Mandatory Housing Affordability Transportation Study: Downtown and South Lake Union

Prepared for:
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SE15-0429

by

FEHR & PEERS

Table of Contents

Appendices

List of Figures

List of Tables

EXECUTIVE SUMMARY

Under Seattle's proposed Mandatory Housing Affordability (MHA) program, developers would be required to contribute to affordable housing when new commercial or multi-family buildings are built. This contribution would be met by including affordable housing within a new development or by paying into a fund that will be invested in affordable housing projects. In exchange for the new affordable housing requirement, development capacity would be added in the form of an increase in the amount of height or floor area allowed by zoning. This study evaluates the expected transportation effects that could occur with the additional housing and employment growth in the Downtown and South Lake Union areas.

The MHA Proposal is evaluated for the year 2035. The 2035 Preferred Alternative included in Seattle's Comprehensive Plan EIS acts as the No Action Alternative. In other words, the MHA Proposal is compared to the Preferred Alternative to assess if there are substantive differences in impacts between the two. The 2035 MHA Proposal evaluated an additional 940 housing units and 2,660 jobs in the study area compared to the No Action scenario. The analysis includes the following metrics:

- Corridor travel time to evaluate auto level of service (LOS)
- Transit route load factors (ratio of riders to number of seats on a bus)
- Screenline vehicle volume-to-capacity ratios, which is the City's existing LOS standard
- Drive alone mode share, which is the City's proposed new LOS standard

Qualitative evaluations of pedestrian, bicycle, freight, parking and safety conditions were also completed.

While the potential incremental increase in growth resulting from the MHA program would add trips to all modes, this study found the difference in effects on the transportation system would be minimal when compared to the No Action Alternative. Therefore, this study found no significant unavoidable adverse impacts to the transportation system as a result of the MHA program's implementation in Downtown and South Lake Union. Full details may be found in the following report.

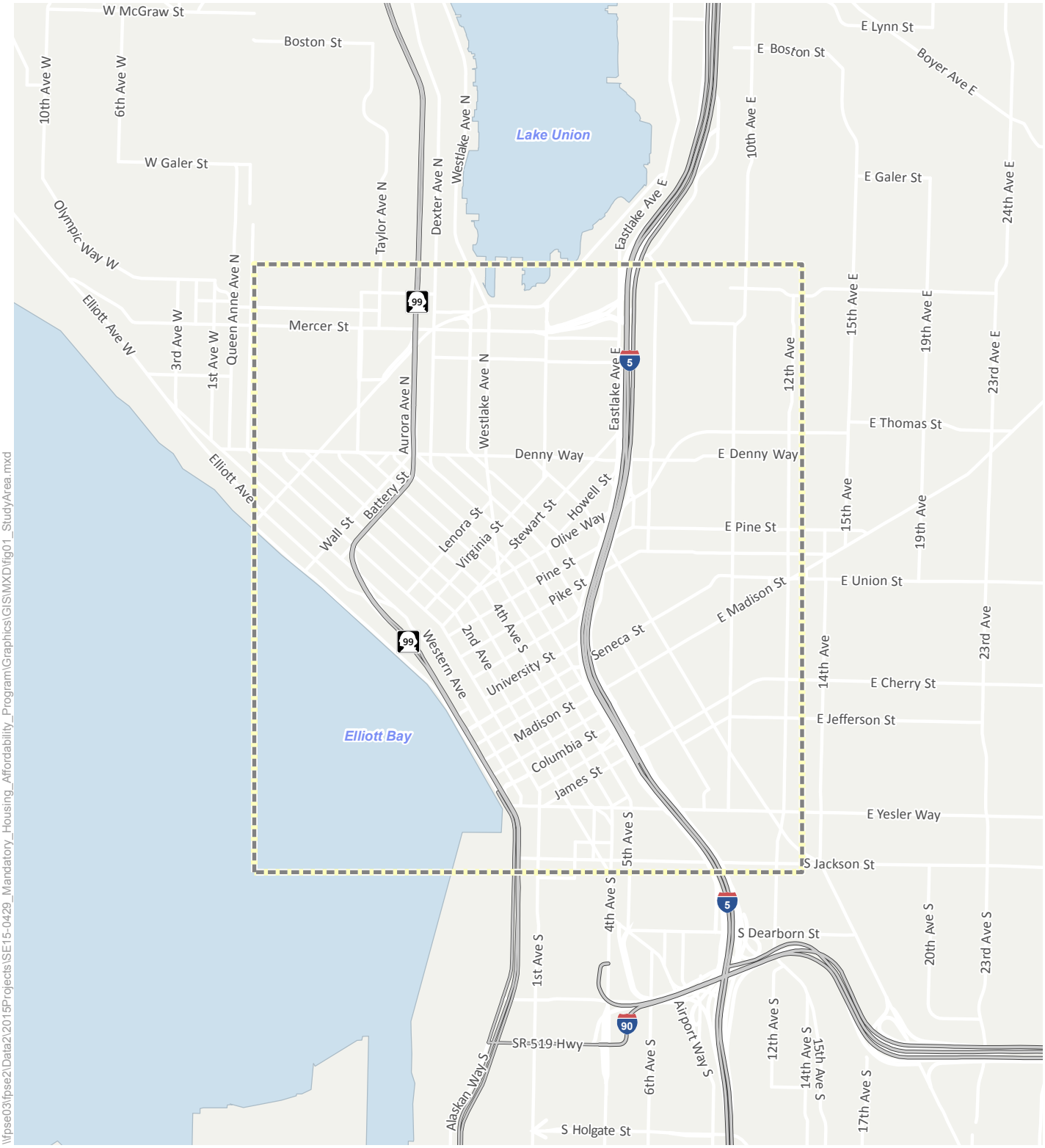
INTRODUCTION

This study evaluates the transportation impacts of Seattle's Mandatory Housing Affordability (MHA) project which would provide additional development capacity in the Downtown Seattle and South Lake Union area. Under this program, developers would be required to contribute to affordable housing when new commercial or multi-family buildings are built. This contribution would be met by including affordable housing within a new development or by paying into a fund that will be invested in affordable housing projects. In exchange for the new affordable housing requirement, development capacity would be added in the form of an increase in the amount of height or floor area allowed by zoning. This report analyzes an incremental increase in the amount of housing unit and job growth between 2015 and 2035 that could occur above the Preferred Alternative of the Seattle Comprehensive Plan Environmental Impact Statement (EIS).

This report first provides an overview of the existing transportation network within the study area for all modes. The expected future transportation conditions are presented for the MHA Proposal compared to the Preferred Alternative of the Comprehensive Plan EIS which acts as the No Action Alternative for this analysis. Impacts are assessed based on the projected conditions for autos, freight, transit, pedestrians, bicycles, safety, and parking.

Study Area

The study area includes the Downtown Seattle and South Lake Union urban centers, which are also identified as Puget Sound Regional Council (PSRC) regional growth centers. These areas are regional travel destinations because they have high employment densities. The study area is mapped in **Figure 1**.



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Study Corridor Boundary

Figure 1

Study Area

Planning Scenarios Evaluated

For this analysis, two future scenarios were modeled and evaluated: the 2035 No Action Alternative and the 2035 MHA Proposal.

- **2035 No Action** assumes the same amount of household and employment growth between 2015 and 2035 as the Preferred Alternative of the Seattle Comprehensive Plan EIS. The planned growth is 19,500 new housing units and 50,000 new jobs within the study area over the next 20 years.
- **2035 MHA Proposal** assumes the same transportation network as the 2035 No Action Alternative with additional household and employment growth in the Downtown and South Lake Union urban centers. This scenario assumes an additional 1,250 housing units and 2,570 jobs in the study area compared to the No Action Alternative. This incremental growth reflects a conservative estimate of the additional housing units and jobs that could be added beyond the No Action Alternative if all new projects use the proposed increase in development capacity. The additional housing units and jobs are distributed across the study area in proportion to the growth scenario that was used in the 2035 No Action Alternative. The growth estimates associated with the MHA proposal were developed by the Seattle Office of Planning and Community Development based on modeling of existing development capacity in the area and the massing of buildings allowed under existing regulations and the proposed regulations.

Table 1:
Study Area Planning Scenarios Land Use Summary

Scenario	Housing Units	Jobs
2035 No Action	19,500	50,000
2035 MHA Proposal	20,750	52,570
MHA Growth[1]	+1,250	+2,570

Notes: 1. A 5 percent vacancy rate is assumed for the housing units. Employment growth was assumed to be 5 percent retail and 95 percent office/service jobs.
Source: City of Seattle, 2016.

AFFECTED ENVIRONMENT

This section describes the existing transportation conditions of the area that would be affected by the MHA Proposal, as well as the methodologies used to evaluate the current performance of the transportation network.

Existing Transportation Network

The existing pedestrian, bicycle, transit, auto, and freight networks within the study area are described below.

Pedestrian Network

The pedestrian network in the study area is composed of sidewalks, crosswalks, staircases, curb ramps and trails. Downtown Seattle and South Lake Union feature a dense pedestrian network, with sidewalks on both sides of nearly all streets, and most intersections having marked crosswalks and curb ramps. Some pedestrian crossing locations have been enhanced with signage and/or curb extensions which shorten crossing distances. While the study area has very good pedestrian facilities overall, the presence, connectivity, and quality of the pedestrian network varies throughout the area.

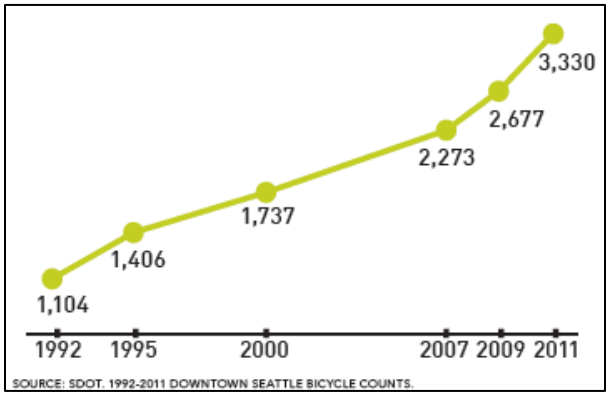
Both the natural and built environments impact walking and can create barriers that are especially challenging for children, people with disabilities, and older residents. One challenge for pedestrians in the study area is the topography. In particular east-west travel within Downtown and to First Hill and Capitol Hill can be difficult due to steep grades. Other barriers to pedestrian travel in the study area are Interstate 5 (I-5) and State Route 99 (SR 99). Both of these highways have a limited number of pedestrian crossings, especially in the northern section of the study area, with no crossings of I-5 between the Denny Way and Lakeview Boulevard E, and no crossings of SR 99 between Denny Way and Mercer Street.

This study evaluates the effects of the proposal on the pedestrian network qualitatively. The City's *Pedestrian Master Plan (PMP)* informs that evaluation. The *2009 PMP*, which is currently in the process of a technical update, designated "high priority" areas based on high potential pedestrian demand, equity and corridor function. With this information, the City prioritized pedestrian improvement locations into two tiers, with Tier 1 being the highest priority projects. The vast majority of the study area was identified as a Tier 1 or 2 priority area, and the PMP identified about 140 intersections and 110 blocks within the study area as Tier 1 or 2 pedestrian improvement project locations.

Bicycle Network

The existing bicycle network in Downtown Seattle and South Lake Union is made up of signed routes, shared streets designated with "sharrow" markings, bicycle lanes, cycle tracks (protected bike lanes), and multi-use trails. The study area, especially Downtown, has a dense bicycle network relative to the rest of the city. There are many streets in the study area with "sharrows" or bike lanes, as well as cycle tracks on 2nd Avenue and Dexter Avenue N. The Cheshiahud Lake Union Loop multi-use trail also runs along Lake Union on the north edge of the study area. Similar to pedestrian travel, bicycle travel in the study area can be challenging due to the steep grades in Downtown on east-west streets.

The Seattle Department of Transportation (SDOT) has conducted periodic counts of bicycles at key access points to Downtown since 1992, providing a snapshot of cycling activity in Downtown Seattle. As shown at right, the number of bicycles entering Downtown has more than tripled since 1992. Between 2007 and 2011, the number of bicycles increased by 46 percent.



This study evaluates the effects of the proposal on the bicycle network qualitatively. The City's *Bicycle Master Plan (BMP)* informs that evaluation. The *BMP* identifies gaps in the bicycle network throughout Seattle, and recommends over 400 miles of new bicycle facilities and connections by 2030. Many of these proposed facilities are within the study area, including numerous cycle track facilities.

Transit Network

The study area features a range of public transit facilities, with local, rapid, express, and commuter bus services provided by King County Metro, Sound Transit, and Community Transit, as well as streetcar, monorail, light rail, and commuter rail services provided by the City of Seattle and Sound Transit.

King County Metro operates a fixed route bus system that provides bus service to downtown from many areas both within and outside the city. King County Metro additionally operates "RapidRide," a separately-branded set of frequent transit routes. RapidRide C Line, D Line, and E Line provide service to Downtown from West Seattle, Ballard, and North Seattle, respectively. The C Line was recently extended to serve South Lake Union in addition to Downtown, providing a new frequent route to South Lake Union residents and workers. Sound Transit and Community Transit operate buses providing service to the study area from locations outside the City of Seattle.

Rail transit services include Sound Transit Link Light Rail, City-operated streetcars in South Lake Union and First Hill, the City-operated monorail between Downtown and Seattle Center and the Sounder Commuter Train that provides service between Lakewood, Seattle and Everett during peak hours. Sound Transit Link Light Rail and many of the buses that serve the study area run in the Downtown Seattle Transit Tunnel, which includes transit tunnel stations throughout the study area.

King County Metro and Sound Transit currently have long-range planning efforts underway. These plans are aimed at accommodating an estimated doubling of regional transit ridership over the next 25 years.

Auto and Freight Network

Downtown Seattle and South Lake Union are served by a dense roadway system of principal, minor, and collector arterials, which generally follow a grid pattern with rectangular blocks. Auto travel is also served by the two highways, I-5 and SR 99, which run north-south through the study area. While these highways facilitate local and regional north-south travel, east-west auto travel is constrained by limited crossings of I-5 and SR 99, especially in South Lake Union with crossings limited to Denny Way, Mercer Street, and Lakeview Boulevard E.

The City has designated a major truck street network throughout the city that carries a substantial amount of freight traffic. In the study area, the major truck street network includes I-5, SR 99, Mercer Street, and Westlake Avenue. The City is currently in the process of updating their freight master plan.

Parking

The City of Seattle sets goals and policies related to parking in its Comprehensive Plan. Goals include managing the parking supply to achieve vitality of urban centers and villages, auto trip reduction, and improved air quality. In addition, the City recognizes that the primary transportation purpose of the arterial street system is to move people and goods.

On-street parking within the study area is regulated by issuing on-street permits, charging by the hour, setting time limits, and defining loading zones. Most of the study area is time-limited paid parking, in effect between 8 AM and 6 or 8 PM, with rates between $1 and $4 per hour depending on location. Some blocks have free time-limited parking, unrestricted parking, carpool only parking, or freight loading only zones. There are also many blocks, particularly in Downtown, which do not have any street parking.

Some of the time-limited parking available in South Lake Union is also designated as part of a Restricted Parking Zone (RPZ) Program. These zones have time-limited parking available to the public, while residents with eligible addresses can apply for a permit to use the curb parking in their neighborhood without time limits (up to 72-hours). The aim is to balance the parking needs of the public and the residents and ease parking congestion in certain locations.

Title 11.16.121 of the Seattle Municipal Code which outlines the City's Performance Based Parking Pricing Program, establishes a target on-street parking occupancy of 70–85 percent utilization citywide. **Table 2** shows the daytime and evening occupancy rates for 2013 and 2014 in the neighborhoods within the study area.

Table 2:
Parking Occupancy (2013/2014)

Neighborhood	Subarea	Daytime Peak Occupancy Percentage	7 PM Occupancy Percentage
Belltown	North	68	74
	South	78	77
Chinatown-ID	Periphery	69	70
Commercial Core	Financial	95	61
	Retail	84	84
	Waterfront	79	81
Denny Triangle	North	68	81
	South	93	88
Pioneer Square	Core	96	87
	Periphery	94	86
South Lake Union	2-Hour	92	74
	10-Hour	100	58
	Northwest	69	31

Source: City of Seattle, 2014.

During the daytime peak, three of the 13 study area zones fell within the target 70–85 percent utilization range, four were below the target range, and six were above the target range. Evening occupancies in South Lake Union, the Financial District, and Pioneer Square tend to be lower than daytime utilization, with the remaining parts of the study area having similar daytime and evening utilization. Three locations have evening utilization above 85 percent: South Denny Triangle, and both the core and periphery of Pioneer Square.

Analysis Methodology

This section describes the methodology used to analyze the existing transportation conditions within the study area. The proposed action evaluated in this document is area-wide and programmatic in nature, rather than location specific. Therefore, the methodology used to evaluate the transportation network is broad-based as is typical for the analysis of larger scale zoning efforts, rather than an intersection-level analysis that may be more appropriate for assessing the effects of development on individual parcels or blocks. The specific analysis methodologies are described below.

Travel Time

Travel time along major arterials was selected as a performance measure because it is easily relatable and addresses the fundamental concern of most travelers – how long does it take to move within and through the study area? This metric is relevant for autos, freight, and transit that travel along these corridors. The travel time study corridors are shown in **Figure 2**. To assess existing conditions, PM peak period (4-6 PM) travel times were collected in March and November 2015.

To provide context for the results, the concept of Level of Service (LOS) is used to describe traffic operations by assigning a letter grade of A through F, where A represents free-flow conditions and F represents highly congested conditions. This study uses concepts from the 2010 Highway Capacity Manual (HCM) to define thresholds for each LOS grade, as shown in **Table 3**. The ranges shown in the table below represent the ratio between observed travel time and free-flow travel time (i.e. at the speed limit). For example, if you are traveling at half the free-flow speed, your travel time will be twice that of the free-flow travel time, which equates to LOS D. Additional details may be found in **Appendix A**.

Table 3: Levels of Service Thresholds for Travel Speeds and Travel Time						
LOS	**A**	**B**	**C**	**D**	**E**	**F**
Ratio between PM Peak Period Travel Time and Free-Flow Speed Travel Time	<1.18	1.18 to <1.49	1.49 to <2.0	2.0 to <2.5	2.5 to <3.33	≥3.33

Source: *Highway Capacity Manual 2010*, Transportation Research Board.

For the purposes of this study, the quality of freight mobility within the study area is assessed using travel time. However, it is acknowledged that traffic congestion is more difficult for freight to navigate, and trucks typically travel at slower speeds than general auto traffic.

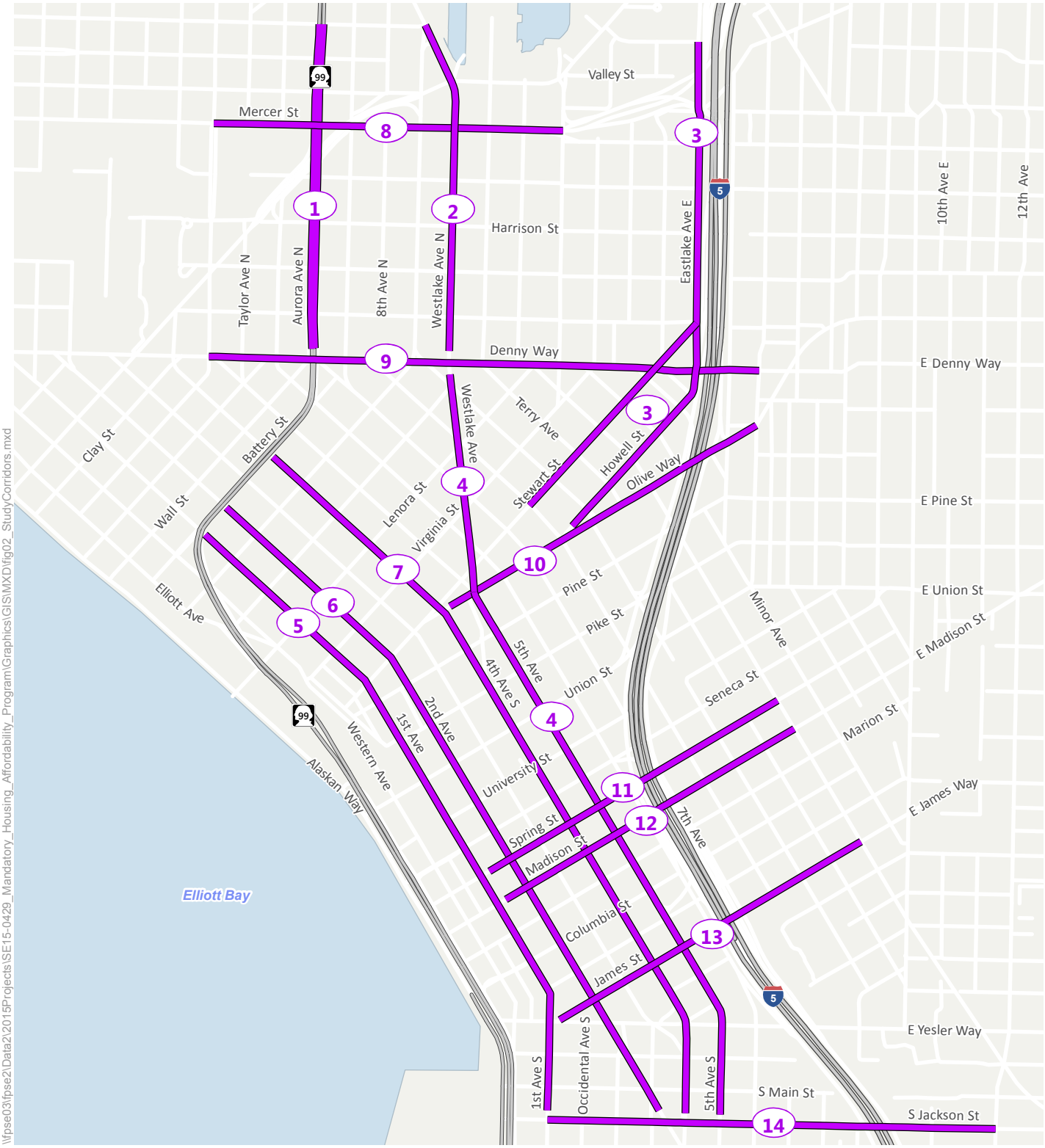


Figure 2

Travel Time Study Corridors

Transit

Transit service is of paramount importance in the study area, with 45 percent of commuters riding transit to work in 2014.[1] This report uses load factors to evaluate the demand along a transit route. Load factor is the ratio of riders to seats and is calculated by dividing the maximum number of passengers by the number of seats on a bus. Passenger loads were collected over the entire PM peak period and factored to the PM peak hour to provide a more conservative estimate of the highest ridership period (rather than assuming ridership is uniformly distributed over the three hour peak period). The maximum load location was identified, and then the PM peak hour passenger load was divided by the total number of seats available over the same time period. In other words, the calculation represents the average load factor over the PM peak hour at the highest ridership location along the route. The nine bus routes selected for evaluation in this report are listed in **Table 4** and shown in **Figure 3**. The study routes are a representative subset of the transit routes serving downtown and South Lake Union, connecting the study area to a variety of neighborhoods and corridors.

The King County Metro Strategic Plan Service Guidelines designate load factor thresholds to identify overcrowded routes. Routes operating every 10 minutes or better should not exceed a load factor of 1.5, and routes operating with headways greater than 10 minutes should not exceed a load factor of 1.25. Directionality is defined as inbound or outbound, with inbound referring to the direction bound for Downtown/South Lake Union/Queen Anne. **Figure 3** includes the designation for each route.

[1] 2014 Center City Commuter Mode Split Survey Results, Commute Seattle.

Table 4:
Transit Routes

Route	Destinations	PM Peak Hour Headway	
		Inbound	Outbound
2	Seattle Pacific, Queen Anne, Seattle Center, Downtown Seattle, First Hill, Madrona	10 min	10 min
4	Queen Anne, Seattle Center, Downtown Seattle, First Hill, Cherry Hill, Madrona, Judkins Park	12 min	15 min
8	Seattle Center, Capitol Hill, Madison Valley, Central District, Mt Baker Transit Center, Rainier Beach	15 min	12 min
36	Downtown Seattle, International District, Beacon Hill Station, Jefferson Park, Beacon Hill, Othello Station	7 min	5 min
40	Downtown Seattle, Fremont, Ballard, Loyal Heights, Northgate Transit Center	10 min	10 min
70	Downtown Seattle, Eastlake, University District	12 min	10 min
545	Downtown Seattle, Montlake Freeway Station, Evergreen Point Freeway Station, Redmond TC, Bear Creek Park & Ride	10 min	6 min
C Line	Downtown Seattle, Westwood Village, Fauntleroy, Alaska Junction, West Seattle	7 min	7 min
D Line	Downtown Seattle, Uptown, Interbay, Ballard, Crown Hill	7 min	7 min
E Line	Downtown Seattle, West Green Lake, Bitter Lake, Shoreline	12 min	5 min

Source: King County Metro and Sound Transit, 2016.

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Figure 3

Transit Route Study Corridors

Screenlines

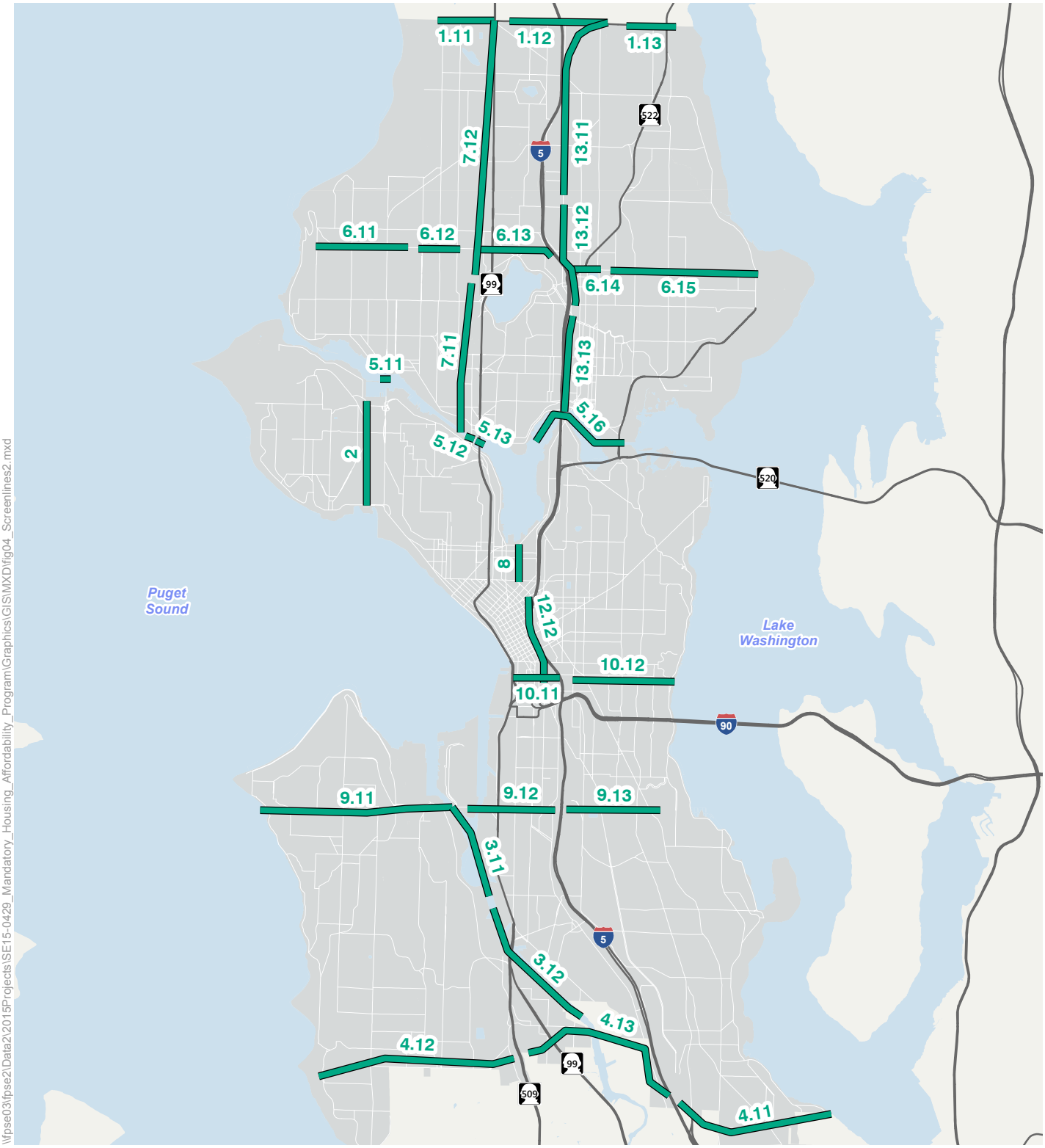
The currently adopted Comprehensive Plan uses a "screenline" methodology to evaluate transportation LOS for locally-owned arterials. The City uses screenlines to evaluate autos (including freight) and transit since buses often travel in the same traffic stream as autos. A screenline is an imaginary line across which the number of passing vehicles is counted. Each screenline has an LOS standard in the form of a volume-to-capacity (v/c) ratio: the number of vehicles crossing the screenline compared to the designated capacity of the roadways crossing the screenline. The City's Comprehensive Plan evaluates 28 screenlines during the PM peak hour. **Table 5** and **Figure 4** summarize the location of each screenline, as well as its LOS standard as designated in the Comprehensive Plan.

Table 5:
Seattle Comprehensive Plan Screenline Level of Service Thresholds

Screenline #	Screenline Location	LOS Standard
1.11	North City Limit—3rd Ave NW to Aurora Ave N	1.2
1.12	North City Limit—Meridian Ave N to 15th Ave NE	1.2
1.13	North City Limit—30th Ave NE to Lake City Way NE	1.2
2	Magnolia	1.0
3.11	Duwamish River—West Seattle Bridge & Spokane St	1.2
3.12	Duwamish River—1st Ave S & 16th Ave S	1.2
4.11	South City Limit—Martin Luther King Jr. Way to Rainier Ave S	1.0
4.12	South City Limit—Marine Dr SW to Meyers Way S	1.0
4.13	South City Limit—SR 99 to Airport Way S	1.0
5.11	Ship Canal—Ballard Bridge	1.2
5.12	Ship Canal—Fremont Bridge	1.2
5.13	Ship Canal—Aurora Bridge	1.2

Table 5: Seattle Comprehensive Plan Screenline Level of Service Thresholds		
Screenline #	**Screenline Location**	**LOS Standard**
5.16	Ship Canal—University & Montlake Bridges	1.2
6.11	South of NW 80th St—Seaview Ave NW to 15th Ave NW	1.0
6.12	South of N(W) 80th St—8th Ave NW to Greenwood Ave N	1.0
6.13	South of N(E) 80th St—Linden Ave N to 1st Ave NE	1.0
6.14	South of NE 80th St—5th Ave NE to 15th Ave NE	1.0
6.15	South of NE 80th St—20th Ave NE to Sand Point Way NE	1.0
7.11	West of Aurora Ave—Fremont Pl N to N 65th St	1.0
7.12	West of Aurora Ave—N 80th St to N 145th St	1.0
8	South of Lake Union	1.2
9.11	South of Spokane St—Beach Dr SW to W Marginal Way SW	1.0
9.12	South of Spokane St—E Marginal Way S to Airport Way S	1.0
9.13	South of Spokane St—15th Ave S to Rainier Ave S	1.0
10.11	South of S Jackson St—Alaskan Way S to 4th Ave S	1.0
10.12	South of S Jackson St—12th Ave S to Lakeside Ave S	1.0
12.12	East of CBD	1.2
13.11	East of I-5—NE Northgate Way to NE 145th St	1.0
13.12	East of I-5—NE 65th St to NE 80th St	1.0
13.13	East of I-5—NE Pacific St to NE Ravenna Blvd	1.0

Source: Seattle's Comprehensive Plan, Toward a Sustainable Seattle, 2008.



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XX.XX Screenline and ID

Figure 4

Screenlines

Mode Share

The City of Seattle is moving toward using a new metric to evaluate the transportation system: single occupant vehicle (SOV) mode share. This new metric focuses on shifting travel from the least space-efficient mode—SOV—to more space-efficient modes such as high occupancy vehicles (HOV), transit, walking, and biking. The City plans to measure mode share by geographic sectors; the study area falls within the Downtown/Lake Union sector which has a target SOV mode share of 18 percent in 2035. This mode share target is for all trip types during the PM peak period. Future year mode shares are estimated by applying the travel demand model's projected change in mode share to existing observed data.

Existing Conditions Analysis Results

This section describes the results of the existing conditions analysis.

Travel Time

Travel time LOS is summarized in **Figure 5** and **Table 6**, with LOS F travel times shown in bold. Existing travel times vary widely with the LOS ranging from B through F among the study corridors. Half of the study corridors currently operate at LOS F conditions in at least one direction:

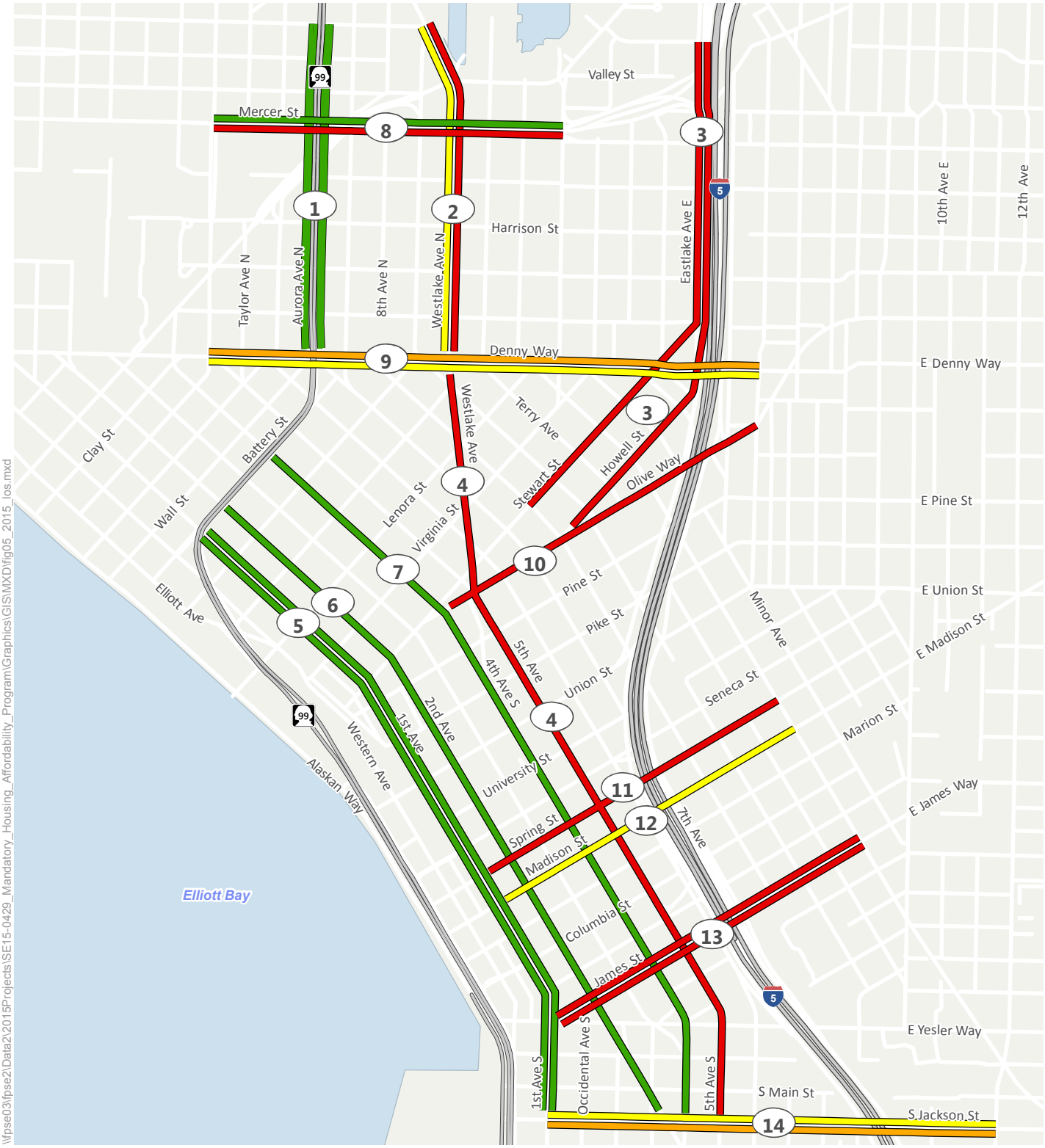
- Westlake Avenue N from Denny Way to 9th Ave N (northbound)
- Eastlake Avenue E/Howell Street/Stewart Street from 8th Avenue to Aloha Street (northbound and southbound)
- 5th Avenue/Westlake Avenue from Denny Way to S Jackson Street (southbound)
- Mercer Street from 5th Avenue N to Fairview Avenue N (eastbound)
- Olive Way from 4th Avenue to Bellevue Avenue (eastbound)
- Spring Street from 1st Avenue to Boren Avenue (eastbound)
- James Street from Yesler Way to Boren Avenue (eastbound and westbound)

These findings reflect traffic operations that are typical of a dense urban area. Several of the corridors lead to I-5 on-ramps which experience queuing back-ups when the highway is congested.

Table 6:
2015 PM Peak Period Auto Travel Times

		Northbound & Eastbound		Southbound & Westbound	
ID	**Corridor**	**LOS**	**Travel Time**	**LOS**	**Travel Time**
1	Aurora Ave – Denny Way to Aloha St	B	1:16	C	1:20
2	Westlake Ave N – Denny Way to 9th Ave N	**F**	**9:54**	D	4:13
3	Eastlake Ave E/Howell St/Stewart St – 8th Ave to Aloha St	**F**	**10:39**	**F**	**12:20**
4	5th Ave/Westlake Ave – Denny Way to S Jackson St			**F**	**16:12**
5	1st Ave – Battery St to S Jackson St	B	6:36	C	8:46
6	2nd Ave – Battery St to S Jackson St			B	6:42
7	4th Ave – Battery St to S Jackson St	B	6:10		
8	Mercer St – 5th Ave N to Fairview Ave N	**F**	**15:22**	C	3:11
9	Denny Way – 5th Ave N to Bellevue Ave E	D	7:10	E	8:45
10	Olive Way – 4th Ave to Bellevue Ave	**F**	**15:43**		
11	Spring St – 1st Ave to Boren Ave	**F**	**7:40**		
12	Madison St – 1st Ave to Boren Ave			D	5:34
13	James St – Yesler Way to Boren Ave	**F**	**9:01**	**F**	**11:20**
14	S Jackson St – 1st Ave S to 12th Ave S	E	8:20	D	5:53

Note: Study Corridor 3 includes Stewart Street in the southbound direction and Howell Street in the northbound direction.
Source: Fehr & Peers, 2015.



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Roadway Segment Level of Service

A-C
D
E
F

1 Study Corridor ID

Figure 5

2015 Level of Service

Transit

Existing load factors for each of the studied transit routes are shown in **Table 7**. The direction with the highest load factor is reported (see **Figure 3** for inbound and outbound designation of each route). One route currently exceeds its load factor threshold: Route 8 which has an average PM peak hour load factor of 1.29 in the outbound direction. The threshold for Route 8 is 1.25 because it currently has headways longer than 10 minutes. The maximum load currently occurs along Denny Way between Stewart Street and Olive Way.

Table 7:
Existing Transit Route Load Factors

Route	Destinations	Direction of Highest Load Factor	Load Factor Threshold	Average PM Peak Hour Load Factor
2	Seattle Pacific, Queen Anne, Seattle Center, Downtown Seattle, First Hill, Madrona	Inbound	1.50	0.48
4	Queen Anne, Seattle Center, Downtown Seattle, First Hill, Cherry Hill, Madrona, Judkins Park	Outbound	1.25	0.70
8	Seattle Center, Capitol Hill, Madison Valley, Central District, Mt Baker Transit Center, Rainier Beach	Outbound	1.25	**1.29**
36	Downtown Seattle, International District, Beacon Hill Station, Jefferson Park, Beacon Hill, Othello Station	Outbound	1.50	0.72
40	Downtown Seattle, Fremont, Ballard, Loyal Heights, Northgate Transit Center	Outbound	1.50	0.81
70	Downtown Seattle, Eastlake, University District	Inbound	1.25	0.86
545	Downtown Seattle, Montlake Freeway Station, Evergreen Point Freeway Station, Redmond TC, Bear Creek Park & Ride	Inbound	1.50	1.30
C Line	Downtown Seattle, Westwood Village, Fauntleroy, Alaska Junction, West Seattle	Outbound	1.50	0.96
D Line	Downtown Seattle, Uptown, Interbay, Ballard, Crown Hill	Outbound	1.50	1.09
E Line	Downtown Seattle, West Green Lake, Bitter Lake, Shoreline	Outbound	1.50	1.24

Source: King County Metro and Fehr & Peers, 2016.

Screenlines

Existing volume-to-capacity ratios across the City's designated screenlines are summarized in **Table 8**. All of the screenlines currently meet their LOS standard.

Table 8:
Existing Screenline Volume-to-Capacity Ratios

Screenline #	Screenline Location	LOS Standard	NB/EB	SB/WB
1.11	North City Limit—3rd Ave NW to Aurora Ave N	1.20	0.70	0.52
1.12	North City Limit—Meridian Ave N to 15th Ave NE	1.20	0.41	0.32
1.13	North City Limit—30th Ave NE to Lake City Way NE	1.20	0.73	0.63
2	Magnolia	1.00	0.53	0.55
3.11	Duwamish River—West Seattle Bridge & Spokane St	1.20	0.61	0.87
3.12	Duwamish River—1st Ave S & 16th Ave S	1.20	0.35	0.52
4.11	South City Limit—Martin Luther King Jr. Way to Rainier Ave S	1.00	0.47	0.63
4.12	South City Limit—Marine Dr SW to Meyers Way S	1.00	0.37	0.42
4.13	South City Limit—SR 99 to Airport Way S	1.00	0.41	0.45
5.11	Ship Canal—Ballard Bridge	1.20	0.99	0.52
5.12	Ship Canal—Fremont Bridge	1.20	0.71	0.54
5.13	Ship Canal—Aurora Bridge	1.20	0.81	0.62
5.16	Ship Canal—University & Montlake Bridges	1.20	0.80	0.87
6.11	South of NW 80th St—Seaview Ave NW to 15th Ave NW	1.00	0.45	0.43
6.12	South of N(W) 80th St—8th Ave NW to Greenwood Ave N	1.00	0.66	0.49
6.13	South of N(E) 80th St—Linden Ave N to 1st Ave NE	1.00	0.44	0.27

Table 8:
Existing Screenline Volume-to-Capacity Ratios

Screenline #	Screenline Location	LOS Standard	NB/EB	SB/WB
6.14	South of NE 80th St—5th Ave NE to 15th Ave NE	1.00	0.65	0.53
6.15	South of NE 80th St—20th Ave NE to Sand Point Way NE	1.00	0.49	0.47
7.11	West of Aurora Ave—Fremont Pl N to N 65th St	1.00	0.48	0.58
7.12	West of Aurora Ave—N 80th St to N 145th St	1.00	0.50	0.57
8	South of Lake Union	1.20	0.78	0.78
9.11	South of Spokane St—Beach Dr SW to W Marginal Way SW	1.00	0.51	0.58
9.12	South of Spokane St—E Marginal Way S to Airport Way S	1.00	0.47	0.52
9.13	South of Spokane St—15th Ave S to Rainier Ave S	1.00	0.45	0.58
10.11	South of S Jackson St—Alaskan Way S to 4th Ave S	1.00	0.56	0.65
10.12	South of S Jackson St—12th Ave S to Lakeside Ave S	1.00	0.48	0.58
12.12	East of CBD	1.20	0.35	0.45
13.11	East of I-5—NE Northgate Way to NE 145th St	1.00	0.71	0.59
13.12	East of I-5—NE 65th St to NE 80th St	1.00	0.44	0.41
13.13	East of I-5—NE Pacific St to NE Ravenna Blvd	1.00	0.55	0.54

Source: Seattle's Comprehensive Plan, Toward a Sustainable Seattle, 2008; SDOT count data, 2014.

Mode Share

According to the PSRC 2014 Household Travel Survey, the Downtown/Lake Union sector currently has a SOV mode share of 23 percent. The target SOV mode share for 2035 is 18 percent reflecting that future travel into and within the study area is expected to be more heavily focused on non-SOV modes

IMPACTS

The following section outlines the thresholds of significance used to identify transportation impacts for each of the performance metrics evaluated.

Thresholds of Significance

Both quantitative and qualitative approaches are used to evaluate the transportation impacts of the MHA Proposal. The MHA Proposal is assessed against the No Action Alternative to identify impacts. This approach isolates the effects caused by the MHA Proposal itself, rather than changes that would happen over time regardless of whether the MHA Proposal or No Action Alternative goes forward. Therefore, potential impacts are based on a future "business-as-usual" condition as opposed to existing conditions.

The following performance metrics were developed to evaluate transportation impacts. The thresholds of significance to identify impacts for the MHA Proposal are also described below:

- **Travel Time**. An impact is identified if the forecasted corridor travel time increases by more than 20 seconds compared to the No Action corridor travel time. This threshold was selected because it is smaller than the standard deviations for all corridor travel times observed during the existing conditions data collection period. In other words, a change in travel time of less than 20 seconds is within the typical travel time variation observed on each route. See **Appendix B** for more detail.
- **Transit Load Factor**. An impact is identified if the forecasted peak hour transit load factor (ratio of riders to seats on a bus) exceeds King County Metro's load factor threshold by at least 0.01. The load factor threshold is 1.5 for routes operating at headways of 10 minutes or better, or 1.25 for routes operating at headways greater than 10 minutes.
- **Screenline v/c Ratios**. An impact is identified if the forecasted PM peak hour v/c ratio exceeds the thresholds stated in the Seattle Comprehensive Plan by at least 0.01.
- **SOV Mode Share**. An impact is identified if the forecasted 2035 SOV mode share exceeds the 18 percent mode share target proposed in the Seattle Comprehensive Plan for the Downtown/Lake Union sector by at least one percent.

Pedestrian and bicycle travel, safety, and parking impacts are evaluated qualitatively.

Future Conditions Analysis Results

This section describes the forecasted future transportation conditions under the MHA Proposal compared to the No Action Alternative. These forecasts were developed using the Seattle Comprehensive Plan EIS model, which is based on the PSRC regional travel demand model. Transit network changes were made to the Comprehensive Plan model to reflect the proposed BRT lines outlined in the Amended Transit Master Plan which are to be funded through the recently passed Move Seattle levy. In addition, some screenline capacities were revised to account for the conversion of general purpose lanes to Business Access and Transit (BAT) lanes to accommodate the new BRT lines. Therefore, there are slight differences between the results presented for the Preferred Alternative in the Comprehensive Plan EIS and those presented here for the No Action Alternative.

Travel Time

Travel time and LOS for the study corridors are summarized in **Figure 6** and **Table 9**. By 2035, corridor travel times are expected to worsen due to increased congestion stemming from land use growth both within the study area and regionally. The 2035 forecasted LOS conditions range from LOS C to LOS F for the study corridors. The following corridors are expected to be at LOS F in at least one direction.

- Westlake Avenue N from Denny Way to 9th Ave N (northbound)
- Eastlake Avenue E/Howell Street/Stewart Street from 8th Avenue to Aloha Street (northbound and southbound)
- 5th Avenue/Westlake Avenue from Denny Way to S Jackson Street (southbound)
- Mercer Street from 5th Avenue N to Fairview Avenue N (eastbound)
- Olive Way from 4th Avenue to Bellevue Avenue (eastbound)
- Spring Street from 1st Avenue to Boren Avenue (eastbound)
- James Street from Yesler Way to Boren Avenue (eastbound and westbound)
- S Jackson St – 1st Ave S to 12th Ave S (eastbound)

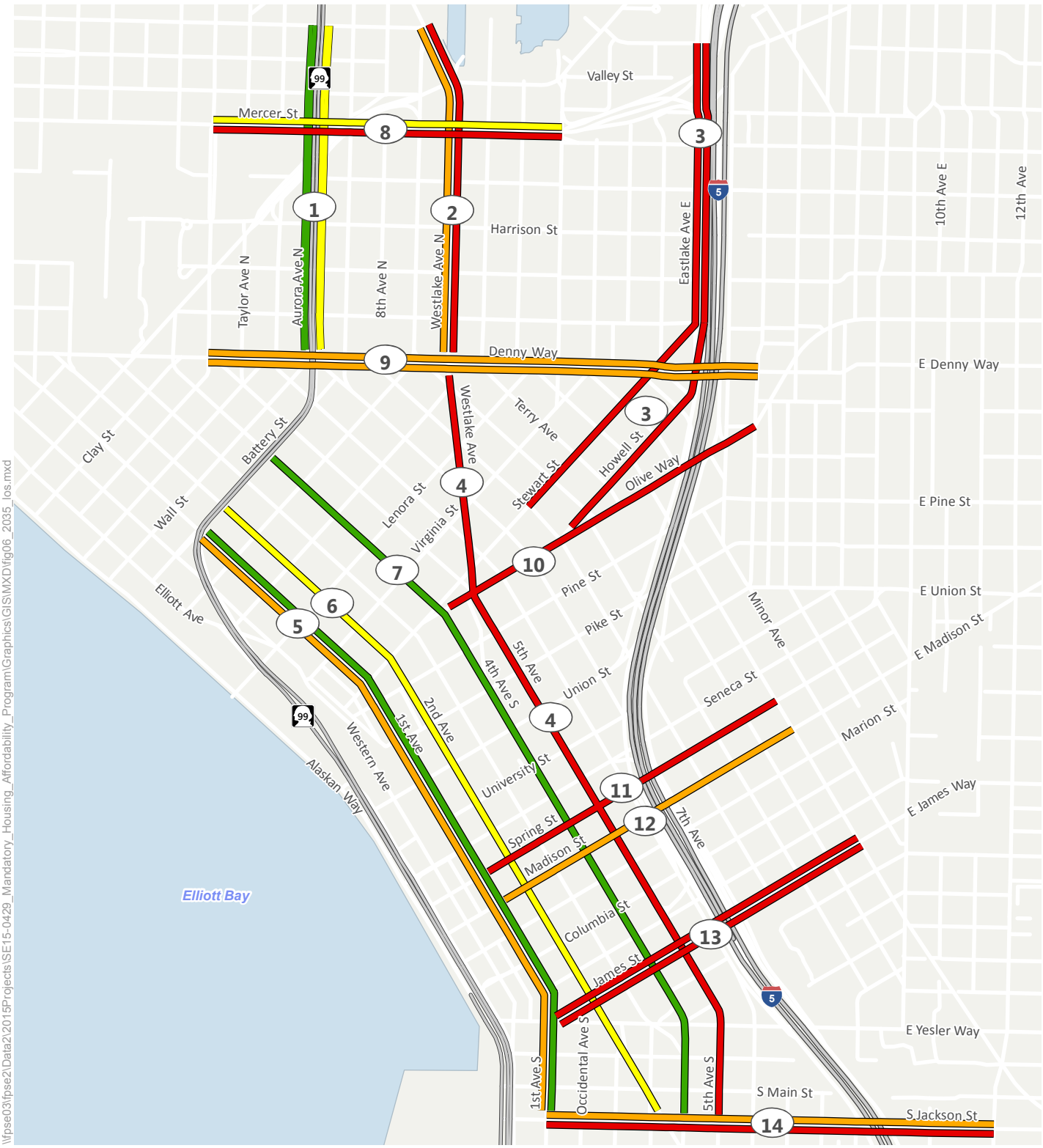
While the study corridor LOS would degrade compared to existing conditions, the LOS grades are not expected to vary between the MHA Proposal and the No Action Alternative. Compared to the No Action Alternative, the MHA Proposal travel times are not expected to increase by more than ten seconds on any corridor. The largest increase in travel time is expected along southbound 1st Avenue. As no study corridor travel times are forecast to increase by more than 20 seconds compared to the

No Action Alternative, no travel time impacts are identified. The minor increase in travel times is consistent with the project team's expectations because the increased vehicle traffic generation of the MHA proposal is less than one percent higher than the traffic generation stemming from existing land use and planned growth.

Table 9:
2035 PM Peak Period Auto Travel Times

		Existing (2015) LOS / Travel Time				No Action Alternative (2035) LOS / Travel Time				MHA Alternative (2035) LOS / Travel Time			
ID	**Study Corridors**	**NB/EB**		**SB/WB**		**NB/EB**		**SB/WB**		**NB/EB**		**SB/WB**	
1	Aurora Ave – Denny Way to Aloha St	B	1:16	C	1:20	D	1:56	C	1:29	D	1:59	C	1:29
2	Westlake Ave N – Denny Way to 9th Ave N	**F**	**9:54**	D	4:13	**F**	**10:43**	E	4:34	**F**	**10:43**	E	4:35
3	Eastlake Ave E/Howell St/Stewart St - 8th Ave to Aloha St	**F**	**10:39**	**F**	**12:20**	**F**	**12:47**	**F**	**23:13**	**F**	**12:48**	**F**	**23:16**
4	5th Ave/Westlake Ave – Denny Way to S Jackson St			**F**	**16:12**			**F**	**22:44**			**F**	**22:47**
5	1st Ave – Battery St to S Jackson St	B	6:36	C	8:46	C	9:03	E	14:37	C	9:03	E	14:47
6	2nd Ave – Battery St to S Jackson St			B	6:42			D	10:27			D	10:30
7	4th Ave – Battery St to S Jackson St	B	6:10			C	7:41			C	7:41		
8	Mercer St – 5th Ave N to Fairview Ave N	**F**	**15:22**	C	3:11	**F**	**23:21**	D	4:02	**F**	**23:23**	D	4:02
9	Denny Way – 5th Ave N to Bellevue Ave E	D	7:10	E	8:45	E	8:05	E	9:32	E	8:06	E	9:32
10	Olive Way – 4th Ave to Bellevue Ave	**F**	**15:43**			**F**	**17:30**			**F**	**17:30**		
11	Spring St – 1st Ave to Boren Ave	**F**	**7:40**			**F**	**8:27**			**F**	**8:27**		
12	Madison St – 1st Ave to Boren Ave			D	5:34			E	6:04			E	6:05
13	James St – Yesler Way to Boren Ave	**F**	**9:01**	**F**	**11:20**	**F**	**9:21**	**F**	**14:10**	**F**	**9:21**	**F**	**14:10**
14	S Jackson St – 1st Ave S to 12th Ave S	E	8:20	D	5:53	**F**	**9:22**	E	7:03	**F**	**9:22**	E	7:04

Note: Study Corridor 3 includes Stewart Street in the southbound direction and Howell Street in the northbound direction.
Source: Fehr & Peers, 2016.



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Roadway Segment Level of Service

A-C
D
E
F

1 Study Corridor ID

Figure 6

2035 Level of Service (No Action and MHA Alternative)

Transit

Study area transit ridership under the No Action Alternative is expected to increase by approximately 73 percent over existing conditions. King County Metro, Sound Transit, and PSRC all have long-range planning efforts underway that are aimed at accommodating roughly double the current ridership, i.e. a 100 percent increase. Therefore, the transit agencies that control Seattle's transit system are planning for service that would accommodate the transit ridership forecasted by the project travel demand model.

Table 10 summarizes projected headways and load factors for each study route. The direction with the higher load factor is shown for each route. King County Metro regularly reallocates its resources to accommodate demand and limit overcrowding. For routes shown with a load factor of 1.5, it is assumed that King County Metro would add service to maintain the LOS standard. The headway required to meet the LOS standard is shown in **Table 10**. The increase in the frequencies on the modified routes is reasonable when compared to the agency's Draft Long Range Plan, which envisions 70 percent more service across the entire route network with an emphasis on high-productivity "frequent" routes like those that run to Downtown and South Lake Union. Because all routes under the No Action Alternative and the MHA Proposal are expected to be able to meet the load factor threshold with reasonable headways, no significant adverse transit impacts are identified.

Table 10: 2035 Peak Hour Transit Load Factors				
Route	**Destinations**	**2035 Headways / Load Factor Threshold**	**No Action Alternative (2035)**	**MHA Proposal (2035)**
2	Seattle Pacific, Queen Anne, Seattle Center, Downtown Seattle, First Hill, Madrona	6 min / 1.50	0.46	0.45
4	Queen Anne, Seattle Center, Downtown Seattle, First Hill, Cherry Hill, Madrona, Judkins Park	6.5 min / 1.50	0.82	0.81
8	Seattle Center, Capitol Hill, Madison Valley, Central District, Mt Baker Transit Center, Rainier Beach	9 min / 1.50	1.45	1.46
36	Downtown Seattle, International District, Beacon Hill Station, Jefferson Park, Beacon Hill, Othello Station	5 min / 1.50	0.86	0.90
40	Downtown Seattle, Fremont, Ballard, Loyal Heights, Northgate Transit Center	8 min / 1.50	1.49	1.50
70	Downtown Seattle, Eastlake, University District	10 min / 1.50	1.29	1.30
545	Downtown Seattle, Montlake Freeway Station, Evergreen Point Freeway Station, Redmond TC, Bear Creek Park & Ride	7 min / 1.50	1.50	1.50
C Line	Downtown Seattle, Westwood Village, Fauntleroy, Alaska Junction, West Seattle	5 min / 1.50	1.50	1.50
D Line	Downtown Seattle, Uptown, Interbay, Ballard, Crown Hill	4 min / 1.50	1.50	1.50
E Line	Downtown Seattle, West Green Lake, Bitter Lake, Shoreline	5 min / 1.5	1.38	1.50

Source: Fehr & Peers, 2016.

Screenlines

All of the City's screenline v/c ratios were reviewed to identify meaningful changes between the No Action Alternative and the MHA Proposal. The forecasted PM peak hour screenline v/c ratios are summarized in **Table 11**. The v/c ratios that are expected to increase under the MHA Proposal compared to the No Action Alternative are bolded; however, no screenline changes by more than 0.01 compared to the No Action Alternative. Because none of the screenlines are projected to exceed their designated thresholds, no impacts are identified.

Table 11:
2035 Screenline Volume-to-Capacity Ratios

Screenline #	Screenline Location	LOS Standard	No Action Alternative (2035)		MHA Proposal (2035)	
			NB/EB	SB/WB	NB/EB	SB/WB
1.11	North City Limit - 3rd Ave NW to Aurora Ave N	1.20	1.04	0.80	1.04	0.80
1.12	North City Limit - Meridian Ave N to 15th Ave NE	1.20	0.77	0.62	0.77	**0.63**
1.13	North City Limit - 30th Ave NE to Lake City Way NE	1.20	0.97	0.84	0.97	0.84
2	Magnolia	1.00	0.56	0.56	0.56	0.56
3.11	Duwamish River - West Seattle Fwy & Spokane St	1.20	0.69	1.15	0.69	1.15
3.12	Duwamish River - 1st Ave S & 16th Ave S	1.20	0.38	0.55	0.38	0.55
4.11	South City Limit - Martin Luther King Jr. Way to Rainier Ave. S	1.00	0.56	0.93	0.56	0.93
4.12	South City Limit - Marine Dr SW to Meyers Way S	1.00	0.56	0.71	0.56	0.71
4.13	South City Limit - SR 99 to Airport Way S	1.00	0.58	0.74	0.58	0.74
5.11	Ship Canal - Ballard Bridge	1.20	1.18	0.72	1.18	0.72

Table 11: 2035 Screenline Volume-to-Capacity Ratios						
Screenline #	Screenline Location	LOS Standard	No Action Alternative (2035)		MHA Proposal (2035)	
			NB/EB	SB/WB	NB/EB	SB/WB
5.12	Ship Canal - Fremont Bridge	1.20	0.79	0.71	0.79	0.71
5.13	Ship Canal - Aurora Bridge	1.20	0.92	0.82	0.92	0.82
5.16	Ship Canal - University & Montlake Bridges	1.20	0.95	1.05	0.95	1.05
6.11	South of NW 80th St - Seaview Ave NW to 15th Ave NW	1.00	0.53	0.50	0.53	0.50
6.12	South of N(W) 80th St - 8th Ave NW to Greenwood Ave N	1.00	0.87	0.78	**0.88**	0.78
6.13	South of N(E) 80th St - Linden Ave N to 1st Ave NE	1.00	0.54	0.41	0.54	0.41
6.14	South of NE 80th St - 5th Ave NE to 15th Ave NE	1.00	0.74	0.67	0.74	0.67
6.15	South of NE 80th St. - 20th Ave NE to Sand Point Way NE	1.00	0.63	0.58	0.63	0.58
7.11	West of Aurora Ave - Fremont Pl N to N 65th St	1.00	0.65	0.87	0.65	0.87
7.12	West of Aurora Ave – N 80th St to N 145th St	1.00	0.65	0.76	**0.66**	0.76
8	South of Lake Union	1.20	0.91	0.82	0.91	0.82
9.11	South of Spokane St - Beach Dr SW to W Marginal Way SW	1.00	0.59	0.72	0.59	0.72
9.12	South of Spokane St - E Marginal Way S to Airport Way S	1.00	0.60	0.70	0.60	0.70
9.13	South of Spokane St - 15th Ave S to Rainier Ave S	1.00	0.66	0.89	0.66	0.89

Table 11:
2035 Screenline Volume-to-Capacity Ratios

Screenline #	Screenline Location	LOS Standard	No Action Alternative (2035)		MHA Proposal (2035)	
			NB/EB	SB/WB	NB/EB	SB/WB
10.11	South of S Jackson St - Alaskan Way S to 4th Ave S	1.00	0.64	0.84	0.64	0.84
10.12	South of S Jackson St - 12th Ave S to Lakeside Ave S	1.00	0.80	0.99	**0.81**	0.99
12.12	East of CBD	1.20	0.39	0.52	0.39	0.52
13.11	East of I-5 - NE Northgate Way to NE 145th St	1.00	0.86	0.79	0.86	0.79
13.12	East of I-5 - NE 65th St to NE 80th St	1.00	0.51	0.53	0.51	0.53
13.13	East of I-5 - NE Pacific St to NE Ravenna Blvd	1.00	0.72	0.76	0.72	**0.77**

Note: The No Action Alternative v/c ratios reported here vary slightly from those reported for the Preferred Alternative in the Comprehensive Plan EIS. This is due to the addition of proposed BRT lines and BAT lanes funded by the Move Seattle levy that are assumed in this project.
Source: Fehr & Peers, 2016.

Mode Share

The forecasted SOV mode share is essentially identical between the MHA Proposal and the No Action Alternative. Both scenarios forecast an 18 percent SOV mode share in 2035. This is not surprising as the proposed land use growth is a small fraction of the total planned growth in the Downtown/Lake Union sector over the next 20 years. As the MHA Proposal is expected to meet the SOV mode share LOS standard, no mode share impacts are identified.

Pedestrian and Bicycle Network

The City's pedestrian and bicycle network is expected to provide enough capacity for the growth projected under the No Action Alternative and MHA Proposal. Moreover, the City has identified robust plans to improve the pedestrian and bicycle network through its Pedestrian Master Plan and Bicycle Master Plan. These plans are actively being implemented and are expected to continue to be implemented regardless of which land use alternative goes forward. Given that the pedestrian and bicycle environment is expected to provide sufficient capacity for expected growth as well as become more robust under either land use alternative, no significant deficiencies or impacts are expected to the pedestrian and bicycle system for either the No Action Alternative or MHA Proposal.

Freight

Although no travel time related impacts are expected for freight, there may be potential issues with changes to loading zones or access needs as individual projects are developed. At this programmatic level of analysis, it is not possible to evaluate these effects; these issues would need to be analyzed and mitigated at the project level.

Parking

There are currently some locations in the study area where on-street parking demand exceeds parking supply. Given the projected growth over the next 20 years and the fact that the supply of on-street parking is unlikely to increase by 2035, there will likely be more competition for on-street parking supply under the No Action Alternative. Because the MHA Proposal would include a slightly higher intensity of land use, competition for parking spaces is expected to be somewhat higher than under the No Action Alternative. While there may be short-term on-street parking shortages as individual developments are completed, it is expected that over the long term, parking supply and demand would reach a new equilibrium as drivers shift to other modes or to using off-street parking facilities in response to the City's ongoing on-street parking management program. The on-street parking supply is a relatively small fraction of total supply and off-street parking in downtown and South Lake

Union is still likely to be readily available. Therefore, the parking impacts are not considered significant.

Safety

The MHA Proposal would result in a higher number of vehicle trips than the No Action Alternative. However, the increase within the study area is very small at less than one percent. While collision rates would not be expected to meaningfully change based on the increase in growth, the total number of collisions could likely be slightly higher due to the small increase in vehicle trips. Therefore, the MHA Proposal is expected to result in an incremental adverse impact. However, given that the difference in vehicle trips is less than one percent and that the collision rates are not expected to increase, this impact is not considered significant. The City will pursue its traffic safety policies and the strategies supporting it regardless of the land use alternative selected.

Summary of Impacts

No impacts were identified under the corridor travel time, transit, screenline, or mode share analysis for the MHA Proposal when compared to the No Action Alternative. Parking and safety impacts are expected, but are not considered to be significant.

MITIGATION STRATEGIES

Because no significant impacts are expected under the MHA Proposal, no mitigation measures are identified.

SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

No significant unavoidable adverse impacts to transportation and parking are expected.

Appendix A:
Methodology and Assumptions

Travel Demand Model

The PSRC travel demand model was used to forecast future travel conditions. This model was recently updated for the Seattle Comprehensive Plan EIS project. Changes to the model include adding the new BRT transit routes and BAT lanes that will be funded through the recently passed Move Seattle Levy. Modifications to the network are similar to those outlined in the Amended Transit Master Plan (2015). The Ballard to Downtown Seattle HCT line was also removed because it is not funded and a specific project has not been identified. Sound Transit is considering four different alignments and two different modes.

Screenlines

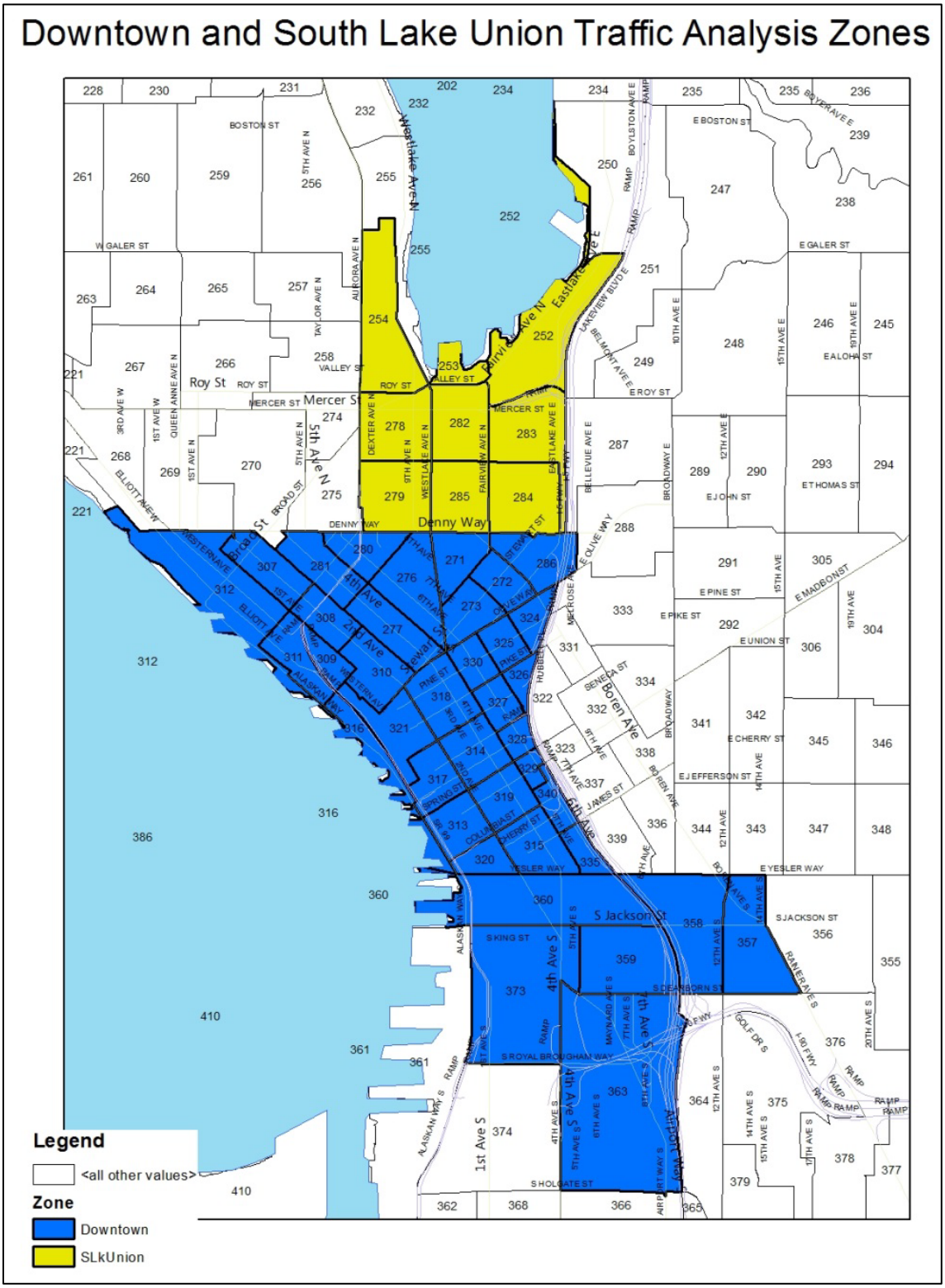
As part of the project assumptions, the BRT lines and BAT lanes proposed in the Amended Transit Master Plan were incorporated into the travel demand model. Several 2035 screenline capacities were assumed to decrease due to conversion of a general purpose lane to a BAT lane. The following screenlines were assumed to have a change in capacity. While the screenline v/c ratios increased for these screenlines, they are all expected to continue meeting the LOS standard in 2035 under the MHA Proposal and the No Action Alternative.

- 7.11 West of Aurora Ave - Fremont Pl N to N 65th St
- 7.12 West of Aurora Ave – N 80th St to N 145th St
- 10.12 South of S Jackson St - 12th Ave S to Lakeside Ave S
- 13.13 East of I-5 - NE Pacific St to NE Ravenna Blvd

Land Use

The increase in land use that is projected to result from the MHA Proposal was proportionately distributed across the Downtown and South Lake Union area based on the planned growth between 2015 and the 2035 Preferred Alternative. The following map shows the Traffic Analysis Zones (TAZs) in which the land use increase was assumed. All other TAZs within the regional travel demand model remained identical to the No Action Alternative.

Downtown and South Lake Union Traffic Analysis Zones



Speed and Travel Time Thresholds

The 2010 Highway Capacity Manual (HCM) defines level of service (LOS) thresholds for speed along urban streets. LOS is a concept used to describe traffic operations by assigning a letter grade of A through F, where A represents free-flow conditions and F represents highly congested conditions.

Since speed is the inverse of travel time, these thresholds can be communicated in terms of travel time as shown in **Table A-1**. In simple terms, if you are traveling at half the free-flow speed, your travel time will be twice that of the free-flow travel time.

Table A-1:
Levels of Service Thresholds for Travel Speeds and Travel Time

LOS	Speed Thresholds – Percent of Free-Flow Speed	Travel Time Thresholds – Ratio between PM Peak Period Travel Time and Travel Time at Free-Flow Speed
A	>85%	<1.18
B	>67 – 85 %	1.18 to <1.49
C	>50 – 67 %	1.49 to <2.0
D	>40 – 50 %	2.0 to <2.5
E	>30 – 40 %	2.5 to <3.33
F	≤ 30%	≥3.33

Source: *Highway Capacity Manual 2010*, Transportation Research Board.

Free-Flow Travel Time Adjustments

The HCM criteria were developed for segments between intersections, rather than including intersections. The corridors used in this study span multiple blocks and thus incorporate the delay experienced at intersections. Therefore, adjustments to the free-flow travel time were made based on the number of signalized intersections to account for the number of mid-segment intersections and to more accurately represent observed conditions.

Appendix B: Data Collection

Existing Travel Time

The floating car travel time data collection is summarized in **Table B-1**. Data was collected in the PM period (4-6PM) in March and November 2015. The smallest standard deviation of all the corridor travel times is 24 seconds for Corridor 1 (Aurora Avenue). This guided the selection of the threshold for a significant travel time impact to a 20 seconds or greater increase over the No Action Alternative. It was assumed that any travel increase below this threshold would be negligible to a driver as corridor travel times vary by more than that amount throughout the peak period.

Table B-1:
Existing Travel Time Data Collection Summary

		PM Avg. Travel Time		Standard Dev.		Travel Time Runs	
Fig ID	**Route**	**NB/EB**	**SB/WB**	**NB/EB**	**SB/WB**	**NB/EB**	**SB/WB**
1	Aurora Avenue (Denny to Aloha)	01:16	01:20	00:24	00:24	3	3
2	Westlake Avenue (Denny to 9th)	09:54	04:13	03:12	01:23	6	7
3	Howell/Stewart/Eastlake Avenue (8th to Aloha)	10:39	12:20	04:14	02:21	5	4
4	5th Avenue/Westlake (Denny to Jackson)		16:12		05:37		6
5	1st Avenue (Battery to Jackson)	06:36	08:46	00:28	01:00	5	4
6	2nd Avenue (Battery to Jackson)		06:42		02:51		4
7	4th Avenue (Battery to Jackson)	06:10		00:52		5	
8	Mercer Street (5th to Fairview)	15:22	03:11	05:08	01:45	6	6
9	Denny Way (5th to Bellevue)	07:10	08:45	02:40	02:45	5	6
10	Olive Way (4th to Bellevue)	15:43		09:15		4	
11	Spring Street (1st to Boren)	07:40		01:48		12	
12	Madison Street (1st to Boren)		05:34		01:42		12
13	James Street (Yesler to Boren)	09:01	11:20	06:20	05:58	4	4
14	Jackson Street (1st to 12th)	08:20	05:53	01:43	02:07	8	7

Existing Transit Load Factors

King County Metro ridership data from Spring 2014 was analyzed to evaluate the existing transit route load factors. Since the data provided aggregated boardings and alightings at the peak period level, a 0.41 factor was used to convert to a peak 1 hour max load. The highest load factor for each route is highlighted in grey.

Table B-2:
Inbound Existing Transit Load Factors

Transit Route	Capacity (seats)	PM Period Max Load	# of Trips in PM Peak Hour	PM Peak Hour Headway	Max Load Location	Peak Hour Load Factor
40	56	296	6	10	9TH AVE N & MERCER ST	0.36
70	56	585	5	12	FAIRVIEW AVE N & JOHN ST	0.86
8	56	360	4	15	DENNY WAY & WESTLAKE AVE	0.66
2	56	396	6	10	SENECA ST & 8TH AVE	0.48
4	56	288	5	12	JAMES ST & 8TH AVE	0.42
E Line	48	680	5	12	AURORA AVE N & N 95TH ST	1.16
36	56	573	9	7	S JACKSON ST & 12TH AVE S	0.47
C Line	48	500	9	7	SW AVALON WAY & SW YANCY ST	0.47
D Line	48	921	9	7	QUEEN ANNE AVE N & W JOHN ST	0.87
545	58	1106	6	10	SR 520 & EVERGREEN PT RD	1.30

Table B-3: Outbound Existing Transit Load Factors						
Transit Route	**Capacity (seats)**	**PM Period Max Load**	**# of Trips in PM Peak Hour**	**PM Peak Hour Headway**	**Max Load Location**	**Peak Hour Load Factor**
40	56	667	6	10	WESTLAKE AVE N & HIGHLAND DR	0.81
70	56	557	6	10	FAIRVIEW AVE E & YALE AVE N	0.68
8	56	878	5	12	DENNY WAY & STEWART ST	1.29
2	56	346	6	10	SENECA ST & 8TH AVE	0.42
4	56	383	4	15	JAMES ST & 5TH AVE	0.70
E Line	48	1738	12	5	AURORA AVE N & DENNY WAY	1.24
36	56	1083	11	5	S JACKSON ST & 8TH AVE S	0.72
C Line	48	1011	9	7	COLUMBIA ST & 2ND AVE	0.96
D Line	48	1148	9	7	1ST AVE N & DENNY WAY	1.09
545	58	1448	10	6	SR 520 RAMP & MONTLAKE FRWY STA	1.02

Assumed articulated buses operate in the PM period to handle peak demand. A 0.41 factor was applied to convert from PM period max load to a PM peak hour transit max load.
Source: King County Metro, Sound Transit, Fehr & Peers, 2016.