

Transportation Impact Analysis

RIO VISTA

Prepared for:
Rio Vista Investments, LLC

June 2015

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Executive Summary

This section provides an executive summary of the Final Transportation Impact Analysis through a set of frequently asked questions (FAQs).

Where is the project located and what would be developed?

The project is located in the City of Duvall near the intersection of NE 143rd Place and 272nd Place NE. Two separate parcels would be developed north and south of NE 143rd Place. The development would include 49 single family homes, 14 duplexes, and 6 triplexes.

What existing public streets will serve the project and where is access proposed?

SR 203 and NE 143rd Place are the two primary roadways serving the site, with 272nd Place NE providing local access. Access to the site is proposed via three full access driveways along NE 143rd Place, accessing the northern parcel, and two private access driveways along 272nd Place NE, accessing the southern parcel.

Is the site currently served by public transit?

The closest transit routes serving the site are King County Metro Routes 224 and 232 and the Valley Shuttle, operated by Snoqualmie Valley Transportation. The closest stop for all three routes is just off of SR 203 at Brown Avenue NE & NE Richardson Street, which is roughly a mile walking distance from the project site.

How many daily vehicular trips would the project generate and when would peak traffic volumes occur?

The project would generate approximately 582 weekday daily trips with 59 occurring during the weekday PM peak hour.

What Transportation impacts are anticipated, if any?

The highest transportation impact is expected to occur at the intersection of SR 203/NE 143rd Place, where the addition of project traffic increases delay on the westbound approach by approximately 24 seconds. Minimal impact is expected at other study intersections.

What measures are proposed to reduce or control traffic impacts?

Impact fees, as calculated by the City, will be paid. Increases in traffic delay between without- and with-project conditions are anticipated to be minor.

Chapter 1. Introduction

The purpose of this transportation impact analysis (TIA) is to identify potential traffic-related impacts associated with the proposed Rio Vista residential development. As necessary, mitigation measures are identified when project impacts exceed city standards.

Project Description

The project is located in the City of Duvall near the intersection of NE 143rd Place and 272nd Place NE. Specifically, the site is bounded by Duvall Sunset Heights, a residential subdivision, on the north, 272nd Place NE on the east and undeveloped property on the south and west. [Figure 1](#) illustrates the project site and the surrounding vicinity. A preliminary site plan is illustrated in [Figure 2](#).

The development would include 49 single family homes, 14 duplexes, and 6 triplexes. The site is anticipated to be completed and occupied by 2017. Three vehicular access points would be provided along NE 143rd Place and two vehicular access points are planned along 272nd Place NE. The western-most access point along NE 143rd Place is a minor access point, while the other two are main access points. The accesses along 272nd Place NE are private accesses for the residential units in that area.

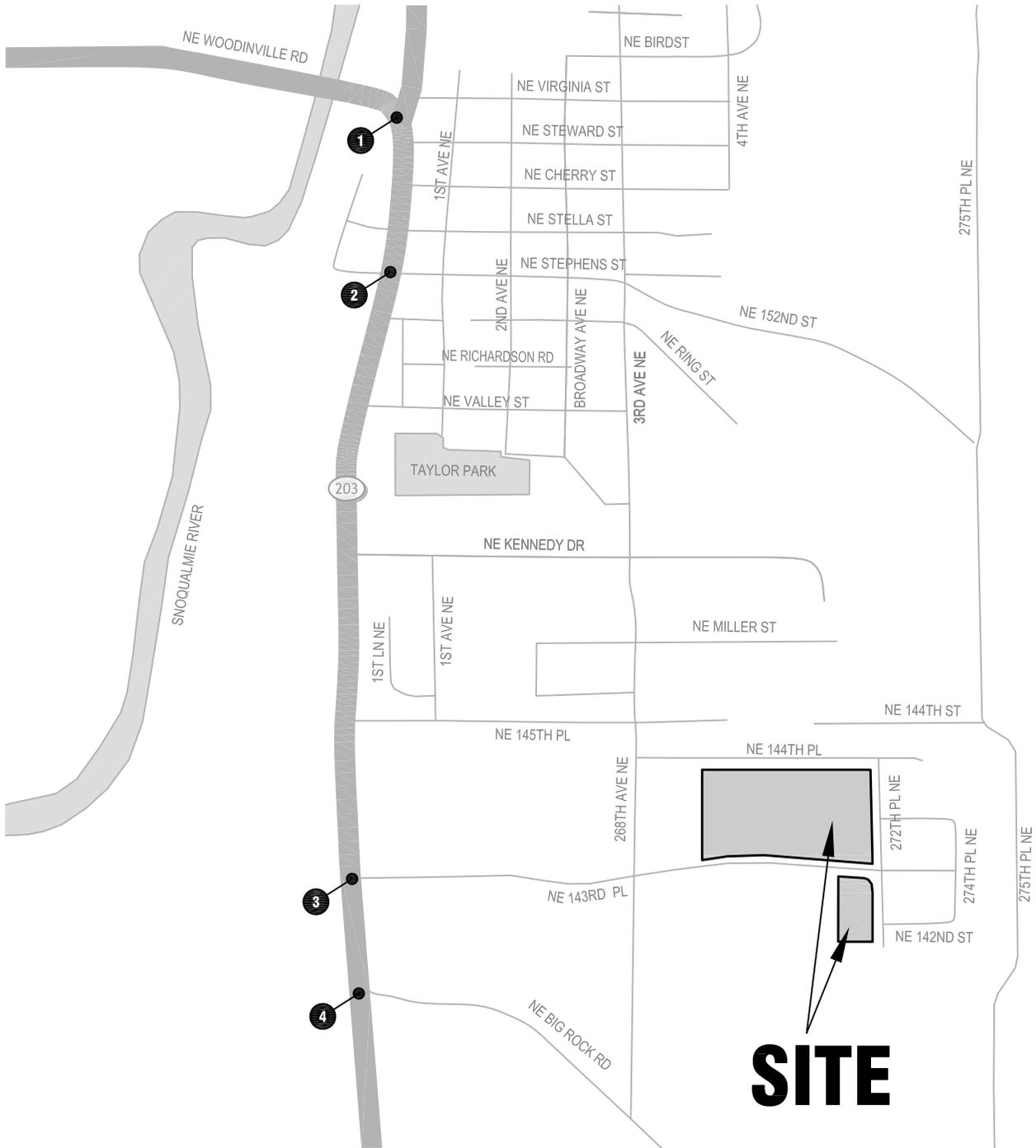
Study Scope

The specific requirements of this study, such as the study area, horizon year, and analysis methodology were confirmed with the City. The analysis focuses on the weekday PM peak hour (between 4:00 and 6:00 p.m.) and includes an evaluation at four intersections, as well as the two site access intersections. The weekday PM peak hour represents the highest cumulative total traffic for the adjacent street system and is consistent with City TIA guidelines. The study intersections include (see also [Figure 1](#)):

1. SR 203/Woodinville-Duvall Road
2. SR 203/NE Stephens Street
3. SR 203/NE 143rd Place
4. SR 203/NE Big Rock Road



NOT TO SCALE



Site Vicinity

Rio Vista

Chapter 2. Existing Conditions

This section describes existing condition within the identified study area. Characteristics are provided for the roadway network, non-motorized facilities, transit service, existing traffic volumes, traffic operations, and traffic safety.

Roadway Network

The project is located in the City of Duvall near the intersection of NE 143rd Place and 272nd Place NE. The major roadways within the study area include:

SR 203 is a principal arterial highway and state route along the west side of Duvall that serves both local and regional traffic. Near downtown Duvall, it is known as Main Street. One travel lane is provided in each direction, with additional turn lanes at major intersections. Continuous sidewalks and bike lanes do not exist along the roadway, but are only provided around developments such as the one south of NE Big Rock Road, and within downtown Duvall. The speed limit is posted at 40 mph south of NE 143rd Place, and is reduced to 30 mph to the north, and through downtown Duvall.

NE 143rd Place is a two-lane collector that extends from SR 203 to residential areas both east and west of the proposed project. Sidewalks are provided on the north side of the street for a short segment west of 268th Avenue NE, and throughout the residential development located east of 272nd Place NE. The posted speed limit is 25 mph.

NE Big Rock Road is a minor arterial that extends east from Carnation-Duvall Rd NE (SR-203). The portion west of NE 140th Street provides two travel lanes with a two-way left-turn lane, bike lanes on both sides, and sidewalks on both sides of the roadway near the retail area. East of NE 140th Street it is a two-lane roadway with turn lanes at some intersections and sidewalks provided along portions of the roadway. The posted speed limit is 35 mph.

Non-Motorized Facilities

Sidewalks are provided along some streets near the project, including portions along NE 143rd Place, 272nd PI NE, NE Big Rock Road, and SR 203 in the main downtown area. All three signalized study intersections include pedestrian crosswalks, push buttons, and signal heads to facilitate pedestrian travel. A dedicated bicycle lane is provided along NE Big Rock Road between Carnation-Duvall Rd (SR-203) and NE 140th Street as well as along SR 203 in the downtown area.

Transit Service

The closest transit routes serving the site are Routes 224 and 232, operated by King County Metro, and the Valley Shuttle, operated by Snoqualmie Valley Transportation. The closest scheduled stop along all three routes is just off of SR 203 at Brown Avenue NE & NE Richardson Street, which is roughly a mile walking distance from the project site.

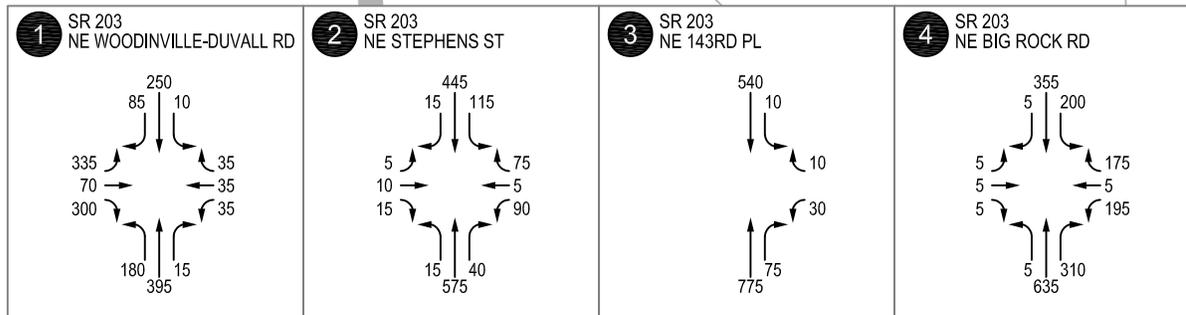
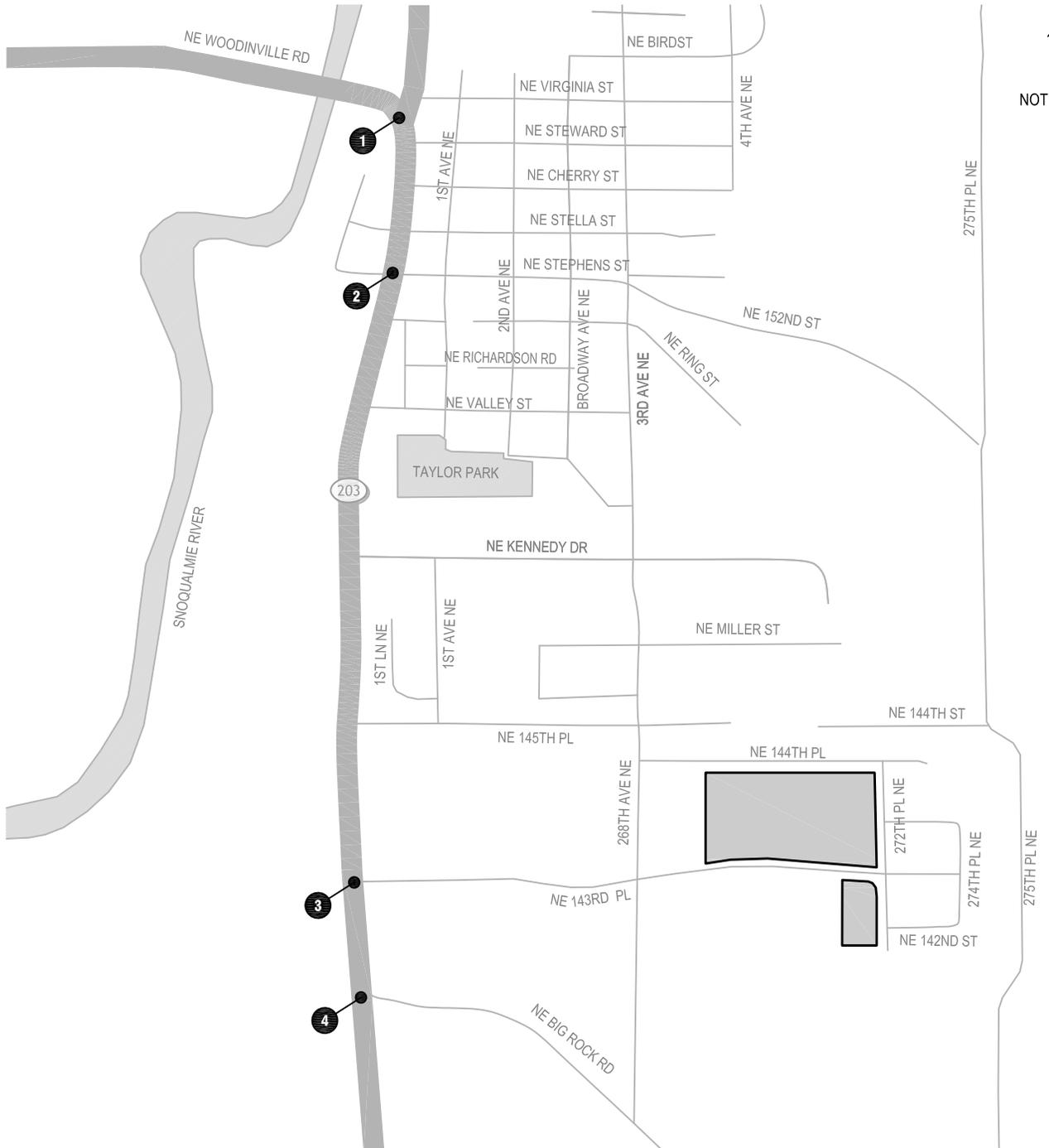
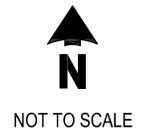
Route 224 operates on weekdays only between Duvall and Redmond Transit Center. Service begins around 5 a.m. and ends around 8:30 p.m., with roughly hour and a half headways.

Route 232 provides weekday service five times during peak commute hours between Duvall and the Bellevue and Redmond areas. It operates between 5:30 a.m. and 8 a.m. in the morning headed to Bellevue and between 4 p.m. and 6:30 p.m. leaving Bellevue headed to Duvall.

The Valley Shuttle is a deviated fixed-route service. It has a specified route it follows between Duvall and North Bend, stopping at Fall City and Snoqualmie along the way. However, it can deviate from this route at either terminus by a ten to fifteen minute travel time to pick up a customer who is not able to travel to the designated stop. The Shuttle operates in Duvall between 6:30 a.m. and 9 p.m. with roughly hour and a half to two hour headways.

Traffic Volumes

This transportation analysis focuses on the weekday PM peak hour. Existing turning movement counts at the study intersections were counted in June 2013 when local schools were still in session. Traffic volumes were adjusted to represent current (2015) volumes by increasing existing intersection volumes at a two percent annual growth rate. This growth rate was determined by calculating growth at each study intersection between 2007 intersection counts and 2013 intersection counts. While most intersections experienced minimal or negative growth, the intersection of SR 203/NE Woodinville-Duvall Road showed approximately a two percent annual growth rate during that time frame. To be conservative, this annual growth rate was applied to all intersections to establish 2015 traffic volumes. The detailed intersection turning movement traffic volumes are provided in [Appendix A](#). Existing weekday PM peak hour traffic volumes are summarized in [Figure 3](#).



Existing Weekday PM Peak Hour Traffic Volumes

Rio Vista



FIGURE

3

Traffic Operations

The operational characteristics of an intersection are evaluated by determining the intersection’s level of service (LOS). The intersection as a whole, and its individual turning movements, can be described alphabetically with a range of levels of service (LOS A to F). LOS A indicates free-flow traffic and LOS F indicates extreme congestion and long vehicle delays. LOS is measured in average control delay per vehicle and is typically reported for the intersection as a whole at signalized intersections. Control delay is defined as the combination of initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. At two-way stop-controlled intersections, LOS is measured in average stopped delay per vehicles for the worst movement of the intersection. A more detailed explanation of LOS is provided in [Appendix B](#).

Existing and future without-project levels of service, delays, and volume-to-capacity (v/c) ratios were calculated at study intersections based on the methodologies contained in the *Highway Capacity Manual*. The software program *Synchro 8* was used to evaluate intersection operations. For unsignalized and signalized intersections HCM 2010 was used to report traffic operations.

The City of Duvall currently has a LOS D standard for all intersections along SR 203. [Appendix B](#) contains a detailed explanation of LOS criteria and definitions.

[Table 1](#) summarizes the existing weekday PM peak hour LOS at study intersections. The detailed LOS worksheets are included in [Appendix C](#).

Table 1. Existing Weekday PM Peak Hour Level of Service

Intersections	2015 Existing		
	LOS ¹	Delay ²	WM ³
1. SR 203/NE Woodinville-Duvall Rd	E	61.9	-
2. SR 203/NE Stephens Street	B	19.1	-
3. SR 203/NE 143rd Place	E	38.5	WB
4. SR 203/NE Big Rock Road	C	28.4	-

1. Level of service (LOS), based on 2000 *Highway Capacity Manual* methodology.
 2. Average delay in seconds per vehicle.
 3. Worst movement reported for unsignalized intersections where EB = eastbound, WB = westbound, SB = southbound, NB = northbound.

As shown in [Table 1](#), all but one of the signalized study intersections are currently operating at LOS D or better during the weekday PM peak hour which meets the City’s LOS standard. The intersection of SR 203/NE Woodinville-Duvall Rd is operating at LOS E due to heavy eastbound turning movements onto SR 203. The stop-controlled intersection at SR 203/NE 143rd Street also currently operates at LOS E, due to limited gaps for westbound left-turns onto SR 203.

Traffic Safety

The Washington State Department of Transportation (WSDOT) provided the collision data for the most recent five-year period at study intersections. Specifically, the data was summarized between January 1, 2010 and December 31, 2014. [Table 2](#) provides a summary of collision history within the study area.

Table 2. Five-Year Collision Summary – 2010 to 2014

Location	Number of Collisions					Total	Annual Average	Collisions per MEV ¹
	2010	2011	2012	2013	2014			
1. SR 203/NE Woodinville-Duvall Rd	2	2	5	0	3	12	2.4	0.38
2. SR 203/NE Stephens Street	1	0	0	0	3	4	0.8	0.16
3. SR 203/NE 143rd Place	1	0	0	0	0	1	0.2	0.04
4. SR 203/NE Big Rock Road	2	1	2	6	1	12	2.4	0.35

1. Million Entering Vehicles

Within the analysis time period and defined study area, the highest number of collisions occurred at both the SR 203/NE Woodinville-Duvall Rd intersection and the SR 203/NE Big Rock Road intersection, with the same average of 2.4 collisions per year. The other study intersections had an average of less than one collision per year. One collision occurring in February 2012 at SR 203/NE Woodinville-Duval Rd involved a pedestrian; this collision occurred during an evening in February 2012 and involved a left-turning vehicle not granting right-of-way to a pedestrian. None of the reported collisions involved a fatality.

By incorporating the traffic volume at the intersection, the rate of collisions per million entering vehicles (MEV) allows a uniform standard for evaluating accident history. Generally, a collision rate at intersections greater than 1.0 collisions per MEV is considered higher than normal and warrant further analysis. None of the study intersections experiences a rate of collisions per MEV great than 1.0.

Chapter 3. Future Without Project Conditions

This section describes the future 2017 traffic conditions during the PM peak hour with assumed background growth and traffic from approved projects, but without the addition of project traffic. The following describes planned transportation improvements, traffic volume forecasts, and traffic operations.

Planned Transportation Improvements

The most recent (2015-2020) Transportation Improvement Plan (TIP) was reviewed to determine if any roadway improvement projects are planned within the study area. The TIP identifies the installation of a signal at SR 203/143rd Avenue; this is assumed to be NE 143rd Place as no street named 143rd Avenue was found in Duvall. Per conversations with the City, this project was not included in the future analysis as it is not anticipated to be built before the proposed project is developed.

Two of the pipeline projects, the CamWest DUV project and the Duvall Village project (both described below), do include transportation improvements. The CamWest DUV project has an extension of 268th Ave NE from NE 143rd Place down to NE Big Rock Road and the Duvall Village project creates a west leg and northbound and southbound left turn lanes at the intersection of SR 203/NE 143rd Place. All of these improvements was assumed as part of the 2017 analysis.

Future Traffic Volume Forecasts

Future traffic volumes were calculated by increasing existing intersection volumes at the same two percent annual growth rate as described in existing conditions. This growth rate was determined by calculating growth at each study intersection between 2007 intersection counts and 2013 intersection counts. While most intersections experienced minimal or negative growth, the intersection of SR 203/NE Woodinville-Duvall Road showed approximately a two percent annual growth rate during that time frame. To be conservative, this annual growth rate was applied to all intersections to establish future 2017 traffic volumes.

In addition, five pipeline projects were added to the increased traffic volumes to account for planned developments within the study area. The following pipeline projects were included:

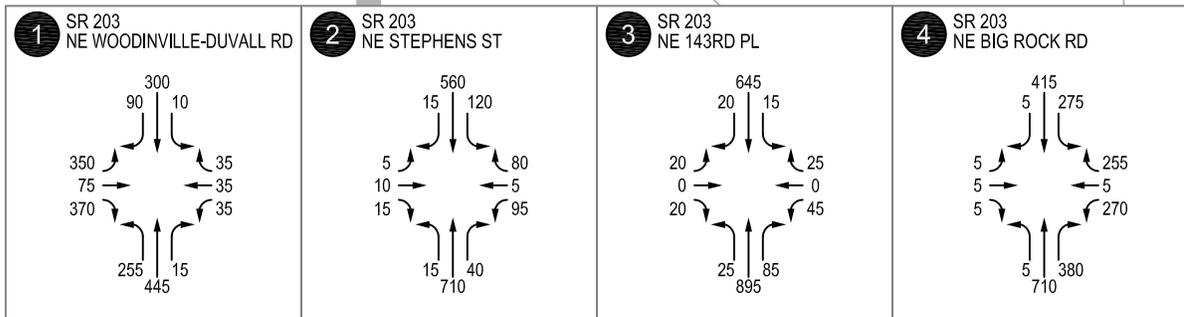
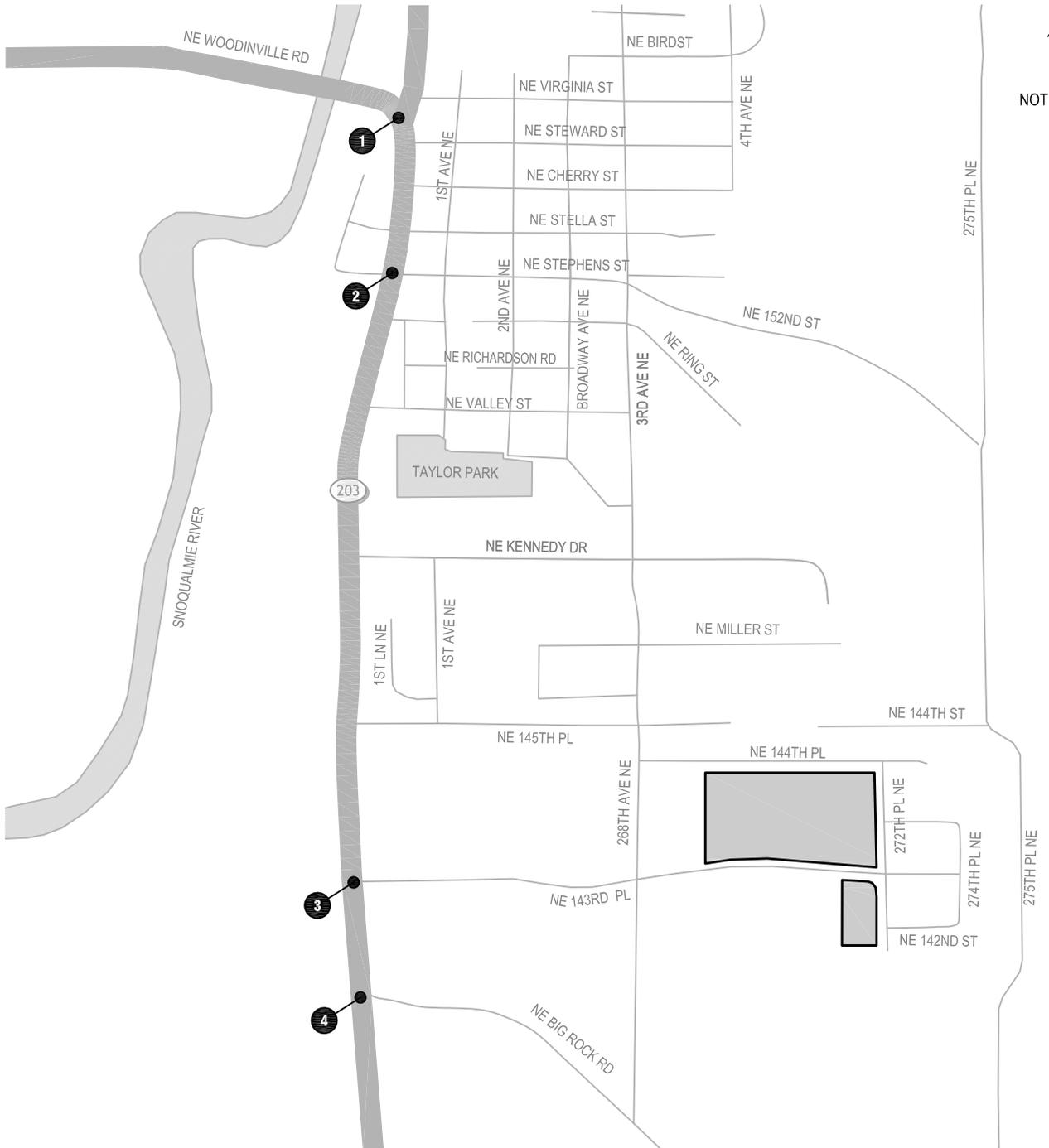
1. **Duvall LDS Meetinghouse**, located at the northeast corner of NE 143rd Place and 3rd Avenue NE. This project includes a church of approximately 18,200 square feet and is expected to generate 10 PM peak hour trips.
2. **Duvall 143**, located at the northwest corner of NE 143rd Place and 3rd Avenue NE. This project includes 19 single-family homes, 6 townhomes, approximately 2,212 square feet of retail space and approximately 6,638 square feet of office space, all of which is expected to generate 59 PM peak hour trips.
3. **CamWest DUV**, located north of NE Big Rock Road and southwest of the terminus of 268th Ave NE. The project is a mixed use development with both residential and retail components. Volumes were taken from the June 24, 2009 TIA which showed project trips at study intersections; over 200 project trips are expected at the study intersection of SR 203/Big Rock Road. The extension of 3rd Avenue NE (268th Avenue NE) from NE 143rd Place to Big Rock Road was assumed as part of the development project.

4. **Duvall Village**, located west of SR 203 across from NE 143rd Place. This project includes 100 condominium units, 10,000 square feet of office, and 10,000 square feet of retail, all of which is expected to generate 82 PM peak hour trips.
5. **145th Street Village**, located south of NE 145th Street near 1st Avenue NE. This project includes 56 residential units (both townhomes and single family homes) and 25,000 square feet of office space. Volumes were taken from the March 2014 Duvall Village TIA which shows 145th St. Village as a pipeline project; 66 trips are expected at the study intersection of SR 203/NE 143rd Place and 40 trips are expected at the study intersection of SR 203/NE Stephens Street.

The 2017 without-project weekday PM peak hour volumes are illustrated in [Figure 4](#).



NOT TO SCALE



2017 Without-Project Weekday PM Peak Hour Traffic Volumes

FIGURE

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4

Future Traffic Operations

Weekday PM peak hour intersection operations were evaluated for the 2017 without project conditions. Intersection LOS was calculated at the study intersections consistent with methodologies described for existing conditions. Signal timings were optimized between existing and without project conditions. [Table 3](#) summarizes the without project 2017 weekday PM peak hour LOS and include the existing LOS has also been included for comparison. Detailed LOS worksheets are included in [Appendix C](#).

Table 3. Existing and 2017 Without-Project Weekday PM Peak Hour Level of Service

Intersections	2015 Existing			2017 Without-Project		
	LOS ¹	Delay ²	WM ³	LOS ¹	Delay ²	WM ³
1. SR 203/NE Woodinville-Duvall Rd	E	61.9	-	E	69.5	-
2. SR 203/NE Stephens Street	B	19.1	-	C	20.2	-
3. SR 203/NE 143rd Place	E	38.5	WB	F	216.2	WB
4. SR 203/NE Big Rock Road	C	28.4	-	D	54.1	-

1. Level of service (LOS), based on 2000 *Highway Capacity Manual* methodology.

2. Average delay in seconds per vehicle.

3. Worst movement reported for unsignalized intersections where EB = eastbound, WB = westbound, SB = southbound, and NB = northbound.

As shown in the table, all but one of the signalized intersections would meet the City's LOS standard during the 2017 without-project conditions. The intersection of SR 203/NE Woodinville-Duvall Rd would continue to operate at LOS E. The stop-controlled intersection at SR 203/NE 143rd Place would operate at LOS F due to the addition of a development on the west leg and limited gaps for the westbound left-turning movement.

Chapter 4. Project Impacts

This section documents project-generated impacts on the surrounding roadway network and at the study intersections. First, project generated traffic volumes are estimated, distributed, and assigned to adjacent roadways and intersection within the study area. Next, 2017 with-project traffic volumes are projected and potential impacts to traffic volumes and traffic operations are identified.

Trip Generation

Project trip generation estimates were developed based on information contained in the Institute of Transportation Engineers (ITE) *Trip Generation*, 9th Edition (2012). *Trip Generation* is a nationally recognized and locally accepted method for determining trip generation for private and public developments. Land use categories for estimating trips included Single Family Detached Housing (ITE LU #210) and Residential Condominium/Townhome (ITE LU #230). A summary of the resulting weekday daily and PM peak hour trip generation estimates are provided in Table 4.

Table 4. Estimated Weekday PM Peak Hour Project Trip Generation

Land Use	Size	Daily Trips	PM Peak Hour Trips		
			Total ¹	In	Out
Future					
Single Family Detached Housing (#210)	49 DU	466	49	31	18
Residential Condominium/Townhome (#230)	20 DU	116	10	7	3
Total Project Trips		582	59	38	21

1. Trip rates from ITE *Trip Generation*, 9th Edition based on average trip rates.

As shown in Table 4, the proposed project is anticipated to generate a total of 582 daily trips and 59 PM peak hour trips (38 entering and 21 exiting).

Trip Distribution and Assignment

Project trips were distributed to the surrounding roadway network based on turning movement counts and anticipated travel patterns in the study area. The trip distribution percentages are consistent with those used in the traffic analysis for the CamWest project located south of the proposed site. The resulting distribution patterns are shown in [Figure 5](#). Trip distribution patterns assumed for this analysis generally include:

1. 18 percent to/from the north
2. 50 percent to/from the south
3. 10 percent to/from the east
4. 22 percent to/from the west

Project trips from each development parcel were individually assigned to the roadway network from the proposed driveway locations and are illustrated in [Figure 6](#).

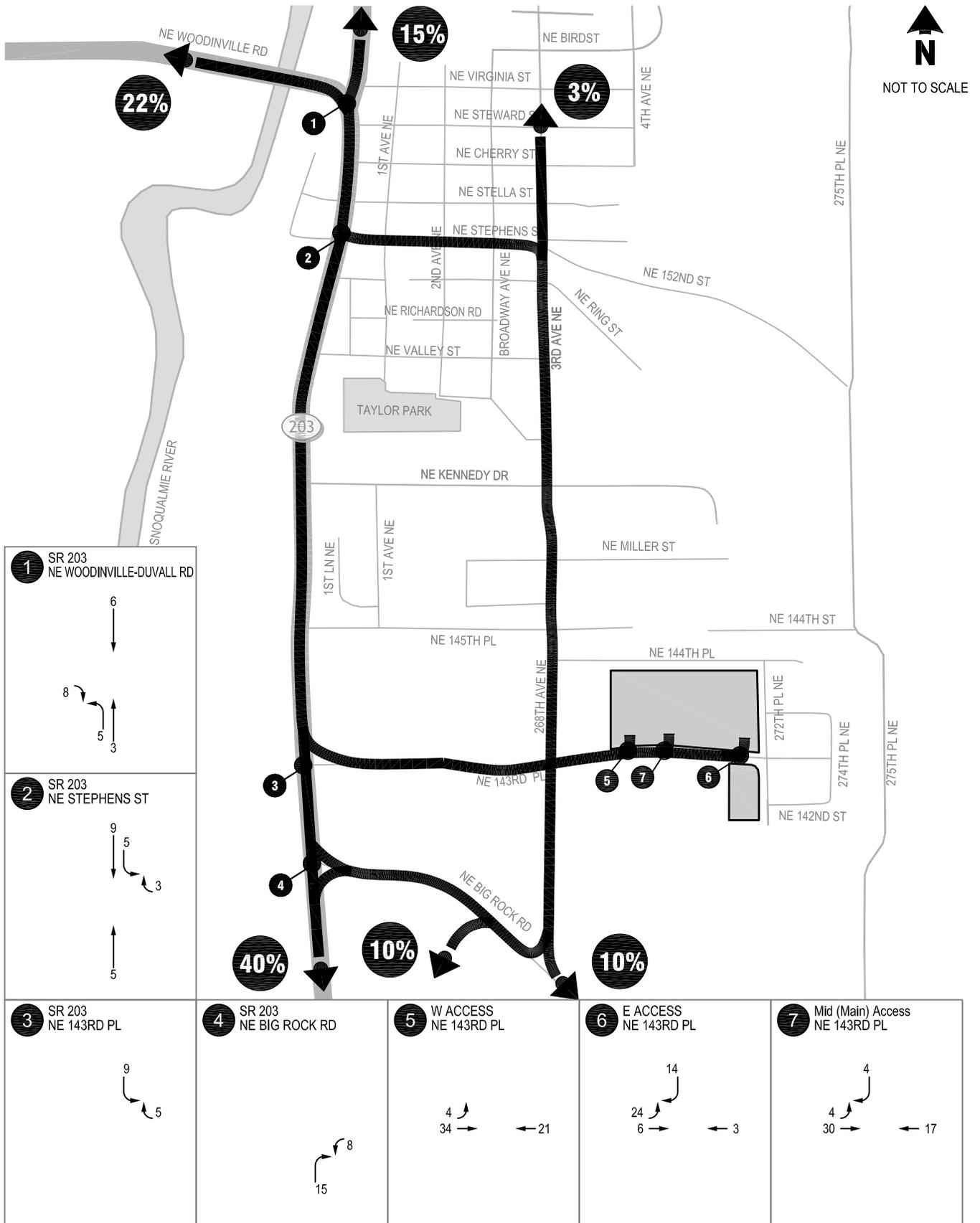
Site-generated weekday PM peak hour traffic volumes were added to future without-project volumes at study intersections. The resulting future with-project traffic volumes are illustrated in [Figure 6](#).

Traffic Volume Impact

A review of the traffic volume impact during the weekday PM peak hour at the study intersection was completed and summarized in [Table 5](#). As shown in the table, project traffic would account for approximately 1 percent of the total weekday PM peak hour traffic volumes at the study intersections in 2017.

Table 5. 2017 Traffic Volume Impact at Study intersections

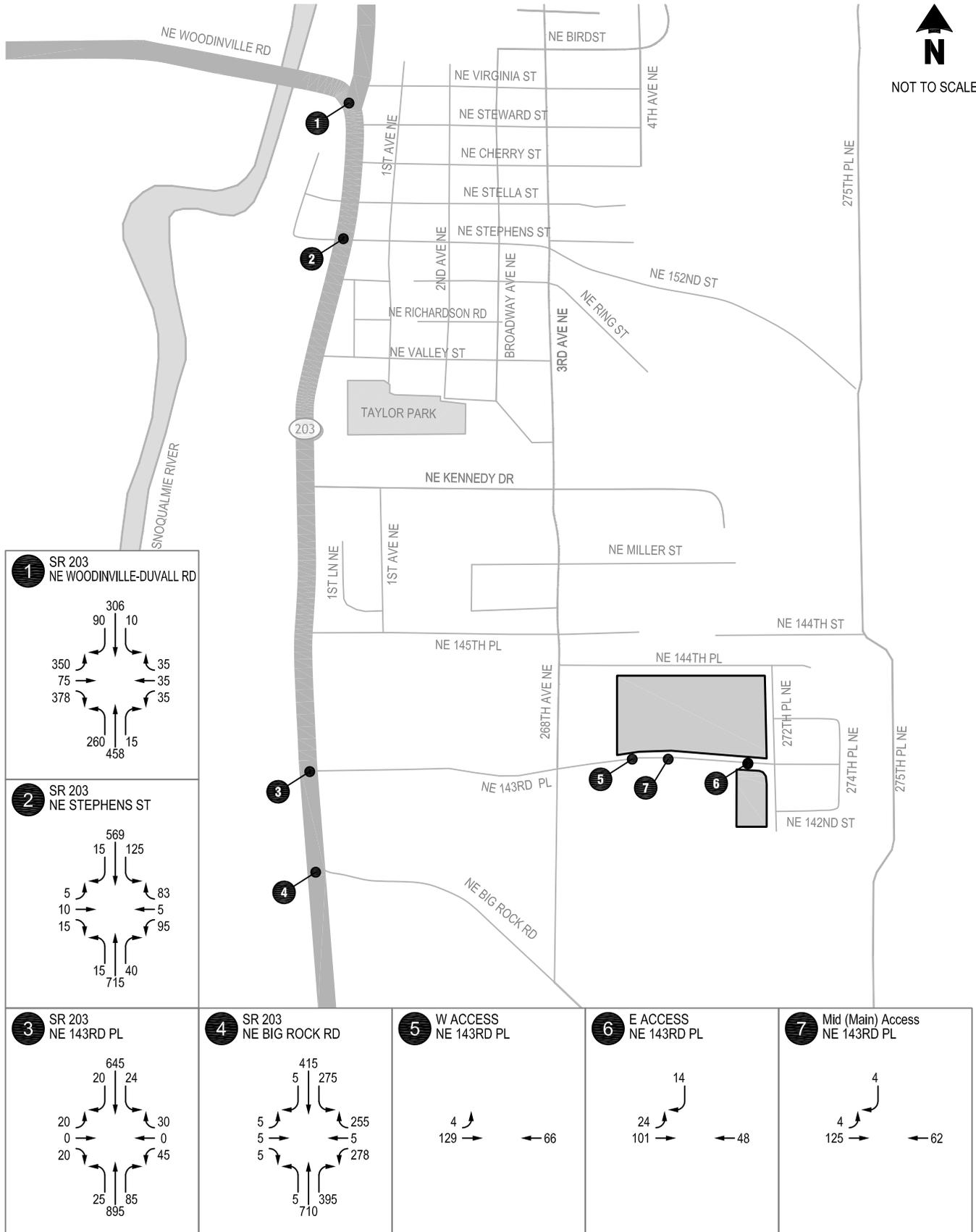
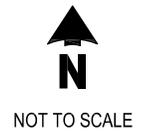
Study Intersections	2017 PM Peak Traffic		
	With- Project	Project Traffic	Project Impact
1. SR 203/NE Woodinville-Duvall Rd	2,047	22	1%
2. SR 203/NE Stephens Street	1,692	22	1%
3. SR 203/NE 143rd Place	1,809	14	1%
4. SR 203/NE Big Rock Road	2,358	23	1%



Project Trip Distribution and Assignment

Rio Vista

FIGURE



2017 With-Project Weekday PM Peak Hour Traffic Volumes FIGURE

Rio Vista



Future With-Project Traffic Operations

Intersection operations analysis was conducted in the study area to evaluate the future 2017 with-project conditions. Signal timings were held constant from the without-project scenario to determine the project's impact. [Table 6](#) provides a comparison between the 2017 with- and without-project conditions. The detailed LOS worksheets are included in [Appendix C](#).

Table 6. 2017 Without- and With-Project Weekday PM Peak Hour Level of Service

Intersections	Without-Project			With-Project		
	LOS ¹	Delay ²	WM ³	LOS ¹	Delay ²	WM ³
1. SR 203/NE Woodinville-Duvall Rd	E	69.5	-	E	73.3	-
2. SR 203/NE Stephens Street	C	20.2	-	C	20.6	-
3. SR 203/NE 143rd Place	F	216.2	WB	F	240.2	WB
4. SR 203/NE Big Rock Road	D	54.1	-	D	54.5	-
5. West Driveway/NE 143rd Place	-	-	-	A	0.2	EB
6. East Driveway/NE 143rd Place	-	-	-	A	8.6	SB
7. Middle Driveway/NE 143rd Place	-	-	-	A	8.6	SB

1. Level of service (LOS), based on 2000 *Highway Capacity Manual* methodology.
2. Average delay in seconds per vehicle.
3. Worst movement reported for unsignalized intersections where EB = eastbound, WB = westbound, SB = southbound, and NB = northbound.

As shown in [Table 6](#), with the addition of project traffic, all but one of the signalized intersections would continue to meet the City's LOS standards. The intersection of SR 203/NE Woodinville-Duvall Road would continue to operate at LOS E with the addition of project traffic, with an increase of approximately 4 seconds of delay.

The side-street stop controlled intersection of SR 203/NE 143rd Place would continue to operate at LOS F with the addition of project traffic due to limited gaps for westbound left-turn movements. The delay for the westbound approach is anticipated to increase by approximately 24 seconds with the addition of project traffic. Background traffic was not shifted to the signalized intersection at Big Rock Road. Traffic destined to the south will be able to access Big Rock Road in the future with the extension of 3rd Avenue NE (268th Avenue NE) anticipated as part of the Toll Brothers Plat.

Project driveways along NE 143rd Place, which would be stop-controlled on the minor approaches, operate at LOS A with less than 10 seconds of delay.

Concurrency Evaluation

As outlined in the City of Duvall's *TIA guidelines* and 2006 *Comprehensive Plan*, concurrency is not applied to Main Street or intersections along Main Street. Concurrency is applied to arterial roadways, which includes NE 143rd Place. The only study intersections which concurrency applies to are the project site driveways. The concurrency program requires LOS C or better on all arterial roadways. As shown in [Table 6](#), all intersections providing access to the site along NE 143rd Place are anticipated to operate at LOS A, which is within the concurrency requirements.

Chapter 5. Mitigation

As noted in this report, two intersections are anticipated to operate above below the City LOS standard in both without- and with-project conditions: SR 203/Woodinville-Duvall Road at LOS E and SR 203/NE 143rd Place at LOS F. The delay at SR 203/Woodinville-Duvall Road is very minimal, at less than 4 seconds. The delay at SR 203/NE 143rd Place is also small, at less than 25 seconds. Due to the anticipated delay at this intersection, exiting traffic from the plat destined for areas south of the site is anticipated to utilize the traffic signal at Big Rock Road. Additionally background traffic would likely shift, although not reflected in the LOS calculations. No intersection mitigation is proposed based on the internal connectivity provided with the future development in the area and the degree of impact anticipated.

Transportation impact fees adopted by the City will be paid by the project. These fees will be determined by the city. Fees paid by the applicant will fund system-wide transportation improvements identified by the City.

Chapter 6. Findings and Recommendations

This transportation impact study summarizes the project traffic impacts of the proposed Rio Vista project. General findings and recommendations include:

- The project would develop 43 single-family detached housing units and 20 residential townhome (duplex and triplex) housing units.
- Based on a calculated project trip generation, the project would generate approximately 59 weekday PM peak hour trips with 38 inbound and 21 outbound.
- Project traffic would represent no more than 1 percent of the 2017 PM peak hour traffic volumes at off-site study intersections.
- One of the signalized intersections is anticipated to operate at an acceptable LOS during the 2017 with-project weekday PM peak hour. The intersection of SR 203/NE Woodinville-Duvall Rd would operate at LOS F and the intersection of SR 203/NE Big Rock Rd would operate at LOS E under both without- and with-project conditions.
- The stop-controlled intersection of SR 203/NE 143rd Place currently operates at LOS E and would continue to operate at LOS E under both without- and with-project conditions.
- Impact fees would be based on the fee schedule in effect at the time of the building permit and calculated by the City.
- The project would meet the City's Concurrency requirements.

Peak Hour Summary

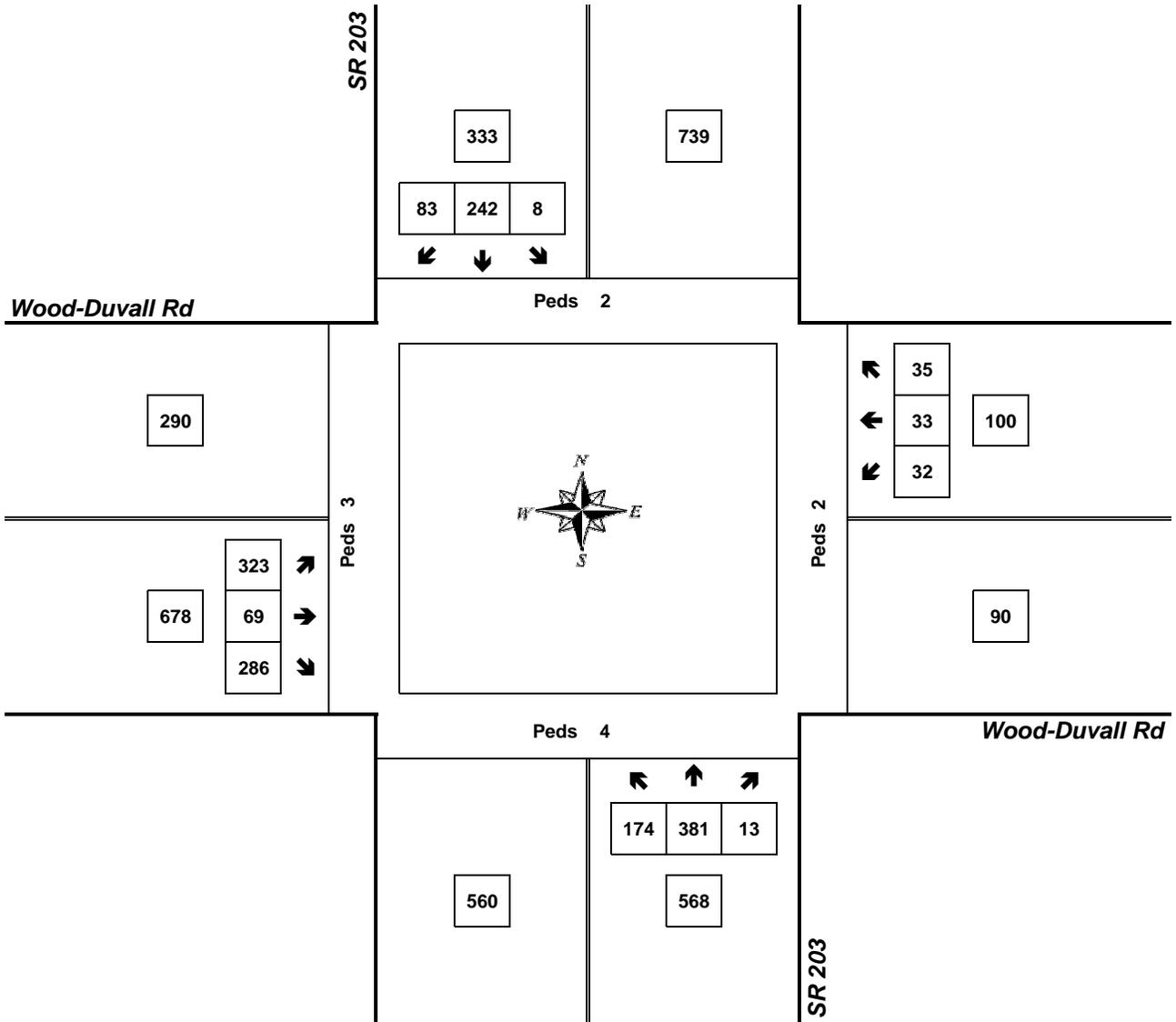


Mark Skaggs
(206) 251-0300

SR 203 & Wood-Duvall Rd

4:30 PM to 5:30 PM

Tuesday, June 04, 2013



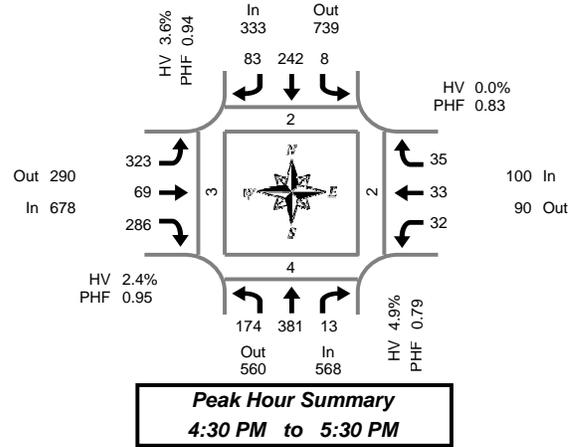
Approach	PHF	HV%	Volume
EB	0.95	2.4%	678
WB	0.83	0.0%	100
NB	0.79	4.9%	568
SB	0.94	3.6%	333
Intersection	0.95	3.3%	1,679

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary



Mark Skaggs
(206) 251-0300



SR 203 & Wood-Duvall Rd

Tuesday, June 04, 2013
4:00 PM to 6:00 PM

15-Minute Interval Summary 4:00 PM to 6:00 PM

Interval Start Time	Northbound SR 203				Southbound SR 203				Eastbound Wood-Duvall Rd				Westbound Wood-Duvall Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	HV	L	T	R	HV	L	T	R	HV	L	T	R	HV		North	South	East	West
4:00 PM	34	92	3	12	1	59	24	7	72	4	73	3	6	7	9	2	384	0	0	0	0
4:15 PM	46	81	4	6	1	60	18	1	83	11	60	9	7	8	5	1	384	0	0	1	0
4:30 PM	44	91	4	8	3	53	22	2	91	15	72	3	7	9	7	0	418	0	0	0	0
4:45 PM	35	87	5	8	0	68	21	4	88	17	67	6	6	3	9	0	406	1	2	1	3
5:00 PM	56	122	1	8	1	61	16	3	67	19	71	4	7	8	14	0	443	1	2	1	0
5:15 PM	39	81	3	4	4	60	24	3	77	18	76	3	12	13	5	0	412	0	0	0	0
5:30 PM	51	84	3	3	1	58	15	1	86	11	85	5	4	6	6	0	410	1	0	0	0
5:45 PM	51	89	1	4	2	34	17	3	88	24	69	3	7	6	6	0	394	0	0	0	1
Total Survey	356	727	24	53	13	453	157	24	652	119	573	36	56	60	61	3	3,251	3	4	3	4

Peak Hour Summary 4:30 PM to 5:30 PM

By Approach	Northbound SR 203				Southbound SR 203				Eastbound Wood-Duvall Rd				Westbound Wood-Duvall Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV		North	South	East	West
Volume	568	560	1,128	28	333	739	1,072	12	678	290	968	16	100	90	190	0	1,679	2	4	2	3
%HV	4.9%				3.6%				2.4%				0.0%				3.3%				
PHF	0.79				0.94				0.95				0.83				0.95				

By Movement	Northbound SR 203				Southbound SR 203				Eastbound Wood-Duvall Rd				Westbound Wood-Duvall Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	174	381	13	568	8	242	83	333	323	69	286	678	32	33	35	100	1,679
PHF	0.78	0.78	0.65	0.79	0.50	0.89	0.86	0.94	0.89	0.91	0.94	0.95	0.67	0.63	0.63	0.83	0.95

Rolling Hour Summary 4:00 PM to 6:00 PM

Interval Start Time	Northbound SR 203				Southbound SR 203				Eastbound Wood-Duvall Rd				Westbound Wood-Duvall Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	HV	L	T	R	HV	L	T	R	HV	L	T	R	HV		North	South	East	West
4:00 PM	159	351	16	34	5	240	85	14	334	47	272	21	26	27	30	3	1,592	1	2	2	3
4:15 PM	181	381	14	30	5	242	77	10	329	62	270	22	27	28	35	1	1,651	2	4	3	3
4:30 PM	174	381	13	28	8	242	83	12	323	69	286	16	32	33	35	0	1,679	2	4	2	3
4:45 PM	181	374	12	23	6	247	76	11	318	65	299	18	29	30	34	0	1,671	3	4	2	3
5:00 PM	197	376	8	19	8	213	72	10	318	72	301	15	30	33	31	0	1,659	2	2	1	1

Peak Hour Summary

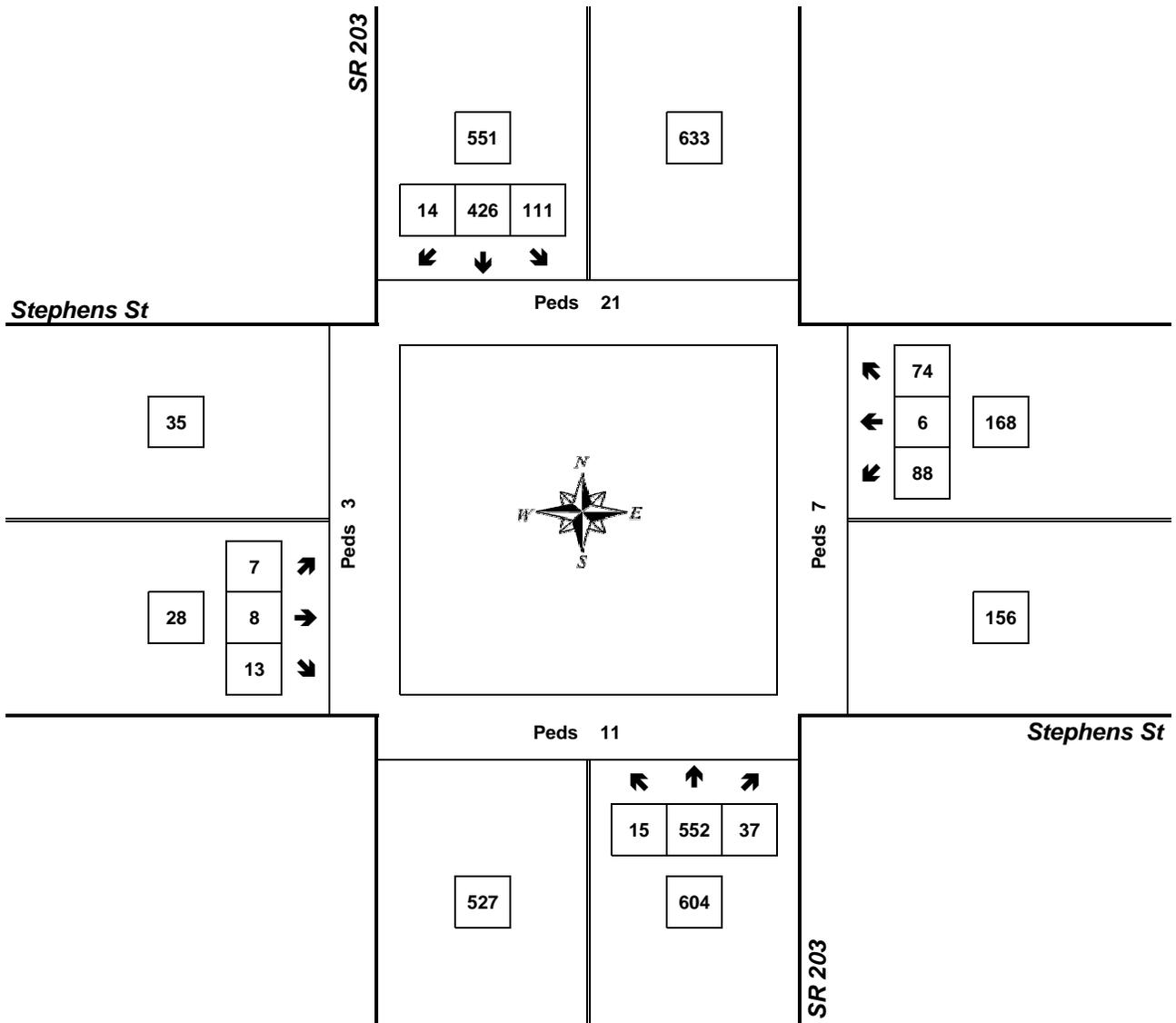


Mark Skaggs
(206) 251-0300

SR 203 & Stephens St

4:45 PM to 5:45 PM

Tuesday, June 04, 2013



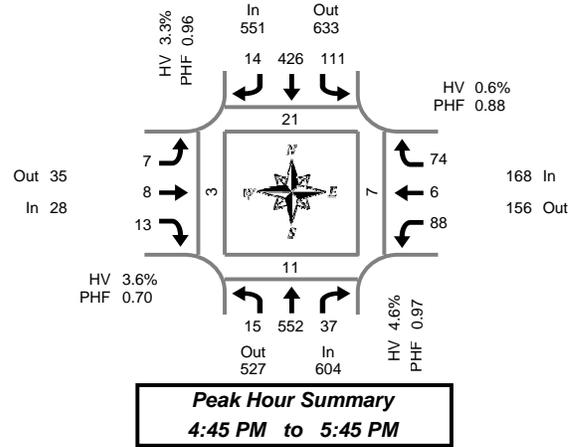
Approach	PHF	HV%	Volume
EB	0.70	3.6%	28
WB	0.88	0.6%	168
NB	0.97	4.6%	604
SB	0.96	3.3%	551
Intersection	0.97	3.6%	1,351

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary



Mark Skaggs
(206) 251-0300



SR 203 & Stephens St

Tuesday, June 04, 2013
4:00 PM to 6:00 PM

15-Minute Interval Summary 4:00 PM to 6:00 PM

Interval Start Time	Northbound SR 203				Southbound SR 203				Eastbound Stephens St				Westbound Stephens St				Interval Total	Pedestrians Crosswalk			
	L	T	R	HV	L	T	R	HV	L	T	R	HV	L	T	R	HV		North	South	East	West
4:00 PM	3	130	8	10	26	107	2	11	5	2	6	0	13	1	9	2	312	8	0	3	0
4:15 PM	1	142	8	7	22	101	1	7	4	0	2	0	17	1	22	2	321	6	3	0	2
4:30 PM	2	130	17	7	31	101	4	3	1	0	6	0	27	2	18	1	339	2	4	2	3
4:45 PM	5	138	10	10	24	108	2	8	1	3	6	0	22	1	18	1	338	2	5	1	0
5:00 PM	1	146	7	5	24	107	4	4	2	0	3	0	27	1	20	0	342	4	3	2	1
5:15 PM	2	128	11	7	27	109	3	2	3	2	2	0	19	0	17	0	323	7	0	0	2
5:30 PM	7	140	9	6	36	102	5	4	1	3	2	1	20	4	19	0	348	8	3	4	0
5:45 PM	3	133	10	5	24	92	6	4	10	2	6	0	19	2	19	0	326	3	2	4	0
Total Survey	24	1,087	80	57	214	827	27	43	27	12	33	1	164	12	142	6	2,649	40	20	16	8

Peak Hour Summary 4:45 PM to 5:45 PM

By Approach	Northbound SR 203				Southbound SR 203				Eastbound Stephens St				Westbound Stephens St				Total	Pedestrians Crosswalk			
	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV		North	South	East	West
Volume	604	527	1,131	28	551	633	1,184	18	28	35	63	1	168	156	324	1	1,351	21	11	7	3
%HV	4.6%				3.3%				3.6%				0.6%				3.6%				
PHF	0.97				0.96				0.70				0.88				0.97				

By Movement	Northbound SR 203				Southbound SR 203				Eastbound Stephens St				Westbound Stephens St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	15	552	37	604	111	426	14	551	7	8	13	28	88	6	74	168	1,351
PHF	0.54	0.95	0.84	0.97	0.77	0.98	0.70	0.96	0.58	0.67	0.54	0.70	0.81	0.38	0.93	0.88	0.97

Rolling Hour Summary 4:00 PM to 6:00 PM

Interval Start Time	Northbound SR 203				Southbound SR 203				Eastbound Stephens St				Westbound Stephens St				Interval Total	Pedestrians Crosswalk			
	L	T	R	HV	L	T	R	HV	L	T	R	HV	L	T	R	HV		North	South	East	West
4:00 PM	11	540	43	34	103	417	9	29	11	5	20	0	79	5	67	6	1,310	18	12	6	5
4:15 PM	9	556	42	29	101	417	11	22	8	3	17	0	93	5	78	4	1,340	14	15	5	6
4:30 PM	10	542	45	29	106	425	13	17	7	5	17	0	95	4	73	2	1,342	15	12	5	6
4:45 PM	15	552	37	28	111	426	14	18	7	8	13	1	88	6	74	1	1,351	21	11	7	3
5:00 PM	13	547	37	23	111	410	18	14	16	7	13	1	85	7	75	0	1,339	22	8	10	3

Peak Hour Summary

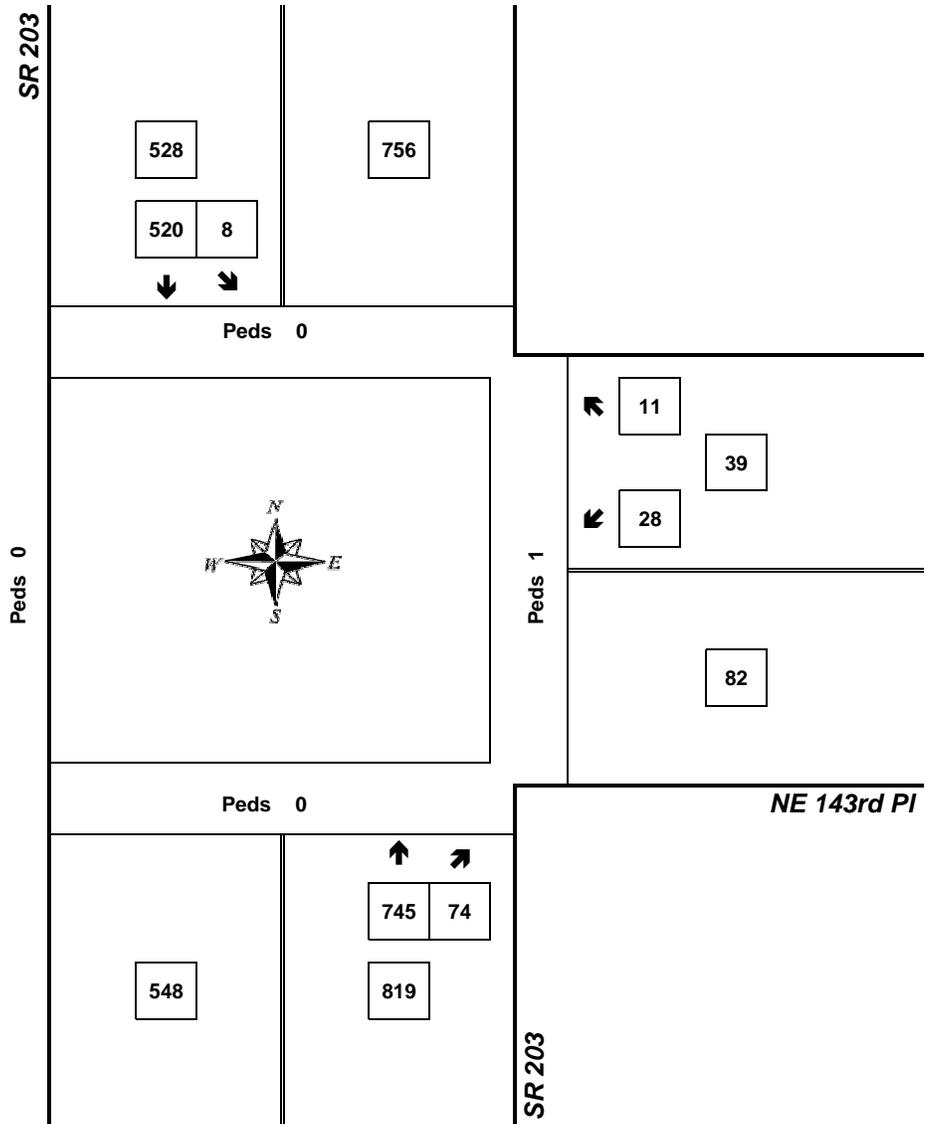


Mark Skaggs
(206) 251-0300

SR 203 & NE 143rd PI

4:30 PM to 5:30 PM

Tuesday, June 04, 2013



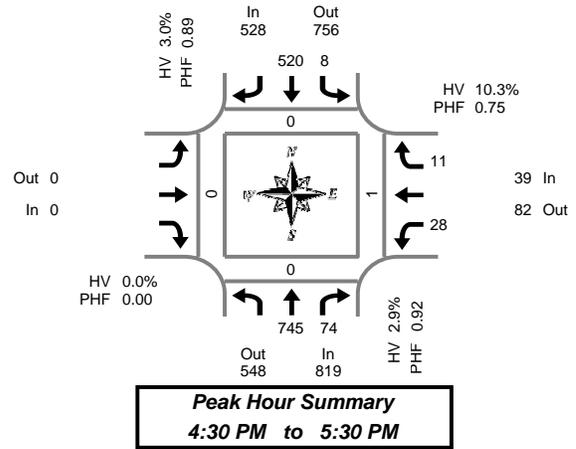
Approach	PHF	HV%	Volume
EB	0.00	0.0%	0
WB	0.75	10.3%	39
NB	0.92	2.9%	819
SB	0.89	3.0%	528
Intersection	0.92	3.2%	1,386

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary



Mark Skaggs
(206) 251-0300



SR 203 & NE 143rd PI

Tuesday, June 04, 2013
4:00 PM to 6:00 PM

15-Minute Interval Summary 4:00 PM to 6:00 PM

Interval Start Time	Northbound SR 203			Southbound SR 203			Eastbound NE 143rd PI			Westbound NE 143rd PI			Interval Total	Pedestrians Crosswalk					
	T	R	HV	L	T	HV				L	R	HV		North	South	East	West		
4:00 PM	172	18	8	1	121		10					11	3	2	326	0	0	0	0
4:15 PM	171	13	3	3	110		4					5	4	0	306	0	0	0	0
4:30 PM	188	15	6	4	127		2					2	2	0	338	0	0	0	0
4:45 PM	208	14	8	2	120		7					11	0	1	355	0	0	0	0
5:00 PM	193	22	3	1	148		6					8	5	3	377	0	0	0	0
5:15 PM	156	23	7	1	125		1					7	4	0	316	0	0	1	0
5:30 PM	171	13	3	1	119		4					3	0	0	307	0	0	0	0
5:45 PM	159	10	4	2	106		2					6	4	0	287	0	0	1	0
Total Survey	1,418	128	42	15	976		36					53	22	6	2,612	0	0	2	0

Peak Hour Summary 4:30 PM to 5:30 PM

By Approach	Northbound SR 203				Southbound SR 203				Eastbound NE 143rd PI			Westbound NE 143rd PI				Total	Pedestrians Crosswalk			
	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	In	Out	Total	HV		North	South	East	West
Volume	819	548	1,367	24	528	756	1,284	16	0	0	0	39	82	121	4	1,386	0	0	1	0
%HV	2.9%				3.0%				0.0%			10.3%				3.2%				
PHF	0.92				0.89				0.00			0.75				0.92				

By Movement	Northbound SR 203			Southbound SR 203			Eastbound NE 143rd PI			Westbound NE 143rd PI			Total
	T	R	Total	L	T	Total			Total	L	R	Total	
Volume	745	74	819	8	520	528			0	28	11	39	1,386
PHF	0.90	0.80	0.92	0.50	0.88	0.89			0.00	0.64	0.55	0.75	0.92

Rolling Hour Summary 4:00 PM to 6:00 PM

Interval Start Time	Northbound SR 203			Southbound SR 203			Eastbound NE 143rd PI			Westbound NE 143rd PI			Interval Total	Pedestrians Crosswalk					
	T	R	HV	L	T	HV				L	R	HV		North	South	East	West		
4:00 PM	739	60	25	10	478		23					29	9	3	1,325	0	0	0	0
4:15 PM	760	64	20	10	505		19					26	11	4	1,376	0	0	0	0
4:30 PM	745	74	24	8	520		16					28	11	4	1,386	0	0	1	0
4:45 PM	728	72	21	5	512		18					29	9	4	1,355	0	0	1	0
5:00 PM	679	68	17	5	498		13					24	13	3	1,287	0	0	2	0

Peak Hour Summary

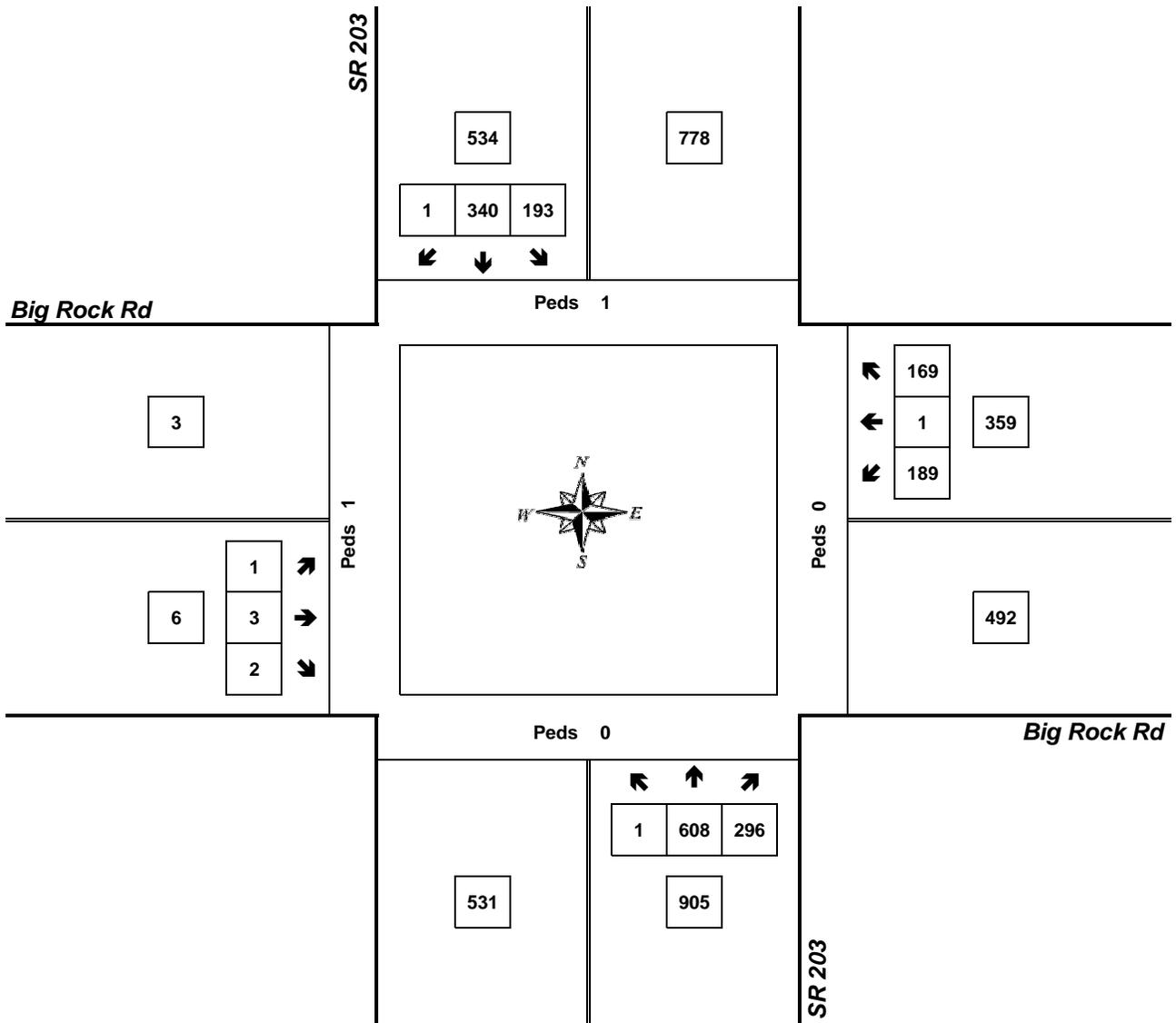


Mark Skaggs
(206) 251-0300

SR 203 & Big Rock Rd

4:45 PM to 5:45 PM

Tuesday, June 04, 2013



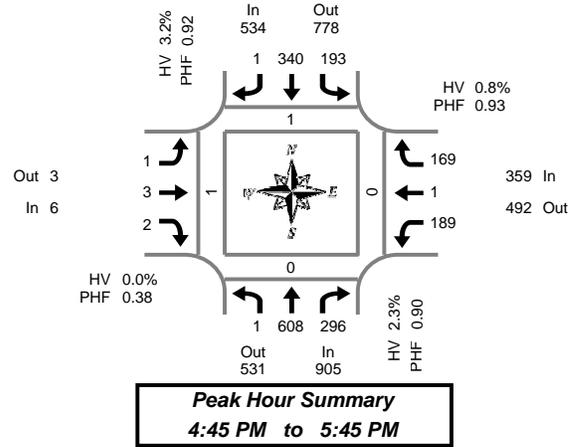
Approach	PHF	HV%	Volume
EB	0.38	0.0%	6
WB	0.93	0.8%	359
NB	0.90	2.3%	905
SB	0.92	3.2%	534
Intersection	0.95	2.3%	1,804

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary



Mark Skaggs
(206) 251-0300



SR 203 & Big Rock Rd

Tuesday, June 04, 2013
4:00 PM to 6:00 PM

15-Minute Interval Summary

4:00 PM to 6:00 PM

Interval Start Time	Northbound SR 203				Southbound SR 203				Eastbound Big Rock Rd				Westbound Big Rock Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	HV	L	T	R	HV	L	T	R	HV	L	T	R	HV		North	South	East	West
4:00 PM	2	148	44	7	47	81	0	10	0	0	1	0	46	1	38	5	408	0	0	0	0
4:15 PM	0	130	39	4	39	81	0	7	1	0	0	0	32	0	38	0	360	0	0	0	0
4:30 PM	0	149	55	3	44	85	1	2	0	0	0	0	37	0	46	3	417	0	0	0	0
4:45 PM	0	170	81	8	41	95	0	6	0	1	0	0	45	0	43	1	476	0	0	0	0
5:00 PM	1	162	57	4	56	88	1	7	1	2	1	0	48	0	48	1	465	1	0	0	1
5:15 PM	0	144	75	7	41	92	0	1	0	0	1	0	48	0	35	0	436	0	0	0	0
5:30 PM	0	132	83	2	55	65	0	3	0	0	0	0	48	1	43	1	427	0	0	0	0
5:45 PM	1	127	69	5	48	71	0	3	0	1	0	0	24	0	43	0	384	0	0	1	0
Total Survey	4	1,162	503	40	371	658	2	39	2	4	3	0	328	2	334	11	3,373	1	0	1	1

Peak Hour Summary

4:45 PM to 5:45 PM

By Approach	Northbound SR 203				Southbound SR 203				Eastbound Big Rock Rd				Westbound Big Rock Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV		North	South	East	West
Volume	905	531	1,436	21	534	778	1,312	17	6	3	9	0	359	492	851	3	1,804	1	0	0	1
%HV	2.3%				3.2%				0.0%				0.8%				2.3%				
PHF	0.90				0.92				0.38				0.93				0.95				

By Movement	Northbound SR 203				Southbound SR 203				Eastbound Big Rock Rd				Westbound Big Rock Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	1	608	296	905	193	340	1	534	1	3	2	6	189	1	169	359	1,804
PHF	0.25	0.89	0.89	0.90	0.86	0.89	0.25	0.92	0.25	0.38	0.50	0.38	0.98	0.25	0.88	0.93	0.95

Rolling Hour Summary

4:00 PM to 6:00 PM

Interval Start Time	Northbound SR 203				Southbound SR 203				Eastbound Big Rock Rd				Westbound Big Rock Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	HV	L	T	R	HV	L	T	R	HV	L	T	R	HV		North	South	East	West
4:00 PM	2	597	219	22	171	342	1	25	1	1	1	0	160	1	165	9	1,661	0	0	0	0
4:15 PM	1	611	232	19	180	349	2	22	2	3	1	0	162	0	175	5	1,718	1	0	0	1
4:30 PM	1	625	268	22	182	360	2	16	1	3	2	0	178	0	172	5	1,794	1	0	0	1
4:45 PM	1	608	296	21	193	340	1	17	1	3	2	0	189	1	169	3	1,804	1	0	0	1
5:00 PM	2	565	284	18	200	316	1	14	1	3	2	0	168	1	169	2	1,712	1	0	1	1

Highway Capacity Manual 2010

Signalized intersection level of service (LOS) is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle experiences due to the traffic signal control as well as provides a surrogate measure for driver discomfort and fuel consumption. Signalized intersection LOS is stated in terms of average control delay per vehicle (in seconds) during a specified time period (e.g., weekday PM peak hour). Control delay is a complex measure based on many variables, including signal phasing and coordination (i.e., progression of movements through the intersection and along the corridor), signal cycle length, and traffic volumes with respect to intersection capacity and resulting queues. Table 1 summarizes the LOS criteria for signalized intersections, as described in the *Highway Capacity Manual 2010* (Transportation Research Board, 2010).

Table 1. Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)	General Description
A	≤10	Free Flow
B	>10 – 20	Stable Flow (slight delays)
C	>20 – 35	Stable flow (acceptable delays)
D	>35 – 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 – 80	Unstable flow (intolerable delay)
F ¹	>80	Forced flow (congested and queues fail to clear)

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

1. If the volume-to-capacity (v/c) ratio for a lane group exceeds 1.0 LOS F is assigned to the individual lane group. LOS for overall approach or intersection is determined solely by the control delay.

Unsignalized intersection LOS criteria can be further reduced into three intersection types: all-way stop, two-way stop, and roundabout control. All-way stop and roundabout control intersection LOS is expressed in terms of the weighted average control delay of the overall intersection or by approach. Two-way stop-controlled intersection LOS is defined in terms of the average control delay for each minor-street movement (or shared movement) as well as major-street left-turns. This approach is because major-street through vehicles are assumed to experience zero delay, a weighted average of all movements results in very low overall average delay, and this calculated low delay could mask deficiencies of minor movements. Table 2 shows LOS criteria for unsignalized intersections.

Table 2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)
A	0 – 10
B	>10 – 15
C	>15 – 25
D	>25 – 35
E	>35 – 50
F ¹	>50

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

1. If the volume-to-capacity (v/c) ratio exceeds 1.0, LOS F is assigned an individual lane group for all unsignalized intersections, or minor street approach at two-way stop-controlled intersections. Overall intersection LOS is determined solely by control delay.

HCM 2010 Signalized Intersection Summary
 1: SR 203 & NE Woodinville-Duvall Road

6/15/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	335	70	300	35	35	35	180	395	15	10	250	85
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		0.99	1.00		0.97	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	1900	1863	1900	1900	1900	1900	1810	1810	1900	1900	1827	1827
Adj Flow Rate, veh/h	353	74	316	37	37	37	189	416	16	11	263	89
Adj No. of Lanes	0	1	0	0	1	1	1	1	0	0	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	0	0	0	5	5	5	4	4	4
Cap, veh/h	303	63	271	67	67	113	307	618	24	54	404	937
Arrive On Green	0.38	0.38	0.38	0.07	0.07	0.07	0.07	0.36	0.36	0.23	0.23	0.23
Sat Flow, veh/h	803	168	719	927	927	1570	1723	1731	67	27	1774	1543
Grp Volume(v), veh/h	743	0	0	74	0	37	189	0	432	274	0	89
Grp Sat Flow(s),veh/h/ln	1691	0	0	1854	0	1570	1723	0	1797	1801	0	1543
Q Serve(g_s), s	29.7	0.0	0.0	3.0	0.0	1.8	5.7	0.0	16.0	0.0	0.0	1.9
Cycle Q Clear(g_c), s	29.7	0.0	0.0	3.0	0.0	1.8	5.7	0.0	16.0	10.7	0.0	1.9
Prop In Lane	0.48		0.43	0.50		1.00	1.00		0.04	0.04		1.00
Lane Grp Cap(c), veh/h	637	0	0	133	0	113	307	0	642	458	0	937
V/C Ratio(X)	1.17	0.00	0.00	0.56	0.00	0.33	0.62	0.00	0.67	0.60	0.00	0.10
Avail Cap(c_a), veh/h	637	0	0	588	0	498	307	0	912	722	0	1168
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	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.6	0.0	0.0	35.4	0.0	34.8	22.8	0.0	21.4	27.6	0.0	6.5
Incr Delay (d2), s/veh	91.1	0.0	0.0	2.7	0.0	1.2	3.7	0.0	1.9	1.8	0.0	0.1
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	29.7	0.0	0.0	1.7	0.0	0.8	1.6	0.0	8.3	5.6	0.0	1.6
LnGrp Delay(d),s/veh	115.6	0.0	0.0	38.0	0.0	36.0	26.5	0.0	23.3	29.4	0.0	6.6
LnGrp LOS	F			D		D	C		C	C		A
Approach Vol, veh/h		743			111			621			363	
Approach Delay, s/veh		115.6			37.4			24.3			23.8	
Approach LOS		F			D			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		33.2		35.0	10.2	23.0		10.7				
Change Period (Y+Rc), s		5.0		5.3	4.5	5.0		5.0				
Max Green Setting (Gmax), s		40.0		29.7	5.7	29.8		25.0				
Max Q Clear Time (g_c+I1), s		18.0		31.7	7.7	12.7		5.0				
Green Ext Time (p_c), s		5.4		0.0	0.0	4.9		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay				61.9								
HCM 2010 LOS				E								

HCM 2010 Signalized Intersection Summary

2: SR 203 & NE Stephens Street

6/15/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	
Volume (veh/h)	5	10	15	90	5	75	15	575	40	115	445	15
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)	0.97		0.95	0.96		0.95	1.00		0.99	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	1900	1827	1900	1900	1881	1900	1810	1810	1900	1845	1845	1900
Adj Flow Rate, veh/h	5	10	15	93	5	77	15	593	41	119	459	15
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	1	1	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	4	4	4	1	1	1	5	5	5	3	3	3
Cap, veh/h	97	151	178	239	36	144	410	705	49	327	843	28
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22	0.02	0.42	0.42	0.07	0.47	0.47
Sat Flow, veh/h	121	671	792	658	159	642	1723	1672	116	1757	1776	58
Grp Volume(v), veh/h	30	0	0	175	0	0	15	0	634	119	0	474
Grp Sat Flow(s),veh/h/ln1585	0	0	0	1460	0	0	1723	0	1788	1757	0	1834
Q Serve(g_s), s	0.0	0.0	0.0	4.4	0.0	0.0	0.3	0.0	19.1	2.2	0.0	11.0
Cycle Q Clear(g_c), s	0.9	0.0	0.0	6.2	0.0	0.0	0.3	0.0	19.1	2.2	0.0	11.0
Prop In Lane	0.17		0.50	0.53		0.44	1.00		0.06	1.00		0.03
Lane Grp Cap(c), veh/h	425	0	0	419	0	0	410	0	754	327	0	871
V/C Ratio(X)	0.07	0.00	0.00	0.42	0.00	0.00	0.04	0.00	0.84	0.36	0.00	0.54
Avail Cap(c_a), veh/h	717	0	0	691	0	0	527	0	825	352	0	871
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	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.4	0.0	0.0	20.4	0.0	0.0	10.0	0.0	15.6	11.9	0.0	11.2
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.7	0.0	0.0	0.0	0.0	9.1	0.5	0.0	1.6
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/ln0.4	0.0	0.0	0.0	2.6	0.0	0.0	0.1	0.0	11.2	1.1	0.0	5.9
LnGrp Delay(d),s/veh	18.5	0.0	0.0	21.1	0.0	0.0	10.1	0.0	24.7	12.4	0.0	12.8
LnGrp LOS	B			C			B		C	B		B
Approach Vol, veh/h		30			175			649			593	
Approach Delay, s/veh		18.5			21.1			24.4			12.7	
Approach LOS		B			C			C			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.8	31.4		19.0	6.6	34.6		19.0				
Change Period (Y+Rc), s	5.5	6.0		5.5	5.5	6.0		5.5				
Max Green Setting (Gmax), s	27.8	27.8		25.0	5.2	27.8		25.0				
Max Q Clear Time (g_c+1), s	11.2	21.1		2.9	2.3	13.0		8.2				
Green Ext Time (p_c), s	0.0	4.2		0.8	0.0	9.2		0.7				
Intersection Summary												
HCM 2010 Ctrl Delay				19.1								
HCM 2010 LOS				B								

Intersection

Int Delay, s/veh 1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	30	10	775	75	10	540
Conflicting Peds, #/hr	1	1	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	10	10	3	3	3	3
Mvmt Flow	33	11	842	82	11	587

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1493	885	0 0 925 0
Stage 1	884	-	- - - -
Stage 2	609	-	- - - -
Critical Hdwy	6.5	6.3	- - 4.13 -
Critical Hdwy Stg 1	5.5	-	- - - -
Critical Hdwy Stg 2	5.5	-	- - - -
Follow-up Hdwy	3.59	3.39	- - 2.227 -
Pot Cap-1 Maneuver	130	333	- - 735 -
Stage 1	391	-	- - - -
Stage 2	528	-	- - - -
Platoon blocked, %			- - - -
Mov Cap-1 Maneuver	127	332	- - 734 -
Mov Cap-2 Maneuver	127	-	- - - -
Stage 1	391	-	- - - -
Stage 2	516	-	- - - -

Approach	WB	NB	SB
HCM Control Delay, s	38.5	0	0.2
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	150	734	-
HCM Lane V/C Ratio	-	-	0.29	0.015	-
HCM Control Delay (s)	-	-	38.5	10	0
HCM Lane LOS	-	-	E	A	A
HCM 95th %tile Q(veh)	-	-	1.1	0	-

HCM 2010 Signalized Intersection Summary
 4: SR 203 & NE Big Rock Road

6/15/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	5	195	5	175	5	635	310	200	355	5
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		1.00
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	1900	1900	1900	1881	1881	1900	1863	1863	1863	1845	1845	1900
Adj Flow Rate, veh/h	5	5	5	205	5	184	5	668	326	211	374	5
Adj No. of Lanes	0	1	0	1	1	0	1	1	1	1	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	1	1	1	2	2	2	3	3	3
Cap, veh/h	121	119	88	366	9	341	12	737	626	250	965	13
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22	0.01	0.40	0.40	0.14	0.53	0.53
Sat Flow, veh/h	264	543	403	1411	42	1559	1774	1863	1581	1757	1816	24
Grp Volume(v), veh/h	15	0	0	205	0	189	5	668	326	211	0	379
Grp Sat Flow(s),veh/h/ln	1210	0	0	1411	0	1602	1774	1863	1581	1757	0	1840
Q Serve(g_s), s	0.0	0.0	0.0	4.5	0.0	7.9	0.2	25.7	11.9	8.9	0.0	9.2
Cycle Q Clear(g_c), s	8.0	0.0	0.0	12.4	0.0	7.9	0.2	25.7	11.9	8.9	0.0	9.2
Prop In Lane	0.33		0.33	1.00		0.97	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	328	0	0	366	0	350	12	737	626	250	0	978
V/C Ratio(X)	0.05	0.00	0.00	0.56	0.00	0.54	0.43	0.91	0.52	0.84	0.00	0.39
Avail Cap(c_a), veh/h	656	0	0	670	0	696	117	785	666	266	0	978
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	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.5	0.0	0.0	28.5	0.0	26.3	37.6	21.6	17.5	31.7	0.0	10.5
Incr Delay (d2), s/veh	0.0	0.0	0.0	1.3	0.0	1.3	17.3	14.1	1.0	19.9	0.0	0.4
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	0.2	0.0	0.0	4.2	0.0	3.6	0.2	16.1	5.3	5.7	0.0	4.7
LnGrp Delay(d),s/veh	23.5	0.0	0.0	29.8	0.0	27.6	54.9	35.7	18.4	51.6	0.0	10.9
LnGrp LOS	C			C		C	D	D	B	D		B
Approach Vol, veh/h		15			394			999			590	
Approach Delay, s/veh		23.5			28.7			30.1			25.4	
Approach LOS		C			C			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	16.3	37.0		22.6	6.0	47.4		22.6				
Change Period (Y+Rc), s	5.5	7.0		6.0	5.5	7.0		6.0				
Max Green Setting (Gmax), s	11.5	32.0		33.0	5.0	38.5		33.0				
Max Q Clear Time (g_c+I1), s	10.9	27.7		10.0	2.2	11.2		14.4				
Green Ext Time (p_c), s	0.0	2.4		2.0	0.0	11.0		1.9				
Intersection Summary												
HCM 2010 Ctrl Delay				28.4								
HCM 2010 LOS				C								

HCM 2010 Signalized Intersection Summary
 1: SR 203 & NE Woodinville-Duvall Road

6/15/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	350	75	370	35	35	35	255	455	15	10	300	90
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		0.97	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	1900	1863	1900	1900	1900	1900	1810	1810	1900	1900	1827	1827
Adj Flow Rate, veh/h	368	79	389	37	37	37	268	479	16	11	316	95
Adj No. of Lanes	0	1	0	0	1	1	1	1	0	0	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	0	0	0	5	5	5	4	4	4
Cap, veh/h	355	76	375	59	59	100	243	593	20	34	378	1080
Arrive On Green	0.48	0.48	0.48	0.06	0.06	0.06	0.09	0.34	0.34	0.22	0.22	0.22
Sat Flow, veh/h	741	159	783	927	927	1565	1723	1741	58	24	1732	1542
Grp Volume(v), veh/h	836	0	0	74	0	37	268	0	495	327	0	95
Grp Sat Flow(s),veh/h/ln	1684	0	0	1854	0	1565	1723	0	1799	1756	0	1542
Q Serve(g_s), s	62.7	0.0	0.0	5.1	0.0	3.0	11.5	0.0	32.8	6.7	0.0	2.6
Cycle Q Clear(g_c), s	62.7	0.0	0.0	5.1	0.0	3.0	11.5	0.0	32.8	23.5	0.0	2.6
Prop In Lane	0.44		0.47	0.50		1.00	1.00		0.03	0.03		1.00
Lane Grp Cap(c), veh/h	806	0	0	119	0	100	243	0	613	412	0	1080
V/C Ratio(X)	1.04	0.00	0.00	0.62	0.00	0.37	1.10	0.00	0.81	0.79	0.00	0.09
Avail Cap(c_a), veh/h	806	0	0	340	0	287	243	0	659	458	0	1120
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	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	34.2	0.0	0.0	59.8	0.0	58.8	42.5	0.0	39.3	49.0	0.0	6.4
Incr Delay (d2), s/veh	41.9	0.0	0.0	3.9	0.0	1.7	87.6	0.0	7.6	9.3	0.0	0.0
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	38.5	0.0	0.0	2.7	0.0	1.3	12.6	0.0	17.5	12.4	0.0	2.9
LnGrp Delay(d),s/veh	76.0	0.0	0.0	63.7	0.0	60.4	130.1	0.0	46.9	58.2	0.0	6.5
LnGrp LOS	F			E		E	F		D	E		A
Approach Vol, veh/h		836			111			763			422	
Approach Delay, s/veh		76.0			62.6			76.1			46.6	
Approach LOS		E			E			E			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		49.6		68.0	16.0	33.6		13.4				
Change Period (Y+Rc), s		5.0		5.3	4.5	5.0		5.0				
Max Green Setting (Gmax), s		48.0		62.7	11.5	32.0		24.0				
Max Q Clear Time (g_c+I1), s		34.8		64.7	13.5	25.5		7.1				
Green Ext Time (p_c), s		5.0		0.0	0.0	3.2		0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			69.5									
HCM 2010 LOS			E									

HCM 2010 Signalized Intersection Summary
 2: SR 203 & NE Stephens Street

6/15/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	
Volume (veh/h)	5	10	15	95	5	80	15	710	40	120	560	15
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)	0.97		0.95	0.95		0.95	1.00		0.99	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	1900	1827	1900	1900	1881	1900	1810	1810	1900	1845	1845	1900
Adj Flow Rate, veh/h	5	10	15	98	5	82	15	732	41	124	577	15
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	1	1	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	4	4	4	1	1	1	5	5	5	3	3	3
Cap, veh/h	83	139	168	213	29	136	393	865	48	293	988	26
Arrive On Green	0.21	0.21	0.21	0.21	0.21	0.21	0.02	0.51	0.51	0.06	0.55	0.55
Sat Flow, veh/h	137	660	796	671	136	643	1723	1697	95	1757	1790	47
Grp Volume(v), veh/h	30	0	0	185	0	0	15	0	773	124	0	592
Grp Sat Flow(s),veh/h/ln1593	0	0	0	1450	0	0	1723	0	1792	1757	0	1836
Q Serve(g_s), s	0.0	0.0	0.0	7.0	0.0	0.0	0.3	0.0	28.9	2.5	0.0	16.6
Cycle Q Clear(g_c), s	1.1	0.0	0.0	8.8	0.0	0.0	0.3	0.0	28.9	2.5	0.0	16.6
Prop In Lane	0.17		0.50	0.53		0.44	1.00		0.05	1.00		0.03
Lane Grp Cap(c), veh/h	391	0	0	377	0	0	393	0	914	293	0	1014
V/C Ratio(X)	0.08	0.00	0.00	0.49	0.00	0.00	0.04	0.00	0.85	0.42	0.00	0.58
Avail Cap(c_a), veh/h	561	0	0	536	0	0	476	0	973	317	0	1014
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	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.6	0.0	0.0	27.5	0.0	0.0	9.9	0.0	16.4	14.3	0.0	11.5
Incr Delay (d2), s/veh	0.1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	8.1	0.7	0.0	1.6
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/ln0.5	0.0	0.0	0.0	3.6	0.0	0.0	0.2	0.0	16.2	1.3	0.0	8.7
LnGrp Delay(d),s/veh	24.7	0.0	0.0	28.5	0.0	0.0	9.9	0.0	24.5	15.0	0.0	13.1
LnGrp LOS	C			C			A		C	B		B
Approach Vol, veh/h		30			185			788			716	
Approach Delay, s/veh		24.7			28.5			24.2			13.5	
Approach LOS		C			C			C			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.2	45.6		21.9	6.9	48.9		21.9				
Change Period (Y+Rc), s	5.5	6.0		5.5	5.5	6.0		5.5				
Max Green Setting (Gmax), s	5.7	42.2		25.1	5.1	42.8		25.1				
Max Q Clear Time (g_c+1),s	11.5	30.9		3.1	2.3	18.6		10.8				
Green Ext Time (p_c), s	0.0	8.7		0.8	0.0	16.1		0.7				
Intersection Summary												
HCM 2010 Ctrl Delay				20.2								
HCM 2010 LOS				C								

Intersection

Int Delay, s/veh 10.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	20	0	20	45	0	25	25	895	85	15	645	20
Conflicting Peds, #/hr	0	0	0	1	0	1	0	0	1	1	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	100	-	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	92	95	92	95	92	92	92	92	95
Heavy Vehicles, %	2	2	2	10	2	10	2	3	3	3	3	2
Mvmt Flow	21	0	21	49	0	27	26	973	92	16	701	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1830	1863	713	1817	1828	1021	722	0	0	1066	0	0
Stage 1	744	744	-	1073	1073	-	-	-	-	-	-	-
Stage 2	1086	1119	-	744	755	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.2	6.52	6.3	4.12	-	-	4.13	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.2	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.2	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.59	4.018	3.39	2.218	-	-	2.227	-	-
Pot Cap-1 Maneuver	59	73	432	57	77	277	880	-	-	650	-	-
Stage 1	407	421	-	257	297	-	-	-	-	-	-	-
Stage 2	262	282	-	394	417	-	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	51	69	432	52	73	277	879	-	-	649	-	-
Mov Cap-2 Maneuver	51	69	-	52	73	-	-	-	-	-	-	-
Stage 1	395	411	-	249	288	-	-	-	-	-	-	-
Stage 2	229	273	-	365	407	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	66.1	216.2	0.2	0.2
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	879	-	-	51	432	73	649	-	-
HCM Lane V/C Ratio	0.03	-	-	0.413	0.049	1.042	0.025	-	-
HCM Control Delay (s)	9.2	-	-	118.3	13.8	216.2	10.7	-	-
HCM Lane LOS	A	-	-	F	B	F	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.5	0.2	5.5	0.1	-	-

HCM 2010 Signalized Intersection Summary

4: SR 203 & NE Big Rock Road

6/15/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	5	270	5	255	5	710	380	275	415	5
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		1.00
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	1900	1900	1900	1881	1881	1900	1863	1863	1863	1845	1845	1900
Adj Flow Rate, veh/h	5	5	5	284	5	268	5	747	400	289	437	5
Adj No. of Lanes	0	1	0	1	1	0	1	1	1	1	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	1	1	1	2	2	2	3	3	3
Cap, veh/h	110	110	89	367	8	450	11	721	612	290	994	11
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.01	0.39	0.39	0.17	0.55	0.55
Sat Flow, veh/h	239	385	312	1411	29	1571	1774	1863	1581	1757	1820	21
Grp Volume(v), veh/h	15	0	0	284	0	273	5	747	400	289	0	442
Grp Sat Flow(s),veh/h/ln	936	0	0	1411	0	1601	1774	1863	1581	1757	0	1841
Q Serve(g_s), s	0.1	0.0	0.0	13.9	0.0	16.9	0.3	44.5	23.8	18.9	0.0	16.5
Cycle Q Clear(g_c), s	17.0	0.0	0.0	30.9	0.0	16.9	0.3	44.5	23.8	18.9	0.0	16.5
Prop In Lane	0.33		0.33	1.00		0.98	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	310	0	0	367	0	458	11	721	612	290	0	1006
V/C Ratio(X)	0.05	0.00	0.00	0.77	0.00	0.60	0.44	1.04	0.65	0.99	0.00	0.44
Avail Cap(c_a), veh/h	311	0	0	368	0	460	77	721	612	290	0	1006
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	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	30.2	0.0	0.0	42.7	0.0	35.3	56.9	35.2	28.9	47.9	0.0	15.6
Incr Delay (d2), s/veh	0.0	0.0	0.0	9.9	0.0	2.1	18.5	43.0	2.8	51.3	0.0	0.4
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	0.3	0.0	0.0	9.8	0.0	7.7	0.2	31.5	10.9	13.3	0.0	8.5
LnGrp Delay(d),s/veh	30.3	0.0	0.0	52.6	0.0	37.4	75.4	78.2	31.7	99.2	0.0	16.0
LnGrp LOS	C			D		D	E	F	C	F		B
Approach Vol, veh/h		15			557			1152			731	
Approach Delay, s/veh		30.3			45.1			62.1			48.9	
Approach LOS		C			D			E			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	24.5	51.5		38.9	6.2	69.8		38.9				
Change Period (Y+Rc), s	5.5	7.0		6.0	5.5	7.0		6.0				
Max Green Setting (Gmax), s	19.0	44.5		33.0	5.0	58.5		33.0				
Max Q Clear Time (g_c+I1), s	20.9	46.5		19.0	2.3	18.5		32.9				
Green Ext Time (p_c), s	0.0	0.0		2.5	0.0	15.7		0.0				
Intersection Summary												
HCM 2010 Ctrl Delay				54.1								
HCM 2010 LOS				D								

HCM 2010 Signalized Intersection Summary
 1: SR 203 & NE Woodinville-Duvall Road

6/15/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	350	75	378	35	35	35	260	458	15	10	306	90
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		0.97	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	1900	1863	1900	1900	1900	1900	1810	1810	1900	1900	1827	1827
Adj Flow Rate, veh/h	368	79	398	37	37	37	274	482	16	11	322	95
Adj No. of Lanes	0	1	0	0	1	1	1	1	0	0	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	0	0	0	5	5	5	4	4	4
Cap, veh/h	350	75	378	59	59	100	241	596	20	34	382	1081
Arrive On Green	0.48	0.48	0.48	0.06	0.06	0.06	0.09	0.34	0.34	0.22	0.22	0.22
Sat Flow, veh/h	733	157	792	927	927	1565	1723	1741	58	24	1730	1542
Grp Volume(v), veh/h	845	0	0	74	0	37	274	0	498	333	0	95
Grp Sat Flow(s),veh/h/ln	1682	0	0	1854	0	1565	1723	0	1799	1754	0	1542
Q Serve(g_s), s	62.7	0.0	0.0	5.1	0.0	3.0	11.5	0.0	33.1	7.0	0.0	2.6
Cycle Q Clear(g_c), s	62.7	0.0	0.0	5.1	0.0	3.0	11.5	0.0	33.1	24.0	0.0	2.6
Prop In Lane	0.44		0.47	0.50		1.00	1.00		0.03	0.03		1.00
Lane Grp Cap(c), veh/h	803	0	0	119	0	100	241	0	616	415	0	1081
V/C Ratio(X)	1.05	0.00	0.00	0.62	0.00	0.37	1.14	0.00	0.81	0.80	0.00	0.09
Avail Cap(c_a), veh/h	803	0	0	338	0	286	241	0	657	456	0	1116
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	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	34.4	0.0	0.0	60.0	0.0	59.0	42.4	0.0	39.3	49.0	0.0	6.4
Incr Delay (d2), s/veh	46.6	0.0	0.0	3.9	0.0	1.7	99.9	0.0	7.7	9.9	0.0	0.0
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	39.4	0.0	0.0	2.8	0.0	1.3	13.2	0.0	17.8	12.8	0.0	2.9
LnGrp Delay(d),s/veh	81.0	0.0	0.0	63.9	0.0	60.6	142.3	0.0	47.0	59.0	0.0	6.4
LnGrp LOS	F			E		E	F		D	E		A
Approach Vol, veh/h		845			111			772			428	
Approach Delay, s/veh		81.0			62.8			80.8			47.3	
Approach LOS		F			E			F			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		50.0		68.0	16.0	34.0		13.4				
Change Period (Y+Rc), s		5.0		5.3	4.5	5.0		5.0				
Max Green Setting (Gmax), s		48.0		62.7	11.5	32.0		24.0				
Max Q Clear Time (g_c+I1), s		35.1		64.7	13.5	26.0		7.1				
Green Ext Time (p_c), s		5.0		0.0	0.0	3.0		0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			73.3									
HCM 2010 LOS			E									

HCM 2010 Signalized Intersection Summary

2: SR 203 & NE Stephens Street

6/15/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	
Volume (veh/h)	5	10	15	95	5	83	15	715	40	125	569	15
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)	0.97		0.95	0.95		0.95	1.00		0.99	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	1900	1827	1900	1900	1881	1900	1810	1810	1900	1845	1845	1900
Adj Flow Rate, veh/h	5	10	15	98	5	86	15	737	41	129	587	15
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	1	1	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	4	4	4	1	1	1	5	5	5	3	3	3
Cap, veh/h	83	140	170	209	29	141	386	865	48	289	988	25
Arrive On Green	0.21	0.21	0.21	0.21	0.21	0.21	0.02	0.51	0.51	0.06	0.55	0.55
Sat Flow, veh/h	138	660	798	655	137	661	1723	1698	94	1757	1790	46
Grp Volume(v), veh/h	30	0	0	189	0	0	15	0	778	129	0	602
Grp Sat Flow(s),veh/h/ln1595	0	0	0	1453	0	0	1723	0	1792	1757	0	1836
Q Serve(g_s), s	0.0	0.0	0.0	7.1	0.0	0.0	0.3	0.0	29.4	2.7	0.0	17.1
Cycle Q Clear(g_c), s	1.1	0.0	0.0	9.0	0.0	0.0	0.3	0.0	29.4	2.7	0.0	17.1
Prop In Lane	0.17		0.50	0.52		0.46	1.00		0.05	1.00		0.02
Lane Grp Cap(c), veh/h	393	0	0	379	0	0	386	0	913	289	0	1013
V/C Ratio(X)	0.08	0.00	0.00	0.50	0.00	0.00	0.04	0.00	0.85	0.45	0.00	0.59
Avail Cap(c_a), veh/h	559	0	0	534	0	0	468	0	969	312	0	1013
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	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.6	0.0	0.0	27.6	0.0	0.0	10.0	0.0	16.6	14.6	0.0	11.7
Incr Delay (d2), s/veh	0.1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	8.5	0.8	0.0	1.7
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/ln0.5	0.0	0.0	0.0	3.8	0.0	0.0	0.2	0.0	16.4	1.3	0.0	9.0
LnGrp Delay(d),s/veh	24.7	0.0	0.0	28.6	0.0	0.0	10.1	0.0	25.1	15.4	0.0	13.4
LnGrp LOS	C			C			B		C	B		B
Approach Vol, veh/h		30			189			793			731	
Approach Delay, s/veh		24.7			28.6			24.8			13.8	
Approach LOS		C			C			C			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.2	45.7		22.1	6.9	49.0		22.1				
Change Period (Y+Rc), s	5.5	6.0		5.5	5.5	6.0		5.5				
Max Green Setting (Gmax), s	5.7	42.2		25.1	5.1	42.8		25.1				
Max Q Clear Time (g_c+1), s	11.7	31.4		3.1	2.3	19.1		11.0				
Green Ext Time (p_c), s	0.0	8.4		0.9	0.0	16.0		0.7				
Intersection Summary												
HCM 2010 Ctrl Delay				20.6								
HCM 2010 LOS				C								

Intersection

Int Delay, s/veh 11.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	20	0	20	45	0	30	25	895	85	24	645	20
Conflicting Peds, #/hr	0	0	0	1	0	1	0	0	1	1	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	100	-	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	92	95	92	95	92	92	92	92	95
Heavy Vehicles, %	2	2	2	10	2	10	2	3	3	3	3	2
Mvmt Flow	21	0	21	49	0	33	26	973	92	26	701	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1853	1883	713	1837	1847	1021	722	0	0	1066	0	0
Stage 1	764	764	-	1073	1073	-	-	-	-	-	-	-
Stage 2	1089	1119	-	764	774	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.2	6.52	6.3	4.12	-	-	4.13	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.2	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.2	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.59	4.018	3.39	2.218	-	-	2.227	-	-
Pot Cap-1 Maneuver	57	71	432	55	75	277	880	-	-	650	-	-
Stage 1	396	413	-	257	297	-	-	-	-	-	-	-
Stage 2	261	282	-	384	408	-	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	48	66	432	49	70	277	879	-	-	649	-	-
Mov Cap-2 Maneuver	48	66	-	49	70	-	-	-	-	-	-	-
Stage 1	384	396	-	249	288	-	-	-	-	-	-	-
Stage 2	223	273	-	350	392	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	71.5	240.2	0.2	0.4
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	879	-	-	48	432	73	649	-	-
HCM Lane V/C Ratio	0.03	-	-	0.439	0.049	1.117	0.04	-	-
HCM Control Delay (s)	9.2	-	-	129.1	13.8	240.2	10.8	-	-
HCM Lane LOS	A	-	-	F	B	F	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.6	0.2	6.1	0.1	-	-

HCM 2010 Signalized Intersection Summary
 4: SR 203 & NE Big Rock Road

6/15/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	5	278	5	255	5	710	395	275	415	5
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		1.00
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	1900	1900	1900	1881	1881	1900	1863	1863	1863	1845	1845	1900
Adj Flow Rate, veh/h	5	5	5	293	5	268	5	747	416	289	437	5
Adj No. of Lanes	0	1	0	1	1	0	1	1	1	1	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	1	1	1	2	2	2	3	3	3
Cap, veh/h	111	110	90	368	8	451	11	721	612	290	993	11
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.01	0.39	0.39	0.17	0.55	0.55
Sat Flow, veh/h	240	385	312	1411	29	1571	1774	1863	1581	1757	1820	21
Grp Volume(v), veh/h	15	0	0	293	0	273	5	747	416	289	0	442
Grp Sat Flow(s),veh/h/ln	937	0	0	1411	0	1601	1774	1863	1581	1757	0	1841
Q Serve(g_s), s	0.1	0.0	0.0	14.8	0.0	16.9	0.3	44.5	25.2	18.9	0.0	16.5
Cycle Q Clear(g_c), s	17.0	0.0	0.0	31.8	0.0	16.9	0.3	44.5	25.2	18.9	0.0	16.5
Prop In Lane	0.33		0.33	1.00		0.98	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	311	0	0	368	0	459	11	721	612	290	0	1005
V/C Ratio(X)	0.05	0.00	0.00	0.80	0.00	0.59	0.44	1.04	0.68	1.00	0.00	0.44
Avail Cap(c_a), veh/h	311	0	0	368	0	459	77	721	612	290	0	1005
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	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	30.2	0.0	0.0	43.1	0.0	35.2	56.9	35.3	29.3	48.0	0.0	15.6
Incr Delay (d2), s/veh	0.0	0.0	0.0	11.6	0.0	2.1	18.5	43.3	3.4	51.6	0.0	0.4
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	0.3	0.0	0.0	10.4	0.0	7.7	0.2	31.5	11.6	13.3	0.0	8.5
LnGrp Delay(d),s/veh	30.3	0.0	0.0	54.7	0.0	37.3	75.4	78.5	32.7	99.5	0.0	16.0
LnGrp LOS	C			D		D	E	F	C	F		B
Approach Vol, veh/h		15			566			1168			731	
Approach Delay, s/veh		30.3			46.3			62.2			49.0	
Approach LOS		C			D			E			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	24.5	51.5		39.0	6.2	69.8		39.0				
Change Period (Y+Rc), s	5.5	7.0		6.0	5.5	7.0		6.0				
Max Green Setting (Gmax), s	19.0	44.5		33.0	5.0	58.5		33.0				
Max Q Clear Time (g_c+I1), s	20.9	46.5		19.0	2.3	18.5		33.8				
Green Ext Time (p_c), s	0.0	0.0		2.6	0.0	15.9		0.0				
Intersection Summary												
HCM 2010 Ctrl Delay				54.5								
HCM 2010 LOS				D								

Intersection

Int Delay, s/veh 0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	4	129	66	0	0	0
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	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	140	72	0	0	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	72	0	221
Stage 1	-	-	72
Stage 2	-	-	149
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1528	-	767
Stage 1	-	-	951
Stage 2	-	-	879
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1528	-	765
Mov Cap-2 Maneuver	-	-	765
Stage 1	-	-	951
Stage 2	-	-	876

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1528	-	-	-	-
HCM Lane V/C Ratio	0.003	-	-	-	-
HCM Control Delay (s)	7.4	0	-	-	0
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection

Int Delay, s/veh 1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	24	101	48	0	0	14
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	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	26	110	52	0	0	15

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	52	0	214
Stage 1	-	-	52
Stage 2	-	-	162
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1554	-	774
Stage 1	-	-	970
Stage 2	-	-	867
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1554	-	760
Mov Cap-2 Maneuver	-	-	760
Stage 1	-	-	970
Stage 2	-	-	851

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	8.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1554	-	-	-	1016
HCM Lane V/C Ratio	0.017	-	-	-	0.015
HCM Control Delay (s)	7.4	0	-	-	8.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0

Intersection

Int Delay, s/veh 0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	4	125	62	0	0	4
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	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	136	67	0	0	4

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	67	0	212
Stage 1	-	-	67
Stage 2	-	-	145
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1535	-	776
Stage 1	-	-	956
Stage 2	-	-	882
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1535	-	774
Mov Cap-2 Maneuver	-	-	774
Stage 1	-	-	956
Stage 2	-	-	879

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	8.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1535	-	-	-	997
HCM Lane V/C Ratio	0.003	-	-	-	0.004
HCM Control Delay (s)	7.4	0	-	-	8.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0