APPENDIX D:

Traffic Impact Analysis

Tumwater Brewery
Planned Action EIS

Tumwater, Washington
May 2015

SCJ ALLIANCE
CONSULTING SERVICES

Traffic Impact Analysis

Project Information

Project:	**Tumwater Brewery Planned Action EIS**
Prepared for:	Thurston Economic Development Council

Reviewing Agency

Jurisdiction:	City of Tumwater

Project Representative

Prepared by:	**SCJ Alliance** 8730 Tallon Lane NE, Suite 200 Lacey, WA 98516 360.352.1465 scjalliance.com
Contact:	George Smith, Senior Transportation Planner

Project Reference:	SCJ #1450.05 Path: N:\Projects\1450 Thurston EDC\1450.05 Tumwater Brewery Planned Action EIS\DEIS\Traffic\Report\R2015-0908 Tumwater Brewery TIA.docx

CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

12/30/2015

Prepared by George Smith, Senior Transportation Planner

Approved by Eric Johnston, PE, Principal

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1. INTRODUCTION

1.1 Project Overview

The City of Tumwater is preparing a Planned Action EIS for the former Olympia Brewery area north of Custer Way in Tumwater. The EIS will review environmental impacts associated with development of the site under a variety of alternatives. SCJ Alliance is preparing a traffic operational assessment of the alternatives that will estimate the traffic volume potential of the development and identify potential impacts to the area transportation systems.

The *Brewery District Plan (2014)* will be used as a resource and basis of comparison for the traffic analysis in this Planned Action EIS. The *Brewery District Plan*, recently adopted by the City of Tumwater, provides a framework for future development and infrastructure improvements within the area. The Plan provides a comprehensive evaluation of existing and forecasted transportation conditions within the study area. The Brewery District Plan transportation analysis included the influence of redevelopment within the Olympia Brewery properties. A product of the Brewery District Plan is a prioritized list of transportation improvements that will allow the area roadways and intersections to operate at acceptable levels through the 2035 planning horizon.

Figure 1 Shows the site vicinity.

1.2 Study Context

The Brewery District Plan provided a thorough evaluation of the roadways and intersections that will serve the *Tumwater Brewery Planned Action* project. The Brewery District Plan evaluated base year (2012) and future year (2035) conditions, which also serve as the base year and horizon year of this Planned Action EIS. The new traffic associated with the Planned Action project was included in the Brewery District Plan traffic analysis.

This analysis was prepared to confirm that traffic from the proposed *Tumwater Brewery Planned Action* development would operate acceptably within the roadway system identified for the area in the Brewery District Plan. Many of the improvements adopted in the Brewery District Plan are designed to enhance the "walkability" of the area to spur the transition to a multi-modal town center. Although it will benefit from the improved multi-modal system, most of the improvements planned are not required to serve traffic generated by the Tumwater Brewery project.

The project trip generation estimate provided in **Section 4** of this TIA report shows that the current proposal is nearly identical in terms of traffic generation to the development assumed in the Brewery District Plan. For the Planned Action EIS, the traffic analysis will not revisit the 2035 analysis and conclusions in the Brewery District Plan, but will focus on analysis of Custer Way and the project access points. The following intersections in the study area were analyzed:

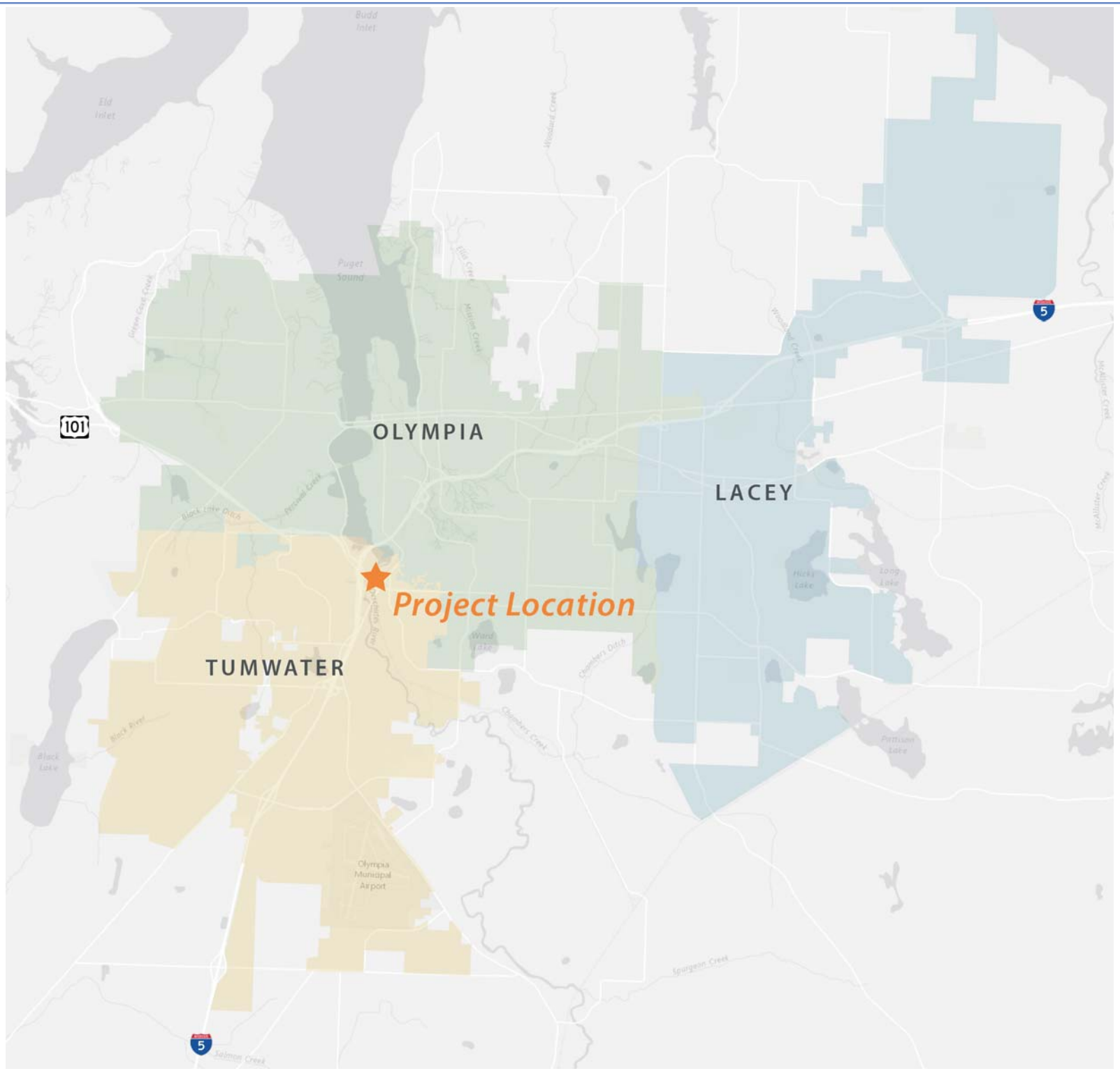
1. Custer Way/Boston Street
2. Custer Way/Schmidt Place
3. Custer Way/Capitol Boulevard

City of Tumwater

Tumwater Brewery
Planned Action EIS

Figure 1

Site Vicinity Map



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2. PROJECT DESCRIPTION

The subject property is the area generally bounded by Custer Way to the south, the Union Pacific railroad tracks to the east, Deschutes River to the west and Capitol Lake to the north. The building and grounds of the "Schmidt House", as well as the brewery properties south of Custer Way, are excluded from the subject property. As envisioned in this EIS, re-development of the property will include a mix of commercial, specialty retail, office and residential uses. The project will develop within a theme built around the historic brewery use.

The project is intended to use the two existing vehicular accesses on Custer Way: one across from Boston Street, and Schmidt Place. The Brewery District Plan has identified a future pedestrian route from Capitol Boulevard to the subject property with a grade-separated crossing over the Union Pacific Railroad right-of-way.

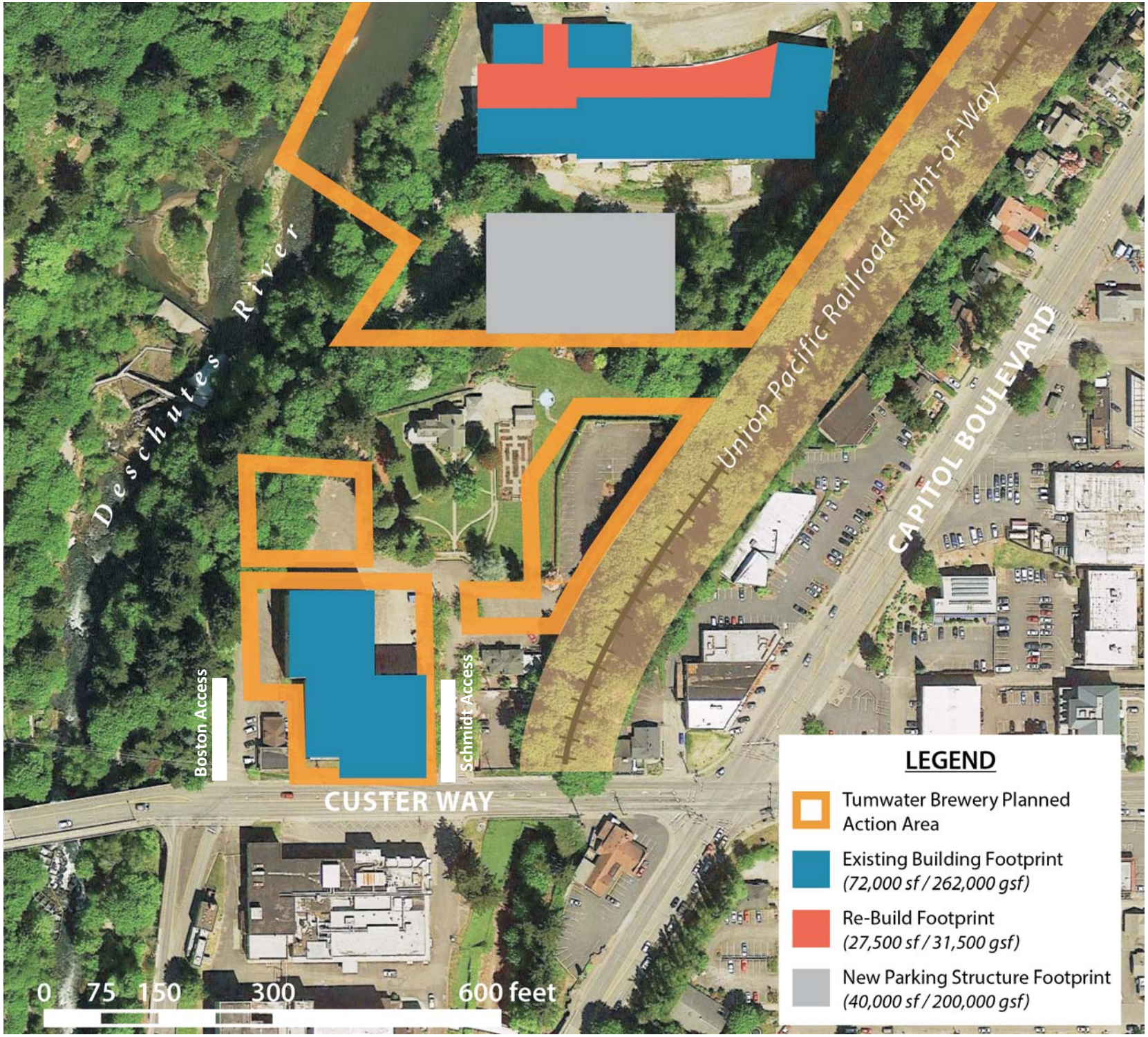
The preliminary site plans for Alternative 2 and Alternative 3, as well as the project access points, are shown in **Figure 2A** and **Figure 2B.**

City of Tumwater

Tumwater Brewery Planned Action EIS

Figure 2A

Proposed Alternative 2 Site Plan



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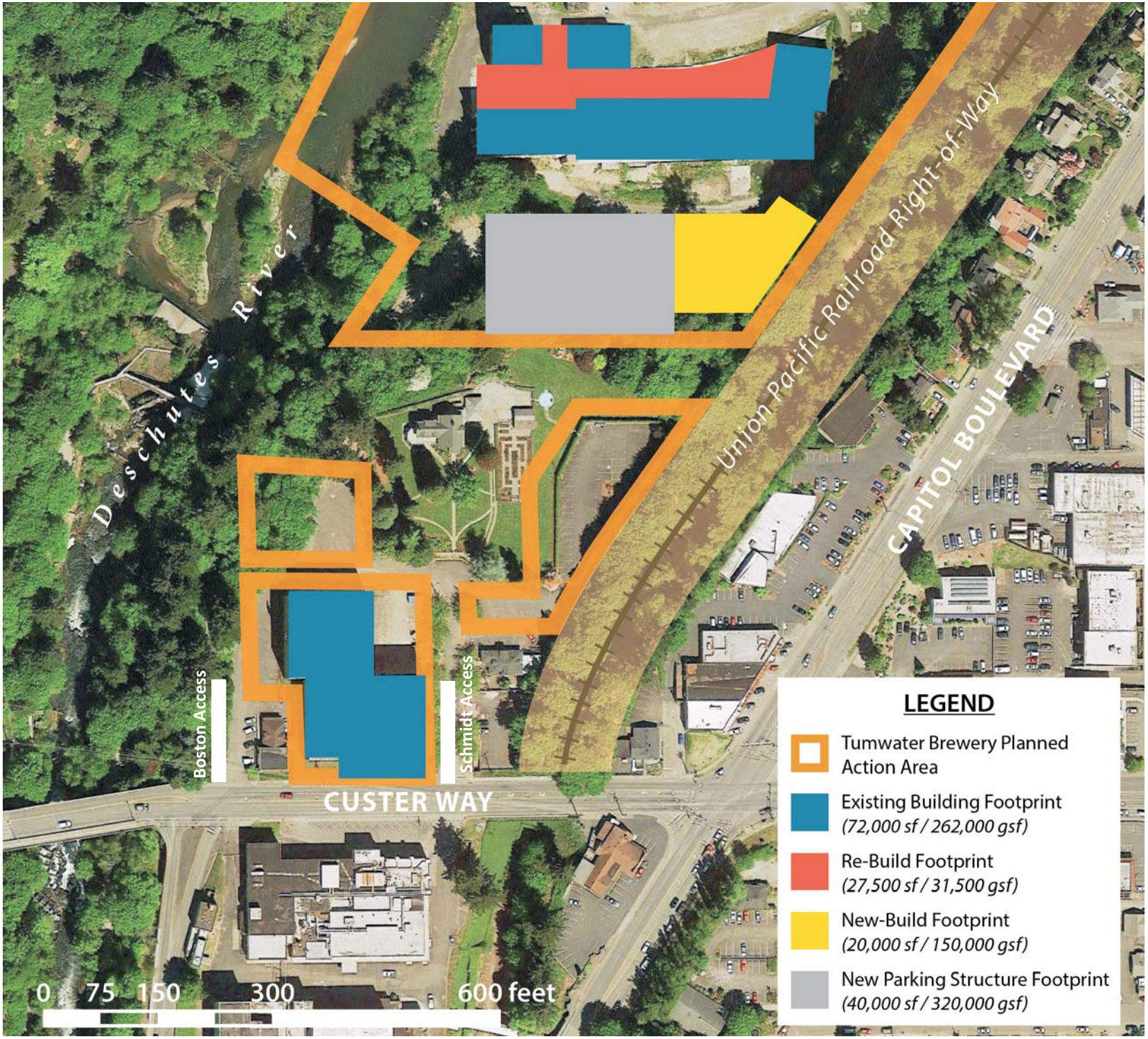
Tumwater Brewery Planned Action EIS

Figure 2B

Proposed Alternative 3 Site Plan



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3. BACKGROUND INFORMATION

3.1 Area Land Uses

The Tumwater Brewery is located in northeast Tumwater on the Deschutes River. The surrounding area is generally developed with commercial retail properties and some residential. Tumwater Falls Park and Tumwater Historical Park are located west of the project.

3.2 Roadway Inventory

A survey was conducted to identify existing conditions of the primary traffic facilities serving the Tumwater Brewery area.

3.2.1 Capitol Boulevard

Capitol Boulevard SE is classified as a principal arterial and is a designated truck route. In the study area, Capitol Boulevard has a five lane section that parallels I-5. The roadway has continuous sidewalks, and bike lanes are provided between E Street and Linwood Avenue. The section of Capitol Boulevard from E Street to Linwood Avenue is divided by a raised median. North of Custer Way, on-street parking is provided on the west side of Capitol Boulevard. The posted speed limit is 35 mph through the study area. Four Intercity Transit bus routes travel on Capitol Boulevard.

3.2.2 Custer Way

Custer Way SE is classified as a minor arterial. It has a four-lane cross section with sidewalks on both sides and a posted speed limit of 25 mph. Custer Way is a designated truck route. The bridge crossing I-5 provides a sidewalk only on the south side of Custer Way.

3.2.3 Boston Street

Boston Street is a short roadway that connects the higher elevation Custer Way to the lower elevation Deschutes Way. The roadway provides a single lane in each direction with sidewalks provided on both sides for most of the roadway. The roadway crosses the Deschutes River on the historic Boston Street Bridge.

3.2.4 Schmidt Place

Schmidt Place is a short local access roadway that extends from Custer Way north to the Schmidt House and Tumwater Brewery property. The roadway has a single lane in each direction with sidewalks and landscaping on both sides of the roadway.

3.3 Traffic Volume Data

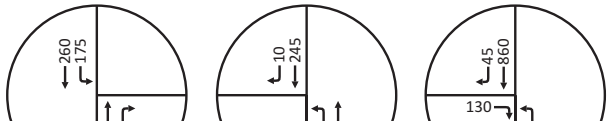
Existing traffic volume counts were collected by Traffic Count Consultants, Inc. (TC2) for the study area. The PM peak period (4:00 PM - 6:00 PM) was counted on Wednesday, November 19th, 2012. **Figure 3** shows the existing 2012 traffic volumes at all of the study intersections included in the Brewery District Plan. Whereas it is typically preferred that traffic counts be no more than two years old, the counts used in this study are three years old. The 2012 counts were determined appropriate for use considering two factors: 1) the focus of the study is 2035 conditions, which will have different circulation patterns than current traffic, and 2) traffic volumes have historically remained fairly stable at the study intersections and there has been very little new development in the area to add significant traffic.

City of Tumwater

Tumwater Brewery Planned Action EIS

Figure 3

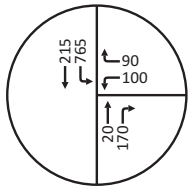
Existing 2012 PM Peak Hour Traffic Volumes



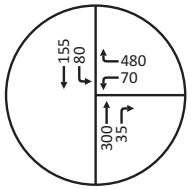
1) Deschutes Way at I-5 NB On-Ramp

2) Deschutes Way at US-101 WB On-Ramp

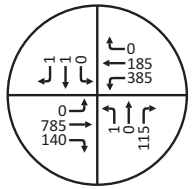
3) 2nd Avenue at I-5 SB Off-Ramp



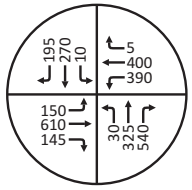
4) 2nd Avenue at Custer Way



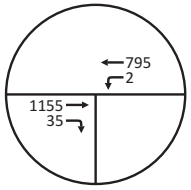
5) Deschutes Way at Boston Street



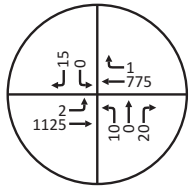
6) Boston Street at Custer Way



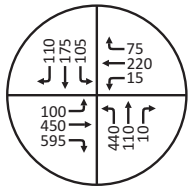
7) Capitol Boulevard at Custer Way



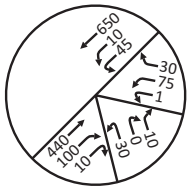
8) Clark Place at Custer Way



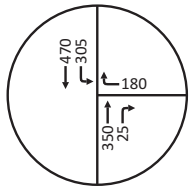
9) Erie Street at Custer Way



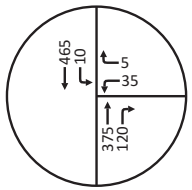
10) Cleveland Avenue at Custer Way



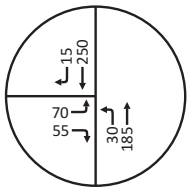
11) Capitol Boulevard at Carlyon Avenue



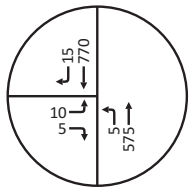
12) Capitol Boulevard at Cleveland Avenue



13) Capitol Boulevard at Emerson Street

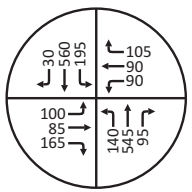


14) Cleveland Avenue at Emerson Street

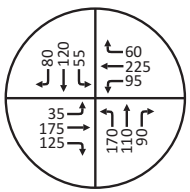


15) Cleveland Avenue at Bates Street

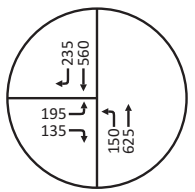
16) Deschutes Way at E Street



17) Capitol Boulevard at E Street



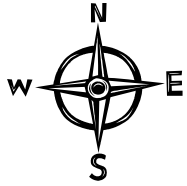
18) 2nd Avenue at Linwood Avenue



19) Capitol Boulevard at Linwood Avenue

LEGEND

XX → PM PEAK HOUR TRAFFIC VOLUMES



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4. PROJECT TRAFFIC CHARACTERISTICS

4.1 Proposed Project

The subject property is the area generally bounded by Custer Way to the south, the Union Pacific railroad tracks to the east, Deschutes River to the west and Capitol Lake to the north. The building and grounds of the "Schmidt House" are excluded from the subject property. As envisioned in this EIS, re-development of the property will include a mix of commercial, specialty retail, office and residential uses. The following is a summary of the *Tumwater Brewery Planned Action* development alternatives being evaluated:

4.1.1 Alternative 1: No Action

The No Action Alternative assumes that development would occur within the site consistent with existing zoning. Any such development or redevelopment that is proposed within the site in conjunction with the No Action Alternative would undergo environmental review on a project-by-project basis.

4.1.2 Alternative 2: Moderate Development Intensity

The Moderate Development Intensity Alternative is assumed to include redevelopment within existing buildings (262,000 GSF), a new parking structure (200,000 GSF) with approximately 625 stalls, and the rebuilding of two demolished structures (31,500 GSF). Prospective land uses would include: parking, office, retail, distillery, craft brewing, hotel, restaurant and a museum. Total lot coverage by buildings is approximately 140,000 SF with approximately 493,500 GSF of buildable space. Improved vehicular access, a connecting trail system and boardwalk are also included in this alternative.

4.1.3 Alternative 3: Maximum Development Intensity

The Maximum Development Intensity Alternative is assumed to include redevelopment within existing buildings (262,000 GSF), a new parking structure (320,000 GSF), with approximately 1,000 stalls, the rebuilding of two demolished structures (31,500 GSF) and a new-build structure (150,000 GSF). Prospective land uses under Alternative 3 would be the same as those under Alternative 2, plus residential (apartments and condos). Total lot coverage by buildings is approximately 160,000 SF with approximately 763,500 GSF of buildable space. Similar to Alternative 2, improved vehicular access, a connecting trail system and boardwalk are included in this alternative.

4.2 Project Access

The project is intended to use the two existing vehicular accesses on Custer Way: one across from Boston Street, and Schmidt Place. In addition, the Brewery District Plan has identified a future pedestrian route from Capitol Boulevard to the subject property with a grade-separated crossing over the Union Pacific Railroad right-of-way.

4.3 Project Trip Generation

Project trip generation was calculated using the trip generation rates contained in the current edition of the Trip Generation Manual by the *Institute of Transportation Engineers (ITE).* The trip generation rates used for this analysis are shown in **Table 1.**

Table 1. Trip Generation Characteristics

LAND USE	ITE LAND USE CODE	UNIT	PM PEAK HOUR TRIP RATES		
			TRIP RATE	% ENTER	% EXIT
Office/Classroom	710	1,000-sf	1.49	17%	83%
Apartments	220	Units	0.62	65%	35%
Specialty Retail	826	1,000-sf	2.71	44%	56%
Distillery	140	Emp	0.36	44%	56%
Hotel	310	Room	0.60	51%	49%
Museum	580	1,000-sf	0.18	16%	84%
Restaurant	932	1,000-sf	9.85	60%	40%

4.3.1 Internal Capture

Internal capture calculations were prepared to reflect on-site interaction among the proposed uses occupying the site. The internal trip discount for the PM peak period was derived from the "Multi-Use Development Trip Generation and Internal Capture Summary" worksheets contained in the ITE Trip Generation Handbook and supplemental information contained in NCHRP Report 684 (Enhancing Internal Trip Capture Estimation for Mixed-Use Developments). The capture was calculated among specialty retail uses, restaurant, hotel, and office. Residential was also included in the capture calculations for Alternative 3.

4.3.2 Pass-By Trips

A project such as a mixed-use commercial center will attract traffic from people already driving on the area roadways. These trips are not new trips added to the local roadways (primary trips) but represent "pass-by" trips according to the following definition:

Pass-by Trips are trips made as an intermediate stop from an origin to a primary destination (i.e., stopping to shop on the way home from work) by vehicles passing directly by the project driveway. The pass-by rates used in this study were taken from the Trip Generation Handbook.

The total trip generation expected from the development is calculated by applying the total number of units to the appropriate trip generation rate. The total project trip generation and new-to-network trip generation are shown in **Table 2** for Alternative 2 and **Table 3** for Alternative 3. The detailed trip generation calculations are included in Appendix A.

Table 2. Project Trip Generation – Alternative 2

LAND USE	SIZE	VARIABLE	PM PEAK HOUR TRIP GENERATION			
			TOTAL TRIPS	LESS INTERNAL CAPTURE	LESS PASS-BY	NEW-TO-NETWORK TOTAL
Office/Classroom	70,000	1,000-sf	104	14	0	90
Apartments	0	Units	0	0	0	0
Specialty Retail	80,000	1,000-sf	215	60	31	124
Distillery	20	Employee	7	0	0	7
Hotel	98	Rooms	59	22	0	37
Museum	10,000	1,000-sf	2	0	0	2
Restaurant	13,000	1,000-sf	128	62	28	38
TOTAL			**515**	**158**	**59**	**298**

Table 3. Project Trip Generation – Alternative 3

LAND USE	SIZE	VARIABLE	PM PEAK HOUR TRIP GENERATION			
			TOTAL TRIPS	LESS INTERNAL CAPTURE	LESS PASS-BY	NEW-TO-NETWORK TOTAL
Office/Classroom	65,000	1,000-sf	97	18	0	79
Apartments	150	Units	94	58	0	36
Specialty Retail	84,000	1,000-sf	226	92	27	107
Distillery	20	Employee	7	0	0	7
Hotel	101	Rooms	61	23	0	38
Museum	10,000	1,000-sf	2	0	0	2
Restaurant	13,000	1,000-sf	128	63	28	37
TOTAL			**615**	**254**	**55**	**306**

4.4 Trip Generation Comparison

The Brewery District Plan used the Thurston Regional Planning Council (TRPC) Travel Demand Model to forecast traffic volumes for the 2035 horizon. The travel demand model forecast includes household and employment increases throughout the entire county as well as within the study area. For that study, the City of Tumwater provided recommended employment infill for the old brewhouse property to reflect redevelopment of the site. The estimated traffic generated by the redevelopment was included in the 2035 forecast volumes used for the Brewery District Plan. **Figure 4** shows the "Traffic Analysis Zone" (TAZ) that represents the old brewhouse property.

Figure 4. Traffic Analysis Zones (TAZs) Used in Travel Demand Modeling for the Brewery District Plan

TAZ number 767 includes the entire developable area within the *Tumwater Brewery Planned Action EIS* property. The portions of TAZ 767 that are excluded from the *Planned Action EIS* subject property are listed below:

- The Schmidt House - Historic house and grounds
- Fuller and Fuller - An attorney office
- Restaurant located on Schmidt Place

These businesses are unlikely to redevelop at a higher intensity usage and are considered traffic-neutral in the context of traffic forecasting for the area.

The traffic demand model forecast used in the Brewery District Plan predicted 286 PM peak hour trips for TAZ 767 for the 2035 horizon. The base year (2009) model volume was 15 PM peak hour trips, for a

net increase of 271 PM peak hour trips. As shown in Tables 2 and 3, Alternatives 2 and 3 of the *Tumwater Brewery Planned Action EIS* are predicted to generate 298 and 306 PM peak hour trips, respectively. The traffic volume comparison is summarized below in **Table 4**. The travel demand model plots showing the 2009 and 2035 traffic forecasts are attached.

Table 4. Traffic Volume Comparison

	New-To-Network PM Peak Hour Trip Generation		
Land-Use Scenario	**Inbound**	**Outbound**	**Total**
Brewery District Plan	101	170	271
Planned Action EIS Alternative 2	115	183	298
Alternative 2 Difference	**+14**	**+13**	**+27**
Planned Action EIS Alternative 3	128	178	306
Alternative 3 Difference	**+27**	**+8**	**+35**

This comparison shows that the traffic forecasts in the Brewery District Plan adequately account for the traffic levels predicted for the *Tumwater Brewery Planned Action* project. The small increase in predicted traffic would result in an increase of no more than 10 to 20 vehicles at any of the nearby intersections (with the exception of the site driveways).

Because both alternatives yield very similar traffic generation estimates, the operational analysis in this report will be prepared for the slightly higher traffic generating alternative (Alternative 3). The traffic conditions and potential roadway improvement needs will be considered the same for Alternative 2 and Alternative 3.

4.5 Site Traffic Distribution and Assignment

The vehicle directional trip distribution to and from the site will be based primarily on:

- The area street system characteristics
- Current travel patterns on the area roadways
- The proposed access system for the project

The directional distribution of traffic to and from the proposed project was estimated using the regional transportation model. The Thurston Regional Planning Council (TRPC) created the area-wide transportation model with cooperation from local jurisdictions within the county. The model, developed using the Emme/3 software package, has been calibrated to represent the existing vehicle travel patterns throughout the entire county.

The *Tumwater Brewery Planned Action EIS* property is located within Traffic Analysis Zone (TAZ) number 767 of the regional transportation model. A distribution analysis was performed for this project by conducting a "Select Zone Analysis" for TAZ 767. This feature of the Emme/3 software package allows

all of the traffic into and out of a particular zone to be isolated and shown separately from the rest of the traffic on the network. This graphically shows the percentage of vehicles currently using each of the available routes into and out of the area (Capitol Boulevard, Boston Street, 2nd Avenue, etc.). From this information, regional distribution percentages were calculated for future traffic from the proposed project.

4.5.1 Site Access Alternatives

The two access locations have been identified as Boston Street Extension and the existing Schmidt Place. Internal circulation options will influence which access people will use to get to/from Custer Way; however, as of now the development plan is conceptual and it is not yet determined how internal circulation will be served on-site.

To accommodate different potential internal circulation options, the site accesses have been analyzed under two "bookend" scenarios: 1) all traffic accessing to/from Boston Street Extension; 2) all traffic accessing to/from Schmidt Place. While either particular scenario is unlikely, it provides a "highest-traffic-potential" scenario for each access.

The traffic assignment was prepared under the future roadway conditions which include a center median on Custer Way between Boston Street and Capitol Boulevard. Under this scenario, Schmidt Place will be a right-turn-only intersection. The Boston Street/Custer Way intersection will be under modern roundabout control with a "teardrop" design that will allow left-turns and u-turns on westbound Custer Way but not eastbound Custer Way. Also, northbound traffic on Boston Street would be required to turn right onto Custer Way. All other movements would be allowed.

The resultant traffic distribution percentages and site traffic assignments on the future roadway network are shown for the full-build scenario with the roadway restrictions described above. **Figure 5** shows the scenario with all traffic using the Boston Street extension, and **Figure 6** shows all site traffic using Schmidt Place.

Figure 5. Site-Generated Traffic Volumes – 100% Boston Street Access

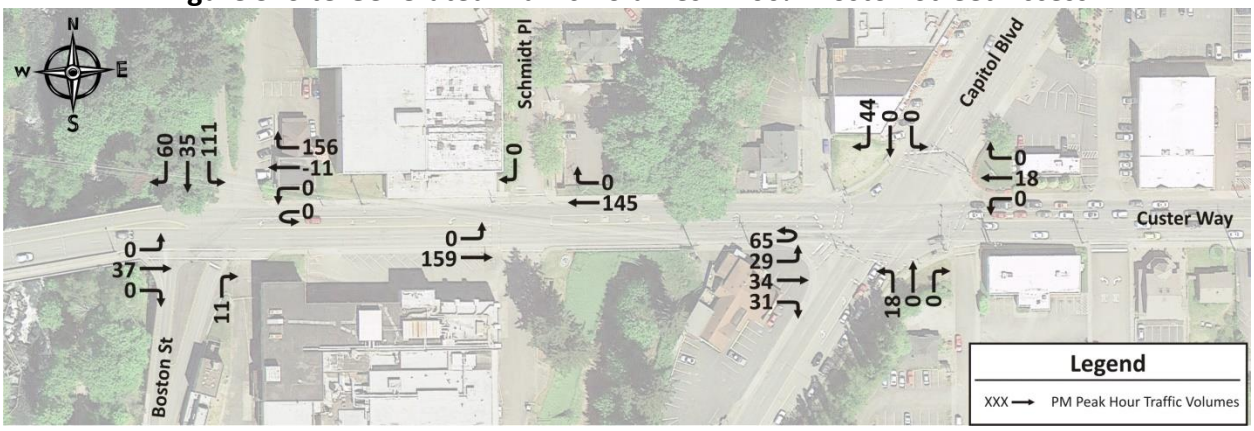
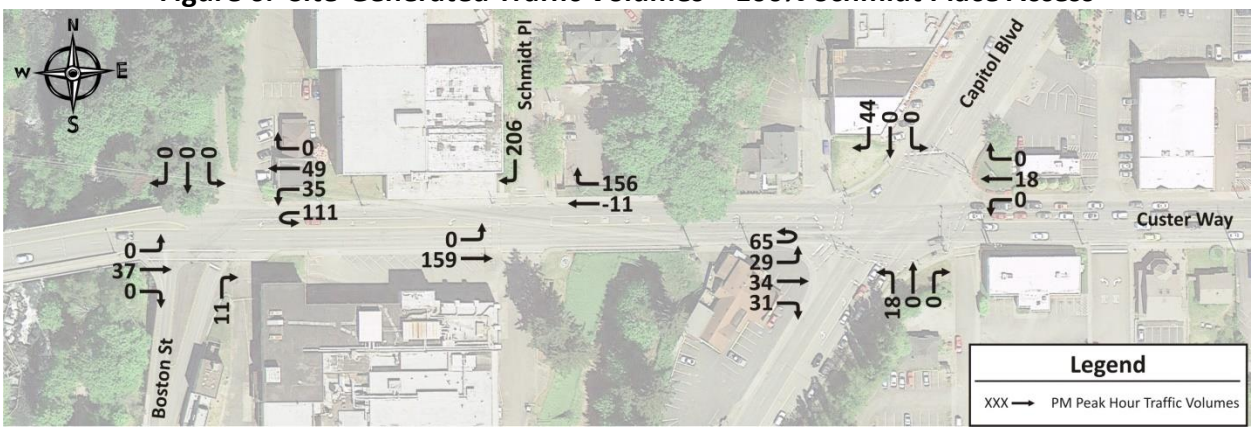


Figure 6. Site-Generated Traffic Volumes – 100% Schmidt Place Access



A graphic showing the project traffic assignment on Deschutes Parkway, Capitol Way and North Street into the City of Olympia is provided in Appendix A.

5. FUTURE TRAFFIC CONDITIONS

The Tumwater Brewery Planned Action EIS has an analysis horizon year of 2035 to be consistent with the recently completed Brewery District Plan. Significant traffic growth has been forecasted for the project area by that horizon year. Also, a list of transportation improvements has been identified to accommodate the traffic growth. The following is a description of the conditions forecasted for the area.

5.1 Future Roadway Conditions

Custer Way currently serves as a commute route to and from I-5 North and US 101. This traffic demand is anticipated to grow over the next 20 years. The Brewery District Plan evaluated the vehicular traffic demands for the area and also evaluated the potential for improving non-motorized circulation within the area. The Brewery District is envisioned as developing into a social/commercial hub with improved facilities, making walking, biking and store-front shopping more comfortable and attractive. The transportation improvement package identified in the Brewery District Plan is designed to accommodate the overall goal of making the area a walkable community, as well as to accommodate commute and local vehicle traffic needs.

A key component of the plan is to implement vehicle lane reductions on Capitol Boulevard and Custer Way to accommodate expanded non-motorized facilities. Specifically, a northbound travel lane will be removed on Capitol Boulevard from E Street to Cleveland Avenue, and a westbound travel lane will be removed from Boston Street to Cleveland Avenue. To provide an alternative for vehicular commute traffic, the E Street Extension will be constructed, providing an arterial connection across the Deschutes River Valley from Deschutes Way to Cleveland Avenue.

Table 5 lists the transportation improvements adopted for implementation by the City of Tumwater to serve the future needs and goals for the Brewery District.

Table 5. Brewery District Plan – Transportation Improvement List

Priority	Roadway or Intersection Project	Description	Notes
1	E Street Extension - Deschutes Way to Cleveland Avenue	Construct a new arterial roadway	Required to accommodate future improvements to Custer Way and Capitol Blvd
2	Custer Way Corridor Preliminary Design Study	Preliminary design to identify roadway and intersection footprint and ROW requirements	Provides a framework to guide future development along Custer Way
3	2nd Avenue/Custer Way Intersection	Restripe southbound approach to add a second left-turn movement	Lower cost project that could be implemented independent of other projects

4	Bates Neighborhood Circulation	Restripe Clark Place and Erie Street to improve circulation and add landscaping improvements to neighborhood streets	Lower cost project that could be implemented independent of other projects
5	Custer Way Corridor – Boston Street to Cleveland Avenue	Remove eastbound vehicle lane and left-turn lanes through corridor. Construct roundabouts at Boston Street, Capitol Boulevard and Cleveland Avenue. Construct a raised median and add non-motorized and landscaping improvements	
6	Capitol Boulevard/Carlyon Avenue Intersection	Construct roundabout	Required for future median section on Capitol Blvd
7	Capitol Boulevard/Cleveland Avenue Intersection	Construct roundabout	Required for future median section on Capitol Blvd
8	Cleveland Avenue – Capitol Boulevard to Custer Way	Remove the center-turn lane and add non-motorized and landscaping improvements	Could be constructed in phases (northern portion requires relocating Tumwater Transit Center)
9	Capitol Boulevard – Custer Way to Cleveland Avenue	Remove the center-turn lane and a northbound vehicle lane. Construct a raised median and add non-motorized and landscaping improvements. Includes relocating Tumwater Transit Center from Cleveland Avenue to Capitol Boulevard	
10	Capitol Boulevard – E Street to Custer Way	Remove a northbound vehicle lane and add non-motorized improvements	
11	Cleveland Avenue – E Street Extension to Custer Way	Remove a northbound vehicle lane and add non-motorized improvements	
12	Capitol Boulevard – Cleveland Avenue to Carlyon Avenue	Remove the center-turn lane and construct raised median. Add non-motorized and landscaping improvements	

5.2 Traffic Volume Forecast

The traffic volume forecast for this analysis is based on the 2035 forecast prepared for the Brewery District Plan. The traffic volume forecasts include the influence of the proposed improvement package described in section 5.1. The traffic volumes at the study intersections were refined slightly to reflect the specific circulation patterns of the proposed Planned Action development and for the "bookend" access alternatives described in section 4.5.1.

The TRPC Regional Travel Demand Model was used in the Brewery District Plan to estimate future traffic flows in the area. The Base Year (2009) travel demand model is calibrated to replicate existing travel patterns. TRPC has also prepared a 2035 scenario, which includes future roadway projects as well as regional growth and shift in household and employment densities. While the model is calibrated to existing conditions, traffic volumes on individual roadways vary somewhat from existing traffic counts. To account for this variance, the transportation model traffic volume assignments were post-processed to align them with existing ground counts. Specifically, the traffic volume growth predicted by the transportation model was used to grow the 2012 traffic volumes to prepare the 2035 PM peak hour traffic volumes used in the analysis. The 2035 volumes were determined by calculating the growth between 2009 and 2035 and applying that growth to the existing 2012 traffic volumes. The traffic volume calculations are provided in **Appendix A.**

As noted previously, the internal circulation design has not yet been completed, and it is not known which driveway (Boston Street Extension or Schmidt Place) drivers will favor to get to/from Custer Way. For this study, two "bookend" scenarios were prepared, with all site-generated traffic using either Boston Street Extension or Schmidt Place. The 2035 total traffic volume assignment with all site-generated traffic using Boston Street is shown on **Figure 7,** and with all site-generated traffic using Schmidt Place is shown on **Figure 8**.

Figure 7. Projected 2035 Total Traffic Assignment – 100% Boston Street Access

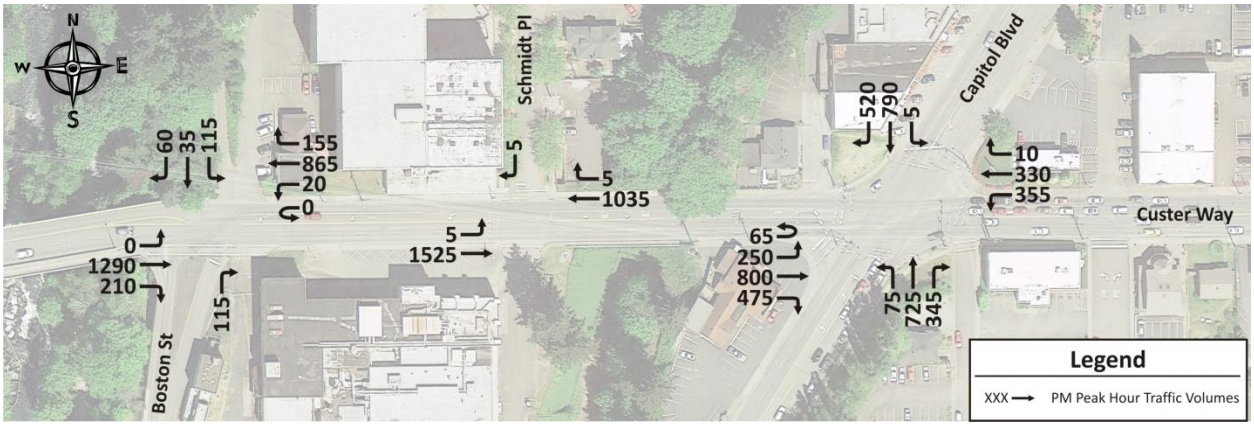
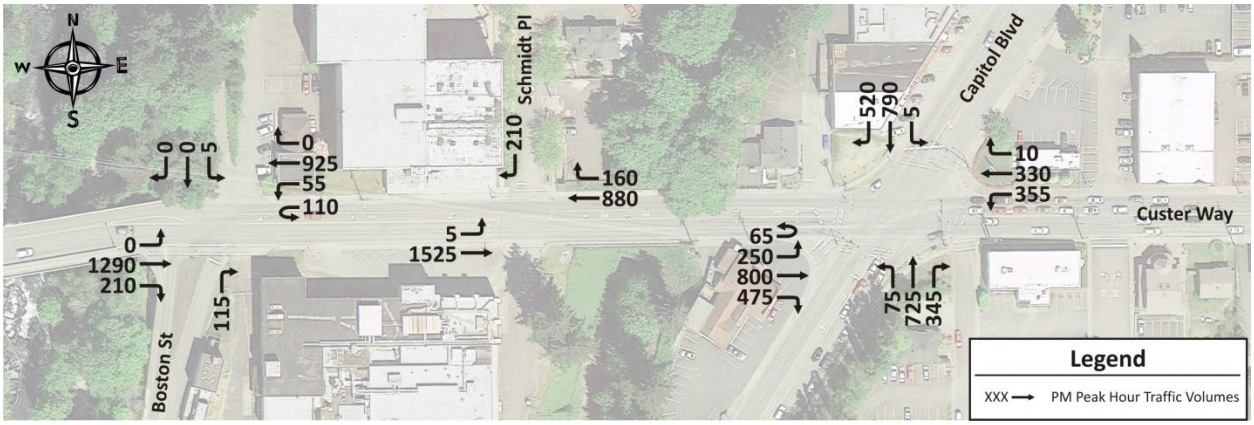


Figure 8. Projected 2035 Total Traffic Assignment – 100% Schmidt Place



6. TRAFFIC OPERATIONS ANALYSIS

Traffic analyses were conducted to identify any existing deficiencies within the study area and for the project completion horizon year. The acknowledged source for determining overall capacity for arterial segments and independent intersections is the current edition of the Highway Capacity Manual (HCM). Capacity analyses were completed for the base year and project horizon year PM peak hour traffic volume scenarios for all intersections.

Intersection analysis was performed using version 8 of the Synchro software package. This software implements the methods of the 2010 HCM. Capacity analysis results are described in terms of Level of Service (LOS). LOS is a qualitative term describing the operating conditions a driver will experience while traveling on a particular street or highway during a specific time interval. It ranges from A (very little delay) to F (long delays and congestion).

6.1 Level of Service

Level of service calculations for intersections determine the amount of "control delay" (in seconds) drivers will experience while proceeding through an intersection. Control delay includes all deceleration delay, stopped delay and acceleration delay caused by the traffic control device. The LOS is directly related to the amount of delay experienced. For traffic signals and modern roundabouts, the LOS grade represents the weighted average of all movements at the intersection. For stop sign-controlled intersections, the LOS represents the worst individual movement at the intersection.

Table 6 shows the Level of Service criteria for stop sign-controlled intersections. **Table 7** shows the LOS criteria for modern roundabouts and signalized intersections.

Table 6. Level of Service Criteria for Stop Sign-Controlled Intersections

Level of Service	Average Control Delay (seconds/vehicle)
A	≤10
B	>10-15
C	>15-25
D	>25-35
E	>35-50
F	>50

Table 7. Level of Service Criteria for Modern Roundabout and Signalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)
A	≤10
B	>10-20
C	>20-35
D	>35-55
E	>55-80
F	>80

6.2 Operational Analysis Summary

The analysis was conducted for the following traffic volume scenarios:

- Existing 2012 traffic volumes
- Projected 2035 traffic volumes with the *Tumwater Brewery Planned Action development*
    - All site-generated traffic to/from Boston Street Extension
    - All site-generated traffic to/from Schmidt Place

The following is a description of each study intersection.

6.2.1 Custer Way/Boston Street

This is a tee intersection that currently operates stop sign-control for Boston Street. There is also a SB driveway approach across from Boston Street that will be rebuilt as part of project development. The NB approach of Boston Street has a single approach lane and is signed to prohibit left turns onto WB Custer Way. The EB approach of Custer Way has two through lanes with right-turns made from the curbside through lane. The WB approach of Custer Way has a left-turn lane and a through lane. The intersection currently operates at a LOS B condition for the NB right-turn movement and a LOS C for the WB left-turn movement.

6.2.1.1 Proposed Brewery District Plan Improvement

This intersection is identified for conversion to modern roundabout control. The intersection will operate with a "teardrop" design that would not allow the NB through movement from Boston Street into the site or EB to NB left-turns into the site. All other movements would be allowed. The westbound approach would be a single lane providing right-turn, left-turn and through movements as well as WB to EB u-turns. The SB approach would provide a single lane allowing right-turn and through movements. The EB approach would provide a through lane and a through-right lane.

Under both 2035 traffic volume scenarios, the intersection would operate at a LOS A condition during the PM peak hour as a Modern Roundabout.

6.2.2 Custer Way/Schmidt Place

This is a tee intersection that operates under stop sign-control for the SB approach. There is also an unused driveway approach across Custer Way from Schmidt Place. SB Schmidt Place has a single shared lane. EB Custer Way has two through lanes, with left turns made from the inside through lane. The WB approach has a shared through/right-turn lane and a left-turn lane; however, the left-turn lane is used as storage for vehicles queuing to turn onto SB Boston Street. During the PM peak hour, the intersection currently operates at a LOS C for the SB approach.

6.2.1.2 Proposed Brewery District Plan Improvement

As part of the Custer Way improvements, a center median will be installed between Boston Street and Capitol Boulevard, which will restrict Schmidt Place to right-in/right out (RIRO). Vehicles wishing to enter from EB Custer Way would go past Schmidt Place, perform a u-turn at Capitol Boulevard, and enter as a right-turn from westbound Custer Way. Similarly, vehicles wishing to exit onto eastbound Custer Way would turn right onto Custer Way and u-turn at Boston Street.

For the 2035 horizon, the operation of this intersection would vary significantly between access scenarios. The SB right-turn movement would operate at a LOS E condition with Schmidt Place as the primary access. With the primary access at Boston Street Extension, the intersection would operate at a LOS C condition.

6.2.3 Custer Way/Capitol Boulevard

This is a four-way signalized intersection. The EB approach on Custer Way provides a left-turn lane, a shared through left-turn lane and a shared through right-turn lane. WB Custer Way provides a left-turn lane and a shared left-turn through right-turn lane. The NB and SB approaches on Capitol Boulevard each have a left turn lane, a through lane and a shared through right-turn lane.

The westbound and eastbound movements operate with split signal phasing. The NB and SB left turn phases are protected. In the PM peak hour, the intersection operates at a LOS D condition.

6.2.1.3 Proposed Brewery District Plan Improvement

This intersection is planned to be converted to a modern roundabout as part of the Brewery District Plan improvements. The intersection will be reconstructed as a two-circulating-lane roundabout with the following lane geometries: the NB approach will have a through/left-turn lane and a right-turn lane. The SB approach will have a through/left-turn lane and a through/right-turn lane. The EB approach will have a right-turn lane, through lane and a shared through/left-turn lane. The WB approach will have a left-turn lane and a shared through/right-turn lane.

Under this configuration the intersection will operate at a LOS C condition during the 2035 horizon under either driveway access scenario.

Table 8 provides a summary of the level of service analysis for the study intersections. The capacity analysis worksheets are provided in **Appendix B**.

Table 8. Level of Service Summary

	Existing 2012 Volumes	Projected 2035 Volumes	
		Boston Street Extension Access	Schmidt Place Access
Intersection	LOS (Delay)	LOS (Delay)	LOS (Delay)
Boston Street/Custer Way	B (14.7)	A (1.3)	A (0.8)
Schmidt Place/Custer Way	C (20.1)	C (19.1)	E (48.3)
Capitol Boulevard/Custer Way	D (38.9)	C (27.7)	C (27.7)

As shown in the previous table, each of the study intersections will operate at an acceptable LOS for the 2035 horizon with the Tumwater Brewery Planned EIS traffic, except for the Schmidt Place/Custer Way intersection. The analysis indicates that Schmidt Place will not operate at an acceptable LOS if it is required to serve all of the inbound/outbound project traffic. The Boston Street/Custer Way intersection is better suited to serving as the primary access to the development. It is recommended that the internal site circulation system be designed such that entering and exiting traffic will be split between Schmidt Place and Boston Street.

6.3 Interim Improvement Strategy

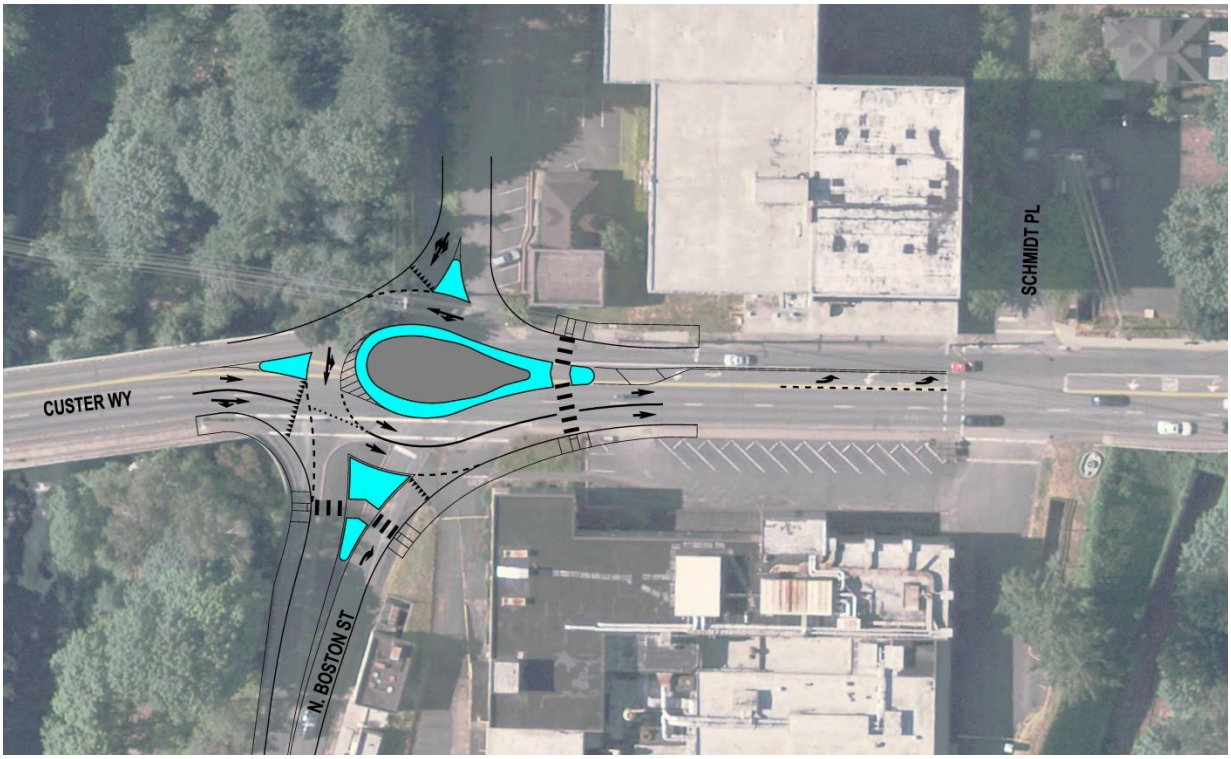
The analysis described above was prepared to confirm that traffic from the proposed *Tumwater Brewery Planned Action EIS* development would operate acceptably within the roadway system identified for the area in the Brewery District Plan. Many of the improvements adopted in the Brewery District Plan are designed to enhance the "walkability" of the area to spur the transition to a multi-modal town center. Although it will benefit from the improved multi-modal system, most of the improvements planned are not required to serve traffic generated by the Tumwater Brewery project. However, the proposed roundabout at Boston Street/Custer Way is essential to the operation of the project. The Boston Street/Custer Way roundabout will provide the following specific benefits:

- Provide access into and out of the project site
- Provide for WB to EB U-turns, which in turn allows the installation of a center median on Custer Way between Boston Street and Capitol Boulevard
- Improve traffic flows and reduce queuing on Custer Way between 2nd Avenue and Cleveland Avenue

If the improvements to the Custer Way corridor are not implemented by the City of Tumwater prior to development of the Tumwater Brewery site, the project developer will be required to construct the "teardrop" roundabout at Boston Street. The roundabout may be designed and constructed in an "interim" configuration, as it may not be possible to construct all of the roadway and non-motorized improvements envisioned within the right-of-way currently available. The design and construction of interim improvements would be planned to fit within the context of the ultimate improvements, to minimize "throw-away" work. The design and construction would be reviewed and approved by the City of Tumwater.

In this interim scenario, the Capitol Boulevard/Custer Way intersection would remain in its current configuration. As noted previously, a benefit of the RAB at Capitol Boulevard would be to allow for EB to WB u-turns on Custer Way, which would in turn allow for construction of a full median along Custer Way. Without the u-turn capability at Capitol Boulevard/Custer Way, the Schmidt Place access becomes more critical to provide entry for vehicles entering the development from the west via 2nd Avenue or from NB Boston Street. A conceptual layout of the interim channelization is shown on **Figure 9.**

Figure 9. Conceptual Interim Channelization



Analysis of the Custer Way intersections with Boston Street, Schmidt Place and Capitol Boulevard has been prepared herein for a near-term scenario with full build-out of the proposed *Tumwater Brewery Planned Action* development. The analysis was prepared for a "hypothetical" 2018 horizon year. This analysis shows the function of the accesses and nearby intersections if some or all of the *Tumwater Brewery Planned Action* development is constructed prior to the roadway improvements identified in the Brewery District Plan.

6.3.1 Traffic Volume Projections

Interim horizon traffic volume projections were prepared by collecting 2015 PM peak hour traffic volume counts at Custer Way/Boston Street and Custer Way/Capitol Boulevard intersections. A 2% annual growth rate was applied to all movements to prepare a 2018 "baseline" volume scenario. The 2015 traffic count volume worksheets are included in **Appendix A**.

Full-development site-generated traffic volumes were added to the 2018 baseline volumes to estimate 2018 volumes with project development. The assignment of traffic would be slightly different under this scenario, with EB to NB left-turns allowed from Custer Way onto Schmidt Place. Schmidt Place could continue to allow SB to EB left turns onto Custer Way, but for this analysis the SB approach was

assumed to operate as a de facto right-turn-only lane, with vehicles wishing to turn onto EB Custer Way using the Boston Street RAB to u-turn. The 2018 PM peak hour volumes with project development are shown on **Figure 9** and **Figure 10**.

Figure 10. Projected 2018 Total Traffic Assignment – 100% Boston Street Access

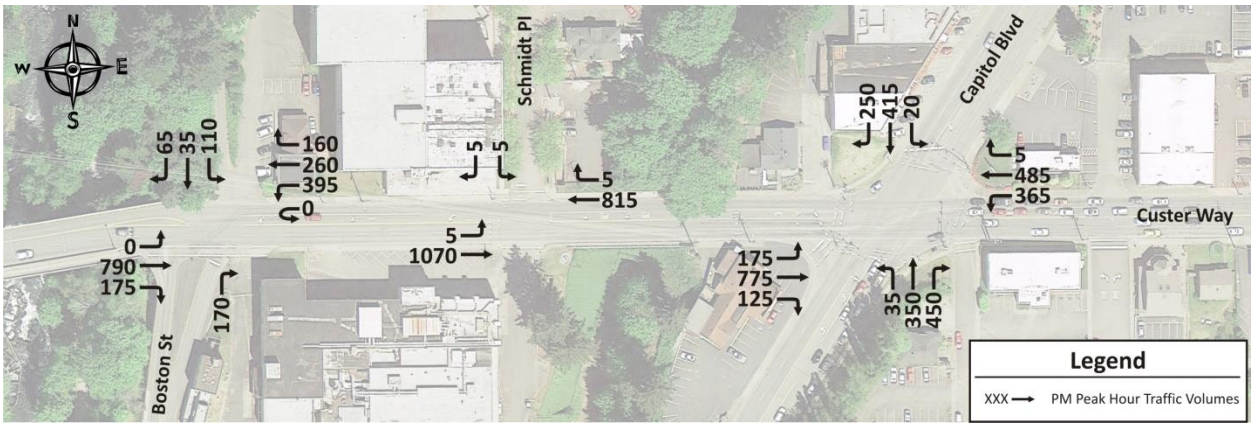
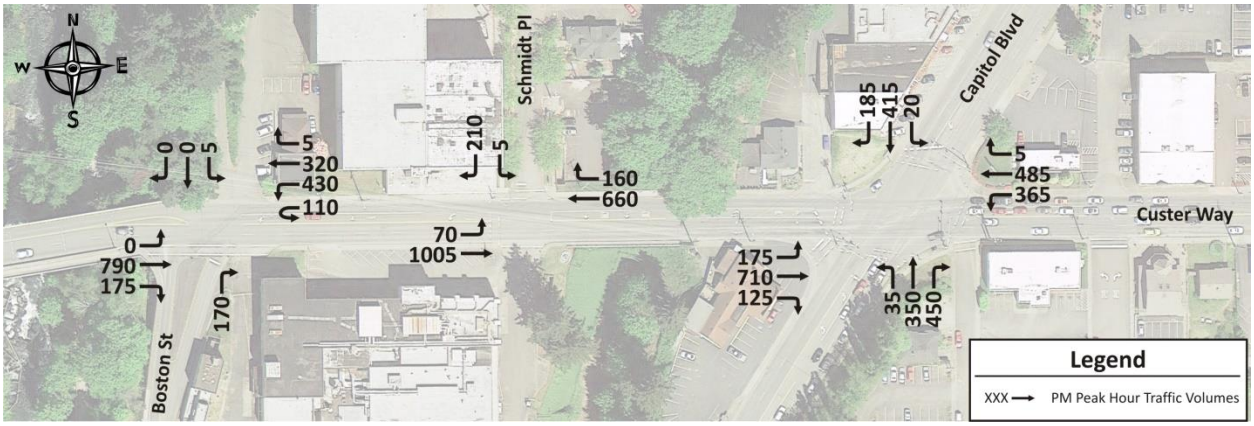


Figure 11. Projected 2018 Total Traffic Assignment – 100% Schmidt Place Access



The following is a description of the operation of each study intersection for the 2018 "interim" scenario. Traffic operations analysis was prepared for the 2018 volumes as described in Section 6 of this report.

6.3.2 Custer Way/Boston Street

This intersection would be built to the same configuration as described in section 6.2.1.1. The roundabout would be of a "teardrop" design that would not allow the NB through movement from Boston Street into the site or EB to NB left-turns into the site. All other movements would be allowed. The WB approach would be a single lane providing right-turn, left-turn and through movements. The SB approach would provide a single lane allowing right-turn and through movements. The EB approach would provide two lanes: a through lane and a through-right lane. The NB approach would provide right-turns only.

Under this scenario the intersection would operate at a LOS A with all site-generated traffic entering at Boston Street or all site generated traffic entering at Schmidt Place.

6.3.3 Custer Way/Schmidt Place

Under the interim scenario, westbound Custer Way would be re-configured to have one westbound lane between Schmidt Place and Boston Street. The center lane, which is currently striped as a WB to SB left-turn lane for vehicles headed south onto Boston Street, would be restriped as an EB to NB left-turn lane into Schmidt Place. The SB approach of Schmidt Place could remain as a full access approach to provide circulation options throughout the day, but it is anticipated that it would function as a de facto right-turn-only approach during the PM peak hour, with vehicles using the Boston Street RAB to perform a WB to EB u-turn.

Under this scenario the SB right-turn movement would operate a LOS D condition with Schmidt Place as the primary access. With the primary access at Boston Street Extension, the intersection would operate at a LOS C condition.

6.3.4 Custer Way/Capitol Boulevard

This intersection would remain under the current configuration under traffic signal control. Under this scenario, the SB right-turn movement would operate at a LOS D condition with Schmidt Place as the primary access. With the primary access at Boston Street Extension, the intersection would operate at a LOS E condition.

Table 4 summarizes the predicted operation of the study intersections for the 2018 interim scenario.

Table 9. Level of Service Summary – Interim Improvement Strategy

	Existing 2012 Volumes	Projected 2018 Volumes	
		Boston Street Extension Access	Schmidt Place Access
Intersection	LOS (Delay)	LOS (Delay)	LOS (Delay)
Boston Street/Custer Way	B (14.7)	A (4.2)	A (3.7)
Schmidt Place/Custer Way	C (20.1)	C (24.6)	D (33.2)
Capitol Boulevard/Custer Way	D (38.9)	E (59.1)	D (54.2)

As shown in the table above, the study intersections will function at a LOS D condition or better for both access scenarios with the exception of Capitol Boulevard/Custer Way for the Boston Street extension-only access scenario. Access to the development via Schmidt Place is necessary to allow vehicles to enter the project site from the west via Custer Way and from the south via Boston Street. Without a Schmidt Place access, those vehicles would be required to go through the Capitol Boulevard/Custer Way intersection, turn around at the Capitol/Cleveland/Custer triangle and return on westbound Custer Way to enter at Boston Street.

6.4 Non-Motorized Circulation

The Brewery District is currently home to a number of parks and recreational areas including the Tumwater Falls Park, Tumwater Historical Park, and Henderson House and Crosby House Museums. Existing trails provide a walking route around the Deschutes River west of the Brewery property, and a trail connection under Interstate 5 to the Capitol Lake Interpretive Park. The City of Tumwater has identified other trail connections that will effectively connect the area to the south along the Deschutes River.

The Brewery District Plan has identified additional non-motorized improvements in the area including an enhanced Transit Transfer Center on Capitol Boulevard. This transfer center would include a pedestrian connection between Capitol Boulevard and the Tumwater Brewery property, with a bridge over the Union Pacific Railroad right-of-way.

The proposed *Tumwater Brewery Planned Action EIS* development is designed to integrate into and enhance the non-motorized network planned for the larger community. Alternatives 2 and 3 both include internal non-motorized connectivity across the property and will accommodate the pedestrian crossing from Capitol Boulevard. The development will likely entail a connection to the existing trail on the Deschutes River.

7. MITIGATION

The proposed development will have a measurable impact on the area roadways and intersections. The Brewery District Plan anticipated the precise type of development and traffic loading expected as part of the *Tumwater Brewery Planned Action* development. The analysis contained in this report confirmed that the proposed *Tumwater Brewery Planned Action* development would function within the context of the roadway and intersection plan identified for the area in the Brewery District Plan. However, to accommodate the specific access needs of the development, the following mitigation items will be required.

7.1 Construct Modern Roundabout at Boston Street/Custer Way

If the City of Tumwater has not completed the Custer Way improvements identified in the Brewery District Plan prior to development of the *Tumwater Brewery Planned Action* project, the project developer will be required to construct a modern roundabout at the Boston Street/Custer Way intersection.

7.2 Pay City of Tumwater Transportation Impact Fee

The City of Tumwater collects for area roadway improvements through the Transportation Impact Fee (TIF) program. The TIF contribution is calculated by ordinance on a "per unit" basis. The *Tumwater Brewery Planned Action* development will pay impact fees incrementally as the site is built-out.

7.3 Pay City of Olympia Transportation Mitigation Fees

Proponents of future development within the *Tumwater Brewery Planned Action* property may be required to pay City of Olympia transportation mitigation fees incrementally as the site is built-out. The City of Olympia collects the fees based on a "per PM peak hour trip" basis. The actual fees would be calculated by the City of Olympia individually for each building project within the development.

8. CONCLUSIONS

The City of Tumwater has prepared a Planned Action EIS for the former Olympia Brewery area north of Custer Way in Tumwater. This report provides a traffic operational assessment of the development alternatives and identifies improvements needed to accommodate project development.

The Brewery District Plan, recently adopted by the City of Tumwater, provides a framework for future development and infrastructure improvements within the area. Traffic analysis for this Planned Action EIS was prepared to confirm that traffic from the proposed *Tumwater Brewery Planned Action* project can be accommodated within the context of the multi-modal improvements envisioned for the area. The analysis shows that the project can be accommodated with specific traffic mitigation items listed in **Section 7** of this report.

APPENDIX A
TRAFFIC VOLUME CALCULATIONS

Tumwater Brewery Planned Action EIS

Tumwater, WA

PM Peak Hour Trip Generation Estimate-Alternative 2																	
Site Plan Description	LUC	ITE Description	Variable	Value	ITE Rate	Distribution		Total Trips			Int. Capture		Pass-By Trips		Net New Trips		
						In	Out	In	Out	Total	%	Total	%	Total	In	Out	Total
Office/Classroom	710	General Office	ksqft	70	1.49	17%	83%	18	86	104	13%	14	0%	0	15	75	90
Apartments	220	Apartments	du	0	0.62	65%	35%	0	0	0	0%	0	0%	0	0	0	0
Retail	826	Specialty Retail	ksqft	80	2.71	44%	56%	95	120	215	28%	60	20%	31	55	69	124
Distillery	140	Manufacturing	emp	20	0.36	44%	56%	3	4	7	0%	0	0%	0	3	4	7
Hotel	310	Hotel	Rooms	98	0.60	51%	49%	30	29	59	37%	22	0%	0	19	18	37
Townhouse	220	Apartments	du	0	0.62	65%	35%	0	0	0	0%	0	0%	0	0	0	0
Public	580	Museum	ksqft	10	0.18	16%	84%	0	2	2	0%	0	0%	0	0	2	2
Restaurant	932	High turnover (sit down) restaurant	ksqft	13	9.85	60%	40%	77	51	128	48%	62	43%	28	23	15	38
		Total						**223**	**292**	**515**	**31%**	**158**		**59**	**115**	**183**	**298**

PM Peak Hour Trip Generation Estimate-Alternative 3																	
Site Plan Description	LUC	ITE Description	Variable	Value	ITE Rate	Distribution		Total Trips			Int. Capture		Pass-By Trips		Net New Trips		
						In	Out	In	Out	Total	%	Total	%	Total	In	Out	Total
Office/Classroom	710	General Office	ksqft	65	1.49	17%	83%	16	81	97	19%	18	0%	0	13	66	79
Apartments	220	Apartments	du	75	0.62	65%	35%	31	16	47	61%	29	0%	0	12	6	18
Retail	826	Specialty Retail	ksqft	84	2.71	44%	56%	99	127	226	41%	92	20%	27	47	60	107
Distillery	140	Manufacturing	emp	20	0.36	44%	56%	3	4	7	0%	0	0%	0	3	4	7
Hotel	310	Hotel	Rooms	101	0.60	51%	49%	31	30	61	37%	23	0%	0	19	19	38
Townhouse	220	Apartments	du	75	0.62	65%	35%	31	16	47	61%	29	0%	0	12	6	18
Public	580	Museum	ksqft	10	0.18	16%	84%	0	2	2	0%	0	0%	0	0	2	2
Restaurant	932	High turnover (sit down) restaurant	ksqft	13	9.85	60%	40%	77	51	128	49%	63	43%	28	22	15	37
		Total						**288**	**327**	**615**	**42%**	**254**		**55**	**128**	**178**	**306**

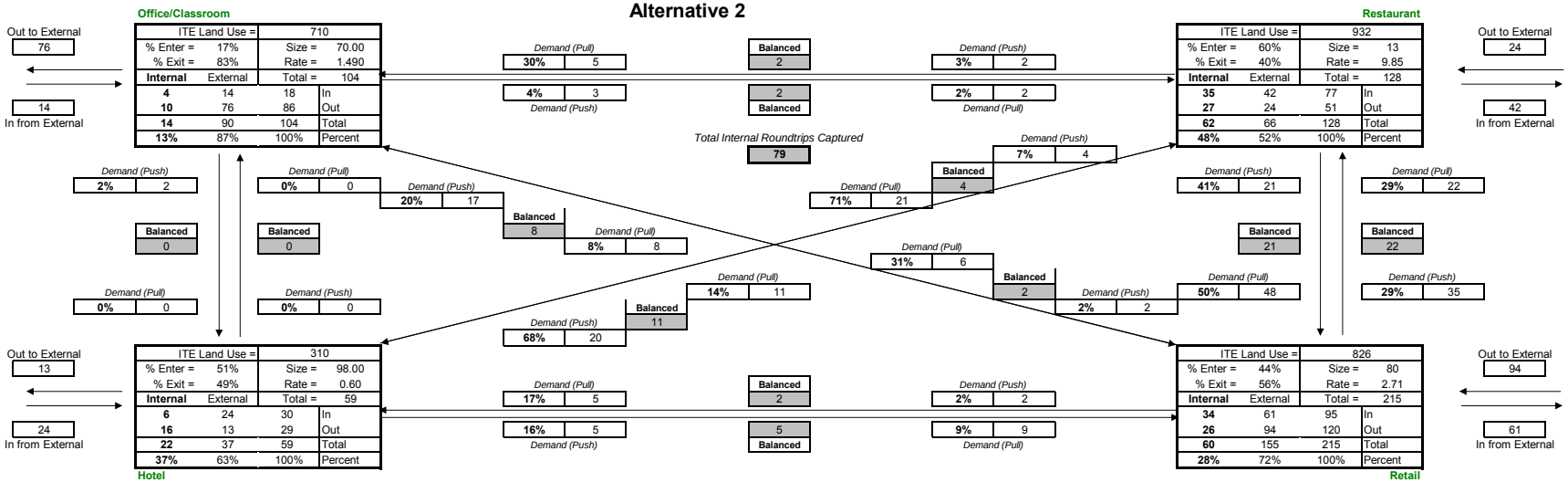
Tumwater Brewery Planned Action EIS

Weekday PM Peak Hour

Multi-Use Development Trip Generation and Internal Capture Summary

Trip Generation Handbook, 2001 (ITE) and *NCHRP Report 684,* 2011 (TRB)

Alternative 2



Multi-Use Development Trip Generation Summary - Weekday PM Peak Hour										
	Office/Classroom		Restaurant		Hotel		Retail		Total Devel.	
Total Gross Trips	104		128		59		215		506	
Less Internal Trips	14	13%	62	48%	22	37%	60	28%	158	31.2%
Total External Trips	90		66		37		155		348	
External In	14		42		24		61		141	
External Out	76		24		13		94		207	

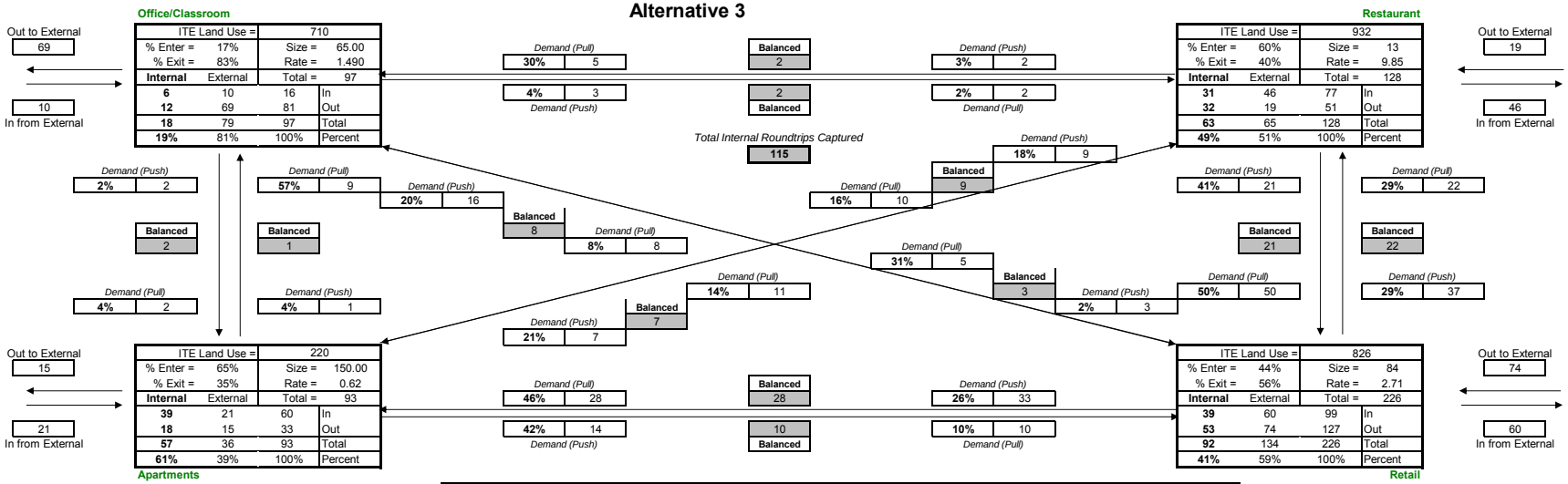
Tumwater Brewery Planned Action EIS

Weekday PM Peak Hour

Multi-Use Development Trip Generation and Internal Capture Summary

Trip Generation Handbook, 2001 (ITE) and *NCHRP Report 684,* 2011 (TRB)

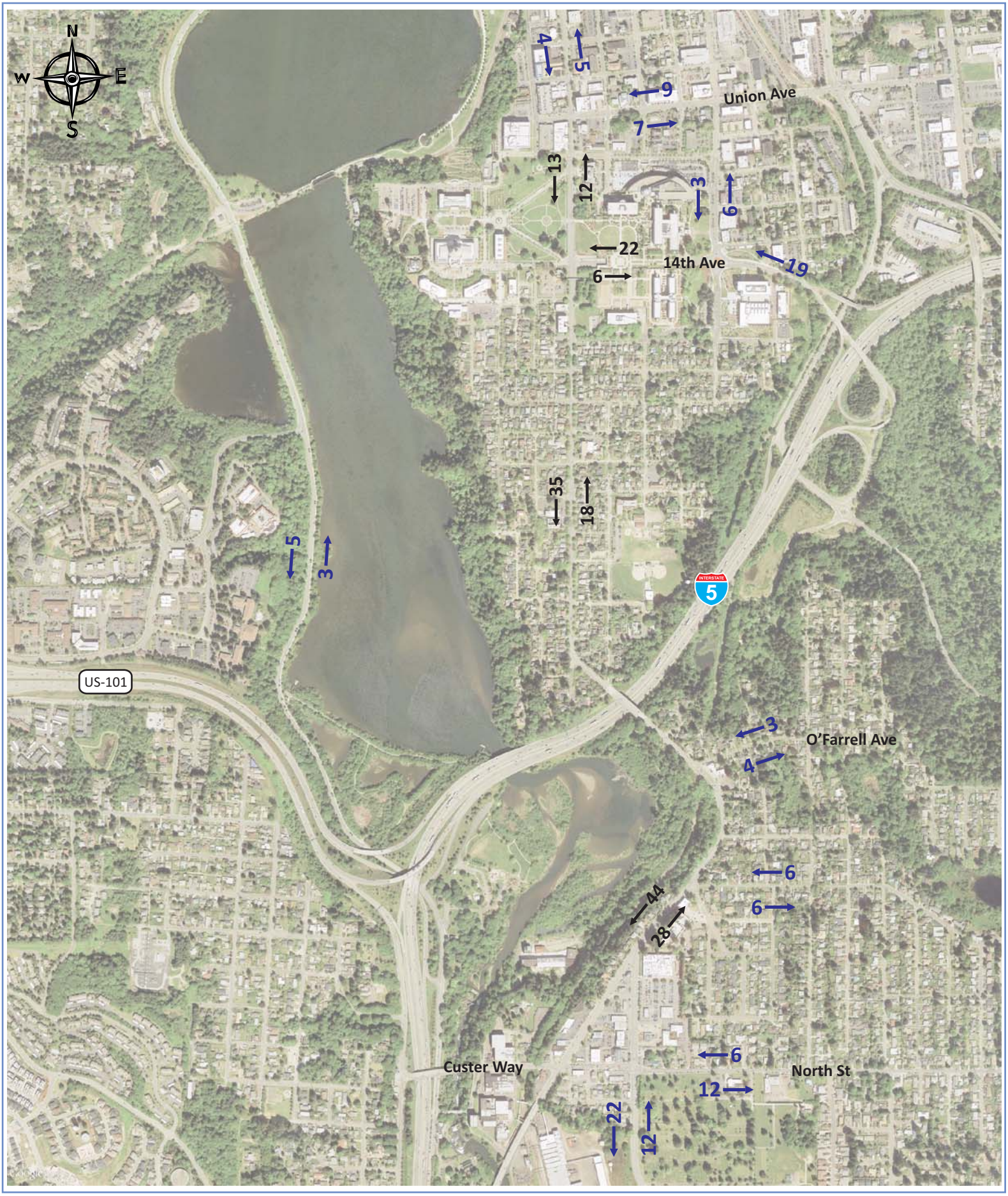
Alternative 3



Multi-Use Development Trip Generation Summary - Weekday PM Peak Hour										
	Office/Classroom		Restaurant		Apartments		Retail		Total Devel.	
Total Gross Trips	97		128		93		226		544	
Less Internal Trips	18	19%	63	49%	57	61%	92	41%	**230**	**42.3%**
Total External Trips	79		65		36		134		314	
External In	10		46		21		60		137	
External Out	69		19		15		74		177	

Table 7.1a Adjusted Internal Trip Capture Rates for Trip Origins within a Multi-Use Development			
Land Use Pairs		Weekday	
		AM Peak Hour	PM Peak Hour
From OFFICE	To Office	0.0%	0.0%
	To Retail	28.0%	20.0%
	To Restaurant	63.0%	4.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	1.0%	2.0%
	To Hotel	0.0%	0.0%
From RETAIL	To Office	29.0%	2.0%
	To Retail	0.0%	0.0%
	To Restaurant	13.0%	29.0%
	To Cinema/Entertainment	0.0%	4.0%
	To Residential	14.0%	26.0%
	To Hotel	0.0%	5.0%
From RESTAURANT	To Office	31.0%	3.0%
	To Retail	14.0%	41.0%
	To Restaurant	0.0%	0.0%
	To Cinema/Entertainment	0.0%	8.0%
	To Residential	4.0%	18.0%
	To Hotel	3.0%	7.0%
From CINEMA/ENTERTAINMENT	To Office	0.0%	2.0%
	To Retail	0.0%	21.0%
	To Restaurant	0.0%	31.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	8.0%
	To Hotel	0.0%	2.0%
From RESIDENTIAL	To Office	2.0%	4.0%
	To Retail	1.0%	42.0%
	To Restaurant	20.0%	21.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	0.0%
	To Hotel	0.0%	3.0%
From HOTEL	To Office	75.0%	0.0%
	To Retail	14.0%	16.0%
	To Restaurant	9.0%	68.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	2.0%
	To Hotel	0.0%	0.0%

Table 7.2a Adjusted Internal Trip Capture Rates for Trip Destinations within a Multi-Use Development			
Land Use Pairs		Weekday	
		AM Peak Hour	PM Peak Hour
To OFFICE	From Office	0.0%	0.0%
	From Retail	4.0%	31.0%
	From Restaurant	14.0%	30.0%
	From Cinema/Entertainment	0.0%	6.0%
	From Residential	3.0%	57.0%
	From Hotel	3.0%	0.0%
To RETAIL	From Office	32.0%	8.0%
	From Retail	0.0%	0.0%
	From Restaurant	8.0%	50.0%
	From Cinema/Entertainment	0.0%	4.0%
	From Residential	17.0%	10.0%
	From Hotel	4.0%	2.0%
To RESTAURANT	From Office	23.0%	2.0%
	From Retail	50.0%	29.0%
	From Restaurant	0.0%	0.0%
	From Cinema/Entertainment	0.0%	3.0%
	From Residential	20.0%	14.0%
	From Hotel	6.0%	5.0%
To CINEMA/ENTERTAINMENT	From Office	0.0%	1.0%
	From Retail	0.0%	26.0%
	From Restaurant	0.0%	32.0%
	From Cinema/Entertainment	0.0%	0.0%
	From Residential	0.0%	0.0%
	From Hotel	0.0%	0.0%
To RESIDENTIAL	From Office	0.0%	4.0%
	From Retail	2.0%	46.0%
	From Restaurant	5.0%	16.0%
	From Cinema/Entertainment	0.0%	4.0%
	From Residential	0.0%	0.0%
	From Hotel	0.0%	0.0%
To HOTEL	From Office	0.0%	0.0%
	From Retail	0.0%	17.0%
	From Restaurant	4.0%	71.0%
	From Cinema/Entertainment	0.0%	1.0%
	From Residential	0.0%	12.0%
	From Hotel	0.0%	0.0%



SCJ ALLIANCE
CONSULTING SERVICES

City of Tumwater

Tumwater Brewery
Planned Action EIS

Regional Site Traffic Distribution

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

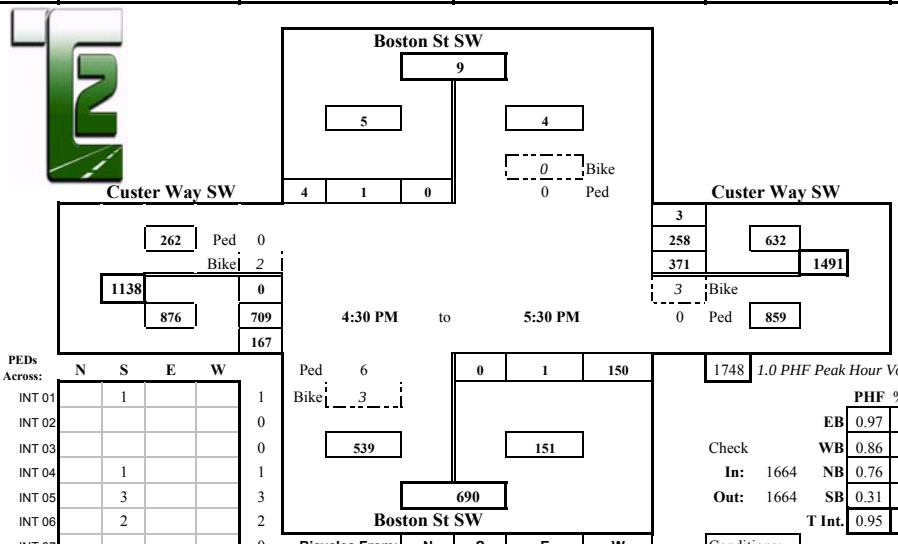
Phone: (253) 926-6009 FAX: (253) 922-7211 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Boston St SW & Custer Way SW **Date of Count:** Thurs 6/25/2015

Location: Tumwater, Washington **Checked By:** Jess

Time Interval	From North on (SB) Boston St SW				From South on (NB) Boston St SW				From East on (WB) Custer Way SW				From West on (EB) Custer Way SW				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	0	0	0	1	0	0	0	31	3	80	47	0	1	1	199	40	399
4:30 P	0	0	0	0	0	0	1	34	2	96	53	0	1	0	172	30	386
4:45 P	0	0	0	1	0	0	0	36	1	80	62	0	0	0	184	34	397
5:00 P	0	0	1	3	0	0	1	33	1	92	58	1	3	0	183	42	414
5:15 P	0	0	0	0	0	0	0	50	0	91	64	1	0	0	172	38	416
5:30 P	0	0	0	0	0	0	0	31	1	108	74	1	4	0	170	53	437
5:45 P	0	0	0	1	0	0	0	32	0	111	56	1	0	0	143	35	379
6:00 P	0	0	0	0	0	0	0	24	1	96	46	0	1	0	149	27	342
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	0	0	1	6	0	0	2	271	9	754	460	4	10	1	1372	299	3170
Peak Hour: 4:30 PM to 5:30 PM																	
Total	0	0	1	4	0	0	1	150	3	371	258	3	7	0	709	167	1664
Approach	5				151				632				876				1664
%HV	n/a				n/a				0.5%				0.8%				0.6%
PHF	0.31				0.76				0.86				0.97				0.95



PEDs Across:	N	S	E	W	
INT 01		1			1
INT 02					0
INT 03					0
INT 04		1			1
INT 05		3			3
INT 06		2			2
INT 07					0
INT 08		1			1
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	8	0	0	8

Bicycles From:	N	S	E	W	
INT 01		1			1
INT 02			1	2	3
INT 03				1	1
INT 04			1	1	2
INT 05		1			1
INT 06		2	2		4
INT 07		1	5	2	8
INT 08		1	2	4	7
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	6	11	10	27

1748 *1.0 PHF Peak Hour Volume*

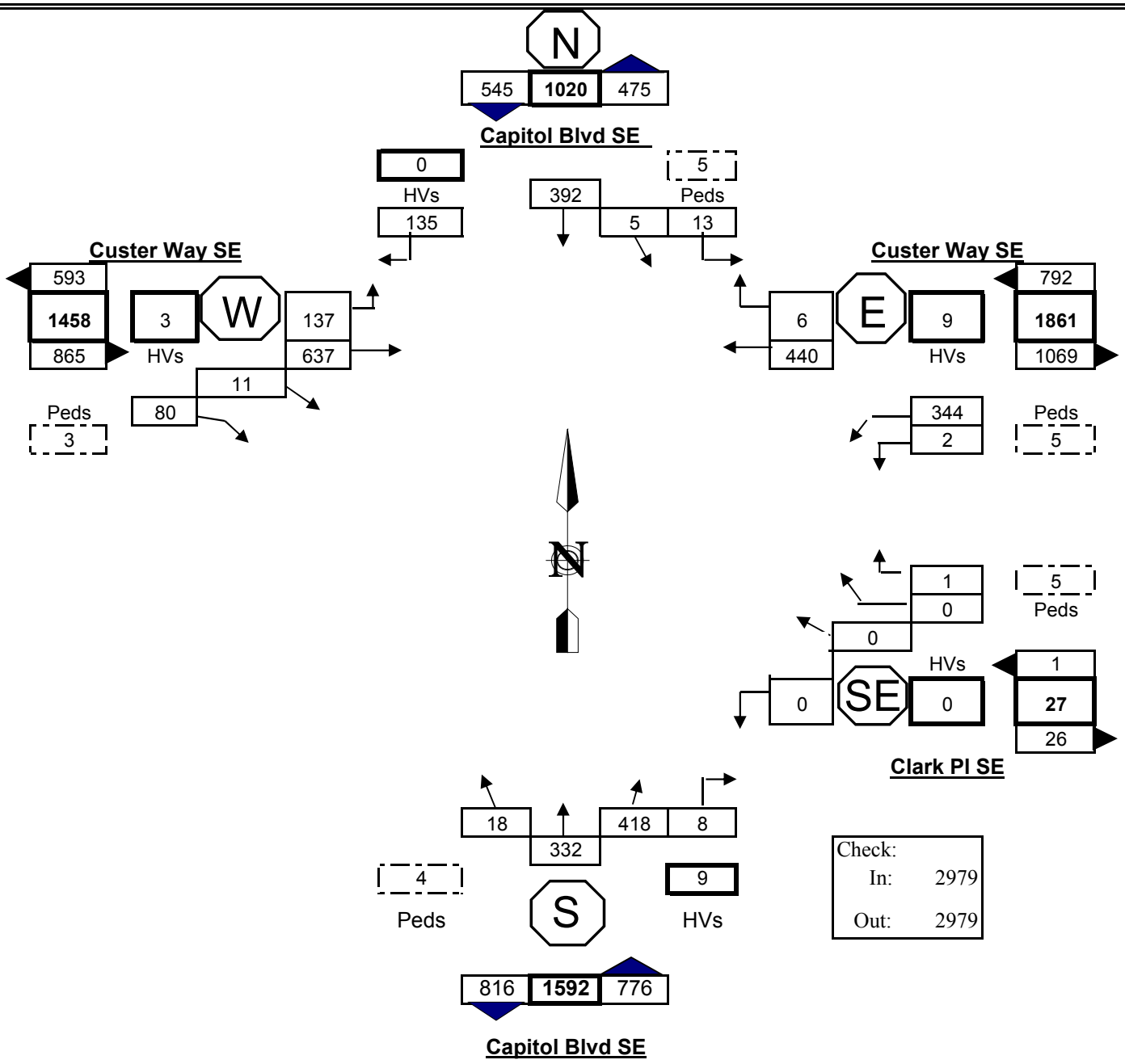
		PHF	%HV
	EB	0.97	0.8%
Check	WB	0.86	0.5%
In: 1664	NB	0.76	n/a
Out: 1664	SB	0.31	n/a
	T Int.	0.95	0.6%

Conditions:

Special Notes

SCJ15075M_19p

Traffic Count Consultants, Inc. DBE/WBE DBE/WBE
Phone: (425) 253 926-6009 E-Mail: Team@TC2inc.com



Intersection: Capitol Blvd SE & Custer Way SE & Clark Pl SE
Location: Tumwater, Washington
Date of Count: Tues 2/10/2015
Peak Period: 4:45 P - 5:45 P
Checked By: Jess
Prepared For: TENW

	%HV	PHF
SB	n/a	0.71
WB	1.1%	0.88
NWB	n/a	0.25
NB	1.2%	0.97
	0.0%	0.00
EB	0.3%	0.92
Intersection	0.7%	0.90

Annual Growth Rate 2%

				OBPA Full Project						OBPA Full Project - Existing Distribution						Projected 2035					Projected 2018	
				100% Boston			100% Schmidt			100% Boston			100% Schmidt									
		Existing 2015	Projected 2018	New-to-Network	Pass-By	Total Project	New-to-Network	Pass-By	Total Project	New-to-Network	Pass-By	Total Project	New-to-Network	Pass-By	Total Project	BDS Volumes	Project traffic from BDS	BDS without Project	**100% Boston**	**100% Schmidt**	**100% Boston**	**100% Schmidt**
Boston/Custer	rt	4	4	49	11	60	0	0	0	49	11	60	0	0	0	50	50	0	**60**	**0**	**64**	**4**
SB	th	1	1	35	0	35	0	0	0	35	0	35	0	0	0	5	5	0	**35**	**0**	**36**	**1**
	lt	0	0	94	17	111	0	0	0	94	17	111	0	0	0	100	95	5	**116**	**5**	**111**	**0**
	rt	3	3	128	28	156	0	0	0	128	28	156	0	0	0	25	25	0	**156**	**0**	**159**	**3**
WB	th	258	273	0	-11	-11	49	0	49	0	-11	-11	49	0	49	875	0	875	**864**	**924**	**262**	**322**
	lt	371	393	0	0	0	35	0	35	0	0	0	35	0	35	50	30	20	**20**	**55**	**393**	**428**
	Ut	0	0	0	0	0	94	17	111	0	0	0	94	17	111	0	0	0	**0**	**111**	**0**	**111**
	rt	150	159	11	0	11	11	0	11	11	0	11	11	0	11	115	10	105	**116**	**116**	**170**	**170**
NB	th	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**1**	**1**
	lt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**0**	**0**
	rt	167	177	0	0	0	0	0	0	0	0	0	0	0	0	210	0	210	**210**	**210**	**177**	**177**
EB	th	709	752	37	0	37	37	0	37	37	0	37	37	0	37	1285	30	1255	**1292**	**1292**	**789**	**789**
	lt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**0**	**0**
																					0	**0**
																					0	**0**
Schmidt/Custer	SB rt	5	5	0	0	0	178	28	206	0	0	0	178	28	206	35	30	5	**5**	**211**	**5**	**211**
	lt	5	5	0	0	0	0	0	0	0	0	0	0	0	0	5	0	5	**5**	**5**	**5**	**5**
WB	rt	5	5	0	0	0	128	28	156	0	0	0	128	28	156	85	80	5	**5**	**161**	**5**	**161**
	th	632	670	128	17	145	0	-11	-11	128	17	145	0	-11	-11	950	25	925	**1070**	**914**	**815**	**659**
EB	th	859	911	142	17	159	142	17	159	142	17	159	94	0	94	1500	135	1365	**1524**	**1524**	**1070**	**1005**
	lt	5	5	0	0	0	0	0	0	0	0	0	48	17	65	5	0	5	**5**	**5**	**5**	**70**
Capitol/Custer	rt	135	143	44	0	44	44	0	44	109	0	109	44	0	44	510	35	475	**519**	**519**	**252**	**187**
SB	th	392	416	0	0	0	0	0	0	0	0	0	0	0	0	790	0	790	**790**	**790**	**416**	**416**
	lt	18	19	0	0	0	0	0	0	0	0	0	0	0	0	5	0	5	**5**	**5**	**19**	**19**
	rt	6	6	0	0	0	0	0	0	0	0	0	0	0	0	10	0	10	**10**	**10**	**6**	**6**
WB	th	440	466	18	0	18	18	0	18	18	0	18	18	0	18	325	15	310	**328**	**328**	**484**	**484**
	lt	344	365	0	0	0	0	0	0	0	0	0	0	0	0	355	0	355	**355**	**355**	**365**	**365**
	rt	426	452	0	0	0	0	0	0	0	0	0	0	0	0	345	0	345	**345**	**345**	**452**	**452**
NB	th	332	352	0	0	0	0	0	0	0	0	0	0	0	0	725	0	725	**725**	**725**	**352**	**352**
	lt	18	19	18	0	18	18	0	18	18	0	18	18	0	18	70	15	55	**73**	**73**	**37**	**37**
	rt	91	96	31	0	31	31	0	31	31	0	31	31	0	31	475	30	445	**476**	**476**	**127**	**127**
EB	th	637	675	34	0	34	34	0	34	99	0	99	34	0	34	800	35	765	**799**	**799**	**774**	**709**
	lt	137	145	29	0	29	29	0	29	29	0	29	29	0	29	250	30	220	**249**	**249**	**174**	**174**
	Ut	0	0	48	17	65	48	17	65	0	0	0	0	0	0	25	40	0	**65**	**65**	**0**	**0**

APPENDIX B
CAPACITY ANALYSIS WORKSHEETS

MOVEMENT SUMMARY

Site: PM Projected 2035 - 100% Boston

Custer Way - Boston St
Roundabout

Movement Performance Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: NB Boston St											
18	R2	115	1.0	0.205	4.7	LOS A	0.9	23.8	0.74	0.74	34.4
Approach		115	1.0	0.205	4.7	LOS A	0.9	23.8	0.74	0.74	34.4
East: WB Custer Way											
1u	U	5	1.0	0.608	0.0	LOS A	0.0	0.0	0.00	0.00	38.5
1	L2	20	1.0	0.608	0.0	LOS A	0.0	0.0	0.00	0.00	37.4
6	T1	865	1.0	0.608	0.0	LOS A	0.0	0.0	0.00	0.00	37.2
16	R2	155	1.0	0.608	0.0	LOS A	0.0	0.0	0.00	0.00	36.2
Approach		1045	1.0	0.608	0.0	LOS A	0.0	0.0	0.00	0.00	37.0
North: SB Brewery Access											
7	L2	115	1.0	0.309	7.4	LOS A	1.9	48.7	0.80	0.76	32.4
4	T1	35	1.0	0.309	7.4	LOS A	1.9	48.7	0.80	0.76	32.3
14	R2	60	1.0	0.309	7.4	LOS A	1.9	48.7	0.80	0.76	31.3
Approach		210	1.0	0.309	7.4	LOS A	1.9	48.7	0.80	0.76	32.1
West: EB Custer Way											
2	T1	1290	1.0	0.577	1.1	LOS A	4.9	122.4	0.53	0.30	36.2
12	R2	210	1.0	0.577	1.0	LOS A	4.9	122.4	0.52	0.30	35.1
Approach		1500	1.0	0.577	1.1	LOS A	4.9	122.4	0.53	0.30	36.1
All Vehicles		2870	1.0	0.608	1.3	LOS A	4.9	122.4	0.36	0.24	36.0

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option is selected.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	1525	1035	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1605	1089	5	0	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1095	0	-	0	1895	1092
Stage 1	-	-	-	-	1092	-
Stage 2	-	-	-	-	803	-
Critical Hdwy	4.12	-	-	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	2.218	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	637	-	-	-	69	260
Stage 1	-	-	-	-	321	-
Stage 2	-	-	-	-	402	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	637	-	-	-	69	260
Mov Cap-2 Maneuver	-	-	-	-	69	-
Stage 1	-	-	-	-	321	-
Stage 2	-	-	-	-	402	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	19.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	637	-	-	-	260
HCM Lane V/C Ratio	-	-	-	-	0.02
HCM Control Delay (s)	0	-	-	-	19.1
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.1

MOVEMENT SUMMARY

Site: PM Projected - 100% Boston

Capital Blvd - Custer Way
Roundabout

Movement Performance Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: WB Custer Way											
1u	U	25	2.0	0.681	16.7	LOS B	8.0	202.1	1.00	1.19	28.9
1a	L1	355	2.0	0.681	16.7	LOS B	8.0	202.1	1.00	1.19	28.1
6	T1	330	2.0	0.748	22.6	LOS C	8.6	218.9	1.00	1.25	27.8
16b	R3	10	2.0	0.748	22.6	LOS C	8.6	218.9	1.00	1.25	26.8
Approach		720	2.0	0.748	19.5	LOS B	8.6	218.9	1.00	1.22	27.9
NorthEast: SB Capital Blvd											
1ux	U	25	1.0	0.856	10.9	LOS B	9.3	233.8	0.96	1.18	33.1
1bx	L3	5	1.0	0.856	10.9	LOS B	9.3	233.8	0.96	1.18	32.7
6x	T1	790	1.0	0.856	10.3	LOS B	10.0	252.6	0.96	1.18	32.5
16ax	R1	520	1.0	0.856	8.9	LOS A	10.0	252.6	0.96	1.18	33.1
Approach		1340	1.0	0.856	9.8	LOS A	10.0	252.6	0.96	1.18	32.8
West: EB Custer Way											
5u	U	65	1.0	0.803	16.3	LOS B	8.9	224.6	1.00	1.26	29.6
5a	L1	250	1.0	0.803	16.3	LOS B	8.9	224.6	1.00	1.26	28.7
2	T1	800	1.0	0.803	13.8	LOS B	9.9	249.4	1.00	1.27	30.8
12b	R3	475	1.0	0.524	5.2	LOS A	4.5	113.5	0.92	0.96	33.6
Approach		1590	1.0	0.803	11.7	LOS B	9.9	249.4	0.98	1.18	31.1
SouthWest: NB Capital Blvd											
5ux	U	25	1.0	1.202	102.6	LOS F	56.0	1411.5	1.00	3.02	14.2
5bx	L3	75	1.0	1.202	102.6	LOS F	56.0	1411.5	1.00	3.02	14.1
2x	T1	725	1.0	1.202	102.6	LOS F	56.0	1411.5	1.00	3.02	14.1
12ax	R1	345	1.0	0.710	9.2	LOS A	5.0	126.4	0.90	1.02	33.0
Approach		1170	1.0	1.202	75.1	LOS E	56.0	1411.5	0.97	2.43	16.9
All Vehicles		4820	1.1	1.202	27.7	LOS C	56.0	1411.5	0.97	1.49	25.8

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option is selected.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: PM Projected 2035 - 100% Schmidt

Custer Way - Boston St
Roundabout

Movement Performance Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: NB Boston St											
18	R2	115	1.0	0.195	4.7	LOS A	0.9	22.1	0.72	0.72	34.4
Approach		115	1.0	0.195	4.7	LOS A	0.9	22.1	0.72	0.72	34.4
East: WB Custer Way											
1u	U	110	1.0	0.637	0.0	LOS A	0.0	0.0	0.00	0.00	37.9
1	L2	55	1.0	0.637	0.0	LOS A	0.0	0.0	0.00	0.00	36.9
6	T1	925	1.0	0.637	0.0	LOS A	0.0	0.0	0.00	0.00	36.7
16	R2	5	1.0	0.637	0.0	LOS A	0.0	0.0	0.00	0.00	35.7
Approach		1095	1.0	0.637	0.0	LOS A	0.0	0.0	0.00	0.00	36.8
North: SB Brewery Access											
7	L2	5	1.0	0.013	9.2	LOS A	0.1	1.9	0.80	0.57	31.2
4	T1	1	1.0	0.013	9.2	LOS A	0.1	1.9	0.80	0.57	31.1
14	R2	1	1.0	0.013	9.2	LOS A	0.1	1.9	0.80	0.57	30.2
Approach		7	1.0	0.013	9.2	LOS A	0.1	1.9	0.80	0.57	31.1
West: EB Custer Way											
2	T1	1290	1.0	0.557	1.0	LOS A	3.8	96.1	0.43	0.26	36.6
12	R2	210	1.0	0.557	0.9	LOS A	3.8	96.1	0.42	0.25	35.5
Approach		1500	1.0	0.557	1.0	LOS A	3.8	96.1	0.43	0.26	36.4
All Vehicles		2717	1.0	0.637	0.8	LOS A	3.8	96.1	0.27	0.18	36.5

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option is selected.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	1525	880	160	0	210
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1605	926	168	0	221

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1095	0	-	0	1814	1011
Stage 1	-	-	-	-	1011	-
Stage 2	-	-	-	-	803	-
Critical Hdwy	4.12	-	-	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	2.218	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	637	-	-	-	77	290
Stage 1	-	-	-	-	350	-
Stage 2	-	-	-	-	402	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	637	-	-	-	77	290
Mov Cap-2 Maneuver	-	-	-	-	77	-
Stage 1	-	-	-	-	350	-
Stage 2	-	-	-	-	402	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	48.3
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	637	-	-	-	290
HCM Lane V/C Ratio	-	-	-	-	0.762
HCM Control Delay (s)	0	-	-	-	48.3
HCM Lane LOS	A	-	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	5.8

MOVEMENT SUMMARY

Site: PM Projected 2035 - 100% Schmidt

Custer Way - Boston St
Roundabout

Movement Performance Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: NB Boston St											
18	R2	115	1.0	0.195	4.7	LOS A	0.9	22.1	0.72	0.72	34.4
Approach		115	1.0	0.195	4.7	LOS A	0.9	22.1	0.72	0.72	34.4
East: WB Custer Way											
1u	U	110	1.0	0.637	0.0	LOS A	0.0	0.0	0.00	0.00	37.9
1	L2	55	1.0	0.637	0.0	LOS A	0.0	0.0	0.00	0.00	36.9
6	T1	925	1.0	0.637	0.0	LOS A	0.0	0.0	0.00	0.00	36.7
16	R2	5	1.0	0.637	0.0	LOS A	0.0	0.0	0.00	0.00	35.7
Approach		1095	1.0	0.637	0.0	LOS A	0.0	0.0	0.00	0.00	36.8
North: SB Brewery Access											
7	L2	5	1.0	0.013	9.2	LOS A	0.1	1.9	0.80	0.57	31.2
4	T1	1	1.0	0.013	9.2	LOS A	0.1	1.9	0.80	0.57	31.1
14	R2	1	1.0	0.013	9.2	LOS A	0.1	1.9	0.80	0.57	30.2
Approach		7	1.0	0.013	9.2	LOS A	0.1	1.9	0.80	0.57	31.1
West: EB Custer Way											
2	T1	1290	1.0	0.557	1.0	LOS A	3.8	96.1	0.43	0.26	36.6
12	R2	210	1.0	0.557	0.9	LOS A	3.8	96.1	0.42	0.25	35.5
Approach		1500	1.0	0.557	1.0	LOS A	3.8	96.1	0.43	0.26	36.4
All Vehicles		2717	1.0	0.637	0.8	LOS A	3.8	96.1	0.27	0.18	36.5

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option is selected.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: PM Projected 2018 - 100% Boston

Custer Way - Boston St
Roundabout

Movement Performance Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: NB Boston St											
18	R2	179	1.0	0.372	5.8	LOS A	1.8	46.2	0.75	0.77	33.8
Approach		179	1.0	0.372	5.8	LOS A	1.8	46.2	0.75	0.77	33.8
East: WB Custer Way											
1u	U	5	1.0	0.545	0.0	LOS A	0.0	0.0	0.00	0.00	37.0
1	L2	416	1.0	0.545	0.0	LOS A	0.0	0.0	0.00	0.00	36.0
6	T1	274	1.0	0.545	0.0	LOS A	0.0	0.0	0.00	0.00	35.8
16	R2	168	1.0	0.545	0.0	LOS A	0.0	0.0	0.00	0.00	35.0
Approach		863	1.0	0.545	0.0	LOS A	0.0	0.0	0.00	0.00	35.8
North: SB Brewery Access											
7	L2	116	1.0	0.372	7.2	LOS A	2.2	54.6	0.75	0.76	32.6
4	T1	37	1.0	0.372	7.2	LOS A	2.2	54.6	0.75	0.76	32.4
14	R2	68	1.0	0.372	7.2	LOS A	2.2	54.6	0.75	0.76	31.4
Approach		221	1.0	0.372	7.2	LOS A	2.2	54.6	0.75	0.76	32.2
West: EB Custer Way											
2	T1	832	1.0	0.630	6.9	LOS A	5.6	140.6	0.80	0.87	34.3
12	R2	184	1.0	0.630	6.9	LOS A	5.6	140.6	0.80	0.87	33.2
Approach		1016	1.0	0.630	6.9	LOS A	5.6	140.6	0.80	0.87	34.1
All Vehicles		2279	1.0	0.630	4.2	LOS A	5.6	140.6	0.49	0.52	34.5

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option is selected.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	5	1070	815	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	1126	858	5	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	863	0	-	0	1435	861
Stage 1	-	-	-	-	861	-
Stage 2	-	-	-	-	574	-
Critical Hdwy	4.12	-	-	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	2.218	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	779	-	-	-	135	354
Stage 1	-	-	-	-	413	-
Stage 2	-	-	-	-	528	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	779	-	-	-	134	354
Mov Cap-2 Maneuver	-	-	-	-	134	-
Stage 1	-	-	-	-	413	-
Stage 2	-	-	-	-	525	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	24.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	779	-	-	-	194
HCM Lane V/C Ratio	0.007	-	-	-	0.054
HCM Control Delay (s)	9.7	-	-	-	24.6
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	175	775	125	365	485	5	35	350	450	20	415	250
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1900	1881	1881	1900	1881	1881	1900	1881	1881	1900
Adj Flow Rate, veh/h	194	861	139	406	539	6	39	389	272	22	461	189
Adj No. of Lanes	1	2	0	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	515	909	147	534	553	6	92	464	320	64	530	215
Arrive On Green	0.29	0.29	0.29	0.30	0.30	0.30	0.05	0.23	0.23	0.04	0.21	0.21
Sat Flow, veh/h	1792	3160	510	1792	1857	21	1792	2020	1395	1792	2474	1006
Grp Volume(v), veh/h	194	513	487	406	0	545	39	344	317	22	332	318
Grp Sat Flow(s),veh/h/ln	1792	1881	1789	1792	0	1877	1792	1787	1628	1792	1787	1692
Q Serve(g_s), s	9.3	28.7	28.7	22.1	0.0	30.8	2.3	19.7	20.0	1.3	19.3	19.5
Cycle Q Clear(g_c), s	9.3	28.7	28.7	22.1	0.0	30.8	2.3	19.7	20.0	1.3	19.3	19.5
Prop In Lane	1.00		0.29	1.00		0.01	1.00		0.86	1.00		0.59
Lane Grp Cap(c), veh/h	515	541	515	534	0	559	92	410	374	64	383	362
V/C Ratio(X)	0.38	0.95	0.95	0.76	0.00	0.97	0.43	0.84	0.85	0.34	0.87	0.88
Avail Cap(c_a), veh/h	517	543	516	534	0	559	133	410	374	133	383	362
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.6	37.5	37.5	34.2	0.0	37.3	49.4	39.5	39.6	50.5	40.7	40.8
Incr Delay (d2), s/veh	0.5	26.0	26.9	6.3	0.0	31.5	3.1	18.1	20.8	3.1	22.4	24.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	18.7	17.9	11.9	0.0	20.8	1.2	11.8	11.2	0.7	11.9	11.6
LnGrp Delay(d),s/veh	31.0	63.4	64.3	40.5	0.0	68.7	52.5	57.6	60.4	53.7	63.1	65.4
LnGrp LOS	C	E	E	D		E	D	E	E	D	E	E
Approach Vol, veh/h		1194			951			700			672	
Approach Delay, s/veh		58.5			56.7			58.6			63.9	
Approach LOS		E			E			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.8	28.7		34.9	9.5	27.0		36.0
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	8.0	23.0		31.0	8.0	23.0		32.0
Max Q Clear Time (g_c+I1), s	3.3	22.0		30.7	4.3	21.5		32.8
Green Ext Time (p_c), s	0.0	0.7		0.2	0.0	1.1		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	59.1
HCM 2010 LOS	E

Notes

User approved volume balancing among the lanes for turning movement.

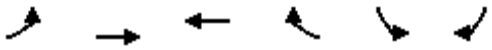
MOVEMENT SUMMARY

Site: PM Projected 2018 - 100% Schmidt

Custer Way - Boston St
Roundabout

Movement Performance Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: NB Boston St											
18	R2	179	1.0	0.368	5.7	LOS A	1.8	45.3	0.74	0.77	33.8
Approach		179	1.0	0.368	5.7	LOS A	1.8	45.3	0.74	0.77	33.8
East: WB Custer Way											
1u	U	116	1.0	0.575	0.0	LOS A	0.0	0.0	0.00	0.00	36.5
1	L2	453	1.0	0.575	0.0	LOS A	0.0	0.0	0.00	0.00	35.5
6	T1	337	1.0	0.575	0.0	LOS A	0.0	0.0	0.00	0.00	35.3
16	R2	5	1.0	0.575	0.0	LOS A	0.0	0.0	0.00	0.00	34.5
Approach		911	1.0	0.575	0.0	LOS A	0.0	0.0	0.00	0.00	35.5
North: SB Brewery Access											
7	L2	5	1.0	0.015	8.1	LOS A	0.1	1.9	0.72	0.55	31.7
4	T1	1	1.0	0.015	8.1	LOS A	0.1	1.9	0.72	0.55	31.6
14	R2	1	1.0	0.015	8.1	LOS A	0.1	1.9	0.72	0.55	30.7
Approach		7	1.0	0.015	8.1	LOS A	0.1	1.9	0.72	0.55	31.5
West: EB Custer Way											
2	T1	832	1.0	0.610	6.6	LOS A	5.1	128.7	0.76	0.82	34.4
12	R2	184	1.0	0.610	6.6	LOS A	5.1	128.7	0.76	0.82	33.3
Approach		1016	1.0	0.610	6.6	LOS A	5.1	128.7	0.76	0.82	34.2
All Vehicles		2113	1.0	0.610	3.7	LOS A	5.1	128.7	0.43	0.46	34.7

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option is selected.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	70	1005	660	160	5	210
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	74	1058	695	168	5	221
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			371			
pX, platoon unblocked	0.71				0.71	0.71
vC, conflicting volume	863				1455	779
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	601				1437	482
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	89				93	41
cM capacity (veh/h)	689				79	376

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	SB 1
Volume Total	74	529	529	863	226
Volume Left	74	0	0	0	5
Volume Right	0	0	0	168	221
cSH	689	1700	1700	1700	345
Volume to Capacity	0.11	0.31	0.31	0.51	0.66
Queue Length 95th (ft)	9	0	0	0	110
Control Delay (s)	10.9	0.0	0.0	0.0	33.2
Lane LOS	B				D
Approach Delay (s)	0.7			0.0	33.2
Approach LOS					D

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	71.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	175	710	125	365	485	5	35	350	450	20	415	185
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1900	1881	1881	1900	1881	1881	1900	1881	1881	1900
Adj Flow Rate, veh/h	194	789	139	406	539	6	39	389	272	22	461	156
Adj No. of Lanes	1	2	0	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	502	873	154	540	559	6	92	469	324	64	568	191
Arrive On Green	0.28	0.28	0.28	0.30	0.30	0.30	0.05	0.23	0.23	0.04	0.22	0.22
Sat Flow, veh/h	1792	3114	549	1792	1857	21	1792	2020	1395	1792	2623	880
Grp Volume(v), veh/h	194	477	451	406	0	545	39	344	317	22	313	304
Grp Sat Flow(s),veh/h/ln	1792	1881	1782	1792	0	1877	1792	1787	1629	1792	1787	1716
Q Serve(g_s), s	9.3	25.9	26.0	21.8	0.0	30.4	2.2	19.4	19.8	1.3	17.7	17.9
Cycle Q Clear(g_c), s	9.3	25.9	26.0	21.8	0.0	30.4	2.2	19.4	19.8	1.3	17.7	17.9
Prop In Lane	1.00		0.31	1.00		0.01	1.00		0.86	1.00		0.51
Lane Grp Cap(c), veh/h	502	527	499	540	0	565	92	415	378	64	387	371
V/C Ratio(X)	0.39	0.90	0.90	0.75	0.00	0.96	0.42	0.83	0.84	0.34	0.81	0.82
Avail Cap(c_a), veh/h	523	549	520	540	0	565	135	415	378	135	387	371
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.9	36.9	36.9	33.6	0.0	36.6	48.9	38.8	38.9	50.0	39.5	39.6
Incr Delay (d2), s/veh	0.5	18.0	18.8	5.9	0.0	28.9	3.1	17.2	19.7	3.1	16.5	17.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	16.1	15.4	11.6	0.0	20.3	1.2	11.5	11.0	0.7	10.5	10.4
LnGrp Delay(d),s/veh	31.3	54.8	55.6	39.4	0.0	65.4	51.9	56.0	58.6	53.1	56.1	57.6
LnGrp LOS	C	D	E	D		E	D	E	E	D	E	E
Approach Vol, veh/h		1122			951			700			639	
Approach Delay, s/veh		51.1			54.3			56.9			56.7	
Approach LOS		D			D			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.8	28.6		33.8	9.5	27.0		36.0
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	8.0	23.0		31.0	8.0	23.0		32.0
Max Q Clear Time (g_c+I1), s	3.3	21.8		28.0	4.2	19.9		32.4
Green Ext Time (p_c), s	0.0	0.9		1.8	0.0	2.1		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	54.2
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.