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APPENDIX A TRAFFIC ANALYSIS

This Appendix[1] describes the traffic analysis for the Tier 1 Screening and Tier 2 Evaluation of alternatives for the Seattle Center City Connector (CCC) project. It focuses on the traffic analysis completed for the Tier 1 Screening and also addresses the analysis planned as part of the Tier 2 Evaluation (subject to change as the Tier 2 Evaluation is defined in more detail). The intent of the appendix is to provide documentation of the key assumptions and methodologies used in the traffic analysis, including analysis years, study area limits, travel demand forecasting and modeling methodologies, and operational parameters.

TIER 1 AND PLANNED TIER 2 METHODOLOGY

Analysis Year and Time Period

The traffic analysis conducted for the Tier 1 Screening was only for the horizon year. This horizon year is considered to be year 2030 based on relevant available data. The Tier 2 analysis may include a year of opening (e.g., 2020) and/or other horizon year analysis.

The traffic analysis was conducted for the PM peak hour as this is considered to be the highest congestion time period in downtown Seattle. Future project stages, such as environmental documentation, may include additional time periods, i.e., AM peak hour.

Alternatives Analyzed

In Tier 1, a No-Build alternative and two Build alternatives (1st Avenue and 4th/5th Avenues) were analyzed using a combination of Synchro and Excel. Design and operational variations were tested for the two Build alternatives, including mixed-traffic and exclusive-lane configurations along each corridor.

In Tier 2, a No-Build alternative and one project alternative will be analyzed using a combination of Synchro (for signal timing inputs) and VISSIM (for multi-modal traffic simulation and operational results). This analysis in Tier 2 would support selecting a Locally Preferred Alternative to advance into the next project phase.

Traffic Measures of Effectiveness

Two Build alternatives were evaluated in the Tier 1 analysis and compared against a No-Build condition. The traffic analysis for Tier 1 incorporated roadway, alignment, traffic signal/operations and stop location options. In Tier 1, a Synchro model was constructed to analyze and screen alternatives to assist in identifying the preferred corridor. Traffic Measures of

[1] Prepared by CH2MHill

Effectiveness (MOE's) produced for the Tier 1 screening include intersection LOS and delay, auto vehicle travel times, and estimated streetcar travel times.

The traffic analysis for Tier 2 screening will compare one build alternative to a no-build condition using both Synchro and VISSIM models. The build alternative in VISSIM will incorporate pedestrian, bicycle, bus and parking movements. Intersection refinements can be evaluated with VISSIM, including separate streetcar signal phases and transit signal priority (TSP) treatments. These design options and treatments will be screened in Tier 2 with the goal of recommending a Locally Preferred Alternative (LPA).

In Tier 2, Synchro will continue to be used but as a basis to establish signal timing parameters and provide intersection LOS and delay while VISSIM will directly simulate the interaction of auto, truck, bus, streetcar, and pedestrian modes of travel along the corridor. MOE's from VISSIM will include travel time for autos, streetcars and buses, as well as vehicle and person throughput. Person throughput will be created by incorporating ridership estimates with vehicle data. Figure A-1 identifies the models used in the Tier 1 and Tier 2 analysis.

Figure A-1 Screening Levels of Analysis

Screening Levels	Tier 1	Tier 2
Type of Analysis	Screen two Build alignment alternatives against a No Build condition.	Compare No Build and one Build alternative and provide impacts of project
Tools	Synchro and Emme/2	Synchro (for signal timing inputs) & VISSIM (multi-modal simulation)
Measures of Effectiveness	▪ Traffic demand diversion caused by lane reductions ▪ Intersection LOS & delay (from Synchro) ▪ Auto travel time (from Synchro) ▪ Streetcar travel time (estimated from Synchro & Excel)	▪ Intersection LOS & delay (from Synchro) ▪ Auto travel time (from VISSIM) ▪ Bus travel time (from VISSIM) ▪ Streetcar travel time (from VISSIM) ▪ Vehicle & person throughput (from VISSIM) ▪ Level of traffic diversion expected with any lane reductions

Traffic Study Area Limits

The traffic analysis study area for the project includes roadways that are under the jurisdiction of the City of Seattle. Chapter 2 of the main Tier 1 report provides maps of the 1st Avenue and 4th/5th Avenue alternatives for the Tier 1 screening of the project.

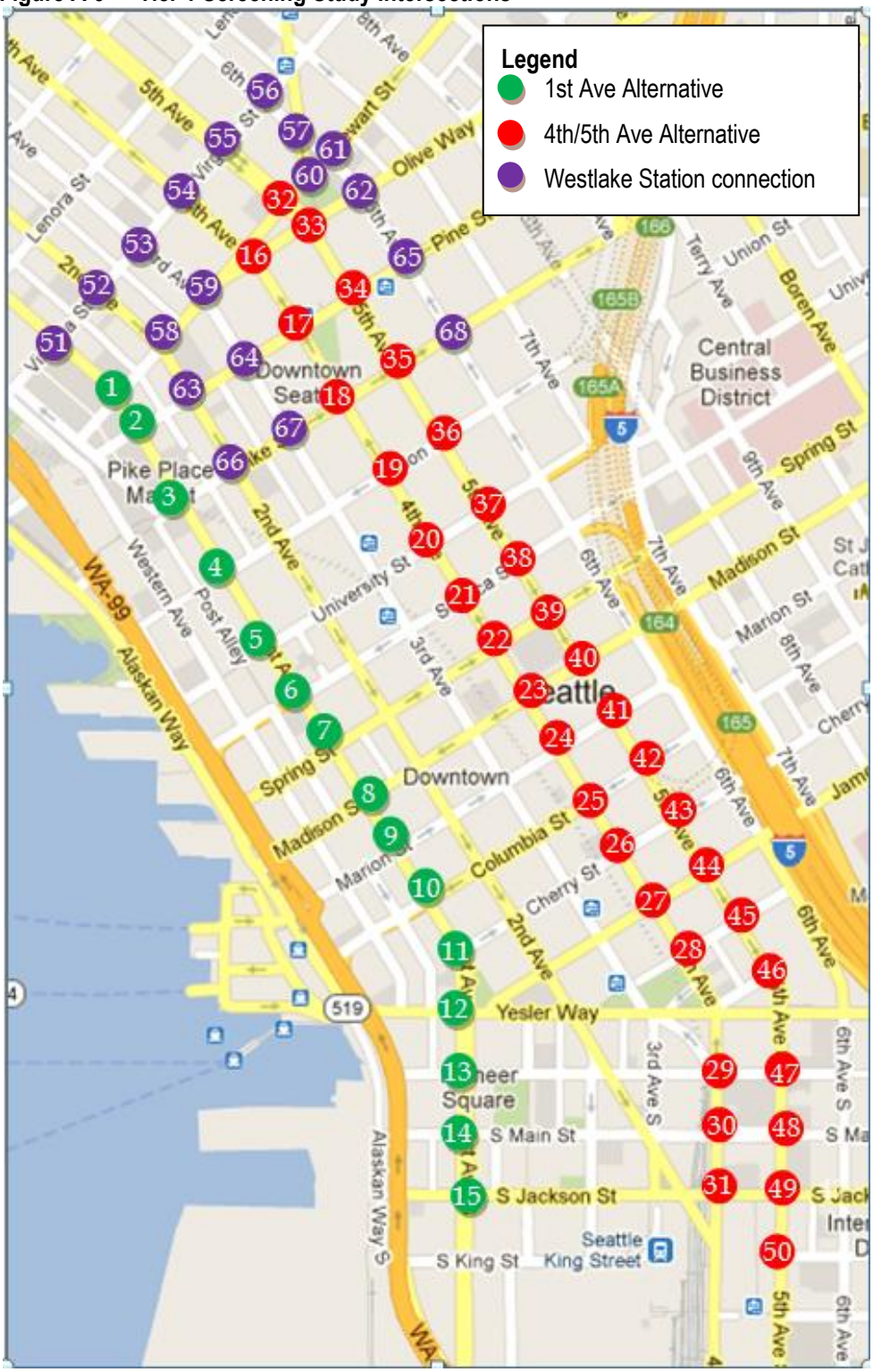
The study area includes up to 68 intersections, with up to 15 along the 1st Avenue alternative, up to 36 along the 4th/5th Avenue Couplet alternative, and an additional 17 intersections for the potential connection options to the Westlake Streetcar Station as seen in Figure A-2. The potential connection options are the options for connecting the 1st Ave and 4th/5th Avenue alternatives with the existing South Lake Union Streetcar at McGraw Square. Intersections along parallel corridors were not included in the Tier 1 traffic analysis, but additional connecting corridors may be considered in Tier 2. Figure A-3 shows the location of each study intersection.

Figure A-2 Traffic Study Intersections – 1st Avenue and 4th/5th Ave

ID #	Intersection	Data Source	ID#	Intersection	Data Source
1	1st Ave & Stewart St	AWV FEIS	36	5th Ave & Union St	SDOT
2	1st Ave & Pine St	AWV FEIS	37	5th Ave & University St	SDOT
3	1st Ave & Pike St	SDOT	38	5th Ave & Seneca St	SDOT
4	1st Ave & Union St	SDOT	39	5th Ave & Spring St	SDOT
5	1st Ave & University St	AWV FEIS	40	5th Ave & Madison St	SDOT
6	1st Ave & Seneca St	AWV FEIS	41	5th Ave & Marion St	SDOT
7	1st Ave & Spring St	AWV FEIS	42	5th Ave & Columbia St	SDOT
8	1st Ave & Madison St	AWV FEIS	43	5th Ave & Cherry St	SDOT
9	1st Ave & Marion St	AWV FEIS	44	5th Ave & James St	SDOT
10	1st Ave & Columbia St	AWV FEIS	45	5th Ave & Jefferson St	SDOT
11	1st Ave & Cherry St	AWV FEIS	46	5th Ave & Terrace St	SDOT
12	1st Ave & Yesler Way	AWV FEIS	47	5th Ave & S Washington St	SDOT
13	1st Ave & S Washington St	AWV FEIS	48	5th Ave & S Main St	SDOT
14	1st Ave & S Main St	AWV FEIS	49	5th Ave & S Jackson St	SDOT
15	1st Ave & Jackson St	AWV FEIS	50	5th Ave & S King St	SDOT
16	4th Ave & Stewart St	AWV FEIS	51	1st Ave & Virginia St	AWV FEIS
17	4th Ave & Pine St	AWV FEIS	52	2nd Ave & Virginia St	AWV FEIS
18	4th Ave & Pike St	AWV FEIS	53	3rd Ave & Virginia St	SDOT
19	4th Ave & Union St	AWV FEIS	54	4th Ave & Virginia St	AWV FEIS
20	4th Ave & University St	AWV FEIS	55	5th Ave & Virginia St	SDOT
21	4th Ave & Seneca St	AWV FEIS	56	6th Ave & Virginia St	SDOT
22	4th Ave & Spring St	AWV FEIS	57	6th Ave & Westlake Ave	SDOT
23	4th Ave & Madison St	AWV FEIS	58	2nd Ave & Stewart St	AWV FEIS
24	4th Ave & Marion St	AWV FEIS	59	3rd Ave & Stewart St	SDOT
25	4th Ave & Columbia St	AWV FEIS	60	Westlake Ave & Stewart St	SDOT
26	4th Ave & Cherry St	AWV FEIS	61	6th Ave & Stewart St	SDOT

ID #	Intersection	Data Source	ID#	Intersection	Data Source
27	4th Ave & James St	AWV FEIS	62	6th Ave & Olive Way	SDOT
28	4th Ave & Jefferson St	AWV FEIS	63	2nd Ave & Pine St	AWV FEIS
29	4th Ave & S Washington St	AWV FEIS	64	3rd Ave & Pine St	SDOT
30	4th Ave & S Main St	AWV FEIS	65	6th Ave & Pine St	SDOT
31	4th Ave & S Jackson St	AWV FEIS	66	2nd Ave & Pike St	AWV FEIS
32	5th & Stewart St	SDOT	67	3rd Ave & Pike St	SDOT
33	5th Ave & Olive Way	SDOT	68	6th Ave & Pike St	SDOT
34	5th Ave & Pine St	SDOT			
35	5th Ave & Pike St	SDOT			

Figure A-3 Tier 1 Screening Study Intersections



Data Collection

Traffic data from other relevant projects, such as Alaskan Way Viaduct (AWV) FEIS, Central Waterfront Project (CWP), and First Hill Streetcar was used to develop the traffic analysis for Tier 1. The data from these files, such as traffic volumes, signal timing and roadway channelization was used to establish project models for the alternatives.

Year 2030 traffic volumes and signal timing data was mainly based on the AWV FEIS Synchro model as it has the greatest coverage of the project's study area. Data gaps were filled in through data obtained from SDOT or other projects (SDOT CWP and SDOT First Hill Streetcar project). Existing traffic signal timing and phasing was gathered from SDOT (refer to Figure A-3 for the data source by intersection).

Traffic Volume Forecasting

Future auto demand volumes were based on the 2030 non-tolled scenario forecast developed for the AWV FEIS. The non-tolled scenario forecasts were utilized since WSDOT is currently in the process of updating the tolling forecasts and these have yet to be finalized or agreed to by stakeholders. In Tier 1, a high-level travel demand forecast was conducted to determine the amount of diversion that is likely to occur from a Streetcar operating scenario that requires the reduction of general-purpose travel lanes on either 1st Avenue or 4th/5th Avenues.

At intersections where future forecasts are not readily available, the future intersection volumes were estimated using a combination of existing traffic counts, post-processing adjustments, and volume-balancing from nearby intersections where future forecasts are published.

Operational Analysis Tools and Inputs

Synchro software, version 8, was used for the intersection analysis in Tier 1. Synchro utilizes methods from the Highway Capacity Manual (HCM) 2000. The reported results include the overall intersection LOS from the HCM report for signalized locations. Level of Service (LOS) is a qualitative measurement of intersection operation based on control delay. LOS is reported as letter grades A (low delay per vehicle, favorable traffic progression) through F (extremely high delay per vehicle, could involve long queues). Critical approaches, as defined by LOS F, will also be reported.

For the Tier 1 screening, transit signal priority (TSP) will be integrated with the streetcar operations, through a combination of Synchro and Excel (using a methodology developed and applied through previous studies for SDOT). The TSP levels analyzed for Tier 1 provided a bookend (limited vs. more extensive) of potential TSP levels. The limited TSP signal adjustments were applied to the mixed-traffic streetcar operating scenario while the more extensive TSP adjustments were applied to the exclusive-lane streetcar operations scenario. In either of these two TSP scenarios, the side-street green times were not reduced below minimum thresholds to allow pedestrians the required street crossing time and did not skip pedestrian phases.

In the Tier 2 evaluation, VISSIM software will be utilized to reflect a more detailed modeling of signal operating conditions. VISSIM has the ability to simulate multi-modal traffic flows, such as cars, trucks, buses, streetcar/LRT, bicyclists, and pedestrians, and signal strategies compared to Synchro. The assumptions and parameters used in the Synchro model are shown in Figure A-4. Values in Figure A-4 were developed based on a combination of discussions with City staff,

previous City project experience and default values recommended from the HCM 2010. Figure A-5 shows the parameters that will be used in the VISSIM model in the Tier 2 Evaluation.

Figure A-4 Synchro Parameters/Assumptions (for Tier 1 screening)

Parameter	Future Year Assumption
Peak Hour Factor	From 2030 AWV Synchro or count, otherwise 0.92 for intersection
Conflicting Pedestrians per Hour	From 2030 AWV Synchro or count, otherwise use 200 peds/hr per crosswalk
Conflicting Bicycles per Hour	From 2030 AWV Synchro or count, otherwise use 20 bicycles/hr
Area Type	CBD
Ideal Saturation Flow Rate (for all movements)	1900
Lane Width	From 2030 AWV Synchro or SDOT paint line sketches, otherwise assume 11'.
Percent Heavy Vehicles	From 2030 AWV Synchro or count/current transit service, otherwise use 3% per approach (including trucks and buses)
Percent Grade	From 2030 AWV Synchro, otherwise calculated from field data
Parking Maneuvers per Hour	From 2030 AWV Synchro, otherwise assume 8 maneuvers/hr for two-way streets; assume 16 maneuvers/hr for one-way streets
Bus Blockages	From 2030 AWV Synchro, otherwise from existing transit routes and headways.
Intersection signal phasing and coordination	From 2030 AWV Synchro or existing data from SDOT
Intersection signal timing optimization limits	From 2030 AWV Synchro or existing data from SDOT (80 sec cycle length)
Minimum Green time	From 2030 AWV Synchro or existing data from SDOT,
Yellow and all-red time	From 2030 AWV Synchro or existing data from SDOT, otherwise use: (Y) = 3.5 seconds and (R) = 1 second
Right Turn on Red	Allow where currently permitted.
Speed Limit	30 mph

Figure A-5 VISSIM Parameters/Assumptions (for Tier 2 Evaluation)

VISSIM Parameters	Future Year Assumption
VISSIM Version	▪ 5.40-03
Simulation Resolution	▪ 10 time steps/sec
Seeding Time	▪ TBD – Minimum of 15 minutes
Recording Time	▪ 1 hr
# of Random Seeds	▪ Starting seed of 100, increment of 10. 10 seeds.
Driver Behavior, Car Following	▪ Wiedemann 74 ▪ Add. Part of safety distance = 2.40 (default= 2.00) ▪ Mult. Part of safety distance = 3.30 (default = 3.00) ▪ Note: parameters changed to make sat. flow rate = 1900 vphg
Traffic Composition	▪ SDOT Data and 2030 AWV Synchro
Vehicle Types	▪ GP Car (vehicle model = Car, Occupancy = TBD) ▪ HGV (vehicle model = HGV, occupancy = 1.0, length ~ 20-70') ▪ Bus (vehicle model = Bus, occupancy = TBD based on ST forecast model, length ~ 40') ▪ Streetcar (vehicle model = Tram, occupancy = TBD based on Ridership model, length ~65')
Conflicting Pedestrians Per Hour	▪ SDOT Data and 2030 AWV Synchro, otherwise assume 200 peds/hr per crosswalk
Parking Maneuvers/Hour	▪ SDOT Data and 2030 AWV Synchro, otherwise 8 maneuvers/hr for two-way streets; assume 16 maneuvers/hr for one-way streets
Grade	▪ From 2030 AWV Synchro, otherwise calculated from field data
Intersection Turning Speed	▪ Right = 11-13 mph; Left = 13-17 mph
Transit Assumptions	▪ Existing Bus Routes (from KC Metro, Sound Transit, and other transit agencies) and stops along Preferred Alignment route will be modeled. Data from KC Metro will be utilized for boarding/alighting and dwell time at stop locations, otherwise assume 20 second dwell time and 10 second standard deviation. ▪ No changes will be made to existing bus service for future No Build alternative. ▪ No changes will be made to existing bus service for future Preferred Build alternative unless alignment calls for modifications to existing bus stop locations, and will be confirmed by SDOT.
Signal Controller Type	▪ No Build = Pre-timed ▪ Build = Actuated-Coordinated with TSP where warranted
Streetcar Headway	▪ Assume 10 minute headways
Streetcar Signal Operations	▪ TSP to be applied where warranted; TSP parameters to be coordinated with SDOT; Exclusive streetcar phases required at intersections where route turns across traffic
Signal Phasing, Timing, and Coordination	▪ No Build based on 2030 AWV FEIS Synchro; ▪ Build to be modified where exclusive streetcar phases are required or where geometric modifications warrant changes in phasing.

APPENDIX B OPERATING AND MAINTENANCE COST ESTIMATES

Note: This appendix supplements the description of scenarios and the evaluation results for Objective C3 that are provided in the Tier 1 Report.

This document[1] describes the methodology for developing an operations plan for use in the Tier 1 Screening and Tier 2 Evaluation for the Center City Connector. The analysis will include estimates of the total operating and maintenance costs for a streetcar network comprised of three segments —South Lake Union (SLU), Center City Connector (CCC), and First Hill (FH)—based on considerations such as frequency, travel speed, operating period, etc.

TIER 1 OPERATING OPTIONS

The Center City Connector will connect the SLU Streetcar line with the FH Streetcar line. Several operating scenarios were modeled and evaluated in the Tier 1 Screening, including single operation for the connected system and split operations. The Tier 1 Report (see Chapter 2) provides additional detail on the operating scenarios that were assumed for the Tier 1 analysis.

Although a combined single line of operations scenario that includes the SLU, CCC, and FH Streetcars is one logical option, there are three vehicles owned by Seattle that cannot be used for such an operation. The current SLU vehicles in operation do not have off-wire capability to travel the Capitol Hill to downtown segment; options to overcome this such as splitting operations or converting the vehicles will be evaluated and discussed. This would impact the project cost and design.

The operations plan estimated the number of streetcar vehicles required to support proposed service levels, including the total number of hours of revenue service.

In some operating scenarios, flexibility can be considered to address predictive priority and/or potential exclusive right-of-way and longer stop spacing for higher travel speed if desired.

APPROACH AND DETAILED METHODOLOGY

Approach

An operating cost model for the Center City Connector was developed for the Tier 1 Screening based on the following high-level approach:

- Estimate annual operating cost of SLU, FH and CCC lines (individually)

[1] Prepared by Shiels Obletz Johnsen (SOJ)

- Estimate annual operating cost and characteristics for combined, single-line Streetcar Network comprised of SLU, FH and CCC segments.
- Estimate annual operating cost and characteristics for other operating scenarios defined for Tier 1 analysis.

This model will be refined further in the Tier 2 Evaluation.

Data Inputs and Sources

The following data sources were utilized to develop and refine the operating cost model for the Center City Connector.

- South Lake Union Streetcar Line – operating data
- South Lake Union Streetcar Line – historic, current, and projected operating costs
- First Hill Streetcar Line – projected operating data[2]. Once operating plans for the FH streetcar line are established, they can be used to refine the Operating Hours and Cost Estimate model.
- Operating Hours and Cost Estimate Model (SOJ)

Detailed Methodology

The operations plan was based upon the distance the streetcar must travel and assumptions with regard to speed of operation. The following are key parameters:

- **Operating Speed**. The Tier 1 Screening included planning-level analysis of mixed-traffic and exclusive right-of-way scenarios for each alignment. The Tier 2 Evaluation will include more detailed analysis of priority scenarios. Operating speed assumptions from the traffic analysis were incorporated into the operations methodology.

  Vehicles are assumed to operate in mixed-traffic with similar operating speeds as buses, except where the design alternatives indicate otherwise. Operating speed includes stopping to pick up passengers. Average speeds for streetcar in mixed-traffic range from 6 mph to 9 mph depending upon the number of stops and volume of passenger load. Peak periods with high traffic and loads can average as low as 6 mph. The Tier 1 and Tier 2 analysis will include consideration of the benefits from priority and "rapid streetcar" type features in achieving desired average speeds. The average operating speed will be determined by dividing the distance by the travel time estimated. This is varied depending upon verification of estimated travel times from simulations.
- **Distance**. The distance of the line is used as a base to estimate round trip time. The distance is assumed as one-way distance with the return trip included at the same travel speed. The estimates are for round trip times.
- **Travel Time.** The actual travel time for the streetcar for the route. This is estimated based upon anticipated operating speeds, and may vary for different priority scenarios.
- **Travel Time + Recovery.** A minimum of 5 minutes is added to the travel time as "recovery" time which allows for the streetcar to make up its schedule. Additional time may be required to assure proper breaks and layover for the operation. Up to an

[2] Initially, this is based on preliminary operating plans for the FH streetcar line (February 2012). Once finalized, the revised/final FH Streetcar operating plan can be used to refine the operating hours and cost estimate.

additional 5 minutes or more is included for such layover. The travel time plus recovery is divided by the number of vehicles to determine frequency.

- **Headway**. The number of minutes between vehicles traveling in the same direction, calculated as travel time and recovery divided by number of vehicles operating.
- **Vehicles.** Service headway goals and the end-to-end travel time including recovery determine the required number of vehicles on a line. The existing fleet of vehicles includes three vehicles in operation and one spare (this does not include one additional vehicle that will be funded by Amazon and used to increase peak frequency).
- **Service Span.** For purposes of the Tier 1 analysis, operation is assumed to be consistent with the FH Streetcar operations plan as of February 2012. That plan assumes 20 hours per day Monday through Saturday and 12.0 hours on Sunday for a total of 132.0 hours per week.[3] Three service span categories operation are assumed—Weekends, Off-Peak and Peak—and this allocation of service is used to determine the total number of annual revenue hours operated:
  - **Peak**. Consists of 78 hours per week of operation (Monday – Saturday 6 AM -7 PM), 10-minute headways.
  - **Off-Peak**. Early mornings (before 6 AM) and evenings (after 7 PM) Monday-Saturday, 15-minute headways.
  - **Sundays/Holidays**. All hours (7 AM – 7 PM), 15-minute headways.
- **Cost per Hour.** The annual cost per revenue hour is used to estimate the total cost of operations.

[3] Service characteristics to be refined in the Tier 2 Evaluation. Current plans for the First Hill Streetcar are for a 20-hour service span Monday-Saturday (5 AM – 1 AM) and 12 hour service span on Sundays and Holidays (7 AM – 7 PM); this is a total of 132 hours per week.

Tier 2 Evaluation

Note that different operating assumptions including a longer service span and shorter headways are likely to be used for Tier 2. Figure B-1 provides an example. Based on detailed ridership modeling, Tier 2 would also analyze requirements for higher capacity vehicles.

Figure B-1 Potential Tier 2 Service Hours and Headway Assumptions

	Start Time:	End Time:	Headway (MIN)	Span
Weekday	**5:00 AM**	**1:00 AM**	**Varies**	**20**
Weekday Early Morning	*5:00 AM*	*6:00 AM*	*15*	*1*
Weekday Day/Early Eve	*6:00 AM*	*8:00 PM*	*10*	*14*
Weekday Later Eve	*8:00 PM*	*1:00 AM*	*15**	*5*
Saturday	**5:00 AM**	**1:00 AM**	**Varies**	**20**
Saturday Early Morning	*5:00 AM*	*8:00 AM*	*15*	*3*
Saturday Day/Early Eve	*8:00 AM*	*11:00 PM*	*10*	*15*
Saturday Later Eve	*11:00 PM*	*1:00 AM*	*15*	*2*
Sunday/Holiday	**7:00 AM**	**10:00 PM**	**15**	**17**
Sunday Early Morning	*6:00 AM*	*8:00 AM*	*15*	*2*
Sunday Day/Early Eve	*8:00 AM*	*11:00 PM*	*10*	*15*
Sunday Later Eve	--	--	--	--
TOTAL HOURS / WEEK				**137**

SAMPLE OPERATING COST MODEL

Figure B-2 provides a sample operating plan for the three lines individually and with combined operations as a network. It includes assumptions for transit service levels and travel times in mixed-traffic. The Tier 1 Report provides results for additional scenarios that demonstrate the effects of priority and fewer stop spacing options.

Figure B-2 Seattle Local Streetcar – Operation Hours and Cost (Example)*

	South Lake Union								
	Vehicles	**Distance**	**Travel Time**	**Time +Recovery**	**Headway**	**Hours/ week**	**Annual Hours**	**Annual Cost**	**MPH**
Sun-Hol	2	1.30	20	30	15	12	1,248		7.80
Mon-Sat. Off-Peak	2	1.30	20	30	15	42	4,368		7.80
Mon-Sat. Peak	3	1.30	22	30	10	78	12,168		7.09
TOTAL						132	17,784	$3,556,800	
	First Hill								
	Vehicles	**Distance**	**Travel Time**	**Time +Recovery**	**Headway**	**Hours/ week**	**Annual Hours**	**Annual Cost**	**MPH**
Sun-Hol	3	2.50	40	45	15	12	1,872		7.80
Mon – Sat Off-Peak	3	2.50	40	45	15	42	6,552		7.80
Mon - Sat Peak	5	2.50	45	50	10	78	20,280		7.09
TOTAL						132	28,704	$5,740,800	
	Center City Connector								
	Vehicles	**Distance**	**Travel Time**	**Time +Recovery**	**Headway**	**Hours/ week**	**Annual Hours**	**Annual Cost**	**MPH**
Sun-Hol	2	1.20	20	30	15	12	1,248		7.50
Mon - Sat Off-Peak	2	1.20	20	30	15	42	4,368		7.50
Mon – Sat Peak	3	1.20	22	30	10	78	12,168		6.67
TOTAL						132	17,784	$3,556,800	
	Combined Seattle Streetcar								
	Vehicles	**Distance**	**Travel Time**	**Time +Recovery**	**Headway**	**Hours/ week**	**Annual Hours**	**Annual Cost**	**MPH**
Sun-Hol	6	5.00	80	90	15	12	3,774		7.50
Mon – Sat Off-Peak	6	5.00	80	90	15	42	13,104		7.50
Mon – Sat Peak	10	5.00	88	98	10	78	40,560		6.82
TOTAL						132	57,408	$11,481,600	

Assumptions:
1. Mixed-traffic operation
2. Cost per revenue hour approx. $200 (based on 2012 actual costs for South Lake Union streetcar, to be confirmed)

APPENDIX C CAPITAL COST ESTIMATES

Note: This appendix supplements the evaluation results for Objective C3 that are provided in the Tier 1 Report.[1]

TIER 1 ORDER-OF-MAGNITUDE CAPITAL COST ESTIMATES

This section describes the methodology used to prepare capital cost estimates for the Tier 1 Screening of alternatives. The purpose of Tier 1 is to compare among a range of alternatives. The Tier 1 capital cost estimates have been prepared using data on cost-per-mile for similar projects.

Cost estimates prepared at this very early planning stage are based on the best available information. However, the streetcar concepts developed to date include only a limited amount of design with many of the details to be determined later. **It is important to understand the limitations with these early estimates and recognize that the next study phase (Tier 2) will include further design refinement and a cost estimating methodology that includes the development of more precise unit costs.** The Tier 1 cost estimates should only be used to compare among the alternative alignments and operating environments and to provide a very general sense of the order-of-magnitude cost for a streetcar project connecting Westlake with S. Jackson Street.

Tier 1 cost estimates have been prepared for each alignment under two conditions; mixed-traffic operation and exclusive transit operation, resulting in cost estimates for four alternatives:

- 4th/5th Couplet – Mixed-Traffic
- 4th/5th Couplet – Exclusive
- 1st Avenue – Mixed-Traffic
- 1st Avenue – Exclusive

Because of the many unknowns associated with each alternative, the Tier 1 capital cost estimates are presented as ranges. These cost ranges are intended to account for a variety of factors that could influence the project cost such as the extent of utility conflicts and sidewalk/streetscape improvements.

Assumptions

The First Hill (FH) Streetcar project provides a current local project to use as the basis for estimating the cost-per-mile. Because each project has unique conditions, adjustments were made to adapt the cost-per-mile to fit the City Center alternatives. The cost-per-mile for the First Hill Streetcar project includes the following conditions:

- Median, double track alignment

[1] Prepared by URS

- Two-way cycle track
- Significant sidewalk/streetscape improvements
- Traffic signal priority at some signalized intersections
- Available costs in 2012 dollars

With an understanding of the conditions that contributed to the average cost-per-mile for the First Hill Streetcar project, URS used that average cost to develop an average cost-per-mile applicable to each of the four alternatives. The most recent cost-per-mile data for First Hill is a cost of $53 million per mile (2012$). This includes all project costs including design, construction management, utilities, vehicles, maintenance facility, cycle track, traffic signals and streetscape improvements in addition to the rail, pavement, overhead contact system, communications and stations.

In order to estimate a per mile cost for each City Center alternative URS adjusted the First Hill costs by:

- Reducing the maintenance facility costs by 70% to account for the currently available maintenance capacity at the First Hill and South Lake Union facilities.
- Increasing the systems and OCS costs by 20% assuming a 2-way OCS configuration (FHS uses OCS for outbound operations only).
- Maintaining the ~~2-way~~ cycle track cost only for the 4th/5th Couplet ~~– Mixed Traffic~~ alternative and removing the ~~2-way~~ cycle track cost from the other alternatives.
- Escalating the costs from 2012 to 2013 by 9% per year – based on recent estimating data in the Seattle area.

A premium for constructing an exclusive transit option was added to the two exclusive alternatives. The cost-per-mile used to estimate the Tier 1 capital cost for the four alternatives is as follows:

- 4th/5th Couplet – Mixed-Traffic: $50.7 million
- 4th/5th Couplet – Exclusive $56.8 million
- 1st Avenue – Mixed-Traffic $54.7 million
- 1st Avenue – Exclusive $58.1 million

These costs are presented per route mile, meaning that they account for both directions for all alternatives.

The **distances** were calculated from where the streetcar route would connect with the existing South Lake Union Streetcar at McGraw Square near 5th and Olive Way to where the streetcar would connect to the First Hill Streetcar (under construction) on S. Jackson Street. The distances include the full alignment needed to connect between the South Lake Union Streetcar and the First Hill Streetcar. Estimated distances for each alignment are:

- 4th/5th Couplet: 1.13 miles
- 1st Avenue: 1.21 miles

Adjustments were made to the cost-per-mile figures for **special circumstances** including:

- Reduced costs assumed for couplet configurations are due to increased flexibility in accommodating existing utilities and reduced construction footprint
- An existing 16” water line in 4th Avenue

- A premium for exclusive operations accounting for extra traffic signal treatments, reconfiguring parking and channelization
- Cost for special bicycle treatments such as cycle tracks

The notion that a couplet configuration would cost less per route mile than double track on a single street may be somewhat counter-intuitive and requires some further explanation. The following provides context for this cost-per-mile assumption.

Every streetcar project has unique considerations which influence costs. The cost of constructing a rail-transit couplet (one track, each direction on two parallel streets) has been found to cost less than constructing two tracks on one street. Factors that influence this cost differential include:

- **Utility Impacts**: It is usually easier to avoid major utility conflicts when establishing the alignment for one track on a street because there can be more opportunity for flexibility to re-configure the existing lane configuration (e.g., modifying lane widths, eliminating parking, etc.) or to develop alternative track alignment geometry.

  When locating two tracks on a single street, the potential to impact utilities doubles (at least). There is usually less opportunity to modify the traffic configuration when locating two tracks because of the competing need to maintain the lane configuration in both directions. The location/configuration of stops may often dictate where the tracks need to be and there is typically less flexibility available within the right-of-way to find space for utilities to be relocated. Utilities may need to be relocated in order to make space for a relocated waterline, etc. Utility relocation can be a major cost driver.
- **Traffic Signal Impacts:** Two tracks operating on a single street typically require that the entire traffic signal be rebuilt, whereas a single track in a street usually requires more limited modifications to traffic signals, often by shortening a mast arm or adding a mast arm from the opposite side of the street. While this would need to be done for twice the number of intersections (each street for each traffic direction) these modifications are usually much less expensive than the full rebuild with two-direction streetcar operations.
- **Construction Impacts:** Two tracks operating in a single street, along with the associated utility relocations, typically require significantly more traffic control and staging. Construction along a street with a single track in one direction can be constructed faster/more easily and would typically require a simpler traffic staging plan.

Order-of-Magnitude Capital Cost Estimates

Figure C-1 Order of Magnitude Capital Cost Estimates

Alternative	Distance	Cost Per Mile	Order-of-Magnitude Cost Estimate (Range)
4th/5th Couplet - Mixed-Traffic	1.13 miles	$50.7M	$54,270,000 - $66,330,000
4th/5th Couplet - Exclusive	1.13 miles	$56.8M	$57,690,000 - $70,510,000
1st Avenue - Mixed-traffic	1.21 miles	$54.7M	$59,580,000 - $72,820,000
1st Avenue - Exclusive	1.21 miles	$58.1M	$63,270,000 - $77,330,000

PLANNED TIER 2 DETAILED EVALUATION CAPITAL COST METHODOLOGY

This sections describes the planned Tier 2 Evaluation methodology for developing capital cost estimates and cost categories consistent with the Federal Transit Administration's (FTA) Standard Cost Categories (SCC), which will be available for use as the project progresses into more detailed design in preliminary engineering and final design.

Format

This methodology will use a modified Construction Specifications Institute (CSI) format that allows development of comparative cost estimates suitable for an Alternatives Analysis. The capital cost estimates developed in this format will be ordered and summarized into major cost categories consistent with FTA 5309 New Starts Criteria and appropriate to the level of project definition. Cost categories can be expanded or reduced as needed to provide appropriate levels of detail.

Estimate Development

Estimates of project capital costs will be developed in three general steps under this methodology. First, potential alignment alternatives identified during initial screening and scoping will be defined in enough detail to enable the necessary analysis and conceptual engineering to be performed for cost estimating purposes. Second, project components, consistent with the application of unit costs and appropriate to the level of definition, will be identified. Quantities and appropriate unit cost data will then be developed. The capital costs will then be summarized in the various cost categories and for each alternative.

Unit Costs

Unit costs appropriate to the level of alignment definition will be developed to support this methodology. Unit costs will be developed from selected historical data including final engineer's estimates, completed projects, First Hill Streetcar bid information from 2012, Portland Streetcar Loop bid information from 2009, and standard estimating practices. Unit costs may include an aggregation of cost elements that are typically itemized in a detailed engineer's estimate. For instance, the unit cost for the track construction will likely include activities such as excavation, soil preparation, aggregate base, and rail procurement. Unit costs will also include allowances for contractor's margins such as overhead, profit and insurance costs. The capital costs will be submitted along with an update of this Capital Cost Methodology which will include a summary of assumptions/inclusions for each unit cost as well as its source of price information.

Management of Costs

Project costs can often be underestimated in the early planning stages and costs tend to grow as project development progresses. The methodology employed in the Center City Connector Transit Study will include steps to guard against the underestimation of project costs and attempt to reduce this problem. Steps included comparing unit costs to historical unit cost bid estimates and construction costs for comparable work; and identifying the specific year-of-expenditure. For the Project Alternatives Analysis, the expected year-of-expenditure will be 2015.

Cost Data Sources

The sources of data used to develop unit costs must be suitable for the type of work, local conditions and scale of the work proposed for the Project. Historical competitive bid data for comparable work is a reliable source. Recent information is the most reliable because it does not require escalation assumptions. Contract as-built prices are the most comprehensive sources because they include the total cost of construction at project closeout and acceptance.

This methodology will employ recent cost information; typically contractor's bid information or engineer's estimates for recent transit projects in Seattle and the Pacific Northwest. Unit costs will be estimated in year 2015 U.S. Dollars.

Cost Categories

Cost categories will be used to summarize the project component costs into a comprehensive total estimate for each alternative. The major cost categories are listed in Figure C-2 and described in detail below. There are five fixed facilities cost categories, five system-wide cost categories, and two dependent cost categories. Right-of-way cost will be determined during the Preliminary Engineering (PE) phase of the Project.

Figure C-2 Capital Cost Categories

- Civil Construction
- Utility Relocation Allowance
- Trackwork
- Stops
- Urban Design
- Maintenance Facility Allowance
- Traffic Control
- Temporary Traffic Control
- Traction Power
- Overhead Contact System
- Train Control and Communications
- Professional Services
- Contractor Fee
- General Conditions Requirements
- Contingency
- Vehicles

Fixed facility categories encompass site-specific project component costs. Capital costs for these categories are typically calculated by using known unit costs and measured quantities for each component. System-wide costs are calculated on an alignment length instead of from measured quantities. A per route-foot unit cost will be developed from historical data to apply to the route length of each section.

The engineering and contingency categories are dependent on the fixed facility and system-wide cost categories. The sum of the twelve categories listed above is the total capital cost estimate for an alignment segment.

The following bullets describe each of the major capital cost categories that will be used to assemble the estimates, together with specific assumptions.

- **Civil Construction** – This category includes the capital costs for infrastructure improvements necessary for each alignment alternative. The capital costs for civil construction included excavation, landscaping, driveway reconstruction, curb and gutter, sidewalk and ramps, street closure, street reconstruction, sidewalk construction, signing and striping, lighting, and drainage. Measurement will be by unit cost or the route foot for in-street transitway.

  Conceptual design drawings and typical sections will be used to form the basis for cost derivation throughout the project limits.

- **Utility Relocation Allowance** – This category includes a cost allowance for the relocation, upgrade or adjustment of all public or private utilities that may become the responsibility of the project during construction. During conceptual design, it will be assumed that most of the existing underground utilities within the immediate transitway envelope will be relocated. Exceptions may be made based on their depth and condition. Typically, three levels of utility relocations are estimated: Major, Moderate and Minor. The type, size, assumed depth and any anticipated construction complications will be considered when assigning a level to each impacted utility line. Measurement will be on a route-foot basis.
- **Transitway** *(Trackwork)* – This category includes capital costs for procurement and installation of tracks, track slab, special trackwork, crossovers, turnouts, track crossings, welding, track drains and other miscellaneous track items. Embedded trackwork is assumed as the project standard consisting of girder rail with electrical isolation embedded in a concrete slab and located in an existing traffic lane. The type of trackwork to be used in later phases of design may vary depending on funding sources and availability of materials. Measurement will be on a track-foot basis.
- **Stops** – This category includes the capital costs for fixed facilities and amenities for streetcar stops. The capital costs for stops include platforms, shelters, lighting, signage, landscaping, furnishings and sidewalks for pedestrian access. The following types of stops will be measured by this methodology: side (incorporated into the sidewalk), center (in the roadway median), and special platform. Measurement will be for each complete stop platform.
- **Urban Design** – This category includes an allowance for streetscape improvements outside the stop areas such as sidewalks, wayfinding, lighting, and public art. Measurement will be on a route-foot basis.
- **Traffic Control** – This category includes modifications to roadway signals, signing and striping to accommodate streetcar operations. For each signalized intersection along the alignment a lump sum cost will be assigned based on one of three anticipated signal treatments; add new signal (to existing unsignalized intersection), modify existing signal (expand or upgrade equipment), or add new signal phase to existing signal.
- An allowance for anticipated improvements to roadway signing and striping will be included, with measurement on a track-foot basis.
- **Temporary Traffic Control** – This category includes modifications to existing traffic control and temporary measures to accommodate traffic operations during construction. Measurement will be by the route-foot.
- **Traction Power** – This category includes capital costs for the system to support electrical power to the streetcar vehicles. The system consists of traction power substations and the associated overhead contact system (OCS). This category includes installation and testing of the system equipment. Measurement will be by the route-foot.

  Pole foundations are included as part of the Civil Construction category.
- **Train Signal and Communications System** – This category includes capital costs for the train control and signal system consisting of track switch control equipment, signals, cables and train detection equipment, with measurement by the route-foot. Also included is an allowance for communications elements such as fiber optic cable and field and central control equipment to remotely monitor and control track switches, signals,

traction power substations, and other systems equipment, with measurement by the route-foot.

- **Maintenance Facility Allowance** – This category includes an allowance for expansion of vehicle storage and maintenance facilities, and equipment needed to support each new streetcar vehicle. Anticipated facility needs will be identified as vehicle fleet and operating scenarios are developed. Measurement will be lump sum with cost based on historic costs of similar facilities.[2]
- **Professional Services** – This category includes the costs for engineering, administration and construction management services. Costs for these services are based on a percentage of the total cost of all direct capital cost categories. Cost items for this category will be as follows:
  - Preliminary Engineering – 4%
  - Final Design – 6%
  - Project Management for Design Construction – 5%
  - Construction Administration and Management – 8%
  - Insurance – 2%
  - Legal (permits and review fees by other agencies, cities, etc.) – 3%
  - Survey, Testing, Investigation, Inspection – 3%
  - Start-Up Costs and Agency Force Account Work – 1%

  The total percentage applied to all capital cost categories except contingencies will be 32%.
- **Contractor Fee** – It is currently assumed that the construction contract will be performed with a General Contractor / Construction Manager (GC/CM) method. Therefore, a contractor fee of 3.5% will be applied to those elements likely included in the construction contract.
- **General Conditions Requirements** – This category includes construction support items as required in the project specifications such as survey, field office, and supervisory staff.
- **Contingencies** – This cost category accounts for the uncertainties inherent in project definition and conceptual design at the alternatives analysis phase. A contingency will be added to the project cost as a percentage of all the capital cost categories except Professional Services. Contingency costs will be calculated as 30% of all capital costs, including vehicles. Contingency should reflect the degree of risk associated with the level of design detail available and the characteristics of the design component. The contingency for future design stages will be reduced as the design process progresses.
- **Vehicles** – This category includes capital costs for procuring new streetcar vehicles compatible with the existing streetcar system and the needs identified for this project. It is assumed that the vehicles will be Buy-America compliant. The number of vehicles will be based on the proposed operating plans.

[2] Both the SLU and FH Streetcar maintenance facilities have unutilized vehicle maintenance capacity; the cost estimates for the Center City Connector will include only costs for additional vehicle storage capacity and spare parts.

APPENDIX D RIDERSHIP ESTIMATES

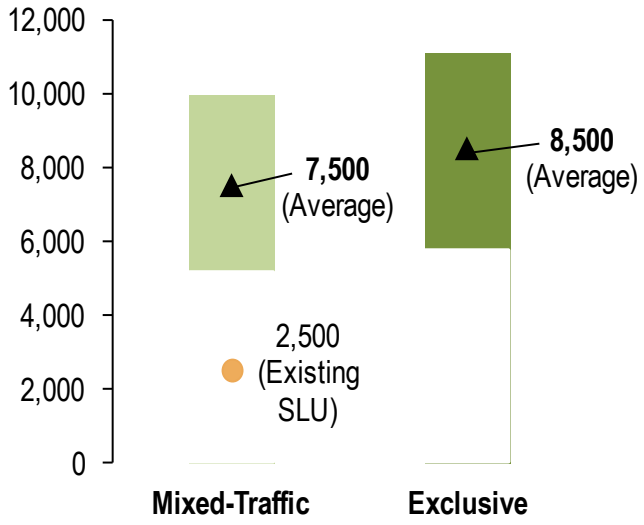
Note: This appendix supplements the evaluation results for Objective C2 that are provided in the Tier 1 Report.

This appendix describes the peer-based ridership forecasting methodology used to estimate ridership for the Tier 1 analysis. It also describes the more detailed ridership forecasting approach planned (currently underway) for the Tier 2 evaluation, using the newly released STOPS model developed by the Federal Transit Administration (FTA). Additional detail on ridership forecasting is provided in the Center City Connector Methodology Report (and Appendix D of that report). The methodology report recommended against using the STOPS model, based on concerns about release availability and the risk of using a newly released and relatively untested model for Center City Connector ridership forecasting. These concerns were allayed after discussion with the FTA. The STOPS model is currently being implemented by the Center City Connector team for use in evaluating ridership in the Tier 2 evaluation.

TIER 1 RIDERSHIP ESTIMATION METHODOLOGY

A peer-based method was used to estimate ridership potential for the Center City Connector alternatives. A similar model was utilized for the Seattle Transit Master Plan (TMP). Productivity and ridership (per mile) on comparable urban rail circulators was adjusted (up or down) based on factors including land use density, major generators, level of tourist visitation, system connectivity, frequency, and design speed/ priority. Portland, Seattle (SLU Streetcar), Tacoma, Memphis, and San Francisco were used as relevant peers. There was no significant difference between ridership for the 4th/5th Avenue and 1st Avenue alignments at this level of analysis. However, based on characteristics such as exclusive right-of-way, high-level of transit priority, longer stop spacing, etc., either Exclusive alternative had a higher level of estimated ridership than the Mixed-Traffic alternatives. Figure D-1 illustrates the low-end, high-end, and average ridership estimates for the Mixed-Traffic and Exclusive alternatives.

Figure D-1 Center City Connector Tier 1 Ridership Estimate, Average Daily Weekday Riders, Complete System (SLU, Center City Connector, First Hill)



TIER 2 RIDERSHIP ESTIMATION METHODOLOGY: FTA STOPS MODEL

Over the past few years the FTA has been encouraging the use of data-driven models to forecast transit ridership as an alternative to regional modeling. These data-driven models are important to consider, especially for areas that may not have on-the-shelf modeling capabilities and/or that don't have a recently calibrated and validated model with the mode being studied. To that end, FTA developed an independent model known as STOPS (Simplified Trips-On-Project Software).

The STOPS model is a modified 4-step model that has been calibrated nationally, against six transit systems that all include fixed-guideway investments. It has been validated against count data for ten other fixed-guideway transit systems. Essentially this model predicts zone-to-zone travel by purpose and assigns trips to GTF networks and reports out station-to-station trip tables and volumes on transit lines and links.

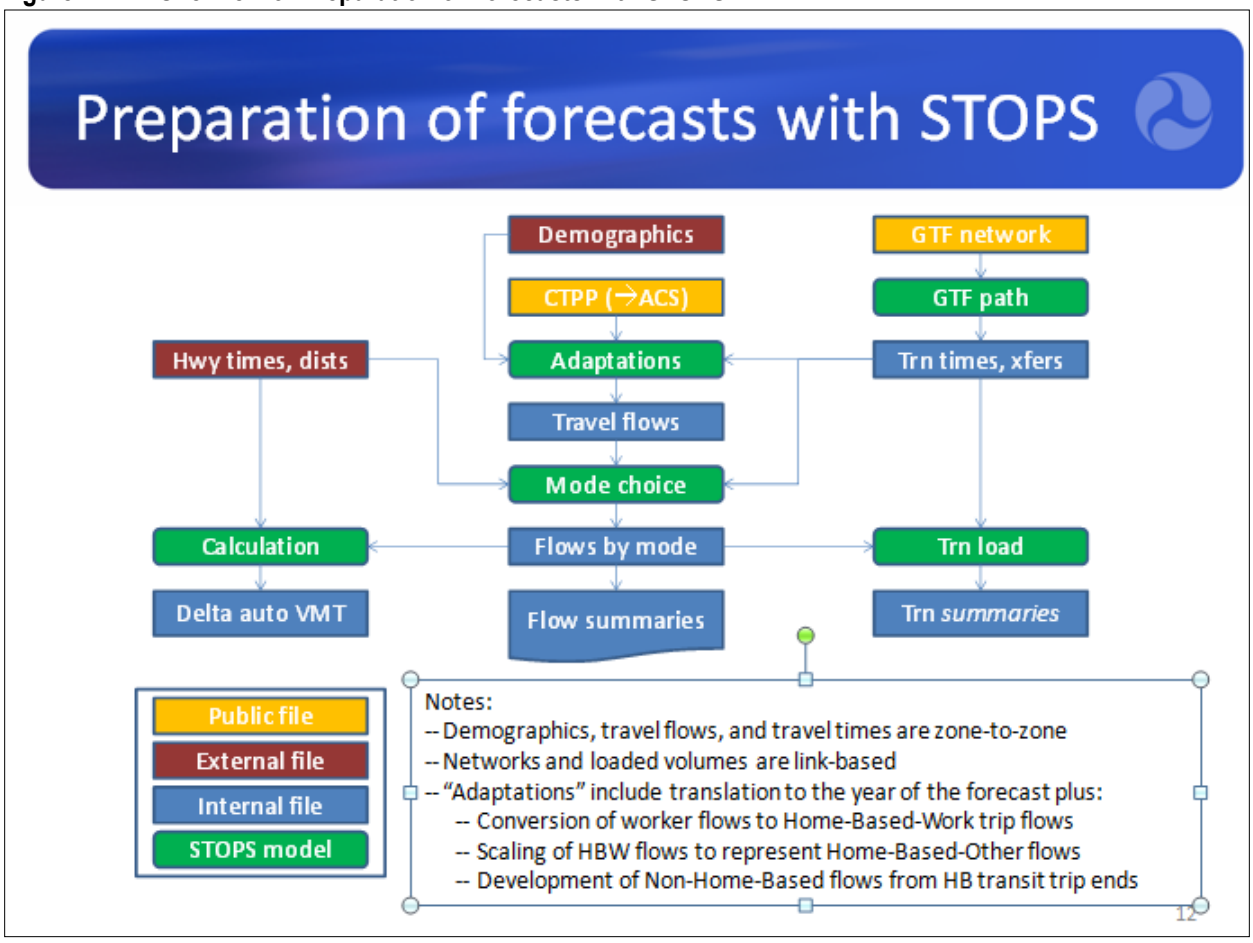
Figure D-2 indicates the types and sources of files that are used by STOPS to arrive at transit ridership forecasts. These include:

- General Transit Feed (GTF) files to represent transit service networks in a nationally consistent way
- CTPP (Census Transportation Planning Package) 2000 files to describe metro-area worker flows in a nationally consistent way
- Metro-area demographic forecasts
- Metro-area highway impedances
- A set of mode choice models that varies by trip purpose (work, home-based other, non home-based)
- Nationally developed coefficients and constants

As noted, Census and Google Transit Feed inputs are designated as "public." Demographics and highway times/distances are designated as "external;" these inputs need to be provided at a zone level for the project area. The current version of STOPS works off of Census year 2000 (CTPP) data. When 2010 data (American Community Survey or ACS) is released the STOPS model will be updated to a new release. For the Seattle Center City Connector Project, because the current version works from year 2000 data, the ridership modeling team will document significant changes between the year 2000 and 2010, and determine whether or not a future adjustment will be required to better reflect these changes.

In the process of running the STOPS model the user defines the base year (current year) as well as an opening year and/or a horizon year. The horizon year is optional and will require the inclusion of demographics and transit system definition for the year selected. The opening year is currently being identified for the Tier 2 evaluation.

Figure D-2 Overview of Preparation of Forecasts with STOPS



Source: FTA

APPENDIX E BUS OPERATIONS ANALYSIS

Note: This appendix supplements the evaluation results for Objectives E1 and C2 that are provided in the Tier 1 Report.

This Appendix describes the methodology used to assess impacts to transit operations for alignment alternatives on 4th and 5th Avenues. Alignments on 1st Avenue would have minimal impacts to transit service, as there is currently only one route operating on 1st Avenue (Route 99). This memo includes a description of the methodology and assumptions used in generating estimates of the aggregate delay to both bus vehicles and passengers resulting from a streetcar alignment on 4th and 5th Avenues. It also summarizes analysis of potential stop capacity impacts at a critical bus zone on 4th Avenue.

TIER 1 ANALYSIS METHODOLOGY

Bus Volumes and Time Period

The bus delay analysis conducted for the Tier 1 Screening assessed impacts to bus routes operating on 4th and 5th Avenues on weekdays between 5:00 and 6:00 PM. Bus volumes were obtained using published schedules and route alignments from King County Metro, Sound Transit, and Community Transit. Volumes and routing for all King County Metro routes were verified by King County Metro staff.

Additionally, because all bus routes currently operating in the Downtown Transit Tunnel (DSTT) are expected to move to surface streets when Link light rail expansions absorb all of the DSTT's capacity, all routes that currently operate in the DSTT were assigned to surface streets. Most routes were assumed to operate using 4th NB and 2nd SB, given that the 3rd Avenue transitway is currently very near maximum capacity. Any additional capacity on 3rd caused by service restructuring associated with opening of University Link was assumed to be replaced with more service on other local routes. Routes currently operating in the tunnel that were assumed to operate on 4th NB include: 41, 76, 77, 101, 106, 150, 255, 316, 550.

Two routes that currently operate in the tunnel were assumed to operate on 5th SB: Routes 255 and 550. Route 255 currently uses the 4th/5th couplet when the tunnel is closed, and Route 550 was assumed to use the 4th/5th couplet that Route 545 currently uses.

Total bus volumes for 4th and 5th Avenues by block are shown in Figure E-1 and Figure E-2. Routes that currently operate in the DSTT are shown in red text.

Figure E-1 Trips per Route by Block, 4th Ave

ROUTE	Jackson-Main	Main-Washington	Washington-Yesler	Yesler-Jefferson	Jefferson-James	James-Cherry	Cherry-Columbia	Columbia-Marion	Marion-Madison	Madison-Spring	Spring-Seneca	Seneca-University	University-Union	Union-Pike	Pike-Pine	Pine-Olive/Stewart
5/21	4	4														
7	8	8														
14	4	4														
15	2	2														
17	3	3														
18	2	2														
19/24/124	4	4														
25	1	1														
131/132/28/26	6	6														
29	5	5														
33	2	2														
36	10	10														
40	4	4														
41	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
64												4	4	4	4	4
76	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
77	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
106	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
101	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
116	1	1														
150	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
212	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
217	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
250	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
252	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
255	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
257	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
260	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

ROUTE	Jackson-Main	Main-Washington	Washington-Yesler	Yesler-Jefferson	Jefferson-James	James-Cherry	Cherry-Columbia	Columbia-Marion	Marion-Madison	Madison-Spring	Spring-Seneca	Seneca-University	University-Union	Union-Pike	Pike-Pine	Pine-Olive/Stewart
265												3	3	3	3	3
268	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
301	6	6	6	6	6	6	6	6	6	6	6	6	6	6		
306	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
308	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
311	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
312	6	6	6	6	6	6	6	6	6	6	6	6	6	6		
316	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
358	9	9														
402	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
405	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
410	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
415	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
417	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
422	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
424	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
510	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
511	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
512	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
513	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
522	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
545	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
550	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
554	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
578												2	2	2	2	2
590	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Figure E-2 Trips per Route by Block, 5th Avenue

Route	Jackson-Main	Main-Washington	Washington-Jefferson	Jefferson-Yesler	Jefferson-James	James-Cherry	Cherry-Columbia	Columbia-Marion	Marion-Madison	Madison-Spring	Spring-Seneca	Seneca-University	University-Union	Union-Pike	Pike-Pine	Pine-Olive/Stewart
111	3	3														
114	2	2														
210	2	2														
212	8	8														
214	4	4														
215	1	1														
255	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
358	5	5	5													
510	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
511	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
512	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
545	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
550	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
554	3	3														

Study Area

The analysis included all routes operating on any block of 4th/5th between Washington Street and Olive Way. For each block, the number of trips made by each route was recorded. The study area therefore included the two blocks from Jackson Street to Main Street and Main to Washington, which are used by a number of local routes to access the 3rd Avenue transitway traveling northbound.

Alternatives Analyzed

In the Tier 1 evaluation, bus delay analysis was conducted for the Mixed-Traffic and Exclusive Alternatives on 4th/5th Avenues (Alternatives A1 and A2). These alternatives were compared to the No Build scenario used for traffic modeling. Because 1st Avenue has very minimal transit service, streetcar impacts to bus vehicles and passengers would be minimal.

The Tier 2 evaluation will consider multiple east-west connection alternatives, including potential transit impacts such as to regional transit operating on Stewart Street.

Bus Vehicle Delay

Average delay in seconds per vehicle by block was calculated by the traffic modeling team using a combination of Synchro and Excel. The Synchro analysis was based on the 2030 no-toll scenario from the Alaskan Way Viaduct (AWV) model. Figure E-5 illustrates these travel times by segment. The delay per vehicle was applied to each bus trip at the block-level within the study area to calculate the total delay per route for each segment of the alignment and the aggregate delay to all routes for each alternative. For blocks where the traffic modeling indicated an improvement in travel time compared to the No Build scenario, the improvement was calculated in the same manner as delay and subtracted from the net delay. The inputs from the traffic model are shown in Figure E-3 and Figure E-4.

Figure E-3 Vehicle Delay by Block, 4th Avenue

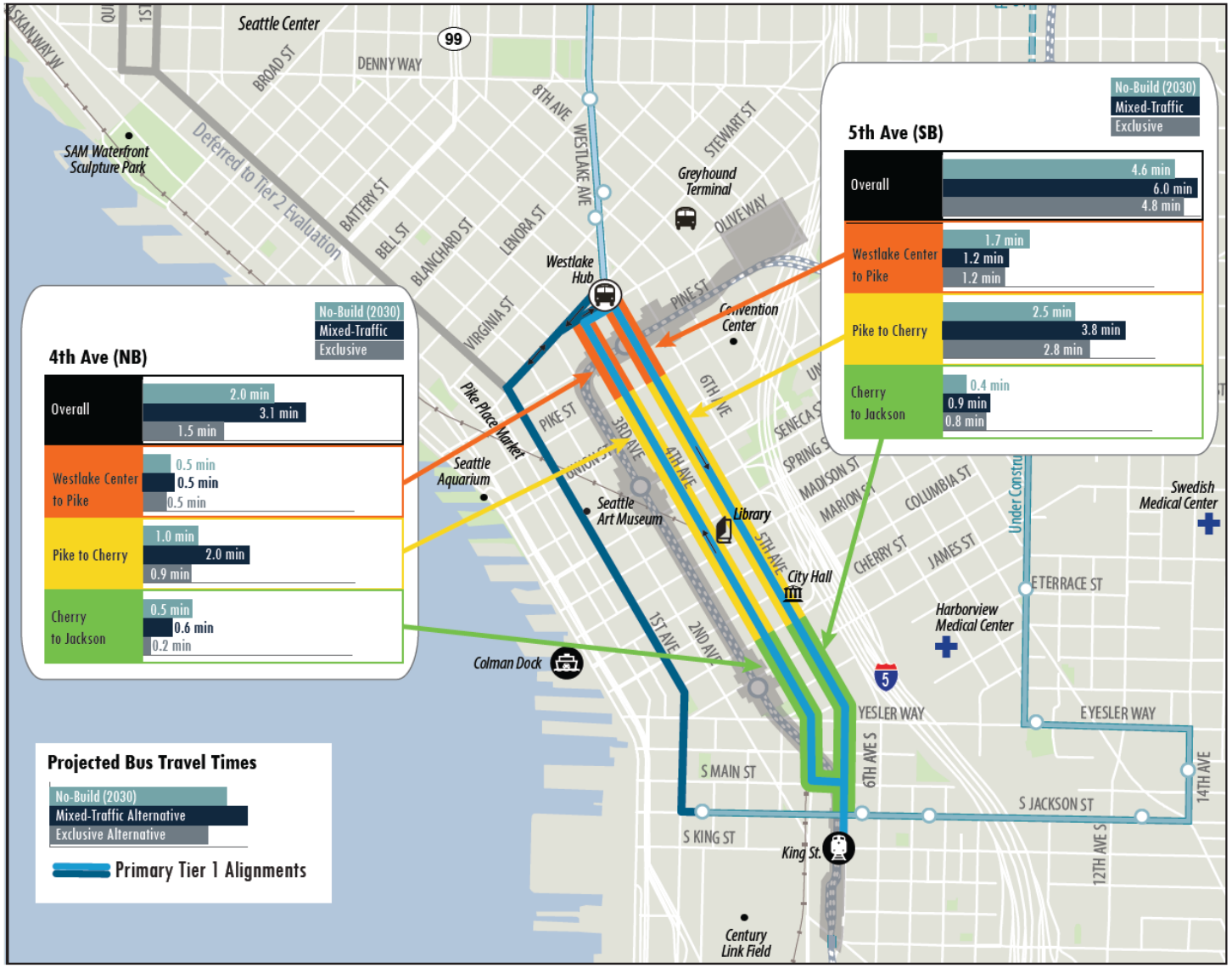
Block #	Block Name	4th Ave				
		No Build	Mixed-Traffic		Exclusive	
		Delay (sec/veh)	Delay (sec/veh)	Difference from No Build	Delay (sec/veh)	Difference. from No Build
1	Main-Washington	4.7	6.1	1.4	3.0	-1.7
2	Washington-Jefferson[1]	8	13.6	5.6	0.3	-7.7
3	Jefferson-James	6.6	5.2	-1.4	1.7	-4.9
4	James-Cherry	7.9	9.0	1.1	4.3	-3.6
5	Cherry-Columbia	6.7	4.8	-1.9	4.7	-2
6	Columbia-Marion	19.9	64.3	44.4	25.5	5.6
7	Marion-Madison	7.9	8.0	0.1	3.9	-4
8	Madison-Spring	2.5	5.4	2.9	4.4	1.9
9	Spring-Seneca	5.1	7.9	2.8	3.4	-1.7
10	Seneca-University	12.7	22.6	9.9	6.8	-5.9
11	University-Union	4.4	5.1	0.7	4.6	0.2
12	Union-Pike	3.7	4.0	0.3	2.2	-1.5
13	Pike-Pine	19.2	19.0	-0.2	9.4	-9.8
14	Pine-Olive/Stewart	4.2	6.5	2.3	11.6	7.4
15	Olive/Stewart-Virginia	6.9	6.8	-0.1	6.2	-0.7

Figure E-4 Vehicle Delay by Block, 5th Avenue

Block #	Block Name	5th Ave				
		No Build	Mixed		Exclusive	
		Delay (sec/veh)	Delay (sec/veh)	Difference from No Build	Delay (sec/veh)	Difference from No Build
1	Virginia-Olive/Stewart	28.9	16.9	-12.0	10.9	-18
2	Olive/Stewart-Pine	12.3	18.3	6	19	6.7
3	Pine-Pike	58.4	39.2	-19.2	41.5	-16.9
4	Pike-Union	17.9	33.2	15.3	30.3	12.4
5	Union-University	13	29.6	16.6	24	11
6	University-Seneca	9.3	63.5	54.2	44.4	35.1
7	Seneca-Spring	10.4	41.6	31.2	26.9	16.5
8	Spring-Madison	42.3	22.8	-19.5	11.5	-30.8
9	Madison-Marion	39.6	18.7	-20.9	8.7	-30.9
10	Marion-Columbia	5.3	7.0	1.7	10.4	5.1
11	Columbia-Cherry	12.5	14.1	1.6	10.7	-1.8
12	Cherry-James	8.5	33.0	24.5	25.4	16.9
13	James-Jefferson	3.6	4.7	1.1	5.5	1.9
14	Jefferson-Terrace	2.1	2.6	0.5	2.9	0.8
15	Terrace-Washington	4.9	7.6	2.7	8.2	3.3
16	Washington-Main	7.4	5.7	-1.7	6.4	-1

[1] Washington-Jefferson is a combined segment in the traffic data for 4th

Figure E-5 Bus Travel Times by Segment, 4th and 5th Avenues, 2030



Bus Passenger Delay

In order to estimate the aggregate delay to passengers, the analysis used average load for each route from automated passenger counter (APC) data from King County Metro as a high-level (likely conservative) estimate of load during the PM peak period. The delay per route during the peak was then multiplied by the average load to calculate the net delay to passengers.

STOP CAPACITY ANALYSIS

In the Exclusive Streetcar alternative on 4th Avenue, the Streetcar would operate in the second lane from the eastern curb, weaving to the eastern curbside lane at stations. The transit operations analysis also considered impacts to bus stop capacity. This is particularly critical at the northern end of 4th where bus stops and streetcar stations may need to be located on the same block, i.e., between Pike and Pine Streets. Figure E-6 identifies the bus zone in this block as one of the critical bus zones (from a stop capacity perspective) on 4th Avenue and Metro estimates a capacity of 70 buses per hour in the PM peak. The bus delay analysis described above identified 114 buses per hour in this segment of 4th, including routes potentially moving from the DSTT.

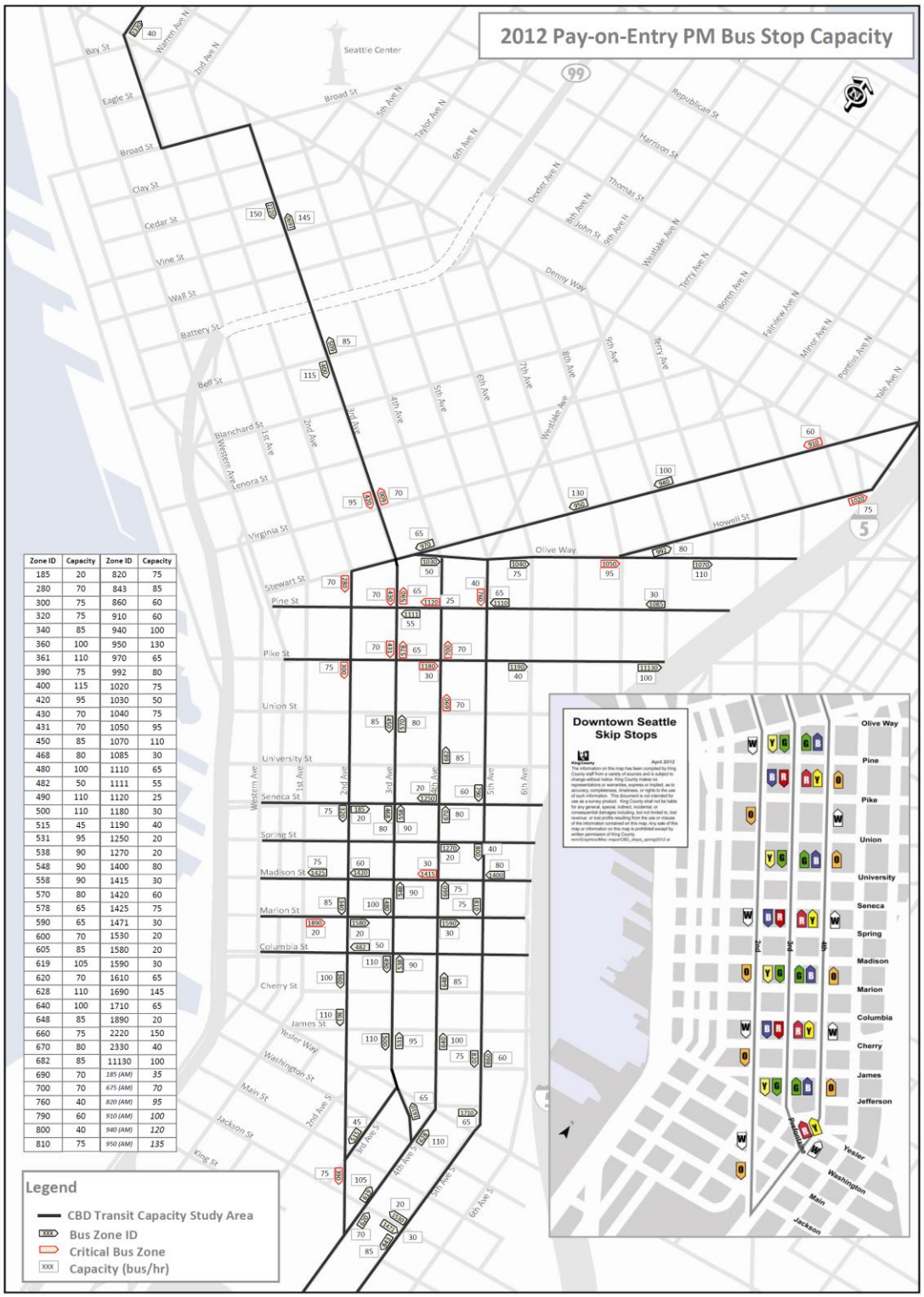
This does not include any potential reduction in stop capacity due to the streetcar, which is primarily of concern where streetcar and buses would stop in the same block of 4th between Pike and Pine. URS estimated the amount of curb space required for a curbside stop platform on 4th Avenue as well as for the streetcar to weave back to the second lane from the curb in this alternative. Figure E-7 shows that about 108 feet would be required for the streetcar to complete the "weave" movement, for a total of nearly 180 feet. This implies that the south end of Metro bus stops on 4th Avenue would likely need to start a minimum of 200 feet from the upstream intersection. The length of this block is approximately 400 feet and the bus stop zone currently starts about 125 south of the Pine intersection, reducing available bus stop space to approximately 75 feet without causing delay to the streetcar.

KEY ASSUMPTIONS/LIMITATIONS

Limitations or key assumptions for this analysis included:

- For routes assumed to move out of the DSTT, whether they would use 4th/5th or other streets.
- Average passenger load by trip is used as a proxy for actual passenger load by stop on 4th and 5th Avenues on bus trips between 5:00 – 6:00 PM.
- The stop capacity analysis did not consider 5th Avenue but focused on 4th, which has higher bus volumes, and also focused on a critical stop on 4th Avenue. However, a more comprehensive analysis could be performed for 4th and 5th Avenues in Tier 2, if an alternative on these alignments is advanced for more detailed analysis.

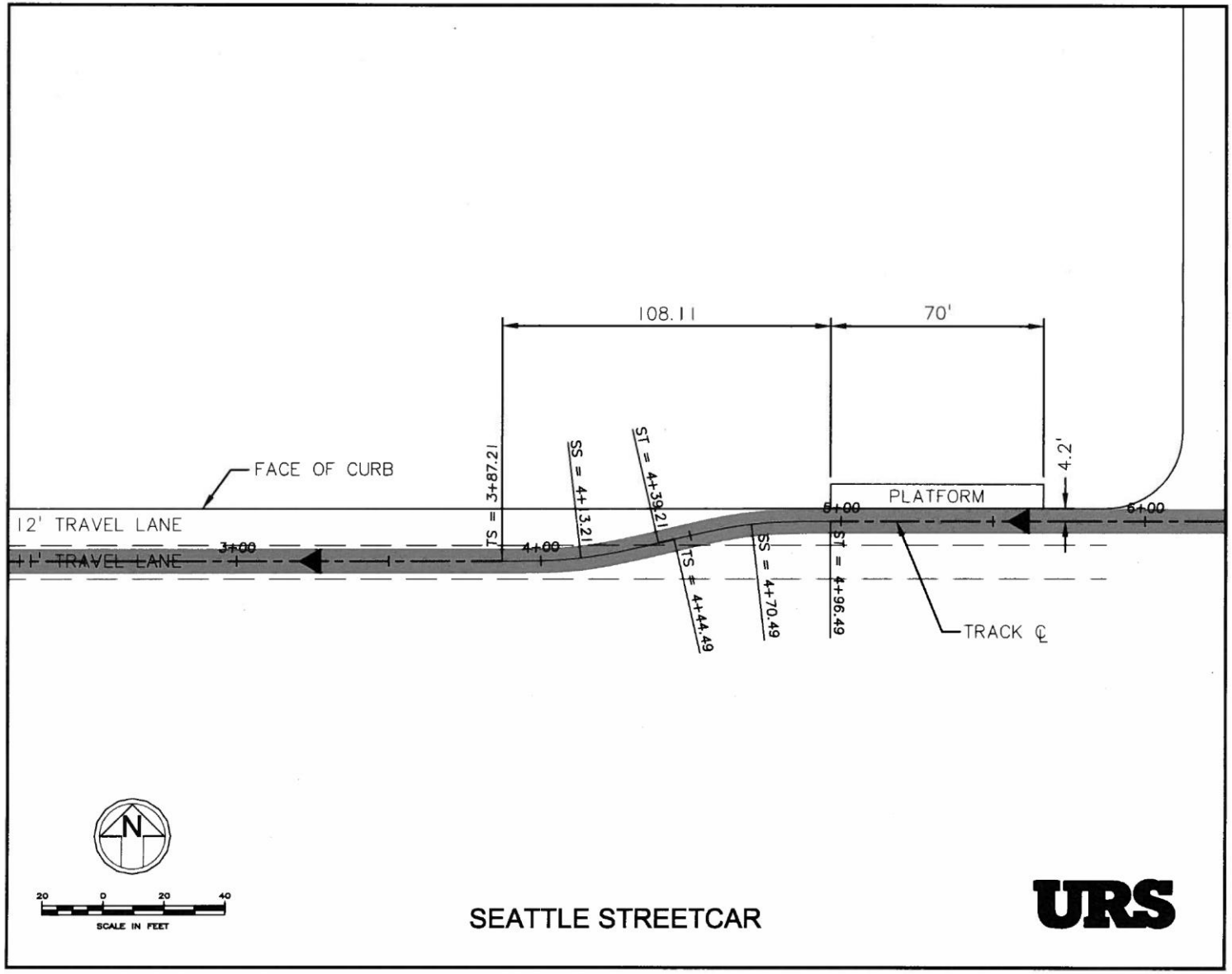
Figure E-6 Metro Skip-Stop Operations, Bus Zone Capacity, and Critical Bus Zones



Zone ID	Capacity	Zone ID	Capacity
185	20	820	75
280	70	843	85
300	75	860	60
320	75	910	60
340	85	940	100
360	100	950	130
361	110	970	65
390	75	992	80
400	115	1020	75
420	95	1030	50
430	70	1040	75
431	70	1050	95
450	85	1070	110
468	80	1085	30
480	100	1110	65
482	50	1111	55
490	110	1120	25
500	110	1180	30
515	45	1190	40
531	95	1250	20
538	90	1270	20
548	90	1400	80
558	90	1415	30
570	80	1420	60
578	65	1425	75
590	65	1471	30
600	70	1530	20
605	85	1580	20
619	105	1590	30
620	70	1610	65
628	110	1690	145
640	100	1710	65
648	85	1890	20
660	75	2220	150
670	80	2330	40
682	85	11130	100
690	70	*185 (AM)*	*35*
700	70	*675 (AM)*	*70*
760	40	*820 (AM)*	*95*
790	60	*910 (AM)*	*100*
800	40	*940 (AM)*	*120*
810	75	*950 (AM)*	*135*

Source: King County Metro

Figure E-7 Streetcar Station Curb Capacity Requirements



APPENDIX F ECONOMIC DEVELOPMENT ANALYSIS

Note: This appendix supplements the evaluation results for Objective D1 that are provided in the Tier 1 Report.[1]

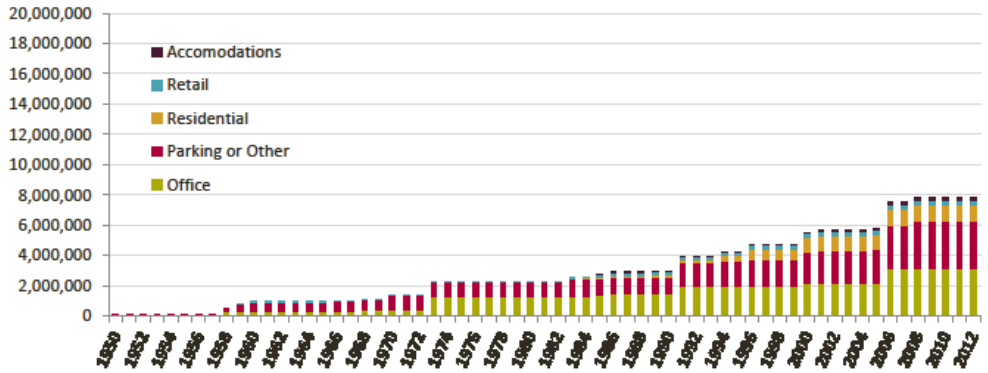
The Tier 1 economic development analysis was conducted to determine how well each corridor meets the "Develop" criteria D1: Promote new development where residents and workers have transportation options. The analysis considered the capacity for new investment, potential for transit to influence future development, and connections to jobs and housing as screening criteria for each corridor. Supplementing the supporting maps for criteria D1 that are included in the Tier 1 Report, additional background information used to conduct the analysis and develop ratings for each corridor is included in Figure F-1 and Figure F-2.

Figure F-1 Existing Economic Activity

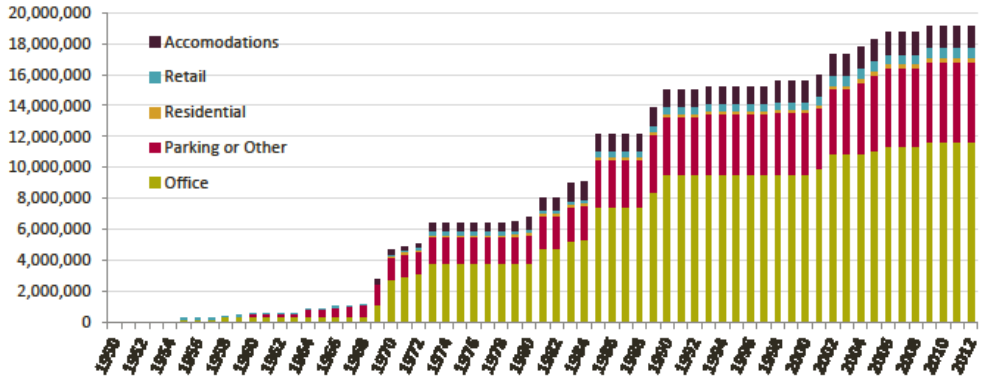
Economic Characteristics	First Avenue Corridor	4th/5th Avenue Corridor
Estimated employment	37,631	65,869
Housing units	2,538	1,128
Population	3,270	1,539
Total assessed value of property	$2,428,726,800	$4,298,818,600
Property Characteristics		
Total acres	49.6	67.1
No. of parcels	188.0	145.0
Avg parcel size	11,499	20,154
Total square feet of buildings	14,120,887	26,111,056
No. of buildings	162.0	121.0
Avg building size	87,166	215,794
Avg age of structure (weighted by size)	1954	1967
Pct of of space built or renovated since 1990	50.7%	60.4%
Building Quality (pct of total buidlings)		
Low	5.6%	6.6%
Average	68.5%	53.7%
Good	25.9%	39.7%

Figure F-2 Historic Development Activity

First Avenue Corridor



4th/5th Avenue Corridor



APPENDIX G URBAN FORM ASSESSMENT

Note: This appendix supplements the evaluation results for objective S1 that are provided in the Tier 1 report.

This appendix summarizes the urban form assessment conducted on both of the primary corridors, including 1st Avenue and 4th/5th Avenues.[1] This assessment was used to evaluate how well each corridor meets the "Sustain" evaluation criteria: "Maximize place-making opportunities" and "Enhance the safety of all roadway users."

The assessment was conducted by walking the alignment, visually observing, recording and photographing the general conditions and characteristics of the following urban design elements:

- Sidewalk paving
- Pedestrian crossings
- Transit facilities
- Adjacent uses
- Pedestrian lighting
- Pedestrian amenities
- Unique places/buildings
- Small business opportunities

It is difficult to make a generalization about each of these elements over the full extent of each entire alignment. Generally, however, the pedestrian conditions are fair to good for almost all areas of the both alignments with only minor areas of relative deficiency. It did not appear that either particular option offered either extensively poor conditions that would need to be improved. The urban form assessment ratings are provided in the Tier 1 Report; the following pages include images and detailed descriptions of each block of each corridor.

[1] Prepared by VIA Architecture

5th & Pine
Facing south

5th & Pike
Facing south

5th & Union
Facing north

5th & Union
Facing south

	5TH AVENUE - OLIVE/PINE
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop, monorail terminus
Adjacent uses	Westlake Center - display windows
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Canopies, bike rack, planters
Unique places or buildings	Adjacent Westlake Center plaza
Small business opportunities	Only storefront space on this block is at corner of 5th & Olive

	5TH AVENUE - PINE/PIKE
Sidewalk paving	Excellent condition
Pedestrian crossings	At block ends & mid-block crossing
Transit facilities	N/A
Adjacent uses	Retail storefronts
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Canopies, street trees
Unique places or buildings	N/A
Small business opportunities	Continuous retail frontage along block

	5TH AVENUE - PIKE/UNION
Sidewalk paving	Excellent condition, large mid-block curb cut & hotel drop-off area
Pedestrian crossings	At block ends & mid-block crossing
Transit facilities	N/A
Adjacent uses	Retail storefronts, Red Lion Hotel
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Canopies, bike rack, street trees
Unique places or buildings	N/A
Small business opportunities	Retail frontage at north and south ends of block

	5TH AVENUE - UNION/UNIVERSITY
Sidewalk paving	Excellent condition, steep south half of block
Pedestrian crossings	At block ends & mid-block crossing
Transit facilities	N/A
Adjacent uses	Rainier Square - some retail frontage
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Some canopies, trash can, street trees and shrubs
Unique places or buildings	N/A
Small business opportunities	Retail frontage at north and south ends of block

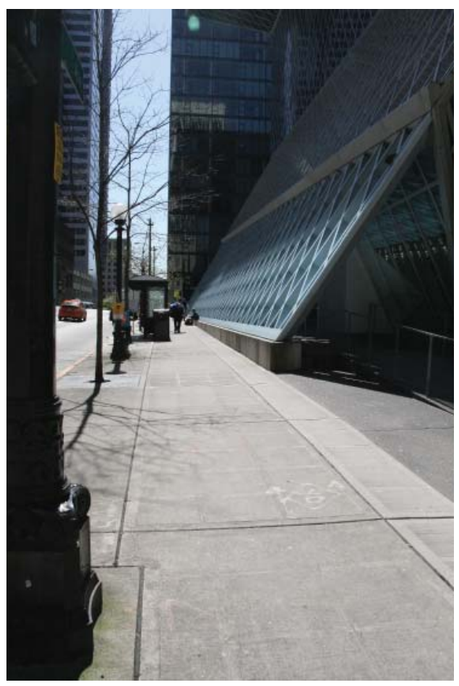
5th & University
Facing south

5th & Spring
Facing north

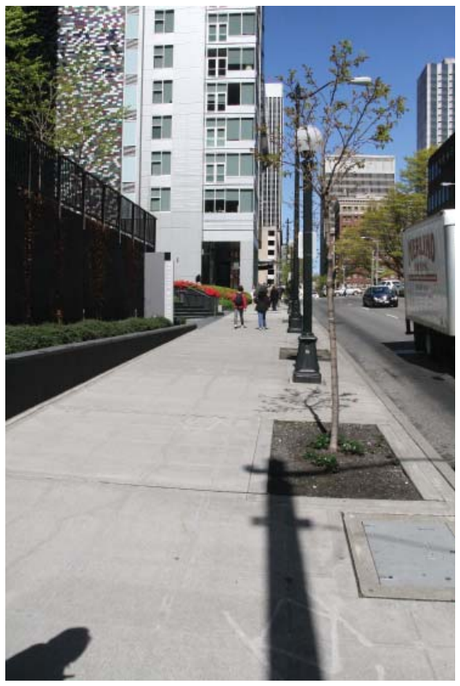
	5TH AVENUE - UNIVERSITY/SENECA
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	None existing
Adjacent uses	Fairmont Olympic hotel - blank facade for almost entire length of block
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Trash cans, street trees, bike racks, news kiosk
Unique places or buildings	N/A
Small business opportunities	N/A

	5TH AVENUE - SENECA/SPRING
Sidewalk paving	Good condition, two large curb cuts for parking garage entry/exit
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Olympic Garage - structured parking
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Street trees
Unique places or buildings	N/A
Small business opportunities	Potential for temporary use (food truck) inside parking structure along street

5th & Spring
Facing south



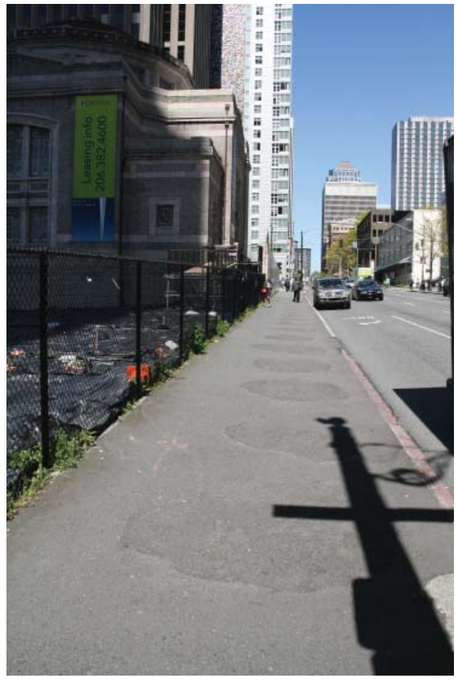
5th & Marion
Facing north

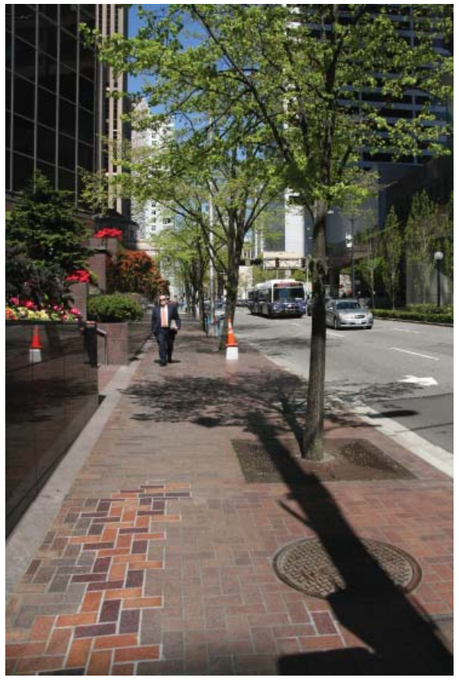


	5TH AVENUE - SPRING/MADISON
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop with shelter
Adjacent uses	Seattle Public Library
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Newspaper boxes, street trees, covered walkway adjacent library
Unique places or buildings	Seattle Public Library
Small business opportunities	N/A

	5TH AVENUE - MADISON/MARION
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop
Adjacent uses	Condo with street-level restaurant space, office building
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Street trees, publicly-accessible private plaza mid-block
Unique places or buildings	N/A
Small business opportunities	N/A

5th & Columbia
Facing north





5th & Cherry
Facing north

	5TH AVENUE - MARION/COLUMBIA
Sidewalk paving	Narrow sidewalk, needs repair - will be replaced with new construction
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	N/A - site under construction
Pedestrian lighting	N/A
Pedestrian amenities	N/A
Unique places or buildings	Historic Sanctuary building
Small business opportunities	N/A

	5TH AVENUE - COLUMBIA/CHERRY
Sidewalk paving	Excellent condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Columbia Tower - high-rise office
Pedestrian lighting	Tall, cobra-head lamps at block ends
Pedestrian amenities	Street trees, newspaper boxes, publicly-accessible private plaza
Unique places or buildings	N/A
Small business opportunities	N/A

5th & James
Facing north

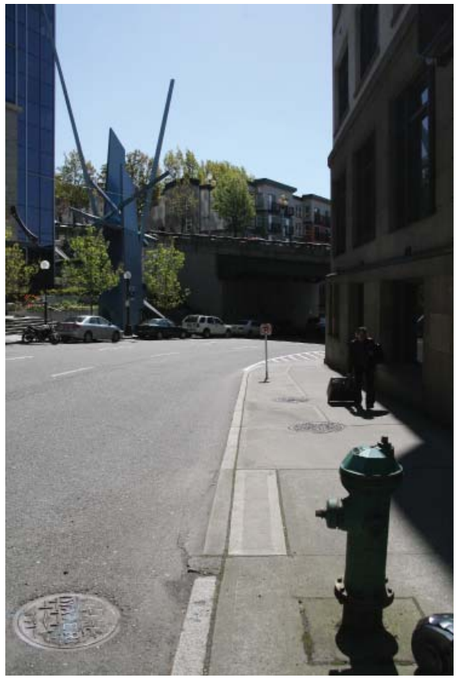
5th & James
Facing south

	5TH AVENUE - CHERRY/JAMES
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	City Hall
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Street trees, bike racks, trash cans, covered walkway adjacent building
Unique places or buildings	City Hall
Small business opportunities	N/A

	5TH AVENUE - JAMES/JEFFERSON
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop with shelter
Adjacent uses	King County Administration Building - bldg. frontage set back from street wall
Pedestrian lighting	Tall, cobra-head lamps at block ends
Pedestrian amenities	Publicly-accessible private plaza,trees and landscaping in building setback
Unique places or buildings	King County Administration Building
Small business opportunities	N/A

5th & Jefferson
Facing south

5th & Terrace
Facing south

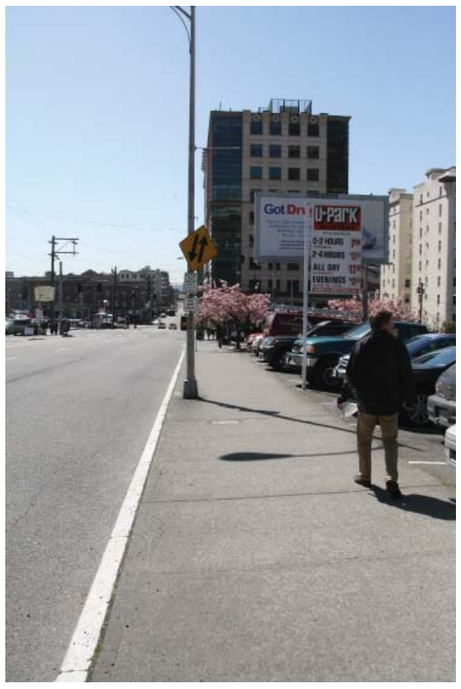


	5TH AVENUE - JEFFERSON/TERRACE
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Chinook Building - government offices
Pedestrian lighting	Tall, cobra-head lamps and pedestrian-scale streetlamps
Pedestrian amenities	Street trees, bike racks, canopies
Unique places or buildings	N/A
Small business opportunities	N/A

	5TH AVENUE - TERRACE/YESLER
Sidewalk paving	Good condition - narrow sidewalk
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Government offices
Pedestrian lighting	Tall, cobra-head lamps at block ends
Pedestrian amenities	N/A
Unique places or buildings	N/A
Small business opportunities	N/A

5th & Washington
Facing north

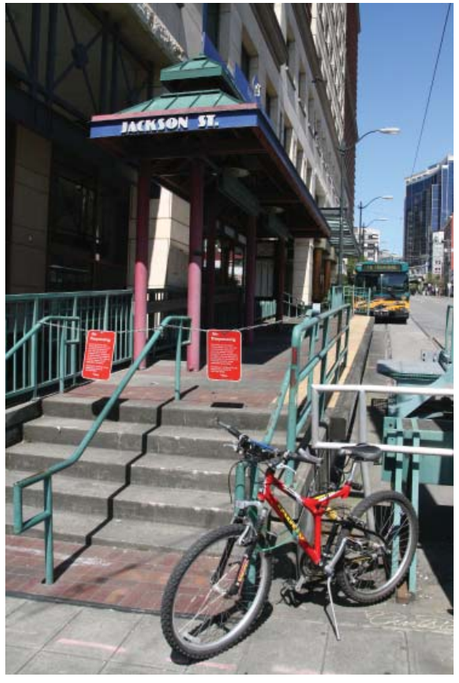
5th & Main
Facing south



	5TH AVENUE - YESLER/WASHINGTON
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Downtown Emergency Services Center, long blank facade
Pedestrian lighting	Tall, cobra-head lamps and one pedestrian-scale streetlamp
Pedestrian amenities	Street trees, landscaping in building setback
Unique places or buildings	N/A
Small business opportunities	N/A

	5TH AVENUE - WASHINGTON/MAIN
Sidewalk paving	Good condition, narrow sidewalk
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Surface parking lot
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees on south end of block
Unique places or buildings	N/A
Small business opportunities	N/A (unless redeveloped)

5th & Main
Facing south

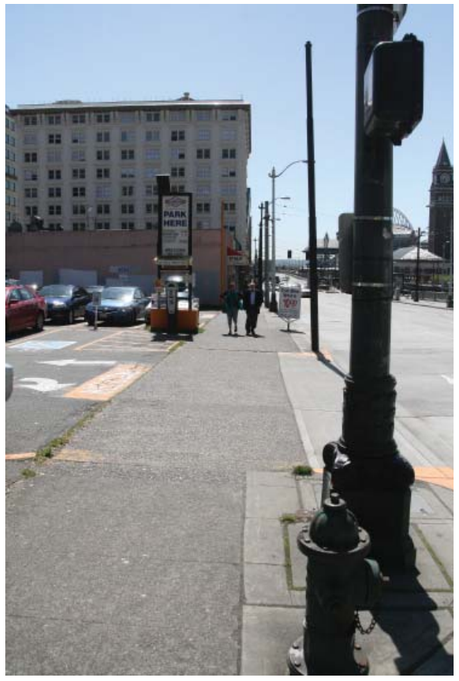


5th & Jackson
Facing north

	5TH AVENUE - MAIN/JACKSON
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop, streetcar stop (not in use)
Adjacent uses	Office building
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street tree, canopy at bus stop, bike racks, covered walkway adjacent building
Unique places or buildings	N/A
Small business opportunities	N/A

5th & Main
Facing north

5th & Washington
Facing south



	4TH AVENUE - JACKSON/MAIN
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop in median
Adjacent uses	Surface parking lot, apartment building with ground-floor retail
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Water fountain, newspaper box, mailbox
Unique places or buildings	N/A
Small business opportunities	Small retail frontages on north half of block, some vacant

	4TH AVENUE - MAIN/WASHINGTON
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Retail, surface parking
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	N/A
Unique places or buildings	N/A
Small business opportunities	Small retail frontages on south half of block, some vacant

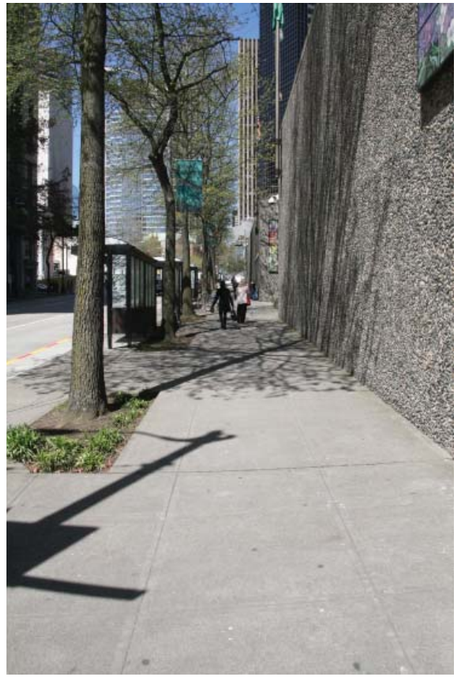
4th & Yesler
Facing south

5th & Jefferson
Facing south

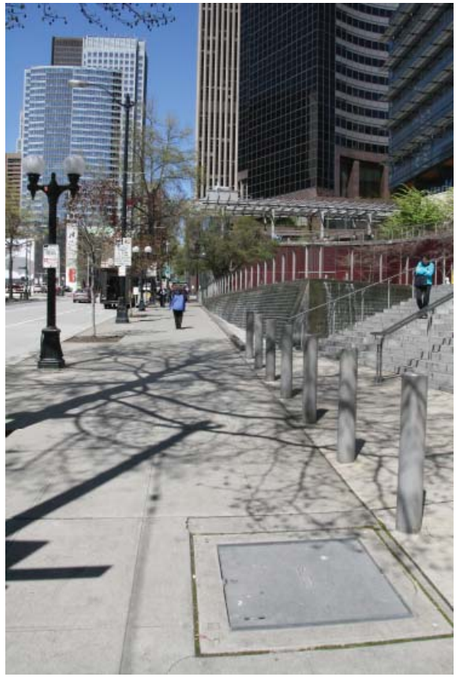
	4TH AVENUE - WASHINGTON/YESLER
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop with shelter
Adjacent uses	Downtown Emergency Services Center, long blank facade; surface parking
Pedestrian lighting	Tall, cobra-head lamps and pedestrian-scale streetlamps
Pedestrian amenities	Some street trees, landscape buffer at parking lot
Unique places or buildings	N/A
Small business opportunities	N/A

	4TH AVENUE - YESLER/JAMES
Sidewalk paving	Good condition, narrow in places - large wells cut for street trees, curb cuts at parking
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Parking garage, apartments, surface parking, low-rise office
Pedestrian lighting	Tall, cobra-head lamps and pedestrian-scale streetlamps
Pedestrian amenities	Street trees
Unique places or buildings	N/A
Small business opportunities	Minimal - small office frontage at north end of block

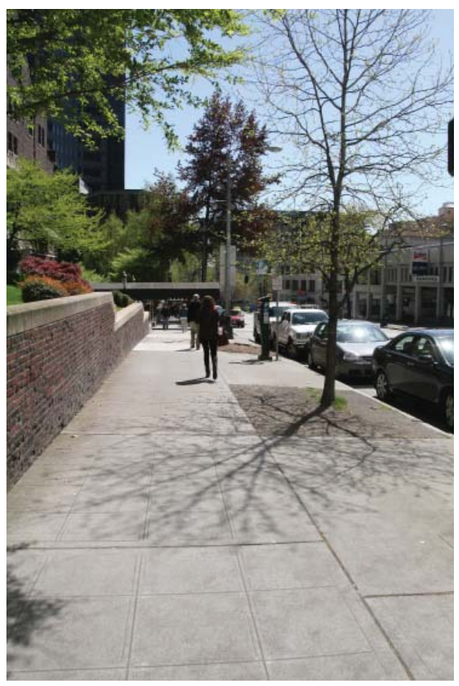
4th & Jefferson
Facing north



4th & James
Facing north



4th & Marion
Facing north



4th & Madison
Facing south

	4TH AVENUE - JAMES/CHERRY
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop with multiple shelters
Adjacent uses	King County Administration Building - long, tall blank facade
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees, trash cans, bike racks
Unique places or buildings	N/A
Small business opportunities	N/A

	4TH AVENUE - CHERRY/COLUMBIA
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	City Hall
Pedestrian lighting	Tall, cobra-head lamps and pedestrian-scale streetlamps
Pedestrian amenities	Street trees, bike racks, public plaza with water feature
Unique places or buildings	City Hall
Small business opportunities	One small retail frontage at north end of block

	4TH AVENUE - COLUMBIA/MARION
Sidewalk paving	Excellent condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop
Adjacent uses	Columbia Tower (high-rise office), office with ground-floor restaurant & outdoor dining
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees, bike racks
Unique places or buildings	Historic McCormick's building
Small business opportunities	Restaurant frontage on north half of block

	4TH AVENUE - MARION/MADISON
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	The Rainier Club, building set back from sidewalk
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees
Unique places or buildings	Historic Rainier Club building
Small business opportunities	N/A

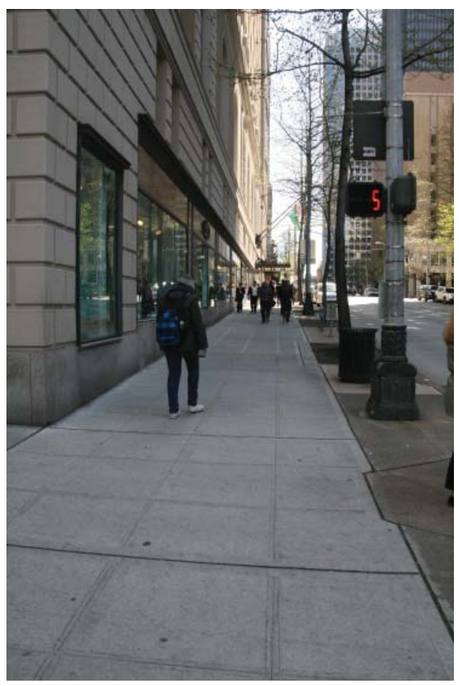
4th & Madison
Facing north

4th & Spring
Facing north

	4TH AVENUE - MADISON/SPRING
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Seattle Public Library
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees, benches, food truck parking space, trash cans, canopy, public plaza
Unique places or buildings	Seattle Public Library
Small business opportunities	N/A

	4TH AVENUE - SPRING/SENECA
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop
Adjacent uses	Coffee shop, restaurants, hotel
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees, trash cans, cafe seating
Unique places or buildings	N/A
Small business opportunities	Some spaces for retail/restaurant

4th & University
Facing south

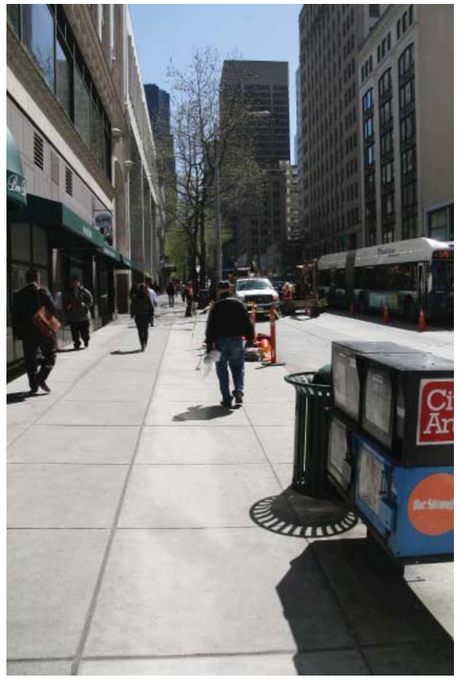


4th & Union
Facing south

	4TH AVENUE - SENECA/UNIVERSITY
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Hotel, ground-floor restaurants and retail
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees, bike racks, trash cans,
Unique places or buildings	Fairmont Olympic Hotel
Small business opportunities	Continuous retail and restaurant frontage along entire block

	4TH AVENUE - UNIVERSITY/UNION
Sidewalk paving	Good condition, extra-wide
Pedestrian crossings	At block ends
Transit facilities	Bus stop with several shelters
Adjacent uses	High-rise office with ground-level retail, building set back from street at mid-block
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees, newspaper boxes, trash cans
Unique places or buildings	N/A
Small business opportunities	Retail frontage along 2/3 of block

4th & Pike
Facing south



4th & Pike
Facing north

	4TH AVENUE - UNION/PIKE
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop with several shelters
Adjacent uses	Office, hotel, bank, ground-floor retail
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees, trash cans, intermittent canopies, newspaper boxes
Unique places or buildings	N/A
Small business opportunities	Some retail frontage

	4TH AVENUE - PIKE/PINE
Sidewalk paving	Excellent condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop
Adjacent uses	Westlake Park, office with ground-floor retail
Pedestrian lighting	Tall, cobra-head lamps and pedestrian-scale streetlamps
Pedestrian amenities	Street trees, water feature, seating, trash cans, public plaza, water fountain, play area
Unique places or buildings	Westlake Park
Small business opportunities	Some retail frontage behind plaza; vendors/food carts possible in plaza?

4th & Pine
Facing south

4th & Olive
Facing south

	4TH AVENUE - PINE/OLIVE
Sidewalk paving	Excellent condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Coffee shop, mall, retail, restaurant, public plaza
Pedestrian lighting	Tall, cobra-head lamps and pedestrian-scale streetlamps
Pedestrian amenities	Street trees, seating, trash cans, newspaper boxes, mailbox, intermittent canopies
Unique places or buildings	Westlake Plaza
Small business opportunities	Retail/restaurant frontage along most of block

2nd & Stewart
Facing west

1st & Stewart
Facing south

	STEWART STREET - PINE/1ST
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Office, coffee shop and retail at corners
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees, bike racks, cafe seating, newspaper boxes
Unique places or buildings	N/A
Small business opportunities	Limited spaces for retail/cafe

	1ST AVENUE - STEWART/PINE
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Midrise apartments with ground-floor retail, restaurant
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Street trees, newspaper boxes, trash cans, cafe seating, canopies
Unique places or buildings	N/A
Small business opportunities	Continuous retail frontage at street level

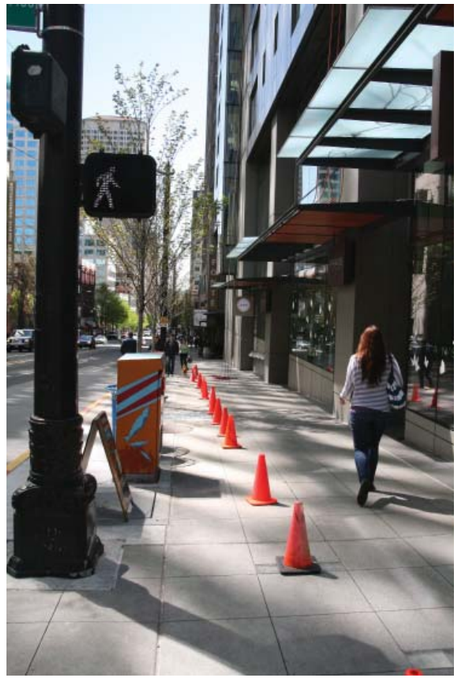
1st & Pike
Facing north

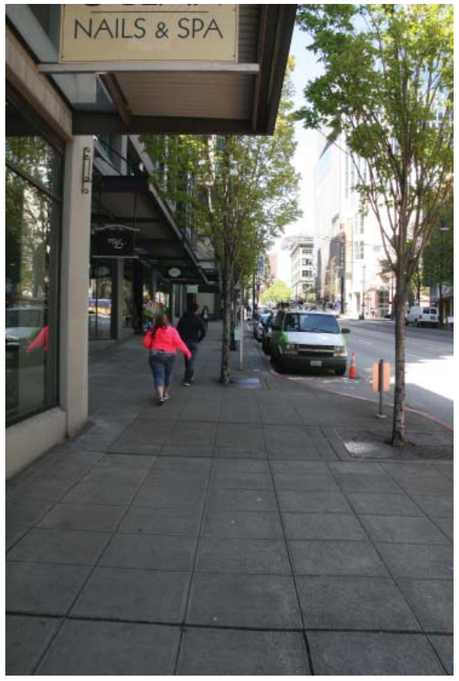
1st & Pike
Facing south

	1ST AVENUE - PINE/PIKE
Sidewalk paving	Fair condition - could use some repair/upgrades
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Midrise apartments with ground-level retail and public market retail and cafes
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Newspaper boxes, trash cans, cafe seating, canopies, mailboxes, bike racks
Unique places or buildings	Pike Place Market
Small business opportunities	Continuous retail frontage at street level

	1ST AVENUE - PIKE/UNION
Sidewalk paving	North half of block needs repair, south half of block in good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Public market, restaurant, cafe, retail; apartments above
Pedestrian lighting	Tall, cobra-head lamps and pedestrian-scale streetlamps
Pedestrian amenities	Street trees, intermittent canopies, bike racks, trash cans, cafe seating, pay phones
Unique places or buildings	Pike Place Market
Small business opportunities	Continuous retail frontage at street level

1st & University
Facing south



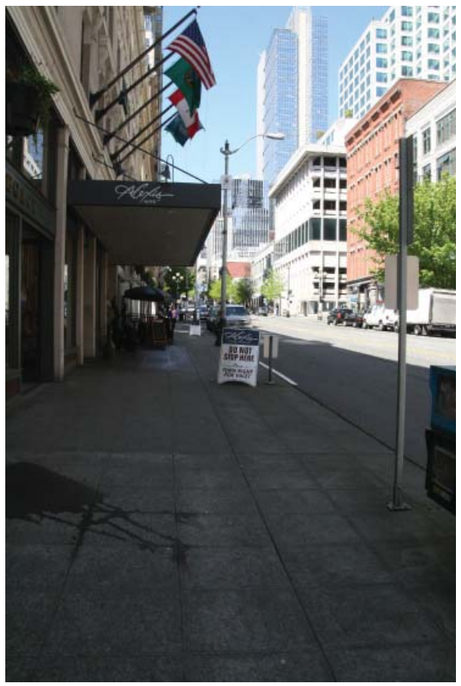


1st & Seneca
Facing north

	1ST AVENUE - UNION/UNIVERSITY
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop
Adjacent uses	High-rise hotel and residential with ground-floor retail, theater
Pedestrian lighting	Tall, cobra-head lamps and pedestrian-scale streetlamps
Pedestrian amenities	Street trees, cafe seating, planters, trash cans, intermittent canopies, short blank wall
Unique places or buildings	Harbor Steps (at University)
Small business opportunities	Retail frontage along most of block, vacant theater building

	1ST AVENUE - UNIVERSITY/SENECA
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	High-rise apartments with street-level restaurants, galleries and retail
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees, trash cans, intermittent canopies
Unique places or buildings	Harbor Steps (at University), stair access to Western/waterfront (at Seneca)
Small business opportunities	Retail frontage along most of block

1st & Spring
Facing north



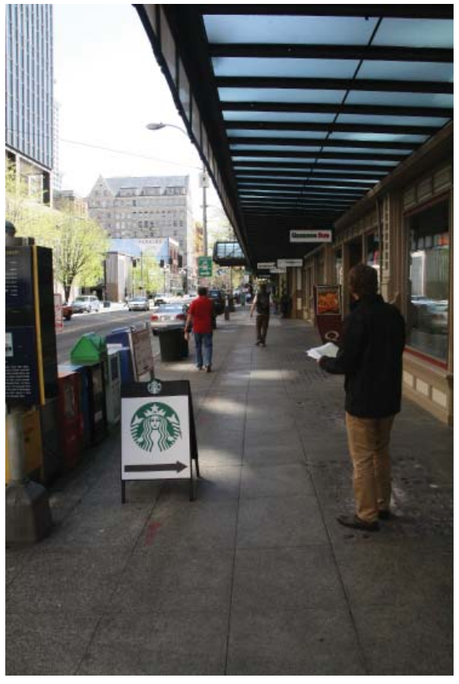
1st & Madison
Facing north

	1ST AVENUE - SENECA/SPRING
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop with shelter
Adjacent uses	Mid- and high-rise apartments with retail, cafe and office at street level
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees on south half of block, newspaper boxes, mailbox, bike racks,
Unique places or buildings	Stair access to Western/waterfront (at Seneca)
Small business opportunities	Retail frontage along most of block

	1ST AVENUE - SPRING/MADISON
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Midrise aparments and hotel with restaurant, retail and salon at street level
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Trash cans, cafe seating, bike racks, one entry canopy,
Unique places or buildings	N/A
Small business opportunities	Continuous retail frontage at street level

1st & Marion
Facing north

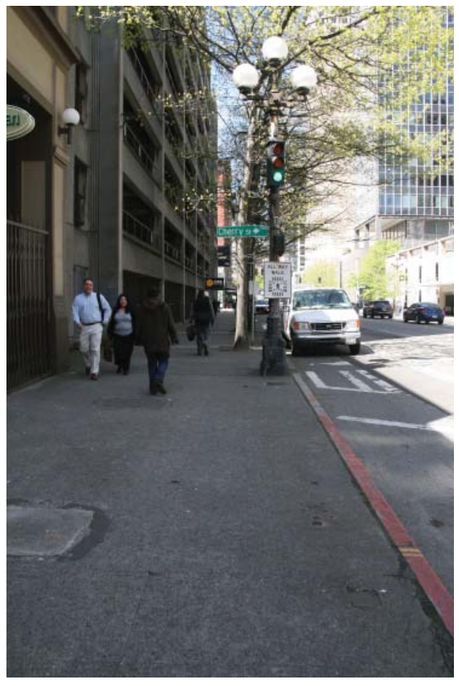
1st & Marion
Facing south



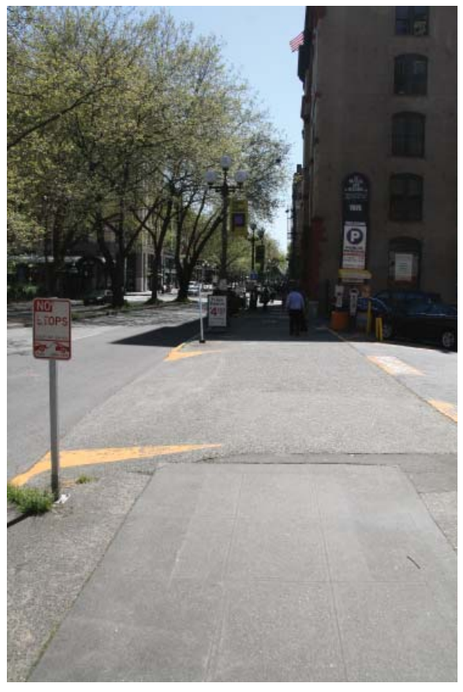
	1ST AVENUE - MADISON/MARION
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Federal office building - post office; long blank facade
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees, newspaper boxes, bike racks, mailboxes, wayfinding signage
Unique places or buildings	Historic Federal Office Building
Small business opportunities	N/A

	1ST AVENUE - MARION/COLUMBIA
Sidewalk paving	Good condition, areaway pavers adjacent buildings
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Office building with restaurant and retail at street level
Pedestrian lighting	Tall, cobra-head lamps, lighting on building canopies
Pedestrian amenities	Canopies, newspaper boxes, trash cans, bike rack, cafe seating
Unique places or buildings	Character building - Colman Building; bridge to Colman Dock/ferry terminal
Small business opportunities	Retail frontage along most of block

1st & Cherry
Facing north



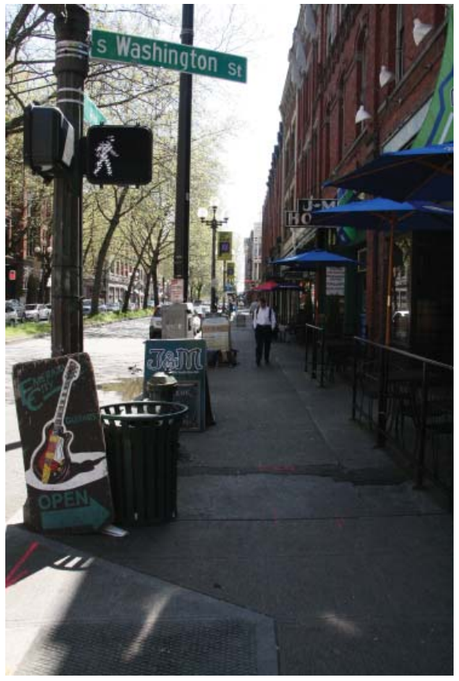
1st & Cherry
Facing south



	1ST AVENUE - COLUMBIA/CHERRY
Sidewalk paving	Good condition, narrow sidewalk
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Bank, parking garage, small gallery/retail at south end of block
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Street trees, trash cans, newspaper boxes
Unique places or buildings	N/A
Small business opportunities	Limited spaces for retail

	1ST AVENUE - CHERRY/YESLER
Sidewalk paving	Fair condition, two large curb cuts for surface parking lot, areaway paving to south
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Surface parking, office with ground-level retail
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Trash cans, street trees in median
Unique places or buildings	Character building - Mutual Life Building
Small business opportunities	Limited spaces for retail

1st & Yesler
Facing south



1st & Washington
Facing south

	1ST AVENUE - YESLER/WASHINGTON
Sidewalk paving	Fair condition, areaway paving (covered over in some places)
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Residential with restaurant and retail below
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Trash cans, mailbox, newspaper boxes, cafe seating, street trees in median
Unique places or buildings	Character buildings - Maynard Building, Terry/Denny Building
Small business opportunities	Retail/restaurant frontage along most of block

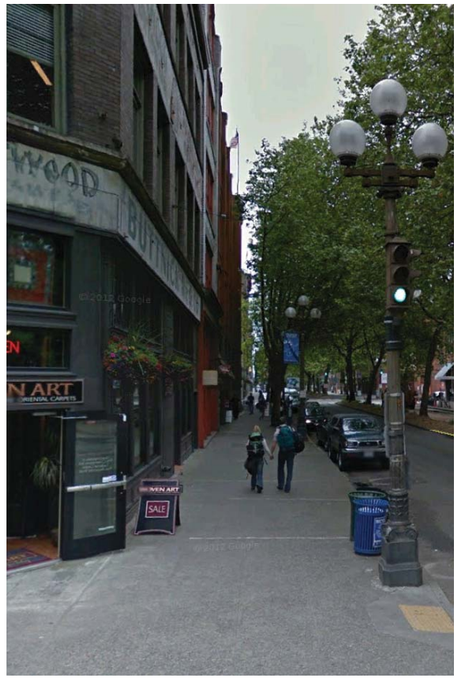
	1ST AVENUE - WASHINGTON/MAIN
Sidewalk paving	Fair condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Midrise residential with retail and restaurant below
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Trash cans, newspaper boxes, cafe seating, some canopies, street trees in median
Unique places or buildings	Character buildings - Skagit Building, OK Cafe, Marathon Building, others
Small business opportunities	Continuous retail frontage at street level

1st & Jackson
Facing north

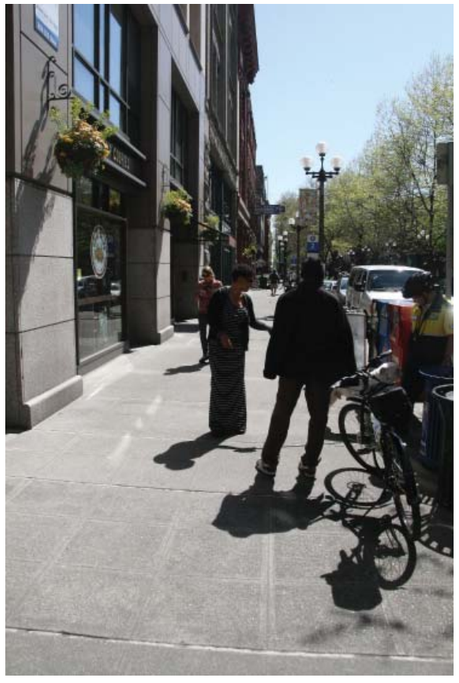
1st & Jackson
Facing east

	1ST AVENUE - MAIN/JACKSON
Sidewalk paving	Fair condition, areaway paving
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Midrise residential with street-level retail, surface parking, Bread of Life Mission
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Street trees, trash cans, some canopies, street trees in median
Unique places or buildings	Character buildings
Small business opportunities	Retail frontage along most of block

1st & Washington
Facing south



1st & Yesler
Facing south



	1ST AVENUE - JACKSON/MAIN
Sidewalk paving	Fair condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Mid-rise office and residential with street-level retail
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Newspaper boxes, some canopies, trash cans, street trees in median
Unique places or buildings	Character buildings - Globe Office Building, others
Small business opportunities	Continuous retail frontage at street level

	1ST AVENUE - MAIN/WASHINGTON
Sidewalk paving	Fair condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Mid-rise office and residential with street-level retail
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Street trees, newspaper boxes, bike racks, some canopies, street trees in median
Unique places or buildings	Character buildings - Grand Central on the Park, others
Small business opportunities	Continuous retail frontage at street level

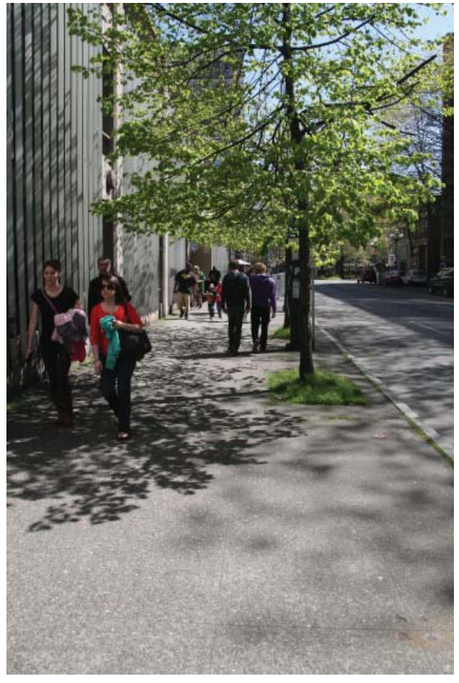
1st & Yesler
Facing north

1st & Cherry
Facing south

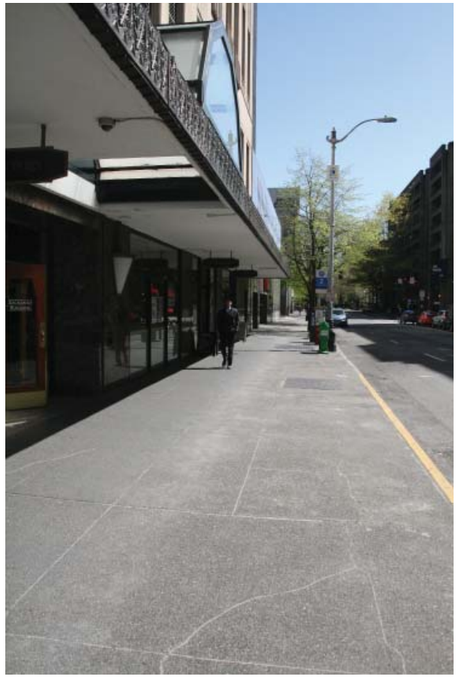
	1ST AVENUE - WASHINGTON/YESLER
Sidewalk paving	Fair condition, areaway paving
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Mid-rise office and residential with street-level retail and restaurant
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Trash cans, bike racks, cafe seating, newspaper boxes
Unique places or buildings	Character buildings - Delmar Building, others
Small business opportunities	Continuous restaurant and retail frontage at street level

	1ST AVENUE - YESLER/CHERRY
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop
Adjacent uses	Office and apartment with retail and restaurant at street level
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Public plaza, planters, benches, trash cans, bike racks, public art, street trees in median
Unique places or buildings	Pioneer Square Park
Small business opportunities	Continuous restaurant and retail frontage at street level

1st & Columbia
Facing south



1st & Marion
Facing south



	1ST AVENUE - CHERRY/COLUMBIA
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Restaurant, parking garage (long blank facade)
Pedestrian lighting	Pedestrian-scale streetlamps
Pedestrian amenities	Street trees at north end, bike racks, trash cans, newspaper boxes
Unique places or buildings	N/A
Small business opportunities	Limited spaces for retail

	1ST AVENUE - COLUMBIA/MARION
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	High-rise office, some retail at street level to north; long blank facade to south
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees on south end of block, bike racks, newspaper boxes, trash cans
Unique places or buildings	N/A
Small business opportunities	Limited spaces for retail

1st & Madison
Facing south

1st & Madison
Facing north

	1ST AVENUE - MARION/MADISON
Sidewalk paving	Excellent condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop with several shelters
Adjacent uses	High-rise office, some retail at street level to north; long blank facade to south
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees, newspaper boxes, trash cans, stair to 2nd Avenue
Unique places or buildings	N/A
Small business opportunities	N/A

	1ST AVENUE - MADISON/SPRING
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Office and residential with ground-level retail, hotel with ground-level restaurant
Pedestrian lighting	Tall, cobra-head lamps and pedestrian-scale streetlamps
Pedestrian amenities	Street trees, cafe seating, some canopies
Unique places or buildings	N/A
Small business opportunities	Retail frontage along most of block

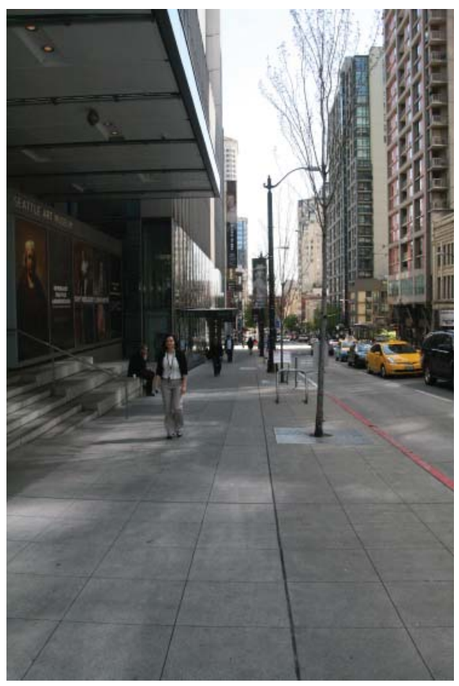
1st & Spring
Facing south

1st & Spring
Facing north

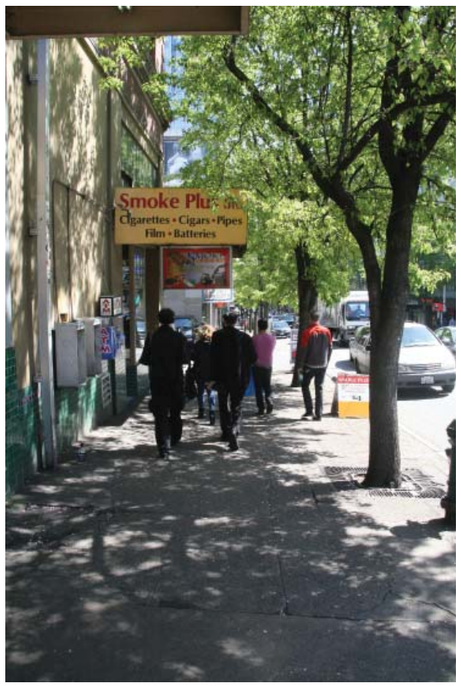
	1ST AVENUE - SPRING/SENECA
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop
Adjacent uses	High-rise office, parking garage (long blank facade)
Pedestrian lighting	Tall, cobra-head lamps and pedestrian-scale streetlamps
Pedestrian amenities	Street trees, trash cans, newspaper boxes, some canopies
Unique places or buildings	N/A
Small business opportunities	N/A

	1ST AVENUE - SENECA/UNIVERSITY
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Playground, retail, cafe, apartments
Pedestrian lighting	Tall, cobra-head lamps and pedestrian-scale streetlamps
Pedestrian amenities	Street trees, trash cans, some canopies
Unique places or buildings	Playground at 1st & Seneca
Small business opportunities	Retail frontage along most of block

1st & Union
Facing south



1st & Pike
Facing south



	1ST AVENUE - UNIVERSITY/UNION
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop with several shelters
Adjacent uses	Seattle Art Museum, museum store, restaurant, office tower above
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees, newspapet boxes, trash cans, corner stair and plaza, public art
Unique places or buildings	Seattle Art Museum
Small business opportunities	N/A

	1ST AVENUE - UNION/PIKE
Sidewalk paving	Good condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Office, retail, music venue, surface parking, restaurant
Pedestrian lighting	Tall, cobra-head lamps and pedestrian-scale streetlamps
Pedestrian amenities	Street trees, trash cans, cafe seating
Unique places or buildings	N/A
Small business opportunities	Retail frontage along most of block

1st & Pike
Facing north

1st & Pine
Facing south

	1ST AVENUE - PIKE/PINE
Sidewalk paving	Fair condition
Pedestrian crossings	At block ends
Transit facilities	Bus stop with several shelters
Adjacent uses	Coffee shop, adult entertainment venue, surface parking, retail
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees at ends of block, trash cans, newspaper boxes
Unique places or buildings	Pike Place Market across 1st Avenue
Small business opportunities	Limited spaces for retail

	1ST AVENUE - PINE/STEWART
Sidewalk paving	Fair condition
Pedestrian crossings	At block ends
Transit facilities	N/A
Adjacent uses	Office with ground-floor retail
Pedestrian lighting	Tall, cobra-head lamps
Pedestrian amenities	Street trees, newspaper boxes, trash cans, some canopies, bike rack
Unique places or buildings	N/A
Small business opportunities	Retail frontage along most of block

1st & Pine
Facing north

1st & Stewart
Facing south

APPENDIX H PUBLIC ENGAGEMENT

Note: This appendix supports the evaluation results for objective T4 that are provided in the Tier 1 report.

This appendix provides a brief summary of public comment and stakeholder input considered as part of the Tier 1 evaluation. The project has held two open houses to provide project updates and to seek public comment on project progress and alternatives. The first open house was held February 6, 2013 at Seattle City Hall and focused on the project purpose, need, goals and objectives, and potential modes and alignments. The second open house was held June 6, 2013 at the South Lake Union Discovery Center and focused on the Initial Screening and Tier 1 Evaluation results.

OPEN HOUSE #1

The first open house for the Center City Connector Transit Study was held on February 6, 2013, at Seattle City Hall. A total of 101 people signed in to the meeting. All meeting participants who signed in received a handout that described the project and provided opportunity for comment on five major project topic areas: project purpose, project need, project goals and objectives, potential street alignments, and modes. The comment card also included a full page for other comments. Additionally, participants could comment by leaving post-it notes on the display boards for each of these subject areas. A set of table top maps allowed participants to draw in potential alignments and place dots next to alignments previously identified in the Seattle Transit Master Plan (TMP) or participant-identified alignments. In total, there were 75 comments placed directly on the project boards and 30 completed comment cards. The following sections provide an overview of the comments by topic area, including examples of representative comments. Many of these findings echo comments made during the stakeholder interview process.

Note: This section is reproduced from a memo summarizing comments from the Open House, available on the SDOT website.[1]

Open House Summary Findings

Project Purpose

1. The vast majority of comments were supportive of the project purpose and the stated goals. In particular, participants responded positively to the emphasis on legibility and transparency. A key concern was lack of continuity for travelers if a bus mode was selected.
    a. Legibility is an issue in the current system, particularly for visitors. Comments were very supportive of improving coordination and connections between streetcar, bus, and Link light rail.

[1] http://www.seattle.gov/transportation/docs/tmp/Seattle%20CC%20Transit%20Study%20Feb%202013%20Open%20House-%20Public%20Comment%20Summary%20FINAL.pdf

- *"Yes, downtown needs a coordinated circulation system, not just whatever regular buses happen to overlap."*

b. Several comments questioned how continuity of travel could be provided if a transfer or change of mode is required (from streetcar to bus or bus to streetcar)

- *"We need to invest in a transit system (streetcar) that is connected, not segmented."*

2. In addition to the project purposes described, a number of comments suggested including a reference to service quality measures such as speed, reliability, and frequency in the project purpose; the project purpose was updated based on these comments.
    - *"The project purpose is mostly complete, however seeing priority and dedicated ROW mentioned would be helpful. Don't let the connector become bottlenecked in downtown traffic!"*
    - *"Should include the goal of making the connection between the two streetcars significantly faster than existing bus service."*
3. There seemed to be some questions about the project purpose in terms of the specific trips needs it should meet in the short-term (short trips *to* and *through* downtown) and the long-term (as a piece of another priority corridor recommended in the TMP such as Ballard-Downtown). Additionally the definition of "center city neighborhoods" may be unclear; clarifications were made to the project purpose to clarify terminology..
4. Two comments took issue with the project purpose, primarily on the grounds that they preferred lower-cost bus alternatives and were concerned about a new service reducing bus service hours.

Project Need

1. There was strong agreement that this project is needed to improve downtown circulation and connections to existing service for reasons including:
    a. Alleviate congestion and accommodate future growth
    b. Current surface transit options downtown are slow and hard to navigate
    c. Reduced transit options for low-income passengers and tourists due to end of Ride Free Zone
    d. Need to connect First Hill Streetcar (FHS) and South Lake Union (SLU) Streetcar to improve usefulness
    e. Poor pedestrian routes through downtown
    f. Reduce GHG emissions and provide a competitive alternative to SOV trips
    g. Improve downtown connectivity between downtown neighborhoods and destinations, such as South Lake Union to the Downtown Core, Pioneer Square, Lower Queen Anne/the Seattle Center, and SODO/Stadiums

Several comments identified needs that are not necessary met by this project, including insufficient East-West connections downtown and connections between other (non-Center City) Seattle neighborhoods.

Project Goals & Objectives

1. Most comments were supportive of the proposed project goals, with some specific suggestions or additions:

a. Goal 1 is important; consider mentioning East-West connections in this goal
b. Goal 5 is key to ridership; include wayfinding, payment, and other aspects of customer experience in the project
c. Add an equity goal (2 comments)
d. Add a goal to address service characteristics (frequency, speed, reliability) and ridership
    i. Consider cost per rider

Modes

1. A strong majority of comments favored streetcar (27) over bus or trolleybus (6) modes. Another set of comments (6) suggested that the level of transit priority was of equal or greater importance than mode. The comments on this topic are summarized in Figure H-1.

Figure H-1 Summary of Mode Comments, Open House #1

Mode	Number of Comments	Comments
Streetcar	27	▪ Smoother/more comfortable ride ▪ Less likely to get stuck in traffic ▪ Easier boarding ▪ More fun/better liked ▪ Greater capacity ▪ Project purpose best or only achieved by maintaining same mode ▪ Better driver of growth ▪ More reliable ▪ Already have a lot of buses downtown
Bus	6	▪ Don't use rails when they aren't needed ▪ Electric power or CNG ▪ No tracks to hinder bicycles and wheelchairs
Priority more important than mode	6	▪ Dedicated ROW, queue jumps, signal priority are essential
Monorail	1	▪ We already own one, why not extend it
Gondola	1	

Other comments

2. Other themes and topics mentioned included the following:
    a. Address cycling routes through downtown and integrate bicycling with the project. Center-running could be better for bikes.
    b. Consider off-board payment and ORCA compatibility .
    c. Implement priority treatments as early as possible, much more difficult to do later.
    d. Lack of clarity as to how this project fits in with other TMP corridor studies – Ballard to Downtown, Madison, Eastlake.
    e. Incorporate universal design concepts into the project, including tactile station maps and audible/Braille frequency information.
    f. Improve connections between DSTT and streetcar.

Potential Street Alignments

Open house participants were invited to draw potential street alignment options on maps and place dots (two per person were suggested) next to alignments previously identified in the Seattle Transit Master Plan (TMP) or alignments identified by open house participants. Participants also provided written comments on the maps, boards, or comment cards. Results of the map/dot prioritization exercise and comments on the alignment alternatives are summarized in Figure H-2 and Figure H-3. Figure H-4 provides a map of the participant-identified alignments.

1. In the dot prioritization exercise:
    a. There were 59 dots placed in support of studying a 1st Avenue alignment, either to Queen Anne or connecting to the SLU Streetcar at Westlake. Participants were somewhat mixed on which should be the priority. Eight additional dots were placed in favor of a potential SODO/Stadium extension.
    b. By comparison, 21 dots were placed in support of studying a 4th/5th alignment.
    c. Twelve dots were placed in favor of further study of a Waterfront Streetcar and it was noted that coordination with the Central Waterfront project is important.
    d. Eight dots were placed in favor of a 3rd Avenue alignment.

2. Written comments on alignment alternatives primarily focused on the difference between a 1st Avenue alignment (B1, B2, or C) and a 4th/5th Couplet (A), with most comments (20) favoring 1st Avenue compared to only 3 in favor of 4th/5th.

3. Additional comments about possible alignments included a preference to avoid couplets if possible, as they are more confusing for users, and questions about whether the final alignment will connect to a streetcar line to Ballard, UW, or West Seattle. Some noted that their preferred alignment was dependent on the question of future connections, and one comment expressed hope that the line would not be incorporated as part of a Ballard-Downtown line. Participants also identified a variety of potential cross-town connections.

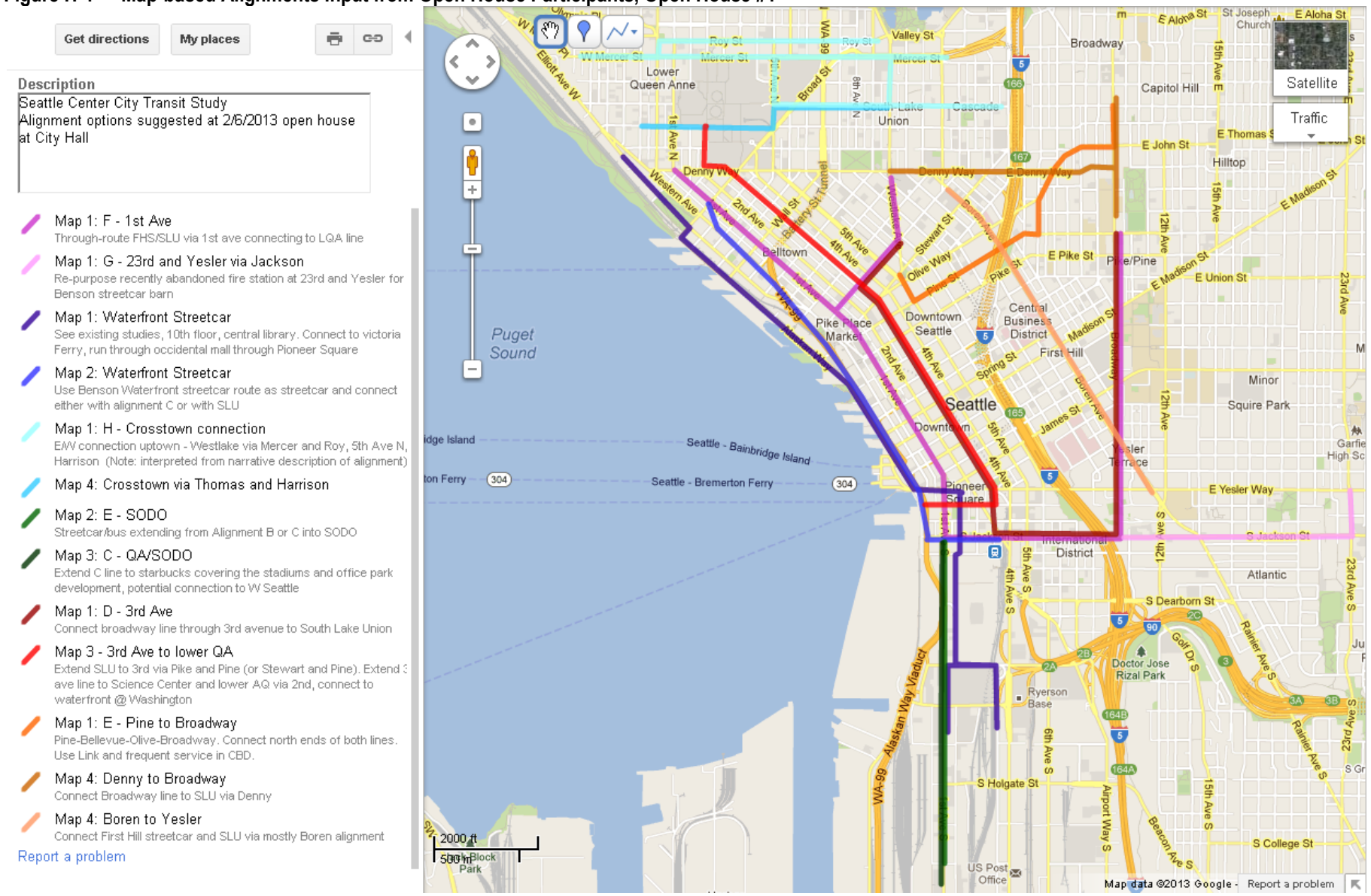
Figure H-2 Summary of Street Alignment Comments and "Dot" Prioritization – Primary Alignments, Open House #1

Street Alignment	# Dots	# Comments	Comments
1st Ave Alignments (Seattle TMP)	▪	▪	▪
1st Ave (General)	59 (total of C, B1, B2)	20	▪ Avoids a couplet ▪ Too much congestion on 4th/5th, which feed I-5 ▪ Strong all-day and weekend demand compared to 4th/5th, which is mostly commuter-oriented ▪ Easier to repurpose for transit use than 4th/5th ▪ More destinations along route ▪ Connects more neighborhoods together ▪ Other streets are currently better served by transit while 1st is poorly served ▪ Opportunity to connect to stadiums ▪ Late night demand not met by existing bus service
Jackson to Queen Anne via 1st Ave (C)	28	6	▪ Connection to Seattle Center ▪ Connection to Lower Queen Anne ▪ Connection to Ballard ▪ Make Queen Anne/Seattle Center first priority, make SLU connection second priority (or vice-versa)
Jackson to Westlake via 1st Ave and Virginia/Stewart (B1)	17	1	▪ Use B1 southbound, B2 northbound (Virginia)
Jackson to Westlake via 1st Ave and Pike/Pine (B2)	14	3	▪ Provides connection to SLU line
4th/5th Ave Alignment (Seattle TMP)			▪
Jackson to Westlake via 4th/5th Ave (A)	21	3	▪ Direct connection between SLU and FHS ▪ Allows locally-oriented "duplicate" of "express" service ▪ Consider 1st Ave as part of waterfront or other projects ▪ 1st Ave requires improvements to E/W connections as it is further from downtown core
Other Primary Potential Street Alignments Identified by Open House Participants			
Waterfront (Sculpture Park to Pioneer square via Elliot or Western, Alaskan Way to Jackson or Alaskan Way through Occidental Park and on to stadiums)	12	3	▪ Alignment already exists ▪ Allows more room for bicycle facilities on downtown streets
3rd Ave (Seattle Center to Pioneer Square/Waterfront, with extension of SLU streetcar to 3rd)	6	2	▪ Make 3rd Ave transit-only ▪ Think of Market Street in San Francisco
3rd Ave (Westlake to FHS via Virginia, 3rd Ave, Jackson, Broadway)	2		

Figure H-3 Alignment Comments and "Dot Prioritization" - Other Variations or Extensions, Open House #1

Description	# Dots	# Comments	Comments
1st Ave			
Extend B or C alignments to SODO/Stadiums	8		▪ Starbucks HQ ▪ New stadium
Broadway to Jackson to 1st to Denny or Westlake (branch at Virginia)	1		▪
Extend via Jackson to 23rd & Yesler	2		▪
Cross-Town Connections			▪
Westlake via Mercer and Roy, 5th Ave N, Harrison	1		▪
1st Ave W to Westlake via W Thomas and Harrison	1		▪
Westlake to Cap Hill via Pine, Bellevue, Olive, Broadway	1		▪
Westlake to Broadway via Denny	1		▪ Connect north ends of both lines; Link and frequent service in CBD
SLU to First Hill via Boren	1		▪

Figure H-4 Map-based Alignments Input from Open House Participants, Open House #1



OPEN HOUSE #2

The second open house for the Center City Connector was held on June 6, 2013 at the South Lake Union Discovery Center. A total of 61 people signed in to the meeting. Participants received a handout that provided a summary of the Tier 1 evaluation results and provided an opportunity for participants to rank and comment on the four alternatives and to rank the importance of the evaluation criteria in their preference.

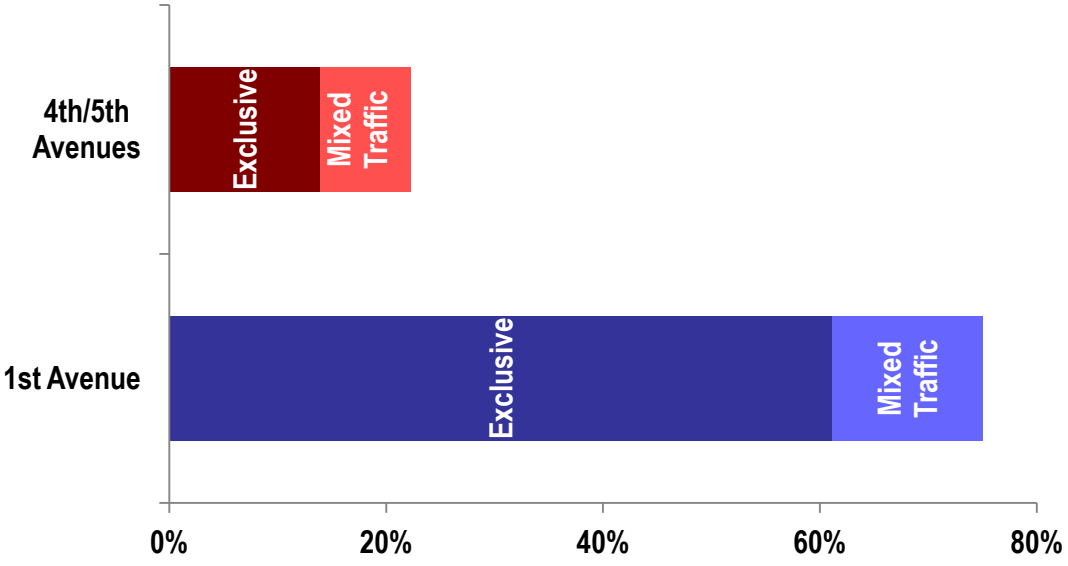
Open House Summary Findings

Alternatives

A handout and comment card distributed at the second open house asked participants to rank the four alternatives (1st Avenue Exclusive and Mixed–Traffic Streetcar, 4th/5th Avenue Exclusive and Mixed–Traffic Streetcar) from 1 (best) to 4. Figure H-9 reproduces the comment card.

Figure H-5 shows the percentage of participants who ranked each alternative as their top choice. In total, a majority of people (22) ranked 1st Avenue Exclusive as their preferred alternative. In comparison, five people preferred 1st Avenue Mixed-Traffic, five preferred 4th/5th Exclusive, and three preferred 4th/5th Mixed Traffic. In addition, more respondents chose a 1st Avenue alternative as their second choice (18), including 14 for 1st Avenue Mixed-Traffic, compared to a 4th/5th Avenue alternative (16). In addition, the First Avenue alternatives received a majority of second-choice votes.

Figure H-5 Alternative Rankings, Open House #2

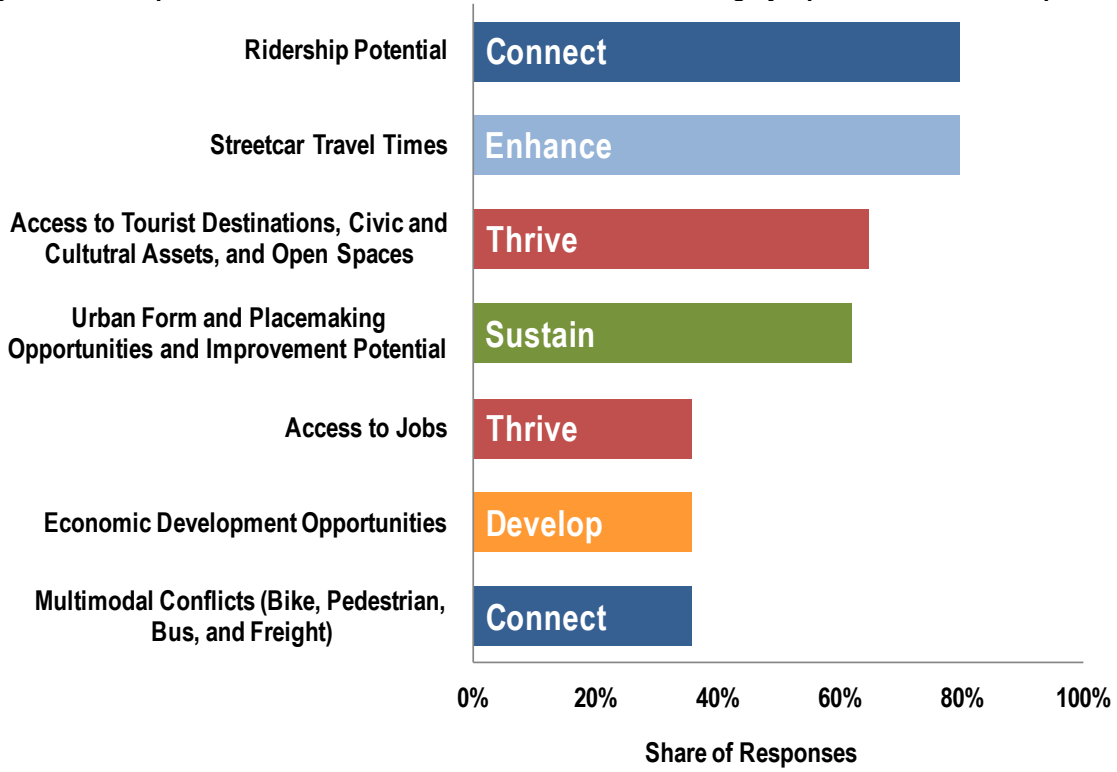


Evaluation Criteria

The open house presented a summary of 14 Tier 1 evaluation measures and asked participants to select the five measures that were most important to their overall ranking of the alternatives and allowed for additional comments on each measure. The measures that received more than 10 votes are shown in Figure H-6. The top-ranked evaluation measures were Ridership Potential and Streetcar Travel Times, both of which favor an exclusive alignment. The 1st Avenue Exclusive

alternative had the fastest streetcar travel times based on the Tier 1 analysis. These findings support previous stakeholder preferences for a 1st Avenue alignment.

Figure H-6 Importance of Evaluation Measures based on Ranking by Open House #2 Participants



Preferences for Street Alignments and Overall Alternative

Figure H-7 summarizes comments from 8 respondents that identified a 4th/5th Avenue alternative as their top choice.

Figure H-7 Advantages of 4th/5th Avenue Street Alignment/Alternatives

Advantages/Comments on 4th/5th	Disadvantages to 1st Ave	# Comments
▪ More direct/central to downtown retail core		4
▪ Better serves Seattle residents	▪ Serves primarily tourists	2
	▪ Uphill walk to destinations	2
▪ Platform will cut into parking but there are enough lanes to handle it	▪ Too few travel lanes	1
	▪ First Ave is busy with cars now, with viaduct construction streetcars would slow down taxis, buses, and cars	1
▪ Keep bikes on a different street to avoid conflict		1
▪ Large built-in ridership		1
▪ Better connection to SLU		1
▪ Closer to existing bus/light rail infrastructure		1

Note: From a total of 8 participants that returned a comment card favoring a 4th/5th Avenue alternative

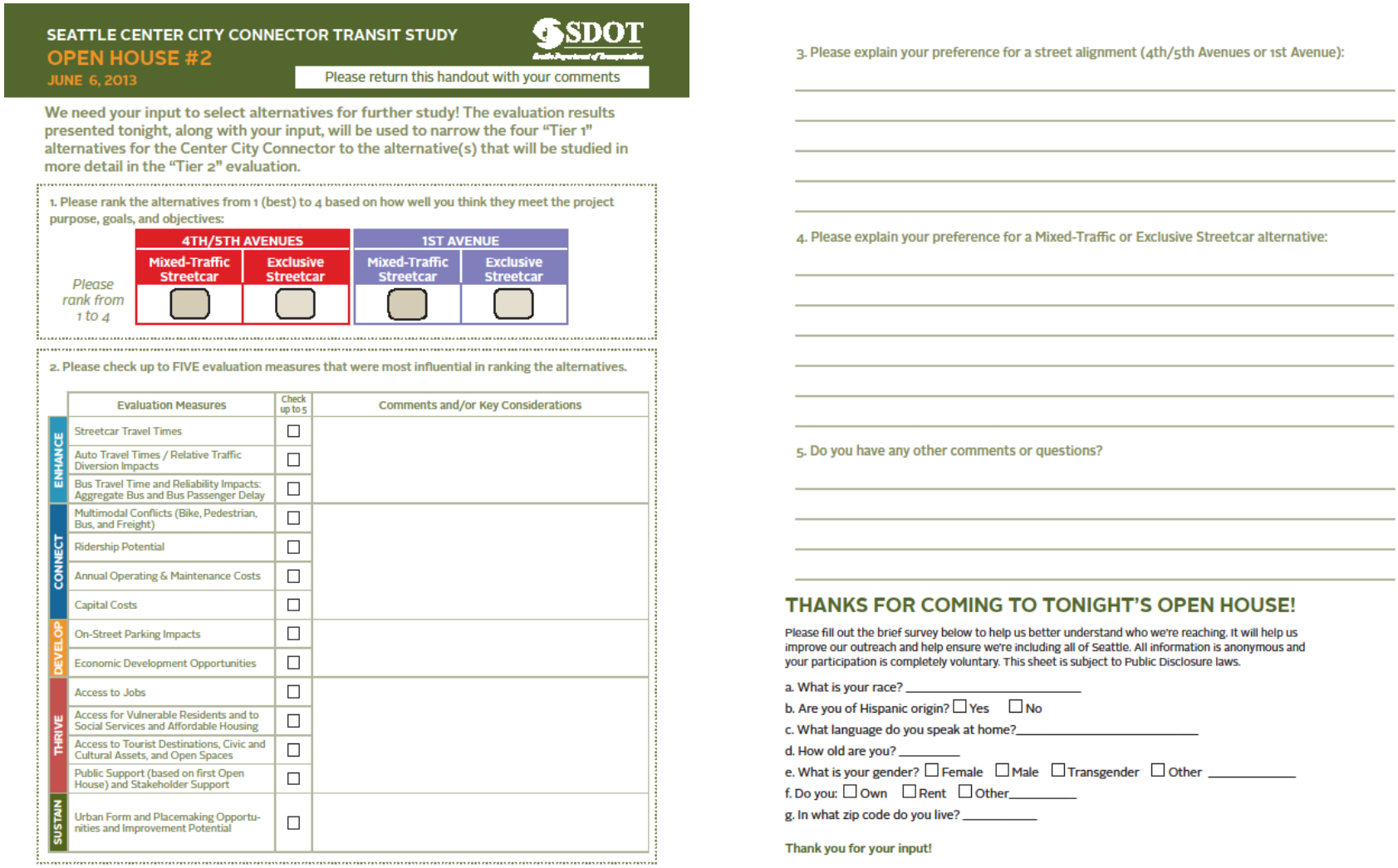
Figure H-8 summarizes comments from 27 respondents that identified a 1st Avenue alternative as their top choice.

Figure H-8 Advantages of 1st Avenue Street Alignment/Alternatives

Advantages/comments on 1st Ave	Disadvantages to 4th/5th	# Comments
▪ Connects more public/cultural amenities		11
▪ Serves locals and tourists, greater off-peak demand	▪ Serves CBD daytime ridership only	8
▪ Like the possibility of an extension to Uptown/LQA & other future opportunities		6
	▪ 4th/5th too close to I-5/too congested with cars and buses, delay to streetcar and buses	5
▪ 1st Ave underserved by transit	▪ Redundancy with 3rd Ave/DSTT, 4th/5th already well served by transit	5
▪ Economic development opportunities on 1st Ave		4
▪ Possibility of through-lining SLU and FHS	▪ Harder to through-line	4
▪ Pine Street connection would provide great access to Westlake Tunnel stations and high visibility along corridor – if tunnel access is improved		2
▪ No couplet	▪ Requires couplet	1
▪ Fastest travel time		1
▪ Fared better in evaluation measures presented at open house		1
▪ Fewer pedestrians		1
▪ Can be done in conjunction with Central Waterfront project		1
▪ Connection at King Street Station		1

Note: From a total of 27 participants that returned a comment card favoring a 1st Avenue alternative

Figure H-9 Open House #2 Comment Card



SEATTLE CENTER CITY CONNECTOR TRANSIT STUDY

OPEN HOUSE #2

JUNE 6, 2013

SDOT

Please return this handout with your comments

We need your input to select alternatives for further study! The evaluation results presented tonight, along with your input, will be used to narrow the four "Tier 1" alternatives for the Center City Connector to the alternative(s) that will be studied in more detail in the "Tier 2" evaluation.

1. Please rank the alternatives from 1 (best) to 4 based on how well you think they meet the project purpose, goals, and objectives:

	4TH/5TH AVENUES		1ST AVENUE	
	Mixed-Traffic Streetcar	Exclusive Streetcar	Mixed-Traffic Streetcar	Exclusive Streetcar
Please rank from 1 to 4	☐	☐	☐	☐

2. Please check up to FIVE evaluation measures that were most influential in ranking the alternatives.

	Evaluation Measures	Check up to 5	Comments and/or Key Considerations
ENHANCE	Streetcar Travel Times	☐	
	Auto Travel Times / Relative Traffic Diversion Impacts	☐	
	Bus Travel Time and Reliability Impacts: Aggregate Bus and Bus Passenger Delay	☐	
CONNECT	Multimodal Conflicts (Bike, Pedestrian, Bus, and Freight)	☐	
	Ridership Potential	☐	
	Annual Operating & Maintenance Costs	☐	
	Capital Costs	☐	
DEVELOP	On-Street Parking Impacts	☐	
	Economic Development Opportunities	☐	
THRIVE	Access to Jobs	☐	
	Access for Vulnerable Residents and to Social Services and Affordable Housing	☐	
	Access to Tourist Destinations, Civic and Cultural Assets, and Open Spaces	☐	
	Public Support (based on first Open House) and Stakeholder Support	☐	
SUSTAIN	Urban Form and Placemaking Opportunities and Improvement Potential	☐	

3. Please explain your preference for a street alignment (4th/5th Avenues or 1st Avenue):

4. Please explain your preference for a Mixed-Traffic or Exclusive Streetcar alternative:

5. Do you have any other comments or questions?

THANKS FOR COMING TO TONIGHT'S OPEN HOUSE!

Please fill out the brief survey below to help us better understand who we're reaching. It will help us improve our outreach and help ensure we're including all of Seattle. All information is anonymous and your participation is completely voluntary. This sheet is subject to Public Disclosure laws.

a. What is your race? _____

b. Are you of Hispanic origin? ☐ Yes ☐ No

c. What language do you speak at home? _____

d. How old are you? _____

e. What is your gender? ☐ Female ☐ Male ☐ Transgender ☐ Other _____

f. Do you: ☐ Own ☐ Rent ☐ Other _____

g. In what zip code do you live? _____

Thank you for your input!

Other Comments (Question 5)

The open house comment card also allowed for other comments and suggestions relevant to the project. These comments included the following topics:

- Other streetcar lines:
  - Extend the First Hill Streetcar up Broadway.
  - Extend the SLU Streetcar to UW (2).
  - Connect the SLU and First Hill lines at their northern ends to create a loop.
  - Extend 1st Ave alignment to LQA (2).
  - Waterfront streetcar would make 1st Ave corridor redundant.
- Wayfinding and connections to transportation hubs
  - Make good connections to the Downtown Transit Tunnel.
  - Planned streetcar connection to Sounder/Amtrak/IDS is terrible and should be improved; the streetcar goes right by the new pedestrian plaza at King Street Station. Don't make this mistake at Westlake.
  - Improve wayfinding and connections between transit modes downtown, especially at King Street and Westlake.
- Operating scenarios
  - Prefer through-routing all three streetcar lines so there are no transfers.
- Streetcar vehicles
  - Use high capacity cars with more doors and quieter operation than current vehicles.
- Roadway design/multimodal conflicts
  - Hope that we can use rubber in the flange ways to reduce risk to cyclists.
  - Concern about 1st Ave alignment and street trees in Pioneer Square

STAKEHOLDER INPUT

Findings from stakeholder interviews can be found in the Stakeholder Interviews Summary Memo, available on SDOT's project website.[2]

[2] http://www.seattle.gov/transportation/docs/Center%20City%20Connector%20stakeholder%20interview%20summary%20for%20web.pdf

APPENDIX I MODAL CONFLICTS ASSESSMENT

Note: This appendix supplements the evaluation results for objective C2 that are provided in the Tier 1 report.

This Appendix describes the evaluation of alignments for conflicts with bicycle, freight and transit priorities ("Connect" evaluation criteria C3b**)**. This assessment considered recent plans and policy documents including the Seattle Transit Master Plan (TMP), 2012; the Seattle Comprehensive Plan (2009 update); the Seattle Transportation Strategic Plan (TSP), 2005; the Seattle Bicycle Master Plan (BMP), 2005, and the Freight Mobility Strategic Action Plan, 2004. In addition, a draft map (November 2012) from the BMP update was reviewed.

This comparison of potential modal conflicts for each alternative is qualitative, but it considers the specific operational issues for each mode and the preliminary operations plans and conceptual designs for each alternative.

TRANSIT

Existing Conditions on 4th and 5th Avenues

According to the TMP, 4th Avenue is an important regional bus corridor and forms a couplet with 2nd Avenue. Almost 40 King County Metro bus routes operate on some or all of 4th Avenue between Washington Street and Olive Way; an additional 30 King County Metro routes operate on 4th Avenue between Jackson and Washington Streets then continue north on 3rd Avenue. Sound Transit and Community Transit each have three bus routes on 4th Avenue. When the Downtown Seattle Transit Tunnel (DSTT) is closed, seven King County Metro bus routes and one Sound Transit route use 4th Avenue as an alternate route. The bus routes that operate on 4th Avenue provide service throughout the greater Seattle area and include both express and local service to nearly all of Seattle's suburbs and surrounding communities. Bus stops are located every other block on 4th Avenue between Jackson Street and Olive Way. Buses serve alternating stops, so each bus stops every four blocks in this area regardless of whether it is a local or express bus. Stops serve up to 18 bus routes and are heavily used. A number of buses turn right from northbound 4th Avenue onto eastbound Pike Street or Olive Way.

5th Avenue is a slightly less important bus corridor; 13 King County Metro bus routes operate on some or all of 5th Avenue between Jackson and Stewart Streets and one Sound Transit express bus use 5th Avenue. Primary stops are located at Jackson, Jefferson, Marion, Seneca, and Pine Streets. Up to ten routes use these stops. There is also a stop at Madison Street which serves two routes. Southbound buses on 5th Avenue make right turns (westbound) at Washington, Seneca, and Stewart Streets.

4th/5th Mixed-Traffic

The 4th/5th Mixed-Traffic alternative would have minimal change to bus operations on 4th Avenue because the streetcar and cycle track would both be on the left (west) side of the street. Bus stops could remain in their current locations on the right (east) side of the street and westbound left turns across the streetcar tracks could be accommodated at their current locations.

On 5th Avenue, buses would share the far right (west) lane with the streetcar and mixed traffic. Buses would need to use the streetcar platforms as shared bus/streetcar stops to avoid conflicts with the proposed cycle track located in the far right lane. Conceptual locations for streetcar stops include all of the blocks where bus stops now exist except for Seneca Street. The closest proposed streetcar stop to Seneca Street is one block north; moving the bus stop to that proposed streetcar stop is unlikely to adversely affect bus operations and would still provide good stop spacing for bus routes. Using the streetcar platforms could benefit midday bus operations by eliminating the need for buses to merge into traffic during hours when on-street parking is allowed. This would only be a benefit if the station locations and bus schedules were arranged to minimize conflicts between different bus routes and the streetcar. Furthermore, stations would need to be designed to accommodate the high passenger volumes for the combined bus and streetcar ridership.

4th/5th Exclusive

The 4th/5th Exclusive alternative would create a second exclusive streetcar/bus lane on 4th Avenue; the streetcar and/or buses would weave to the existing transit-only curbside lane at stops. For the most part, streetcar stations would be located on blocks where there are no bus stops and buses would be allowed to pass streetcars stopped at stations so there would not be a significant conflict between buses and the streetcar. As described in Appendix E, the exception is in the north part of 4th where streetcar and bus stops would need to be located on the same block and the streetcar stop would reduce capacity at a critical bus stop. The exclusive transit lane would benefit bus operations, but there would be some conflicts with right-turning automobiles, which would need to cross the new transit-only lane to access the right-turn lane.

On 5th Avenue, the design for the 4th/5th Exclusive alternative is the same as the 4th/5th Mixed Traffic alternative except that the bus/streetcar lane could be transit-only for several block and station locations. As with the Mixed Traffic alternative, buses would need to use the streetcar platforms as shared bus/streetcar stops to avoid conflicts with the proposed cycle track located in the far right (west) lane. The 4th/5th Exclusive alternative would not provide stops near the existing Marion or Seneca Street bus stops, so those bus stops would need to be relocated. Relocating the bus stops would change the bus stop spacing along 5th Avenue and could affect bus operations and transfer opportunities.

Existing Conditions on 1st Avenue

Fewer bus routes operate on 1st Avenue than either 4th or 5th Avenues. There are 17 King County Metro bus routes that operate on some portion of 1st Avenue between Jackson and Virginia Streets. No Community Transit or Sound Transit bus routes use 1st Avenue. The buses that operate on 1st Avenue are primarily local buses serving the Central Seattle, but a few buses also serve West Seattle, Burien, and the University District. Buses that currently access 1st Avenue from the Alaskan Way Viaduct use it north of Seneca Street, however this would likely change with opening of the Alaskan Way Viaduct bored tunnel, which does not have an egress in this

vicinity. Stops are located approximately every other block. In the south part of 1st Avenue, only the Route 99 circulator uses 1st Avenue.

1st Avenue Mixed Traffic

With the Mixed Traffic alternative, the streetcar would operate with mixed traffic in the center lanes and buses would use the curb lanes. The bus and streetcar stops would need to be offset to avoid completely blocking traffic. Left and right turns off of 1st Avenue would be similar to current conditions. Overall, there would be little impact to bus operations with this alternative.

1st Avenue Exclusive

With the Exclusive alternative, the streetcar would operate in an exclusive, transit-only center lane. Given the limited number of buses operating on 1st Avenue it could be possible for to share the exclusive transit lane with streetcars, but buses would need to weave back to the outer curb lane at stops. It may be more realistic for buses to continue to operate in mixed traffic and avoid the weaving. Bus stops located at critical intersections may need to be moved to avoid conflicts with turn lanes; those located in areas where there is on-street parking and a single through lane could be accommodated by prohibiting parking in the block with the bus stop. Critical turn locations for bus routes include a southbound left from 1st to Marion Street, and northbound rights from 1st at Pine and Virginia Streets.

BICYCLE

Existing Conditions on 4th and 5th Avenues

The BMP designates 4th Avenue as a bike route; the BMP map shows 4th Avenue as planned for an in-street, major separation facility. Currently there is a striped bicycle lane on the left (west) side of 4th Avenue. The BMP identifies planned bicycle facilities on 5th Avenue to be in-street with minor separation; currently, there are no bicycle facilities on 5th Avenue.

4th/5th Mixed Traffic

The Mixed Traffic alternative includes one-way cycle tracks on both 4th and 5th Avenues. The cycle track would be located on the left (west) side of 4th Avenue where the bike lane currently exists and the right (west) side of 5th Avenue. On both streets, the cycle track would be adjacent to on-street parking. At streetcar platforms the cycle track would be located between the sidewalk and the station platforms. At certain locations, parking and station platforms would provide a beneficial buffer from moving vehicles, but could potentially obscure bicyclists from drivers turning left off of 4th Avenue or right off of 5th Avenue. Right-turn pockets are planned for critical intersections to minimize this conflict.

Streetcar passengers walking to and from the streetcar platforms would be a potential conflict for cyclists. Pedestrians would need to cross the cycle track to access the streetcar platform. Platform area designs that direct pedestrians' attention to traffic in the cycle track, along with signage for both bicyclists and pedestrians would help to mitigate this conflict.

4th/5th Exclusive

The Exclusive alternative also includes one-way cycle tracks on both 4th and 5th Avenues, located on the left (west) side of 4th Avenue and the right (west) side of 5th Avenue. On 4th Avenue, the streetcar would operate on the right (east) side of the street and the cycle track would be adjacent to an automobile travel lane. Although a smaller buffer would be possible, particularly at key pinch points, making the cycle track slightly less pleasant than the Mixed Traffic design, it would improve cyclists' visibility to turning motorists. On 5th Avenue, bicycle operations would be the same as with the Mixed Traffic design.

1st Avenue Mixed Traffic and 1st Avenue Exclusive

Neither of the two 1st Avenue alternatives includes bicycle facilities on 1st Ave. Bicyclists would be served by alterative facilities as planned in the BMP. The BMP currently recommends an in-street, major separation facility on 4th Ave and 2nd Ave and an in-street, minor separation facility on 5th Ave and Western Ave. The Central Waterfront Project design also includes an off-street major separation facility adjacent to Alaskan Way. The BMP does not include 1st Avenue as a bicycle route south of Cherry. Because the streetcar tracks in this block would likely be located in the left lane, the tracks would not pose a danger to bicyclists traveling on 1st Avenue. However, the exclusive transit-only left lane would limit motorists' ability to pass bicyclists and increase the potential for bicycle/auto conflicts. Exclusive streetcar operation in the left lanes of 1st Avenue could create undesirable conditions for cyclists using 1st Ave.

FREIGHT

None of the streets that are proposed for the Center City Connector streetcar alignment is identified as a Major Truck Street in the TSP. Downtown routes for through freight movement include I-5, Highway 99, State Route 519, Alaskan Way, Broad Street, and Elliott Avenue W. None of the alternative streetcar alignments would affect through freight movement.

Local deliveries and access to specific businesses could be affected by changes in traffic patterns and lane configurations. Some freight delivery loading zones could be affected and some loading zones may need to be relocated. This level of detail on loading zones will be captured with the refined design detail in Tier 2.