmond (LOS D)	D	46	D	46
64	Redmond Way and 176th Avenue NE	N/A/TWSC[4]	City of Redmond (LOS D)	--	--	C	18
65	East Lake Sammamish Parkway and NE 63rd Street	N/A/TWSC[4]	City of Redmond (LOS D)	--	--	***F***	***54***

[1] Synchro analyzes intersections in isolation and doesn't take into account downstream congestion. Actual intersection operations may have more delay based on intersection interactions and queuing propagating upstream and downstream between intersections.

[2] Intersection operates as TWSC under the Project Baseline and as signalized under the Project Baseline with Marymoor Subarea Plan.

[3] Intersection operates as TWSC under the Project Baseline and as ASWC under the Project Baseline with Marymoor Subarea Plan.

[4] Intersection does not exist under the Project Baseline; it is developed as TWSC under the Project Baseline with Marymoor Subarea Plan.

Cells highlighted in ***grey bold and italicized*** identify intersections that operate below the LOS standard for the facility

Intersections were analyzed using the Synchro outputs for signalized intersections and 2010 Highway Capacity Manual outputs for unsignalized intersections.

TWSC = two-way stop controlled

AWSC = all-way stop controlled

2035 PM analysis

During the 2035 PM peak hour, 13 of the study area intersections are forecast to operate below the LOS standard for the facility under the Project Baseline with Marymoor Subarea Plan including:

- Intersection #2: Redmond Way and Cleveland Street/160th Avenue
- Intersection #4: Redmond Way and NE 80th Street
- Intersection #14: Leary Way and Cleveland Street
- Intersection #15: Leary Way and NE 76th Street
- Intersection #32: Redmond Way and NE 70th Street
- Intersection #33: Redmond Way and East Lake Sammamish Parkway
- Intersection #36: 176th Avenue NE and NE 67th Street
- Intersection #37: 176th Avenue NE and NE 65th Street
- Intersection #40: SR 520 and NE Union Hill Road/Avondale Road
- Intersection #41: SR 520 Westbound Ramps and West Lake Sammamish Parkway/Leary Way NE
- Intersection #43: West Lake Sammamish Parkway and NE Marymoor Way
- Intersection #64: Redmond Way and 176th Avenue NE
- Intersection #65: East Lake Sammamish Parkway and NE 63rd Street

Increased delay at intersection #2, #4, and #15 would result from background growth in Redmond and nearby communities. Delay at intersections #32, #33, #35, #36, #37, #64, and #65 would result primarily from the increased household and employment planned in the Marymoor Subarea Plan. Under the Project Baseline with the Marymoor Subarea Plan, operations at intersection #35 would improve compared to the Project Baseline, because of the planned signalization of the intersection.

Intersections #14, #40, #41, and #43 are forecast to operate below standard under the Project Baseline and would operate with the same or almost the same delays under the Project Baseline with the Marymoor Subarea Plan. Table 2-3 shows the 2035 PM peak hour traffic operations under the Project Baseline with the Marymoor Subarea Plan.

Table 2-3. Project Baseline with Marymoor Subarea Plan 2035 PM Peak Hour Traffic Operations

				Project Baseline[1]		Project Baseline with Marymoor Subarea Plan[1]	
ID	Intersection	Control Type	Agency (Standard)	LOS	Delay (sec)	LOS	Delay (sec)
1	Redmond Way and Bear Creek Parkway	Signal	City of Redmond (LOS D)	B	18	B	19
2	Redmond Way and Cleveland Street/160th Avenue NE	Signal	City of Redmond (LOS D)	***E***	***67***	***E***	***77***
3	Redmond Way and 161st Avenue NE	Signal	City of Redmond (LOS D)	C	33	C	34
4	Redmond Way and NE 80th Street	TWSC	City of Redmond (LOS D)	D	25	***F***	***64***

Table 2-3. Project Baseline with Marymoor Subarea Plan 2035 PM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	Project Baseline[1]		Project Baseline with Marymoor Subarea Plan[1]	
				LOS	Delay (sec)	LOS	Delay (sec)
5	Redmond Way and Leary Way	Signal	City of Redmond (LOS D)	C	21	C	23
6	Redmond Way and 164th Avenue NE	Signal	City of Redmond (LOS D)	C	31	C	33
7	Redmond Way and 166th Avenue NE	Signal	City of Redmond (LOS D)	B	11	B	13
8	Redmond Way and 168th Avenue NE	Signal	City of Redmond (LOS D)	C	25	C	32
9	Redmond Way and Avondale Way	Signal	City of Redmond (LOS D)	D	39	D	37
10	Redmond Way and 170th Avenue NE	Signal	City of Redmond (LOS D)	D	37	D	44
11	161st Avenue NE and NE 83rd Street	Signal	City of Redmond (LOS D)	B	17	B	19
12	161st Avenue NE and Cleveland Street	Signal	City of Redmond (LOS D)	B	19	B	19
13	161st Avenue NE and Bear Creek Parkway	Signal	City of Redmond (LOS D)	B	10	B	10
14	Leary Way and Cleveland Street	Signal	City of Redmond (LOS D)	***E***	***71***	***E***	***71***
15	Leary Way and NE 76th Street	TWSC	City of Redmond (LOS D)	***F***	***139***	***F***	***153***
16	Leary Way and Bear Creek Parkway	Signal	City of Redmond (LOS D)	D	50	D	50
17	164th Avenue NE and NE 83rd Street	Signal	City of Redmond (LOS D)	C	24	C	26
18	164th Avenue NE and NE 80th Street	Signal	City of Redmond (LOS D)	D	44	D	45
19	164th Avenue NE and Cleveland Street	Signal	City of Redmond (LOS D)	C	29	D	37
20	164th Avenue NE and NE 76th Street	Roundabout	City of Redmond (LOS D)	A	0.39[2]	A	0.39[2]
21	166th Avenue NE and Cleveland Street	Signal	City of Redmond (LOS D)	B	18	B	17
22	166th Avenue NE and NE 76th Street	AWSC	City of Redmond (LOS D)	B	16	B	17
23	170th Avenue NE and NE 76th Street/Bartell's	Signal	City of Redmond (LOS D)	B	15	B	19
29	Redmond Way and Bear Creek Crossing	Signal	City of Redmond (LOS D)	C	25	C	29
30	Redmond Way and SR 520 Westbound On-Ramp/NE 76th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	16	B	17
31	Redmond Way and SR 520 Eastbound Ramp	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	30	D	41
32	Redmond Way and NE 70th Street	Signal	City of Redmond (LOS D)	D	47	***F***	***124***

Table 2-3. Project Baseline with Marymoor Subarea Plan 2035 PM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	Project Baseline[1]		Project Baseline with Marymoor Subarea Plan[1]	
				LOS	Delay (sec)	LOS	Delay (sec)
33	Redmond Way and East Lake Sammamish Parkway/ 180th Avenue NE	Signal	City of Redmond (LOS D)	***E***	***76***	***F***	***125***
34	East Lake Sammamish Parkway and NE 65th Street	Signal	City of Redmond (LOS D)	B	18	D	41
35	176th Avenue NE and NE 70th Street	TWSC/Signal[3]	City of Redmond (LOS D)	***F***	***54***	D	50
36	176th Avenue NE and NE 67th Street	TWSC/AWSC[4]	City of Redmond (LOS D)	C	16	***F***	***103***
37	176th Avenue NE and NE 65th Street	TWSC/AWSC[4]	City of Redmond (LOS D)	D	28	***F***	***126***
38	NE 76th Street and SR 520 Westbound Off-Ramp	TWSC	WSDOT Highways of Statewide Significance (LOS D)	D	26	D	26
39	NE 76th Street and SR 520 Eastbound On-Ramp/ Fred Meyer	TWSC	WSDOT Highways of Statewide Significance (LOS D)	B	15	B	15
40	SR 520 and NE Union Hill Road/Avondale Road	Signal	City of Redmond (LOS D)	***F***	***157***	***F***	***157***
41	SR 520 Westbound Ramps and West Lake Sammamish Parkway/Leary Way NE	Signal	WSDOT Highways of Statewide Significance (LOS D)	***F***	***93***	***F***	***93***
42	SR 520 Eastbound Ramp and West Lake Sammamish Parkway	Signal	WSDOT Highways of Statewide Significance (LOS D)	D	48	D	48
43	West Lake Sammamish Parkway and NE Marymoor Way	Signal	City of Redmond (LOS D)	***E***	***74***	***E***	***74***
44	Redmond-Fall City Road and 185th Avenue NE	Signal	City of Redmond (LOS D)	B	16	B	17
45	Redmond-Fall City Road and 187th Avenue NE/ 188th Avenue NE	Signal	City of Redmond (LOS D)	C	29	D	44
46	Redmond-Fall City Road and 192nd Drive NE	Signal	WSDOT Regionally Significant Highway (LOS E)	A	6	A	7
47	Redmond-Fall City Road and 204th Place NE	Signal	WSDOT Regionally Significant Highway (LOS E)	B	12	B	15
48	Redmond-Fall City Road and Sahalee Way NE/NE 58th Street	Signal	WSDOT Regionally Significant Highway (LOS E)	D	47	E	59
51	SR 520 Westbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	10	B	10
52	SR 520 Eastbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	20	C	20
61	SR 520 Westbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	25	C	25

Table 2-3. Project Baseline with Marymoor Subarea Plan 2035 PM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	Project Baseline[1]		Project Baseline with Marymoor Subarea Plan[1]	
				LOS	Delay (sec)	LOS	Delay (sec)
62	SR 520 Eastbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	24	C	24
63	NE 40th Street and 156th Avenue NE	Signal	City of Redmond (LOS D)	D	44	D	44
64	Redmond Way and 176th Avenue NE	N/A/TWSC[5]		--	--	***F***	***>300***
65	East Lake Sammamish Parkway and NE 63rd Street	N/A/TWSC[5]		--	--	***F***	***>300***

[1] Synchro analyzes intersections in isolation and doesn't take into account downstream congestion. Actual intersection operations may have more delay based on intersection interactions and queuing propagating upstream and downstream between intersections.

[2] Operation of the roundabout is represented as a v/c ratio rather than a time delay.

[3] Intersection operates as TWSC under the Project Baseline and as signalized under the Project Baseline with Marymoor Subarea Plan.

[4] Intersection operates as TWSC under the Project Baseline and as ASWC under the Project Baseline with Marymoor Subarea Plan.

[5] Intersection does not exist under the Project Baseline; it is developed as TWSC under the Project Baseline with Marymoor Subarea Plan.

Cells highlighted in ***grey bold and italicized*** identify intersections that operate below the LOS standard for the facility.

Intersections were analyzed using the Synchro outputs for signalized intersections and 2010 Highway Capacity Manual outputs for unsignalized intersections.

TWSC = two-way stop controlled

AWSC = all-way stop controlled

2.2 Freight

Under the Project Baseline with Marymoor Subarea Plan, freight traffic is expected to be affected similar to general purpose traffic. Freight would experience the same levels of delay as general purpose traffic on roadways and at intersections with increased congestion.

2.3 Transit

In the Project Baseline with Marymoor Subarea Plan, Link light rail service and bus service would be the same as the Project Baseline. Bus service frequency and routing would be the same, as would the active bay and layover needs.

2.4 Nonmotorized Facilities

The nonmotorized improvements included in the Project Baseline would also be included in the Project Baseline with Marymoor Subarea Plan. The revisions to the roadway network identified in the Marymoor Subarea Plan would facilitate additional pedestrian and bicycle circulation.

2.5 Parking

On-street parking and park-and-ride facilities in the study area would be the same in the Project Baseline and in the Project Baseline with Marymoor Subarea Plan. Additional on-street parking in the Marymoor Village neighborhood could be provided in conjunction with changes to the roadway network. The City of Redmond may choose to implement time restrictions in this neighborhood, similar to downtown Redmond.

2.6 Safety

Because of the increased residential and commercial densities planned in the Marymoor Subarea, the traffic and nonmotorized volumes in the study area by 2035 are expected to be greater under the Project Baseline with Marymoor Subarea Plan than the Project Baseline. This could increase collision frequencies for both motor vehicle and nonmotorized users in the study area. As with the Project Baseline, planned transportation projects could improve safety.

3. PROPOSED DESIGN REFINEMENTS WITH MARYMOOR SUBAREA PLAN

The Proposed Design Refinements with Marymoor Subarea Plan represents the Proposed Design Refinements, as described in Section 5.2 of the Transportation Technical Report, combined with the land use and transportation network changes envisioned in the Marymoor Subarea Plan. This section analyzes the operational impacts of the Proposed Design Refinements with Marymoor Subarea Plan for the 2035 forecast year and compares them with the Project Baseline, Project Baseline with Marymoor Subarea Plan, and with the Proposed Design Refinements.

3.1 Arterial and Local Street Operations

This section analyzes the operational impacts of the Proposed Design Refinements with Marymoor Subarea Plan within the study area for the 2035 forecast year and compares them to the Proposed Design Refinements.

Roadway Network and Intersection Modifications

The Proposed Design Refinements with Marymoor Subarea Plan is mostly the same as the roadway network and intersections included in the Proposed Design Refinements, as well as the improvements in the Marymoor Subarea described in the Project Baseline with Marymoor Subarea Plan. Under the Proposed Design Refinements with Marymoor Subarea Plan, the driveway to the ramps accessing the parking garage at the SE Redmond station would serve as the southbound leg of intersection #35. In order to retain the connection between Redmond Way and NE 70th Street via intersection #64, an additional 3-way intersection (intersection #66) would be installed along NE 70th Street between intersection #32 and #35.

Traffic Volumes

Traffic volumes for the Proposed Design Refinements with Marymoor Subarea Plan were developed using the same modeling process used for the Project Baseline with Marymoor Subarea Plan. The trips generated by light rail station usage, using the same assumptions and as calculated for the Proposed Design Refinements, were added to the Proposed Design Refinements with Marymoor Subarea Plan's estimated volumes for 2035 and are summarized in Figure 3-1. Trip generation for each station comprises automobile trips to and from park-and-ride lots, passenger drop-off/pick-up trips, new bus trips, and nonmotorized trips.

Traffic volumes are forecast to increase throughout the study area during both the 2035 AM and PM peak hours. Figure 3-2 shows the forecasted 2035 AM and PM peak hour turning movements under the Proposed Design Refinements.

Intersection Operations

The forecasted 2035 AM and PM peak hour LOS and delay for the study area intersections under the Proposed Design Refinements with Marymoor Subarea Plan, as well as the Project Baseline, Project Baseline with Marymoor Subarea Plan, and Proposed Design Refinements are shown in Tables 3-1 and 3-2, respectively. These tables also show the operational changes associated with proposed mitigation for impacted intersections, as described in Section 6.1 of the Transportation Technical Report. Figures 3-3 and 3-4 show 2035 AM and PM peak hour operations at the study intersections under the Proposed Design Refinements with Marymoor Subarea Plan.

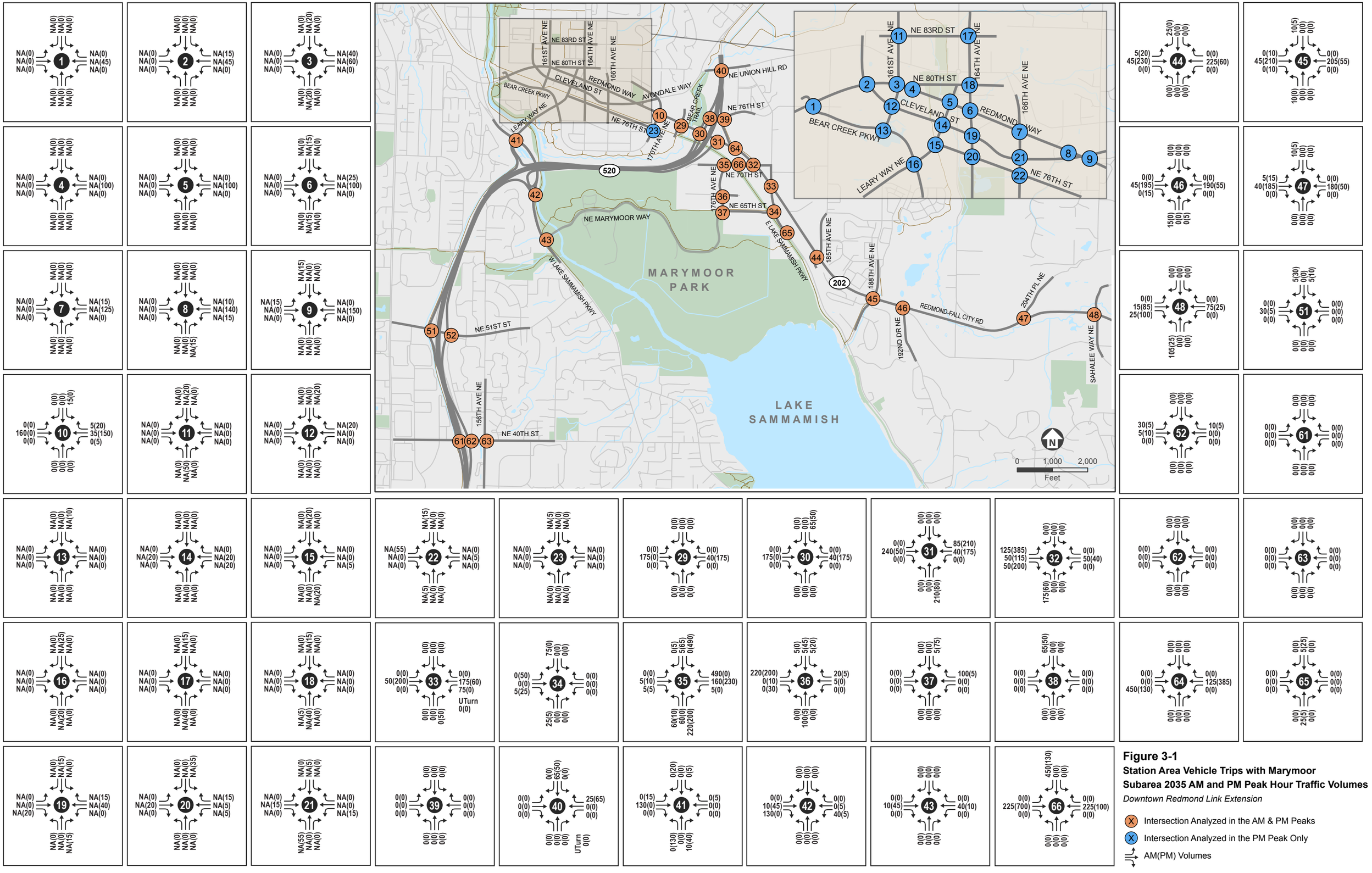


Figure 3-1
Station Area Vehicle Trips with Marymoor Subarea 2035 AM and PM Peak Hour Traffic Volumes
Downtown Redmond Link Extension

X Intersection Analyzed in the AM & PM Peaks
X Intersection Analyzed in the PM Peak Only
AM(PM) Volumes

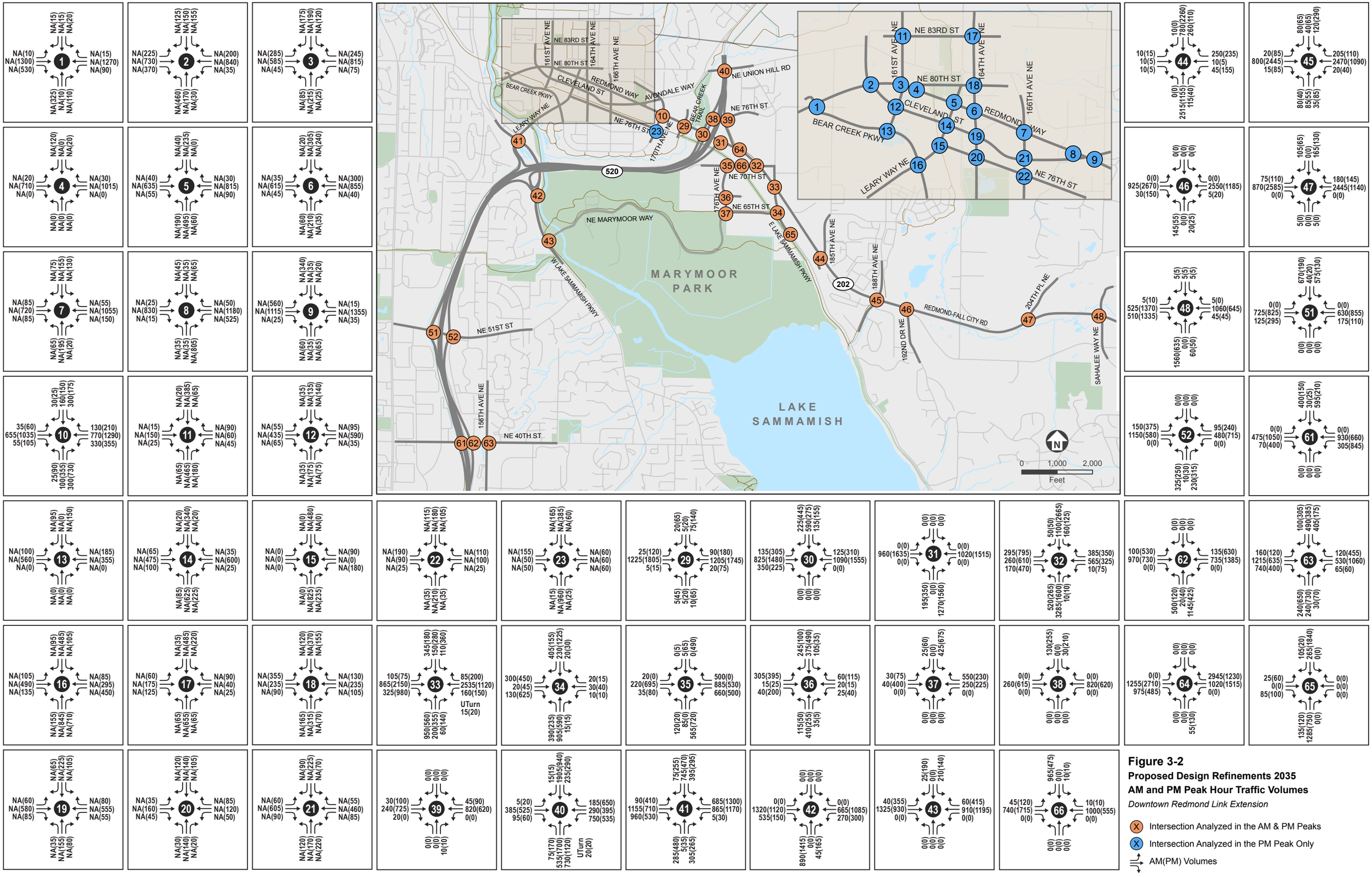


Figure 3-2
Proposed Design Refinements 2035
AM and PM Peak Hour Traffic Volumes
Downtown Redmond Link Extension

X Intersection Analyzed in the AM & PM Peaks
X Intersection Analyzed in the PM Peak Only
AM(PM) Volumes

Table 3-1. Proposed Design Refinements with Marymoor Subarea Plan 2035 AM Peak Hour Traffic Operations

ID	Intersection	Control Type	Agency (Standard)	Project Baseline		Proposed Design Refinements		Project Baseline with Marymoor Subarea Plan[1,2]		Proposed Design Refinements with Marymoor Subarea Plan[1,2]	
				LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
10	Redmond Way and 170th Avenue NE	Signal	City of Redmond (LOS D)	C	24	C	25	C	24	C	26
29	Redmond Way and Bear Creek Crossing	Signal	City of Redmond (LOS D)	A	8	A	8	A	8	A	8
30	Redmond Way and SR 520 Westbound On-Ramp/NE 76th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	20	C	20	C	20	C	20
31	Redmond Way and SR 520 Eastbound Ramp	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	16	B	18	B	18	C	21
32	Redmond Way and NE 70th Street	Signal	City of Redmond (LOS D)	***E***	***67***	***E***	***69***	***F***	***132***	***F***	***169***
33	Redmond Way and East Lake Sammamish Parkway/180th Avenue NE	Signal	City of Redmond (LOS D)	***F***	***111***	***F***	***116***	***F***	***120***	***F***	***155***
34	East Lake Sammamish Parkway and NE 65th Street	Signal	City of Redmond (LOS D)	A	7	A	6	B	13	B	14
35	176th Avenue NE and NE 70th Street	TWSC/Signal[3]	City of Redmond (LOS D)	D	27	***F***	***>300***	C	21	C	25
36	176th Avenue NE and NE 67th Street	TWSC/AWSC[4]	City of Redmond (LOS D)	B	15	***F***	***94***	***F***	***71***	***F***	***183***
37	176th Avenue NE and NE 65th Street	TWSC/AWSC[4]	City of Redmond (LOS D)	B	13	B	14	***F***	***67***	***F***	***108***
38	NE 76th Street and SR 520 Westbound Off-Ramp	TWSC	WSDOT Highways of Statewide Significance (LOS D)	C	18	C	23	C	18	C	23
39	NE 76th Street and SR 520 Eastbound On-Ramp/Fred Meyer	TWSC	WSDOT Highways of Statewide Significance (LOS D)	B	10	B	10	B	10	B	10
40	SR 520 and NE Union Hill Road/Avondale Road	Signal	City of Redmond (LOS D)	***E***	***75***	***F***	***81***	***E***	***75***	***F***	***81***

Table 3-1. Proposed Design Refinements with Marymoor Subarea Plan 2035 AM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	Project Baseline		Proposed Design Refinements		Project Baseline with Marymoor Subarea Plan[1,2]		Proposed Design Refinements with Marymoor Subarea Plan[1,2]	
				LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
41	SR 520 Westbound Ramps and West Lake Sammamish Parkway/Leary Way NE	Signal	WSDOT Highways of Statewide Significance (LOS D)	D	51	D	53	D	51	D	51
42	SR 520 Eastbound Ramp and West Lake Sammamish Parkway	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	29	C	32	C	29	C	30
43	West Lake Sammamish Parkway and NE Marymoor Way	Signal	City of Redmond (LOS D)	B	18	B	18	B	18	B	19
44	Redmond-Fall City Road and 185th Avenue NE	Signal	City of Redmond (LOS D)	C	21	D	38	C	31	D	54
45	Redmond-Fall City Road and 187th Avenue NE/188th Avenue NE	Signal	City of Redmond (LOS D)	B	15	C	32	B	15	C	32
46	Redmond-Fall City Road and 192nd Drive NE	Signal	WSDOT Regionally Significant Highway (LOS E)	A	8	A	9	A	9	D	42
47	Redmond-Fall City Road and 204th Place NE	Signal	WSDOT Regionally Significant Highway (LOS E)	C	21	D	37	C	27	D	47
48	Redmond-Fall City Road and Sahalee Way NE/NE 58th Street	Signal	WSDOT Regionally Significant Highway (LOS E)	D	43	D	49	D	46	E	57
51	SR 520 Westbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	D	47	D	49	D	47	D	49
52	SR 520 Eastbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	18	B	18	B	18	B	18
61	SR 520 Westbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	34	C	34	C	34	C	34
62	SR 520 Eastbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	D	40	D	40	D	40	D	40
63	NE 40th Street and 156th Avenue NE	Signal	City of Redmond (LOS D)	D	46	D	46	D	46	D	46

Table 3-1. Proposed Design Refinements with Marymoor Subarea Plan AM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	Project Baseline		Proposed Design Refinements		Project Baseline with Marymoor Subarea Plan[1,2]		Proposed Design Refinements with Marymoor Subarea Plan[1,2]	
				LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
64	Redmond Way and 176th Avenue NE	N/A/TWSC[5]	City of Redmond (LOS D)	--	--	--	--	C	18	C	18
65	East Lake Sammamish Parkway and NE 63rd Street	N/A/TWSC[5]	City of Redmond (LOS D)	--	--	--	--	***F***	***54***	***F***	***58***
66	NE 70th Street and 176th Avenue NE	N/A/TWSC[5]	City of Redmond (LOS D)	--	--	--	--	--	--	***F***	***>300***

[1] Synchro analyzes intersections in isolation and doesn't take into account downstream congestion. Actual intersection operations may have more delay based on intersection interactions and queuing propagating upstream and downstream between intersections.

[2] The intersection operations evaluation for the Project Baseline with Marymoor Subarea Plan and Proposed Design Refinements with Marymoor Subarea Plan do not assume incorporation of the improvements identified as proposed mitigation in Section 6.1 of the Transportation Technical Report.

[3] Intersection operates as TWSC under the Project Baseline and Proposed Design Refinements and as signalized under the Project Baseline with Marymoor Subarea Plan and Proposed Design Refinements with Marymoor Subarea Plan.

[4] Intersection operates as TWSC under the Project Baseline and Proposed Design Refinements and as ASWC under the Project Baseline with Marymoor Subarea Plan and Proposed Design Refinements with Marymoor Subarea Plan.

[5] Intersection does not exist under the Project Baseline or Proposed Design Refinements; it is developed as TWSC under the Project Baseline with Marymoor Subarea Plan and Proposed Design Refinements with Marymoor Subarea Plan.

Cells highlighted in ***grey bold and italicized*** identify intersections that operate below the LOS standard for the facility.

Intersections were analyzed using the Synchro outputs for signalized intersections and 2010 Highway Capacity Manual outputs for unsignalized intersections.

TWSC = two-way stop controlled

AWSC = all-way stop controlled

Table 3-2. Proposed Design Refinements with Marymoor Subarea Plan 2035 PM Peak Hour Traffic Operations

ID	Intersection	Control Type	Agency (Standard)	Project Baseline		Proposed Design Refinements		Project Baseline with Marymoor Subarea Plan[1,2]		Proposed Design Refinements with Marymoor Subarea Plan[1,2]	
				LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
1	Redmond Way and Bear Creek Parkway	Signal	City of Redmond (LOS D)	B	18	B	18	B	19	B	19
2	Redmond Way and Cleveland Street/ 160th Avenue NE	Signal	City of Redmond (LOS D)	***E***	***67***	***E***	***73***	***E***	***77***	***E***	***79***
3	Redmond Way and 161st Avenue NE	Signal	City of Redmond (LOS D)	C	33	D	36	C	34	D	36
4	Redmond Way and NE 80th Street	TWSC	City of Redmond (LOS D)	D	25	D	31	***F***	***64***	***F***	***93***
5	Redmond Way and Leary Way	Signal	City of Redmond (LOS D)	C	21	C	25	C	23	C	30
6	Redmond Way and 164th Avenue NE	Signal	City of Redmond (LOS D)	C	31	D	41	C	33	D	44
7	Redmond Way and 166th Avenue NE	Signal	City of Redmond (LOS D)	B	11	B	12	B	13	B	11
8	Redmond Way and 168th Avenue NE	Signal	City of Redmond (LOS D)	C	25	C	31	C	32	C	33
9	Redmond Way and Avondale Way	Signal	City of Redmond (LOS D)	D	39	D	41	D	37	D	40
10	Redmond Way and 170th Avenue NE	Signal	City of Redmond (LOS D)	D	37	D	39	D	44	D	45
11	161st Avenue NE and NE 83rd Street	Signal	City of Redmond (LOS D)	B	17	B	18	B	19	C	20
12	161st Avenue NE and Cleveland Street	Signal	City of Redmond (LOS D)	B	19	C	20	B	19	C	20
13	161st Avenue NE and Bear Creek Parkway	Signal	City of Redmond (LOS D)	B	10	B	10	B	10	B	11
14	Leary Way and Cleveland Street	Signal	City of Redmond (LOS D)	***E***	***71***	***E***	***80***	***E***	***71***	***F***	***84***
15	Leary Way and NE 76th Street	TWSC	City of Redmond (LOS D)	***F***	***139***	***F***	***161***	***F***	***153***	***F***	***176***
16	Leary Way and Bear Creek Parkway	Signal	City of Redmond (LOS D)	D	50	D	50	D	50	D	50
17	164th Avenue NE and NE 83rd Street	Signal	City of Redmond (LOS D)	C	24	C	26	C	26	C	29

Table 3-2. Proposed Design Refinements with Marymoor Subarea Plan 2035 PM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	Project Baseline		Proposed Design Refinements		Project Baseline with Marymoor Subarea Plan[1,2]		Proposed Design Refinements with Marymoor Subarea Plan[1,2]	
				LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
18	164th Avenue NE and NE 80th Street	Signal	City of Redmond (LOS D)	D	44	D	46	D	45	D	47
19	164th Avenue NE and Cleveland Street	Signal	City of Redmond (LOS D)	C	29	D	39	D	37	D	52
20	164th Avenue NE and NE 76th Street	Roundabout	City of Redmond (LOS D)	A	0.39[2]	A	0.43[2]	A	0.39[2]	A	0.44[3]
21	166th Avenue NE and Cleveland Street	Signal	City of Redmond (LOS D)	B	18	C	29	B	17	D	35
22	166th Avenue NE and NE 76th Street	AWSC	City of Redmond (LOS D)	B	16	B	18	B	17	B	19
23	170th Avenue NE and NE 76th Street/ Bartell's	Signal	City of Redmond (LOS D)	B	15	B	15	B	19	B	19
29	Redmond Way and Bear Creek Crossing	Signal	City of Redmond (LOS D)	C	25	C	30	C	29	D	42
30	Redmond Way and SR 520 Westbound On-Ramp/NE 76th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	16	B	18	B	17	C	21
31	Redmond Way and SR 520 Eastbound Ramp	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	30	D	42	D	41	D	54
32	Redmond Way and NE 70th Street	Signal	City of Redmond (LOS D)	D	47	***F***	***137***	***F***	***124***	***F***	***209***
33	Redmond Way and East Lake Sammamish Parkway/180th Avenue NE	Signal	City of Redmond (LOS D)	***E***	***76***	***F***	***100***	***F***	***125***	***F***	***164***
34	East Lake Sammamish Parkway and NE 65th Street	Signal	City of Redmond (LOS D)	B	18	B	19	D	41	D	43
35	176th Avenue NE and NE 70th Street	TWSC/Signal[4]	City of Redmond (LOS D)	***F***	***54***	***F***	***210***	D	50	***F***	***215***
36	176th Avenue NE and NE 67th Street	TWSC/AWSC[5]	City of Redmond (LOS D)	C	16	***F***	***97***	***F***	***103***	***F***	***174***
37	176th Avenue NE and NE 65th Street	TWSC/AWSC[5]	City of Redmond (LOS D)	D	28	***F***	***53***	***F***	***126***	***F***	***164***
38	NE 76th Street and SR 520 Westbound Off-Ramp	TWSC	WSDOT Highways of Statewide Significance (LOS D)	D	26	D	28	D	26	D	28

Table 3-2. Proposed Design Refinements with Marymoor Subarea Plan 2035 PM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	Project Baseline		Proposed Design Refinements		Project Baseline with Marymoor Subarea Plan[1,2]		Proposed Design Refinements with Marymoor Subarea Plan[1,2]	
				LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
39	NE 76th Street and SR 520 Eastbound On-Ramp/Fred Meyer	TWSC	WSDOT Highways of Statewide Significance (LOS D)	B	15	B	15	B	15	B	15
40	SR 520 and NE Union Hill Road/Avondale Road	Signal	City of Redmond (LOS D)	***F***	***157***	***F***	***155***	***F***	***157***	***F***	***155***
41	SR 520 Westbound Ramps and West Lake Sammamish Parkway/ Leary Way NE	Signal	WSDOT Highways of Statewide Significance (LOS D)	***F***	***93***	***F***	***103***	***F***	***93***	***F***	***114***
42	SR 520 Eastbound Ramp and West Lake Sammamish Parkway	Signal	WSDOT Highways of Statewide Significance (LOS D)	D	48	D	54	D	48	D	53
43	West Lake Sammamish Parkway and NE Marymoor Way	Signal	City of Redmond (LOS D)	***E***	***74***	***E***	***74***	***E***	***74***	***E***	***74***
44	Redmond-Fall City Road and 185th Avenue NE	Signal	City of Redmond (LOS D)	B	16	B	17	B	17	C	26
45	Redmond-Fall City Road and 187th Avenue NE/188th Avenue NE	Signal	City of Redmond (LOS D)	C	29	D	50	D	44	***E***	***68***
46	Redmond-Fall City Road and 192nd Drive NE	Signal	WSDOT Regionally Significant Highway (LOS E)	A	6	A	8	A	7	B	11
47	Redmond-Fall City Road and 204th Place NE	Signal	WSDOT Regionally Significant Highway (LOS E)	B	12	B	18	B	15	C	27
	Redmond-Fall City Road and Sahalee Way NE/NE 58th Street	Signal	WSDOT Regionally Significant Highway (LOS E)	D	47	E	61	E	59	E	73
51	SR 520 Westbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	B	10	B	11	B	10	B	11
52	SR 520 Eastbound Ramps and NE 51st Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	20	C	20	C	20	C	20
61	SR 520 Westbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	25	C	25	C	25	C	25

Table 3-2. Proposed Design Refinements with Marymoor Subarea Plan 2035 PM Peak Hour Traffic Operations (continued)

ID	Intersection	Control Type	Agency (Standard)	Project Baseline		Proposed Design Refinements		Project Baseline with Marymoor Subarea Plan[1,2]		Proposed Design Refinements with Marymoor Subarea Plan[1,2]	
				LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
62	SR 520 Eastbound Ramps and NE 40th Street	Signal	WSDOT Highways of Statewide Significance (LOS D)	C	24	C	24	C	24	C	24
63	NE 40th Street and 156th Avenue NE	Signal	City of Redmond (LOS D)	D	44	D	44	D	44	D	44
64	Redmond Way and 176th Avenue NE	N/A/TWSC[6]		--	--	--	--	***F***	***>300***	***F***	***>300***
65	East Lake Sammamish Parkway and NE 63rd Street	N/A/TWSC[6]		--	--	--	--	***F***	***>300***	***F***	***>300***
66	NE 70th Street and 176th Avenue NE	N/A/TWSC[6]		--	--	--	--	--	--	C	24

[1] Synchro analyzes intersections in isolation and doesn't take into account downstream congestion. Actual intersection operations may have more delay based on intersection interactions and queuing propagating upstream and downstream between intersections.

[2] The intersection operations evaluation for the Project Baseline with Marymoor Subarea Plan and Proposed Design Refinements with Marymoor Subarea Plan do not assume incorporation of the improvements identified as proposed mitigation in Section 6.1 of the Transportation Technical Report.

[3] Operation of the roundabout is represented as a v/c ratio rather than a time delay.

[4] Intersection operates as TWSC under the Project Baseline and Proposed Design Refinements and as signalized under the Project Baseline with Marymoor Subarea Plan and Proposed Design Refinements with Marymoor Subarea Plan.

[5] Intersection operates as TWSC under the Project Baseline and Proposed Design Refinements and as ASWC under the Project Baseline with Marymoor Subarea Plan and Proposed Design Refinements with Marymoor Subarea Plan.

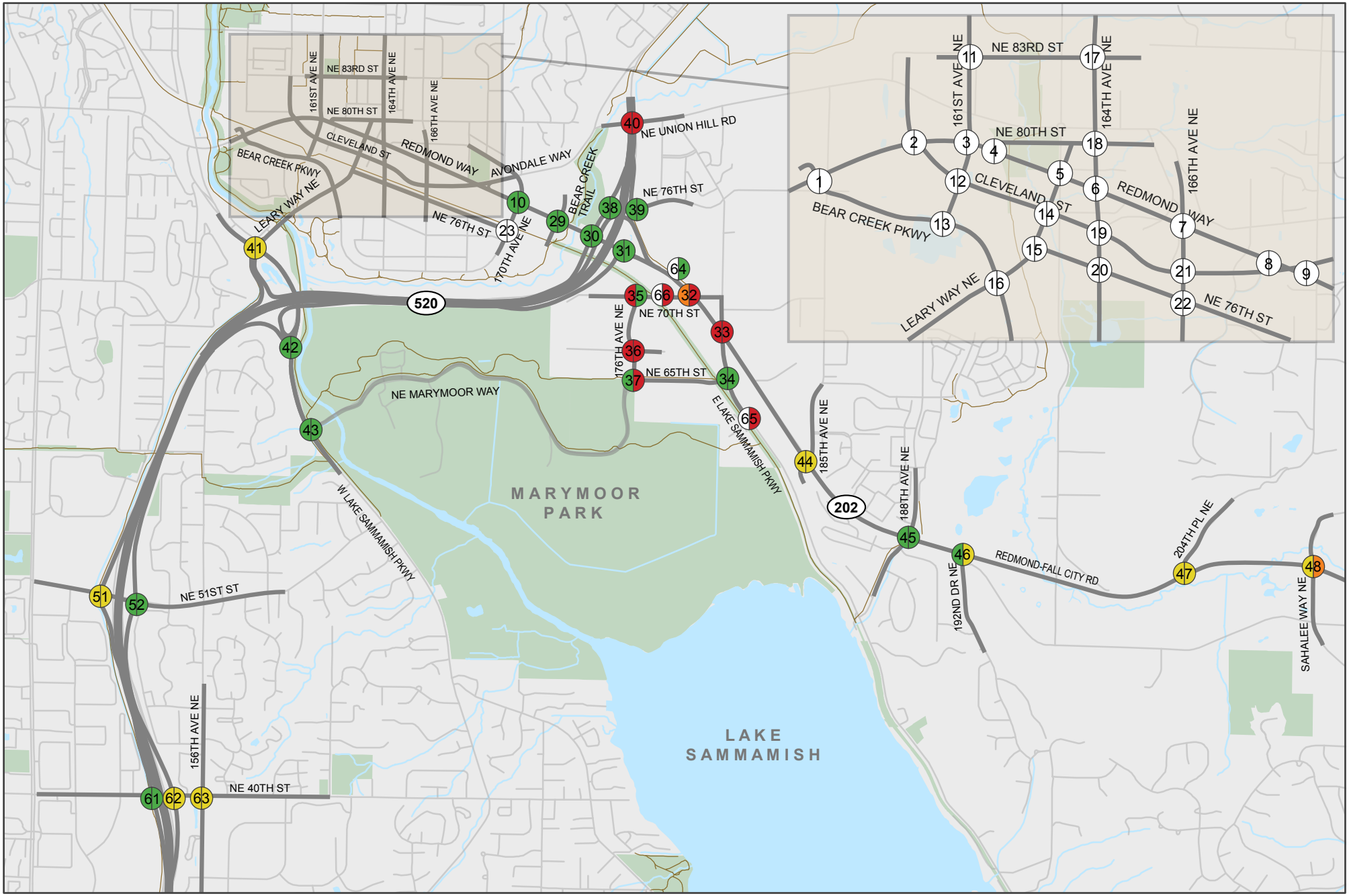
[6] Intersection does not exist under the Project Baseline or Proposed Design Refinements; it is developed as TWSC under the Project Baseline with Marymoor Subarea Plan and Proposed Design Refinements with Marymoor Subarea Plan.

Cells highlighted in ***grey bold and italicized*** identify intersections that operate below the LOS standard for the facility

Intersections were analyzed using the Synchro outputs for signalized intersections and 2010 Highway Capacity Manual outputs for unsignalized intersections.

TWSC = two-way stop controlled

AWSC = all-way stop controlled



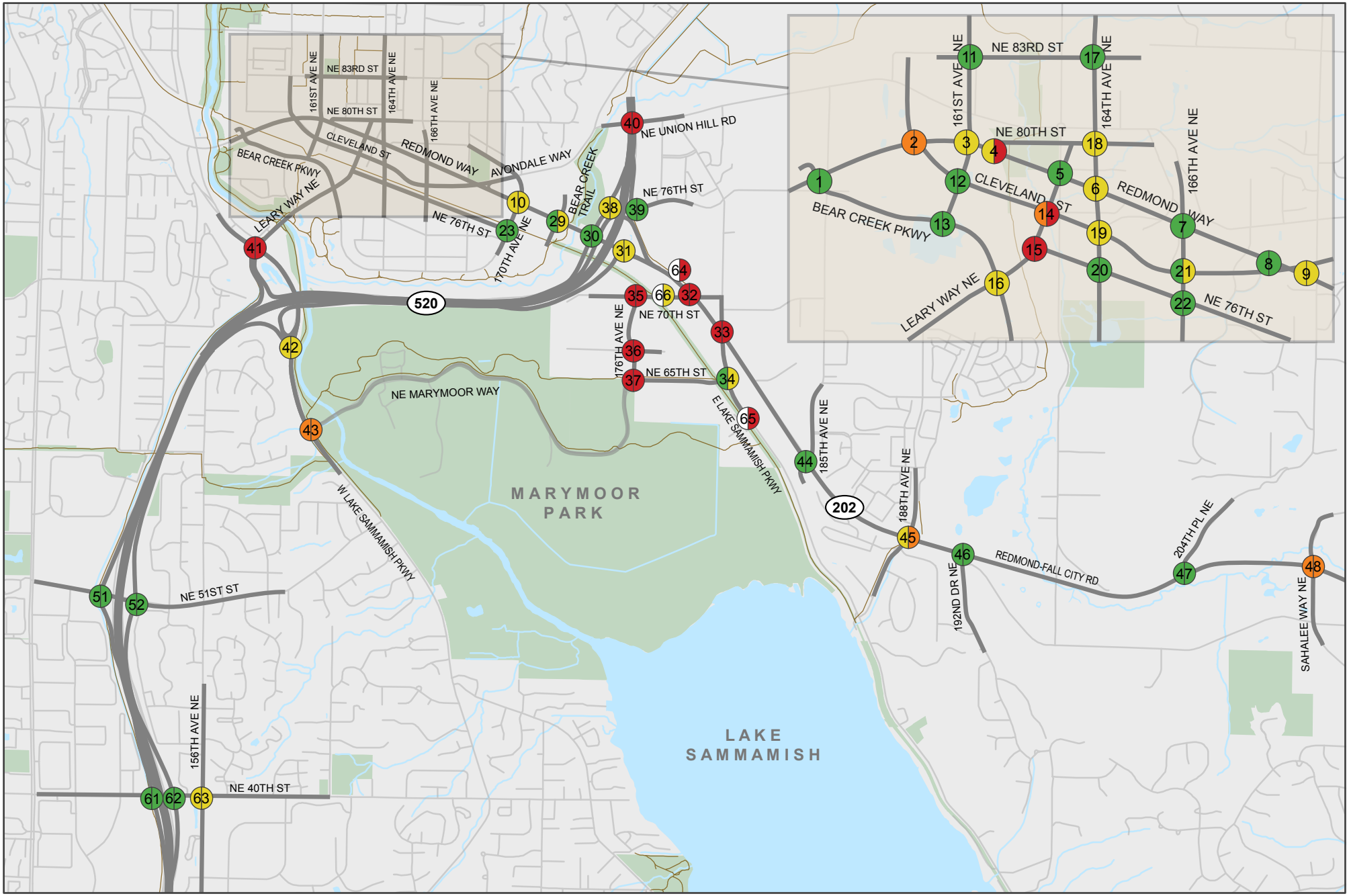
0 1,000 2,000
Feet

- LOS A-C
- LOS D
- LOS E
- LOS F
- No Analysis

Proposed Design Refinements

Proposed Design Refinements with Marymoor Subarea Plan

Figure 3-3
2035 Proposed Design Refinements with Marymoor Subarea Plan
Traffic Operations During AM Peak Hour
Downtown Redmond Link Extension



0 1,000 2,000
Feet

- LOS A-C
- LOS D
- LOS E
- LOS F
- No Analysis

Proposed Design Refinements

Proposed Design Refinements with Marymoor Subarea Plan

Figure 3-4
2035 Proposed Design Refinements with Marymoor Subarea Plan Traffic Operations During PM Peak Hour
Downtown Redmond Link Extension

2035 AM analysis

Under the Proposed Design Refinements with Marymoor Subarea Plan, seven intersections are forecast to operate below the LOS standard for the facility. As shown in Table 3-1, these include:

- Intersection #32: Redmond Way and NE 70th Street
- Intersection #33: Redmond Way and East Lake Sammamish Parkway
- Intersection #36: 176th Avenue NE and NE 67th Street
- Intersection #37: 176th Avenue NE and NE 65th Street
- Intersection #40: SR 520 and NE Union Hill Road/Avondale Road
- Intersection #65: East Lake Sammamish Parkway and NE 63rd Street
- Intersection #66: NE 70th Street and 176th Avenue NE

Intersections #32 and #33 are forecast to operate below standard under the Proposed Design Refinements as well as the Proposed Design Refinements with Marymoor Subarea Plan. Intersection #40 is forecast to operate below standard under the Proposed Design Refinements and would operate with the same delay under the Proposed Design Refinements with Marymoor Subarea Plan. Intersections #36 and #37 are forecast to operate below standard under the Proposed Design Refinements with Marymoor Subarea Plan but not under the Proposed Design Refinements. Intersections #65 and #66 would not exist under the Proposed Design Refinements.

The additional delay forecast for intersections #32, #33, #36, and #37 under the Proposed Design Refinements with Marymoor Subarea Plan, as compared to the Proposed Design Refinements, can be attributed to the growth anticipated with the Marymoor Subarea Plan.

Operations at intersection #35 are forecast to improve over the Proposed Design Refinements because the intersection would be signalized as part of the improvements included in the Marymoor Subarea Plan.

2035 PM analysis

As shown in Table 3-2, 15 of the study area intersections are forecast to operate below the LOS standard for the project during the 2035 PM peak hour. Intersections #15, #33, #36, and #37 are forecast to operate below standard under the Proposed Design Refinements, with delay increasing under the Proposed Design Refinements with Marymoor Subarea Plan. Intersections #2, #14, #32, #40, #41, and #43 are forecast to operate below standard under the Proposed Design Refinements, and would operate with the same or similar delay under the Proposed Design Refinements with Marymoor Subarea Plan. Intersections #64 and #65 do not exist under the Proposed Design Refinements but are forecast to operate below standard under the Proposed Design Refinements with Marymoor Subarea Plan. Intersections #4 and #45 are the only existing study area intersection forecast to operate below standard under the Proposed Design Refinements with Marymoor Subarea Plan that is not forecast to operate below standard under the Proposed Design Refinements.

Most of the delay at intersections near the SE Redmond Station (intersections #32, #33, #36, #37, #45, #64, and #65) can be attributed to the presence of the light rail station as well as the planned growth identified in the Marymoor Subarea Plan.

Operations at intersection #35 are forecast to operate below standard under the Proposed Design Refinements with Marymoor Subarea Plan; however, delay would be reduced from that anticipated under the Proposed Design Refinements because the intersection would be signalized as part of the improvements included in the Marymoor Subarea Plan.

3.2 Freight

Under the Proposed Design Refinements with Marymoor Subarea Plan, freight traffic is expected to be affected similar to general purpose traffic. Freight would experience the same levels of delay as general purpose traffic on roadways and at intersections with increased congestion.

3.3 Transit

With the Proposed Design Refinements with Marymoor Subarea Plan, Link light rail service and bus service would be the same as the Proposed Design Refinements. Bus service frequency and routing would be the same, as would the active bay and layover needs. The Link light rail station designs and on-site parking configurations would also be the same.

3.4 Nonmotorized Facilities

The nonmotorized improvements included in the Project Baseline with Marymoor Subarea Plan would also be included in the Proposed Design Refinements with Marymoor Subarea Plan. Additionally, Sound Transit would construct new sidewalks along the frontage of each station as part of the project. The project would also construct a new shared use path from the SE Redmond Station area across the SR 520 interchange on a bridge over Bear Creek to where it connects into the Bear Creek/Redmond Central Connector corridor.

3.5 Parking

On-street parking and park-and-ride facilities in the study area would be the same in the Project Baseline with Marymoor Subarea Plan and in the Proposed Design Refinements with Marymoor Subarea Plan. Additionally, the project would construct new park-and-ride facilities at the SE Redmond Station, as described in the Proposed Design Refinements.

3.6 Safety

The Proposed Design Refinements with Marymoor Subarea Plan represents the highest traffic volumes in 2035 of the four scenarios described in this report. This could result in an increase in collision frequencies for both motor vehicles and nonmotorized users in the study area. As with the other scenarios, planned transportation projects could improve safety.

4. POTENTIAL IMPROVEMENTS

Section 6.1 of the Transportation Technical Report describes measures that Sound Transit proposes to take to mitigate impacts associated with the Proposed Design Refinements. Using the methodology described in Section 6.1 of the Transportation Technical Report to identify impacts, several study area intersections require improvements under the Proposed Design Refinements with Marymoor Subarea Plan. The responsibility for improvements of the additional impacts under the Proposed Design Refinements with Marymoor Subarea Plan would be the responsibility of jurisdictions or agencies other than Sound Transit. Potential improvements for the some of the intersections are identified below. These improvements would be modifications to the intersections as they are assumed under the Proposed Design Refinements with Marymoor Subarea Plan, which differ from those assumed under the Proposed Design Refinements.

- Intersection #32: Redmond Way and NE 70th Street—Provide additional southbound and northbound through lanes, as well as a southbound right-turn pocket and a second northbound left-turn pocket. These improvements would reduce the forecast delay at the intersection, however it would still operate below standard during the 2035 PM peak period.
- Intersection #33: Redmond Way and East Lake Sammamish Parkway/180th Avenue NE—Provide additional southbound and northbound through lanes, as well as a westbound left-turn pocket. These improvements would reduce the forecast delay at the intersection; however, it would still operate below standard during the 2035 AM and PM peak periods.
- Intersection #35: 176th Avenue NE and NE 70th Street—While delay is reduced from the Proposed Design Refinements to the Proposed Design Refinements with Marymoor Subarea due to installation of a traffic signal, the intersection still operates below standard for the facility. Providing an additional eastbound through lane will help to further reduce delay at this intersection, however it would still operate below standard during the 2035 PM peak period.
- Intersection #36: 176th Avenue NE and NE 67th Street—Convert from two-way stop control to a signal
- Intersection #37: 176th Avenue NE and NE 65th Street—Convert from two-way stop control to a signal
- Intersection #65: NE 63rd Street and East Lake Sammamish Parkway—Convert from two-way stop control to a signal
- Intersection #66: NE 70th Street and 176th Avenue NE —Convert from two-way stop control to a signal

Intersections #4, #14, #15, #41, #45, and #64 are all forecast to operate below standard for the facility under the Proposed Design Refinements with Marymoor Subarea Plan. In order to improve operations at these intersections, improvements and sometimes substantial improvements would be required. No improvements are identified at these intersections.

Table 4-1 summarizes the operational results associated with implementation of the potential improvements identified.

No additional impacts were identified for freight, transit, nonmotorized facilities, or parking.

Table 4-1. Intersections with Impacts Under Proposed Design Refinements with Marymoor Subarea Plan with Improvements

ID	Intersection	Control Type	Project Baseline with Marymoor Subarea Plan		Proposed Design Refinements with Marymoor Subarea Plan		Proposed Design Refinements with Marymoor Subarea Plan with Improvements		Potential Improvements
			LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	
					2035 AM Peak Hour				
32	Redmond Way and NE 70th Street	Signal	***F***	***132***	***F***	***169***	***F***	***113***	Provide additional southbound and northbound through lanes, southbound right-turn pocket, additional northbound left-turn pocket
33	Redmond Way and East Lake Sammamish Parkway/180th Avenue NE	Signal	***F***	***120***	***F***	***155***	***F***	***106***	Provide additional southbound and northbound through lanes, westbound left-turn pocket
36	176th Avenue NE and NE 67th Street	AWSC	***F***	***>300***	***F***	***>300***	C	30	Convert from two-way stop control to signal
37	176th Avenue NE and NE 65th Street	AWSC	***F***	***114***	***F***	***157***	C	26	Convert from two-way stop control to signal
66	NE 70th Street and 176th Avenue NE	TWSC	NA	NA	***F***	***>300***	D	54	Convert from two-way stop control to signal
					2035 PM Peak Hour				
4	Redmond Way and NE 80th Street	TWSC	***F***	***64***	***F***	***93***	No improvements proposed		The intersection operates below standard with or without the Downtown Redmond Link Extension with the Marymoor Subarea Plan.
32	Redmond Way and NE 70th Street	Signal	***F***	***124***	***F***	***209***	***F***	***152***	Provide additional southbound and northbound through lanes, southbound right-turn pocket, additional northbound left-turn pocket
33	Redmond Way and East Lake Sammamish Parkway/180th Avenue NE	Signal	***F***	***125***	***F***	***164***	***F***	***104***	Provide additional southbound and northbound through lanes, westbound left-turn pocket
35	176th Avenue NE and NE 70th Street	Signal	D	50	***F***	***215***	***F***	***99***	Provide additional eastbound through lane
36	176th Avenue NE and NE 67th Street	AWSC	***F***	***>300***	***F***	***>300***	D	47	Convert from two-way stop control to signal
37	176th Avenue NE and NE 65th Street	AWSC	***F***	***>300***	***F***	***>300***	D	53	Convert from two-way stop control to signal

Table 4-1. Intersections with Impacts Under Proposed Design Refinements with Marymoor Subarea Plan with Mitigation (continued)

ID	Intersection	Control Type	Project Baseline with Marymoor Subarea Plan		Proposed Design Refinements with Marymoor Subarea Plan		Proposed Design Refinements with Marymoor Subarea Plan with Improvements		Potential Improvements
			LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	
41	SR 520 Westbound Ramps and West Lake Sammamish Parkway/ Leary Way NE	Signal	***F***	***93***	***F***	***114***	No improvements proposed		The intersection operates below standard with or without the Downtown Redmond Link Extension with the Marymoor Subarea Plan.
45	Redmond-Fall City Road and 187th Avenue NE/ 188th Avenue NE	Signal	D	44	***E***	***68***	No improvements proposed		No improvements proposed.
64	Redmond Way and 176th Avenue NE	TWSC	***F***	***>300***	***F***	***>300***	No improvements proposed		The intersection operates below standard with or without the Downtown Redmond Link Extension with the Marymoor Subarea Plan.
65	East Lake Sammamish Parkway and NE 63rd Street	TWSC	***F***	***>300***	***F***	***>300***	A	9	Convert from two-way stop control to signal

Cells highlighted in ***grey bold and italicized*** identify intersections that operate below the LOS standard for the facility.

TWSC = two-way stop controlled

AWSC = all-way stop controlled

Attachment C

Bus Integration Assumptions for Downtown Redmond Link Extension Technical Memorandum

Parametrix
ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

719 2ND AVENUE, SUITE 200 | SEATTLE, WA 98104 | P 206.394.3700

TECHNICAL MEMORANDUM

DATE: February 12, 2018

TO: Leonard McGhee, Sound Transit

FROM: Brad Phillips, Parametrix
Ryan LeProwse, Parametrix
Alicia McIntire, Parametrix

SUBJECT: Downtown Redmond Link Extension
Bus Integration Assumptions at the Downtown Redmond and SE Redmond Stations

INTRODUCTION

This technical memorandum summarizes bus service assumptions used to calculate the estimated layover areas and active bay needs at the two light rail stations in the Downtown Redmond Link Extension.

STATION DESIGN AND RIDERSHIP MODELING CONTEXT

While light rail service at these stations is anticipated to begin in 2024, the bus volumes and routing assumed at the Downtown Redmond and SE Redmond Stations represent the Metro service levels planned to be in place by 2040, as this allows for planning for the greatest anticipated bus volumes. The Sound Transit bus service assumptions represent those planned to be in place by 2024, as Sound Transit bus service levels beyond that year are unknown at this time. Peak period bus volumes are anticipated to provide the greatest number of bus trips, resulting in the highest number of layover and active bays to accommodate operations, and thus were used to calculate station facility needs. It is important to note this process was not meant to finalize bus routing, as Sound Transit and Metro will pursue independent restructure processes in order to do so.

BUS SERVICE ROUTING AND FREQUENCY ASSUMPTIONS

Metro developed its bus service assumptions for the Downtown Redmond Link Extension stations in accordance with the 2040 bus service network included in their long range plan, METRO CONNECTS. METRO CONNECTS identifies three types of bus service: Frequent (which includes RapidRide), Express, and Local. Twelve Metro routes will provide service to one or both of the stations. By 2024, Sound Transit anticipates providing bus service to the two light rail stations via two express bus routes. **Table 1** summarizes the planned bus service frequencies for each service type for both agencies.

Table 1. Planned Bus Frequencies by Service Type

		Peak Period		Off-Peak Period	
	Service Type	**Service Frequency**	**Buses per Hour per Direction**	**Service Frequency**	**Buses per Hour per Direction**
Metro	Frequent/ RapidRide	Every 10 minutes	6	Every 15 minutes	4
	Express	Every 15 minutes	4	Every 30 minutes	2
	Local	Every 15-30 minutes	2-4	Every 30 minutes	2
Sound Transit	ST Express	Every 10-15 minutes	4-6	Every 30 minutes	2

Figures 1 and **2** show the planned bus routing for the two Downtown Redmond Link Extension stations. Several routes will provide "pass through" service to a light rail station; however, they will terminate elsewhere.

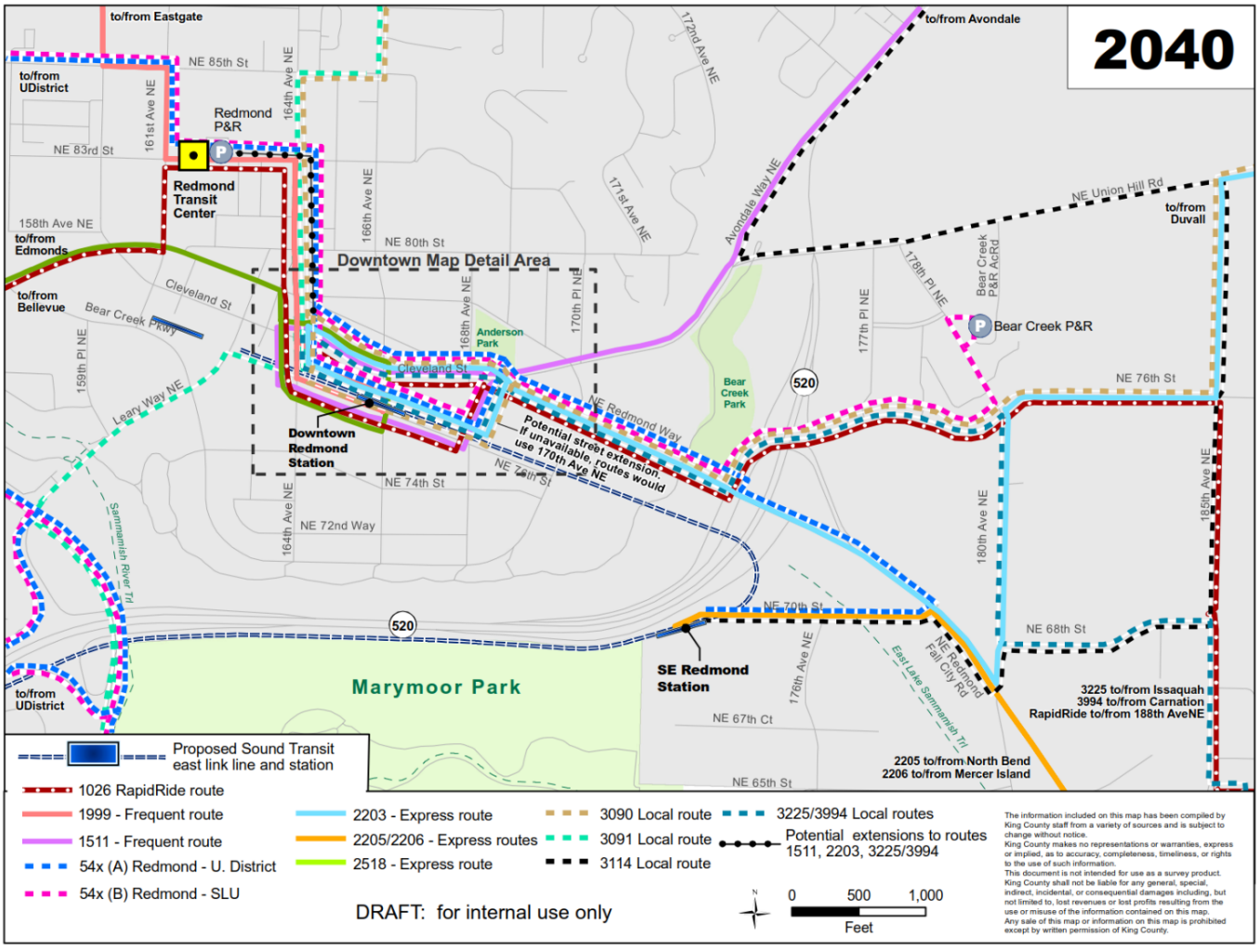


Figure 1. Bus routing to Downtown Redmond and SE Redmond Stations

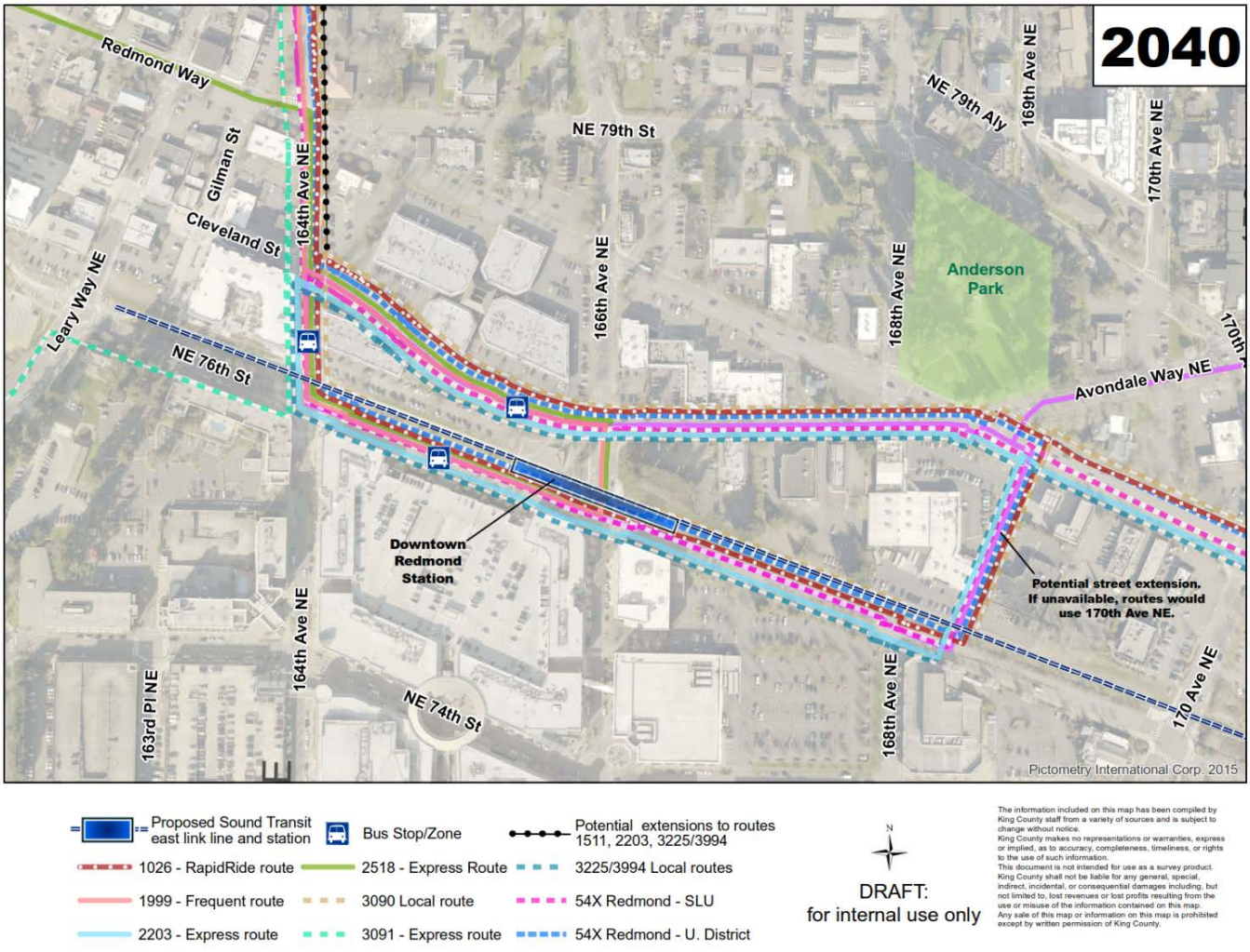


Figure 2. Bus routing to Downtown Redmond Station - Detail

Table 2 summarizes the planned bus service in the City of Redmond, including forecast trips per hour and the light rail station terminus, when applicable.

Table 2. Planned Bus Service

Service Provider	Route[1, 2]	Type	Trips/Hour/ Direction		Description	Light Rail Station where Bus Route Terminates
			Peak	Off Peak		
Metro	1026	RapidRide	6	4	East Redmond to Kirkland	N/A
	1511	Frequent	6	4	Avondale to Redmond CBD	Downtown Redmond Station
	1999	Frequent	6	4	Redmond CBD to Eastgate	Downtown Redmond Station
	2203	Express	4	2	Duvall to Redmond CBD	Downtown Redmond Station
	2205	Express	4	2	North Bend to Redmond	SE Redmond Station
	2206	Express	4	2	Mercer Island to Redmond	SE Redmond Station
	2518	Express	4	2	Edmonds to Redmond CBD	Downtown Redmond Station
	3090	Local	2	2	Woodinville to Sammamish	N/A
	3091	Local	4	2	English Hill to Overlake	N/A
	3114	Local	2	2	Redmond to Kenmore	SE Redmond Station
	3225	Local	2	2	Issaquah to Redmond CBD	Downtown Redmond Station
	3994	Local	2	2	Carnation to Redmond CBD	Downtown Redmond Station
Sound Transit	54X(U Dist)	ST Express	4-6	2	Southeast Redmond to University District	SE Redmond Station
	54X(SLU)	ST Express	4-6	2	Bear Creek Park & Ride to South Lake Union	N/A

[1] Metro route numbers correspond to those used in the service networks included in METRO CONNECTS.

[2] Final Sound Transit route numbers to be determined.

CBD Central Business District

LAYOVER AND ACTIVE BAYS

Layover Areas: Quantity and Design

Layover areas can be designed to allow for dependent or independent bus operation. Dependent operation means that a bus cannot enter and/or exit the layover area without relocation of another bus. **Figure 3** displays dependent operation wherein a bus cannot enter at the front of the layover area if a bus is parked in the rear due to insufficient maneuvering space. **Figure 4** displays dependent operation wherein a bus cannot enter the front of the layover area if a bus is parked in the rear due to insufficient maneuvering space and the bus parked in the rear cannot exit if a bus is parked in the front of the bay. Dependent operation presents challenges because a) Metro is required to provide operators with the opportunity to access a comfort station during all scheduled layovers and b) operators are not required to remain on board their coach during scheduled layovers. Because the layover space at the light rail stations will be used by multiple routes, it cannot be guaranteed that operators will be available to move their bus during a scheduled layover.

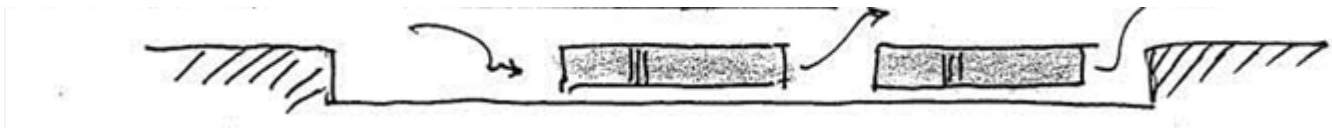


Figure 3. Dependent Bus Operation in a Layover Area – Independent Out Only

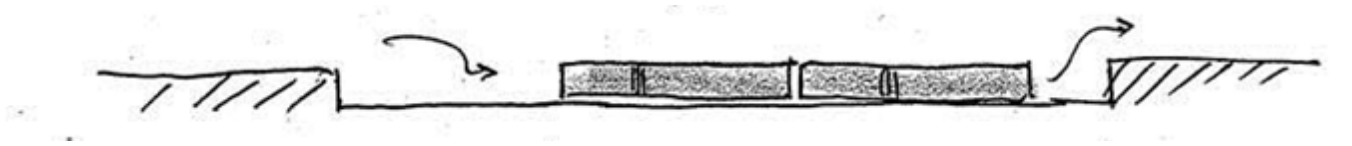


Figure 4. Dependent Bus Operation in a Layover Area – No Independency

Independent operation allows for buses to enter and exit a layover area without requiring the relocation of other buses in order to do so, as shown in **Figure 5**. Independent layover areas ensure that operators can deboard from their buses during all scheduled layovers without interfering with the opportunity for other buses to use layover space.

Figure 5. Independent Bus Operation in a Layover Area

Metro has requested all layover areas to be used by their buses, at both light rail stations, allow for independent bus operation. Sound Transit has determined the three layover areas at the SE Redmond Station can be designed for dependent operation (see **Table 3**).

Metro and Sound Transit have indicated the following dimensional needs for on-street layover areas.

- Independent: Each independent on-street layover area should be 60 feet long with 60 feet spacing minimum between bus operation locations for maneuvering. Because Metro is required to provide operators with the opportunity to access a comfort station during all scheduled layovers, on-street layover areas should be located no more than 1000 feet from them.
  - It is important to note these dimensions assume layover is provided in a pullout. A pullout would be required for on-street layover if the travel lane is too narrow to enable other vehicles to pass a bus parked at the curb (i.e. less than 22 feet).
  - If the travel lane is 22 feet or wider and there are no obstructions (e.g. parked vehicles) present near the back of the layover area, then the 60 feet for deceleration maneuvering would not be required.
- Dependent: The dependent layover area at the SE Redmond Station should be 195 feet long to accommodate three 60 foot buses.

Design for off-street layover areas requires refinement depending on specific site design characteristics, configuration of bays, interior roadways, and other factors.

Metro and Sound Transit calculated the peak period layover needs for each route at the Downtown Redmond and SE Redmond Stations. Metro calculated their layover needs for each route as a function of the route's run time and frequency. Sound Transit provided estimates based on comparisons to existing service levels and layover needs. **Table 3** summarizes the projected layover needs by route at each light rail station.

Table 3. Projected Layover Needs

Light Rail Station where Bus Route Terminates	Route	Type	Description	Estimated Layover Needed at Light Rail Stations in 2040	Layover Operation
Downtown Redmond Station	1511	Frequent	Avondale to Redmond CBD	1	Independent
	1999	Frequent	Redmond CBD to Eastgate	2	Independent
	2203	Express	Duvall to Redmond CBD	1	Independent
	2518	Express	Edmonds to Redmond CBD	2	Independent
	3225	Local	Issaquah to Redmond CBD	1	Independent
	3994	Local	Carnation to Redmond CBD	1	Independent
			Total	8	
SE Redmond Station	2205	Express	North Bend to Redmond	2	Independent
	2206	Express	Mercer Island to Redmond	2	Independent
	3114	Local	Redmond to Kenmore	1	Independent
	54X(U Dist)	ST Express	Southeast Redmond to University District	3	Dependent
			Total	8	

CBD Central Business District

Active Bays: Quantity and Design

Active bay needs are a function of service frequency and operational needs, such as whether the bay allows for pick-up and drop-off of passengers or drop-off only, and if the stop serves as a time point within the schedule. Drop-off only stops require less dwell time, as they are the last stop on a route and the driver will proceed to the layover point once all passengers have deboarded. When a stop is identified as a time point, the driver will often wait at that location if the bus is running ahead of schedule. This is a consideration when determining the needs if bays will be shared by multiple routes. It would most frequently apply when buses are providing "pass through" service, as those beginning at a station would likely remain at the layover bay until such time service is ready to begin. Multiple routes are often assigned to a single bay when they serve common areas, allowing some riders the convenience of selecting any bus if they are traveling to such an area.

Metro and Sound Transit undertook a multi-step process to calculate the estimated active bay needs for the Downtown Redmond Station. Metro staff has identified a peak period bus frequency of 96 coaches/hour during the PM peak. Metro staff provided preliminary suggested active bay assignments for the bus routes planned to serve the station (**Attachment B-1**). The assignments identified a total of nine bays needed to accommodate all routes. Metro staff also provided theoretical bus per hour capacity calculations for the nine bays based upon a variety of factors, such as green time ratio for traffic signals, bus dwell time, and traffic signal cycle length (**Attachment B-2**). The buses per hour for the active bay assignments were compared to the theoretical capacity calculations for each bay, using an average dwell time of 60 seconds. It was determined there was excess capacity at the nine bays. Metro and Sound Transit staff then reviewed the active bay needs at the station and determined the number of active bays could be reduced by two, for a total of seven active bays needed to accommodate all routes. The anticipated capacity needs for the SE Redmond Station determined by Metro staff include 32 coaches/hour during the PM peak. Two active bays are needed to accommodate these planned bus volumes at the SE Redmond Station. All active bays at this station are anticipated to be located off-street.

For the purpose of providing the active bay estimates, buses were assumed to be 60 feet long for all services. Metro and Sound Transit have indicated the following dimensional needs for on-street active bays.

- All active bays should be 130 feet long and accommodate two 60 foot buses with 60 feet spacing minimum between bays.
  - It is important to note these dimensions assume the bay is provided in a pullout. A pullout may be required if the travel lane is too narrow to allow other vehicles to pass a bus stopped at the curb (i.e. less than 22 feet). If the travel lane is 22 feet or wider and there are no obstructions (e.g. parked vehicles) present near the back of the bay, then the 60 feet for deceleration maneuvering would not be required.

At the SE Redmond Station, it is anticipated that off-street active bays will be located within the parking structure. Design for off-street active bays requires refinement depending on specific site design characteristics, configuration of bays, interior roadways, and other factors.

Modifications to the assumptions used to determine capacity could result in a change in the estimated number of bays needed.

Layover and Active Bay Needs

Table 4 summarizes the total number of estimated layover and active bays needed at each station. Dimensional requirements for bays are as follows:

- Each active bay shall be 130 feet long and accommodate two 60 foot buses with 60 feet of spacing minimum between bays.
- Each independent layover area shall be 60 feet long each with 60 feet of spacing minimum between bus operation locations.
- Each dependent layover area at the SE Redmond Station shall be 195 feet long and accommodate three 60 foot buses.

Table 4. Active and Layover Bay Needs

	Downtown Redmond Station		SE Redmond Station	
	Layover	Active Bays	Layover	Active Bays
Metro	8	7	5	2
Sound Transit	0		3	
Total	8	7	8	2

As shown in **Figures 1** and **2**, four Metro routes which access the City of Redmond from the south and/or east (1511, 2203, 3225, and 3994) have the potential to be extended from the planned terminus at the Downtown Redmond Station to the existing Redmond Transit Center without resulting in duplication along the route. These routes are estimated to need a combined total of four layover spaces. The Redmond Transit Center has five off-street layover bays, one on-street layover bay, and a comfort station. Metro is actively planning for installation of an electric battery powered vehicle charging station at the Redmond Transit Center, with construction anticipated to be complete by 2019. Use of the Redmond Transit Center for the four Metro routes could allow for a reduction in the number of layover bays needed at the Downtown Redmond Station to four needed layover spaces versus eight layover spaces. However, extending the four Metro routes from the Downtown Redmond Station to the existing Redmond Transit Center would add approximately 5 minutes of travel time to each one-way trip. Metro has determined that this could influence service levels in the area, such

as a change to the assumed service frequency and/or span of service associated with these routes or others serving the area, in order to maintain the assumed service hours within the network.

These layover and active bay needs will be utilized during the final station design process to site the bays, including those that will be located on-street and off-street. The design process will include further input from Metro, Sound Transit, and the City of Redmond.