Lake Washington Boulevard SE & SE 60th Street Intersection Study

KPG

September 2019

Lake Washington Boulevard SE and SE 60th Street Intersection Study

Prepared for:

City of Bellevue
450 110th Avenue NE
Bellevue, WA 98004

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September 2019

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Introduction

In November 2016, voters passed the Neighborhood Safety, Connectivity and Congestion Levy, which helps the city address a backlog of important projects. The levy provides approximately $2 million per year for the Neighborhood Congestion Reduction program that focuses on reducing motor vehicle congestion. Levy funding pays for the planning, public outreach, design and construction of projects that rate the highest for reducing congestion.

This study recommends improvements for the Lake Washington Boulevard SE and SE 60th Street intersection. After this study is completed, the City will compare the benefits and costs of this project with other Neighborhood Congestion Reduction projects throughout the city to determine which projects will move forward to design and construction.

Background

The Lake Washington Boulevard SE and SE 60th Street intersection is located in southwest Bellevue and primarily provides access to residential neighborhoods and schools. The intersection has all-way stop control. It experiences congestion and queuing primarily during the morning commute, when a high volume of northbound traffic uses Lake Washington Boulevard SE to bypass I-405 congestion and access the interchange located a half mile to the north of the study intersection. **Figure 1** shows the study intersection and the surrounding area.

The intersection primarily functions as a three-leg intersection. Lake Washington Boulevard SE runs north-south, parallel to I-405, and SE 60th Street forms the east leg of the intersection. The west side of the intersection has three access points. It is comprised of two driveways for single family homes and the west leg of SE 60th Street, which transitions to a narrow, low-volume residential street, serving six existing residences and a new development is constructing 14 new homes. The west leg of SE 60th Street is offset approximately 35 feet south of the east leg of SE 60th Street. Due to the offset, drivers turning left from the west leg, first turn onto northbound Lake Washington Boulevard SE, just before the stop sign, and then enter the intersection.

Purpose

As part of the Neighborhood Congestion Reduction program, the focus of this study is to identify intersection improvements that address existing traffic congestion and accommodate future 2035 traffic volumes. Recommendations address safety, property access, non-motorized mobility, and aesthetics as well as upgrading facilities to current design standards. An alternatives analysis evaluated the benefits and costs, including property and environmental impacts caused by widening for improvements.

A key product of the study is the development of a preliminary (10 percent) engineering design and cost estimate for the recommended alternative. This information will help define the project for the Neighborhood Congestion Reduction ranking process and enables the project to pursue funding from grants and other City funding sources.

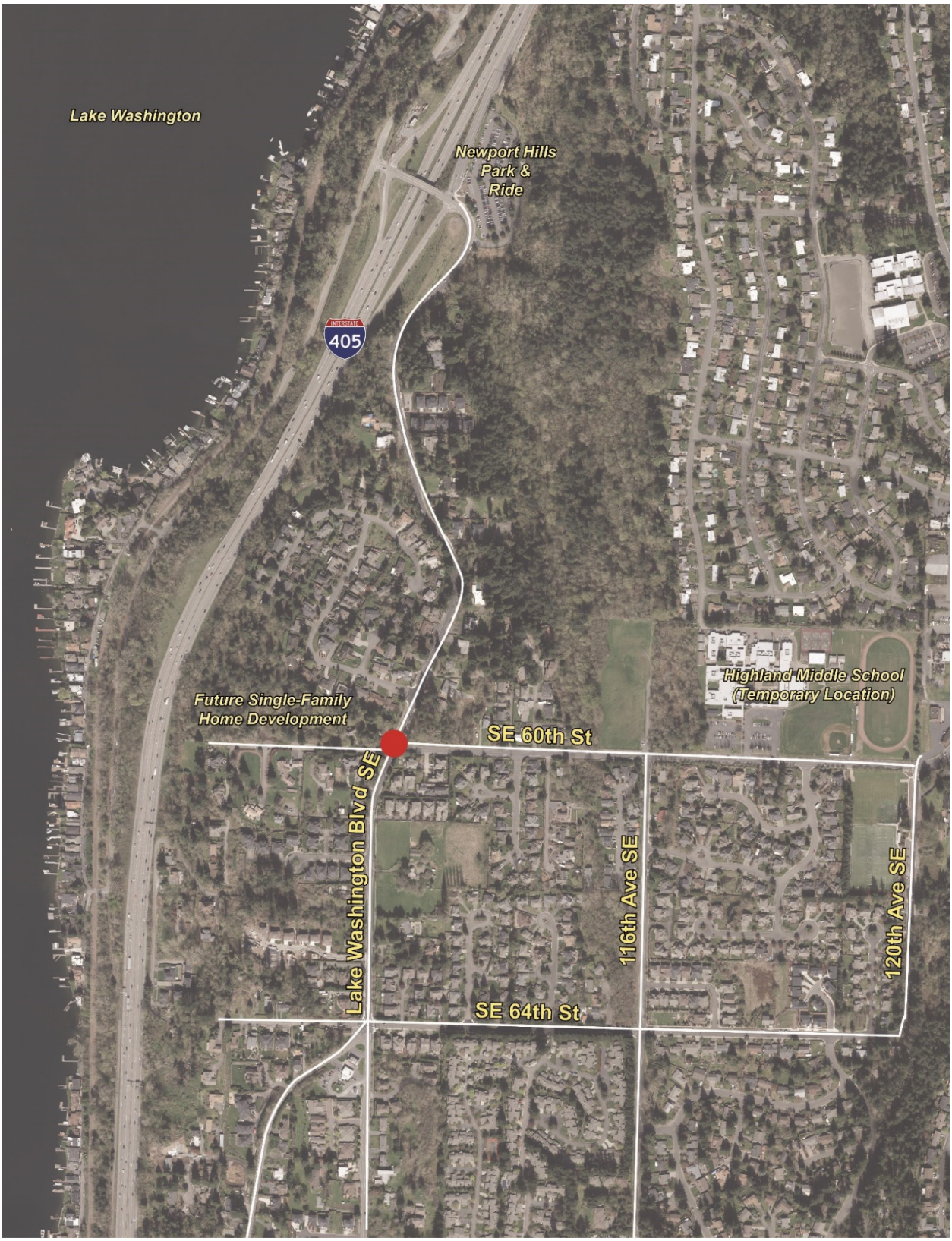


Figure 1. Study Intersection and Surrounding Area

Summary of Transportation Analysis

KPG completed the following tasks to analyze transportation conditions and select a recommended alternative for the study intersection.

- Analyzed existing transportation conditions, including collecting new traffic counts and creating Synchro/SimTraffic traffic operations models for the AM and PM peak hours.
- Analyzed five years of collision data.
- Forecasted 2035 AM and PM peak hour traffic volumes using future land use projections and the City of Bellevue's travel demand model.
- Analyzed 2035 AM and PM traffic operations for baseline conditions (without improvements) and for improvement alternatives, including enhanced all-way stop, roundabout and signal.
- Identified a signal as the recommended alternative for the study intersection.
- Developed a conceptual (10 percent) engineering design and cost estimate for the recommended improvement.

Recommendation

The recommended improvement is to construct a traffic signal at the intersection. The signal will improve traffic congestion from level of service (LOS) F to LOS C during the AM peak hour.

The recommended improvement will consolidate the three access points at the west side of the intersection into a single access point. This will require relocating the two private driveways to tie into SE 60th Street before connecting to Lake Washington Boulevard SE. The west leg of SE 60th Street will be relocated to the north to create a fourth approach at the signalized intersection. This will simplify and improve access for residents living west of the intersection. The improvement will require right of way from the two properties west of the intersection and relocation of the garage just west of the intersection.

Currently, the south leg of the intersection does not include a marked crosswalk, the improvement will add a marked crosswalk and ADA compliant curb ramps at all four legs of the intersection. Bike lanes will be included at the north, east and south legs of the intersection.

A signal was selected over a compact roundabout because of lower construction costs and lower right of way and property impacts. A four-leg, compact roundabout would have a larger footprint and require the purchase of one or two houses at the west side of the intersection.

Existing Conditions

This section describes the existing non-motorized facilities, transit service, roadway facilities, vehicle volumes, intersection operations and collision data.

Non-Motorized Facilities

East of the intersection, SE 60th Street has a sidewalk on the south side of the street and bicycle lanes on both sides of the street. North of the intersection, Lake Washington Boulevard SE has sidewalks and bicycle lanes on both sides of the street. South of the intersection, Lake Washington Boulevard SE has a sidewalk on the east side and bicycle lanes on both sides of the street which extend for approximately 200 feet. The City's 2009 Pedestrian-Bicycle Plan calls for further build-out of bike facilities to the south. The intersection has marked crosswalks on the east and north legs, but not on the south leg.

Transit Service

King County Metro route 887 provides service between Newport High School and International School in Bellevue; it travels on the north leg and east leg of the study intersection. The intersection is approximately 0.5 miles south of the Newport Hills Freeway Station and Park and Ride, a 275-stall parking lot served by King County Metro routes 111, 167, 342, 887, 952 and Sound Transit route 560.

Roadway Facilities

Lake Washington Boulevard SE is a minor arterial, running parallel to I-405, with interstate access approximately 0.5 miles to the north of the study intersection. SE 60th Street transitions from a collector arterial east of the intersection to a narrow, low-volume residential street west of the intersection. Lake Washington Boulevard SE and the east leg of SE 60th Street both have 30 mile per hour speed limits.

Looking west from SE 60th Street.

A challenge of this intersection is the offset geometry of SE 60th Street. The west side of the intersection is comprised of two residential driveways and the west leg of SE 60th Street which is offset approximately 35 feet south of the east leg of SE 60th Street. Due to the offset, drivers turning left from the west leg of SE 60th Street first turn onto northbound Lake Washington Boulevard SE, just before the stop sign, and then enter the intersection. During peak travel times, these left turning vehicles are dependent on northbound drivers leaving them a gap so that they can pull into the northbound approach of the intersection.

Vehicle Volumes

Vehicle counts were done in 2017 and 2018 at the study intersection. The segment of Lake Washington Boulevard SE, north of SE 60th Street has an average weekday volume of 9,800 vehicles. The segment of SE 60th Street, east of Lake Washington Boulevard SE has an average weekday volume of 5,600 vehicles.

On Lake Washington Boulevard SE, northbound is the peak travel direction in the morning, and southbound is the peak travel direction in the afternoon. The highest weekday traffic volumes occur during the morning commute when northbound traffic is a mix of local traffic and regional traffic avoiding congestion on I-405. During the AM peak hour, over 1,000 vehicles per hour travel through this intersection, and continue northbound toward I-405. At the I-405 and Lake Washington Boulevard SE interchange, the northbound on-ramp is an add-lane which increases freeway capacity and does not require northbound drivers to merge into freeway traffic. **Figure 2** shows northbound and southbound vehicle volumes over the course of a 24-hour period on Lake Washington Boulevard SE, north of SE 60th Street.

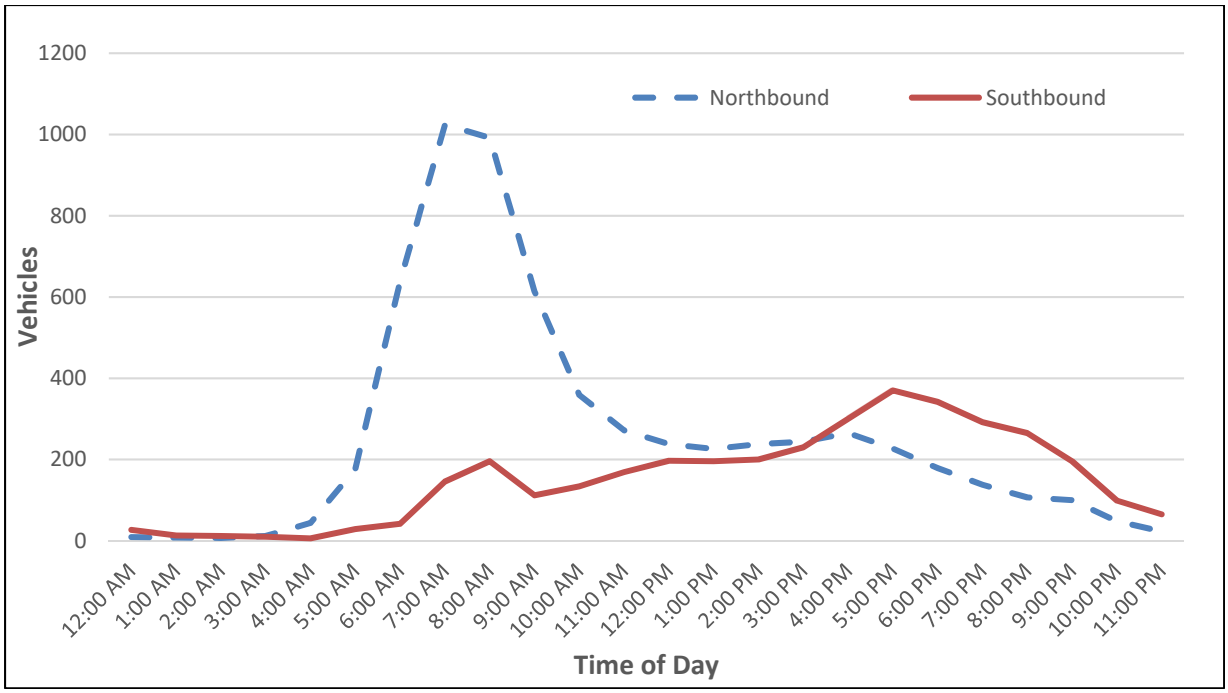


Figure 2. Existing Weekday Volumes on Lake Washington Boulevard, north of SE 60th Street
Source: Counts from February 2017.

In addition to the weekday traffic counts, AM and PM peak hour turning movement counts were collected at the study intersection. During the AM peak hour, the primary traffic movements are the northbound through and westbound right turn, and during the PM peak hour the primary movements are the southbound through and westbound left turn.

Figure 5 shows the existing 2018 AM and PM peak hour vehicle movements at the study intersection. The vehicle, pedestrian and bicycle counts for the AM and PM peak hours are included in Appendix A.

Figure 3. Existing 2018 AM and PM Peak Hour Vehicle Volumes
Source: Counts from November 2018.

Intersection Operations

Intersection level of service (LOS) is a measurement of the traffic flow or traffic congestion at an intersection. Intersection LOS is defined by the average seconds of delay experienced by vehicles traveling through the intersection. The intersection LOS ranges from A to F, with LOS A assigned when minimal delays are present and LOS F when lengthy delays occur. **Table 1** shows the LOS criteria for unsignalized and signalized intersections.

Table 1. Level of Service Criteria for Unsignalized and Signalized Intersections

Level of Service	Unsignalized Average Delay per Vehicle (seconds)	Signalized Average Delay per Vehicle (seconds)
A	0 to 10	0 to 10
B	10 to 15	10 to 20
C	15 to 25	20 to 35
D	25 to 35	35 to 55
E	35 to 50	55 to 80
F	> 50	> 80

Source: 2010 Highway Capacity Manual.

KPG used Synchro 10 traffic modeling software to calculate intersection delay and LOS. **Table 2** shows the 2018 existing AM and PM peak hour intersection LOS and delay for the study

intersection. The AM peak hour has the highest traffic volumes and experiences the longest delays, resulting in LOS F. The intersection operates at LOS C during the PM peak hour. The calculations for the traffic operations analysis are included in Appendix B.

Table 2. 2018 Existing AM and PM Peak Hour Intersection LOS and Delay (seconds)

Intersection	Traffic Control	AM Peak Hour		PM Peak Hour	
		LOS	Delay	LOS	Delay
Lake Washington Blvd SE/ SE 60th St	All-Way	F	53	C	16

Note: LOS calculated using Highway Capacity Manual (HCM) 6th Edition methodology.

Collision Analysis

WSDOT provided collision data for the five-year period from 7/1/2013 to 6/30/2018, during which time two collisions were reported. One collision was related to a driver exiting the west leg of SE 60th Street and not yielding the right of way to another driver traveling southbound on Lake Washington Boulevard SE. The second reported incident was an unpredictable event in which an unsecured load came loose. Neither collision resulted in serious injuries or fatalities. **Table 3** lists the number and type of collisions and the intersection collision rate, which calculates the number of collisions per million vehicles entering the intersection. The study intersection has a collision rate of 0.08, lower than the typical collision rate at unsignalized intersections, which is approximately 0.5 collisions per million entering vehicles.

Table 3. Five-Year Intersection Collision Data

Intersection	Total	Rear End	Side swipe	Angle	Head On	Ped/ Bike	Other	Average Weekday Traffic	Collision Rate*
Lake Wa. Blvd SE/ SE 60th St	2	0	0	1	0	0	1	11,800	0.08

Source: WSDOT data from 7/1/2013 to 6/30/2018.
*Intersection Collision Rate = number of collisions per million vehicles entering the intersection.

Traffic Signal Warrants Analysis

Traffic signal warrants use standard minimum thresholds for vehicle volumes, operations and safety to determine if a traffic signal could be an appropriate treatment at an intersection. The satisfaction of a traffic signal warrant or warrants does not in itself require the installation of a traffic signal. A transportation engineering study is used to determine if a traffic signal will improve the overall safety and operation of the intersection. The City of Bellevue completed a traffic signal warrants analysis in 2017. Chapter 4C of the *Manual on Uniform Traffic Control Devices, 2009 Edition* (MUTCD) provides nine warrants to determine the suitability of a traffic signal at an intersection. The analysis found that the study intersection meets two MUTCD warrants under existing transportation conditions. The study intersection meets the 4-hour signal warrant and the roadway network warrant. The complete MUTCD traffic signal warrants analysis memo is found in Appendix C.

2035 Traffic Analysis and Modeling Methodology

This section describes the 2035 vehicle volumes and the traffic operations analysis for 2035 baseline conditions. Baseline conditions represent 2035 traffic volumes and planned projects that are funded or likely to be constructed by 2035. Baseline conditions include WSDOT's I-405 - Renton to Bellevue Widening and Express Toll Lanes Project that will add a new lane in each direction of I-405 and is scheduled to be completed in 2024. Baseline conditions does not include improvements to the study intersection.

2035 Vehicle Volumes

The City of Bellevue developed 2035 vehicle volumes using the City's travel demand model that forecasts future volumes and travel patterns based on adopted land use projections. The 2035 vehicle volumes are used to analyze baseline traffic conditions and conditions with the improvement alternatives. Traffic volumes at the intersection are forecast to increase by 15 percent from 2018 to 2035. A new development at the west leg of the intersection is constructing fourteen new single-family homes. **Figure 4** shows the 2035 AM and PM peak hour vehicle volumes at the study intersection.

Figure 4. 2035 AM and PM Peak Hour Intersection Volumes

2035 Traffic Operations

Under 2035 baseline conditions, the study intersection is forecast to operate at LOS F during the AM peak hour and LOS E during the PM peak hour. **Table 4** shows 2035 peak hour intersection LOS and seconds of delay for baseline conditions.

Table 4. 2035 Baseline AM and PM Peak Hour Intersection LOS and Delay (seconds)

Intersection	Traffic Control	AM Peak Hour	PM Peak Hour
Lake Washington Blvd SE/ SE 60th St	All-Way Stop	F (72)	E (39)

Note: LOS calculated using HCM 6th Edition methodology.

Alternatives Analysis

This section describes the evaluation criteria used for the alternatives analysis, descriptions of the alternatives, a multimodal LOS analysis, and an alternatives screening analysis to select the recommended alternative for the study intersection.

Evaluation Criteria

The evaluation criteria used for the alternatives analysis include the following:

- Congestion Reduction – intersection traffic operations, including vehicle delays and queuing.
- Safety – expected type and frequency of collisions, and traffic calming to reduce vehicle speeds.
- Pedestrian and Bicycle Mobility – facilities and crossing treatments.
- Property Impacts – how widening for improvements impacts properties, driveways and buildings.
- Environmental Impacts – how widening for improvements impacts wetlands and trees.
- Cost – related to construction, purchase of right of way, and property and environmental restoration.

Description of Alternatives

Many improvement options were evaluated for the study intersection, and three traffic control alternatives were selected for more detailed analysis. Each alternative includes improvements to pedestrian and bicycle facilities, lighting, landscaping and aesthetics, and upgrading facilities to current design standards.

Enhanced All-Way Stop: Same lane configuration with single-lane approaches. Add a marked crossing of the south leg and upgrade pedestrian facilities. At the west side of the intersection, the two private driveways and SE 60th Street would not be relocated or consolidated.

Compact Roundabout: A compact roundabout with single-lane approaches; new pedestrian crossing of the south leg and center refuge islands at all crossings. The two driveways and SE 60th Street at the west side of the intersection would be consolidated to form the west leg of the intersection.

Traffic Signal: Single-lane approaches, except southbound includes a left turn lane. Add a pedestrian crossing of the south leg. The two driveways and SE 60th Street at the west side of the intersection would be consolidated to form the west leg of the intersection.

Table 5 compares the three alternatives using the evaluation criteria.

Table 5. Comparison of Intersection Traffic Control Alternatives

Criteria	Enhanced All-Way Stop	Compact Single-Lane Roundabout	Traffic Signal
Traffic Operations (Congestion Reduction)	A lower capacity option; all vehicles must stop before entering the intersection.	A higher capacity option; drivers entering the roundabout only need to yield to vehicles from one direction.	A higher capacity option; assigns the right of way for individual intersection movements.
Traffic Calming (Safety)	Traffic calming benefit as vehicles must stop.	Traffic calming benefit as vehicles must reduce speeds to navigate the roundabout. Improved operations may increase vehicle volumes.	Minimal traffic calming benefit. Improved operations may increase traffic volumes.
Collisions (Safety)	Collisions typically occur at lower speeds. Typically higher occurrence of angle collisions.	Design reduces the number of injury collisions such as angle and head-on crashes.	Collisions may occur at higher speeds. Typically higher occurrence of rear-end collisions.
Pedestrian and Bike Crossings	All vehicles stop at intersection crosswalks.	Single lane crossings with center refuge island. Vehicles yield to pedestrians.	Provides a dedicated walk phase with the corresponding through traffic movement.
Property and Environmental Impacts	Smaller property and environmental impacts.	Largest footprint has greatest property and environmental impacts.	Smaller property and environmental impacts.
Cost	Lowest cost.	Highest construction cost due to largest impact to right of way and need to purchase one or two properties.	Cost related to the installation of signal equipment, purchase of right of way, and reconstruction of the west leg.

Multimodal LOS

Multimodal Level of Service (LOS) describes the operations of the transportation system by evaluating each of the travel modes. Pedestrian, bicycle and transit LOS are related to comfort, access, and safety while vehicle LOS is related to intersection capacity and efficiency of traffic flow. For this analysis, how each of the improvement alternatives impacts the different modes traveling through the intersection is compared to baseline conditions. Baseline conditions represent the existing transportation network with 2035 forecasted vehicle volumes. **Table 6** compares the alternatives to baseline conditions, providing a relative assessment of "Improves", "No change", or "Worsens" for each mode.

Table 6. Multimodal LOS – Alternatives Compared to Baseline

Mode	Enhanced All-Way Stop[1]	Compact Single-Lane Roundabout[2]	Signal[1]
Vehicle LOS			
LOS with 2035 Volumes	No change. AM peak hour: F (72 sec.) PM peak hour: E (39 sec.)	Improves. AM peak hour: A (6 sec.) PM peak hour: (5 sec.)	Improves. AM peak hour: C (34 sec.) PM peak hour: B (17 sec.)
Pedestrian LOS			
Comfort, Access and Safety	Improves. Upgrades sidewalks and curb ramps and adds lighting. Adds a marked crossing of the south leg.	Improves. Upgrades sidewalks and curb ramps and adds lighting. Crosswalks include center refuge islands.	Improves. Upgrades sidewalks and curb ramps and adds lighting. Adds a marked crossing of the south leg.
Bicycle LOS			
Level of Traffic Stress	Improves. Upgrades lighting.	Improves. Reduces vehicle speeds and the number of conflict points.	Improves. Facilitates southbound left-turn bicycle movements by adding a marked crossing of the south leg, allowing a two-stage left.
Transit LOS			
Passenger Comfort, Access and Safety Traveling To Bus Stops	Improves. Upgrades sidewalks and curb ramps and adds lighting. Adds a marked crossing of the south leg.	Improves. Upgrades sidewalks and curb ramps and adds lighting. Crosswalks include center refuge islands.	Improves. Upgrades sidewalks and curb ramps and adds lighting. Adds a marked crossing of the south leg.
Transit Travel Speed	No change.	Improves. Better intersection LOS improves bus travel speed.	Improves. Better intersection LOS improves bus travel speed.

[1] Vehicle LOS and delay calculated using HCM 6th Edition methodology.
[2] Vehicle LOS and delay for roundabout calculated using SIDRA 8.

Results of Alternatives Screening Analysis

The Lake Washington Boulevard SE and SE 60th Street intersection currently experiences congestion during the morning commute. Under baseline conditions, the intersection is forecast to operate at LOS F during the 2035 AM peak hour and LOS E during the 2035 PM peak hour.

The signal alternative is recommended because it relieves traffic congestion during the peak hours and consolidates the three access points at the west side of the intersection into a single access point that forms the west approach of the intersection.

A compact roundabout was not selected because it would have the highest construction cost, and require right of way at all four corners of the intersection, including the purchase of one or two homes on the west side to consolidate the three access points into a single access point that forms the west approach of the roundabout. **Figure 5** shows a conceptual design for a roundabout.

An all-way stop was not selected because the intersection currently operates at LOS F during the AM peak hour, and delays and queuing are forecast to increase by 2035.

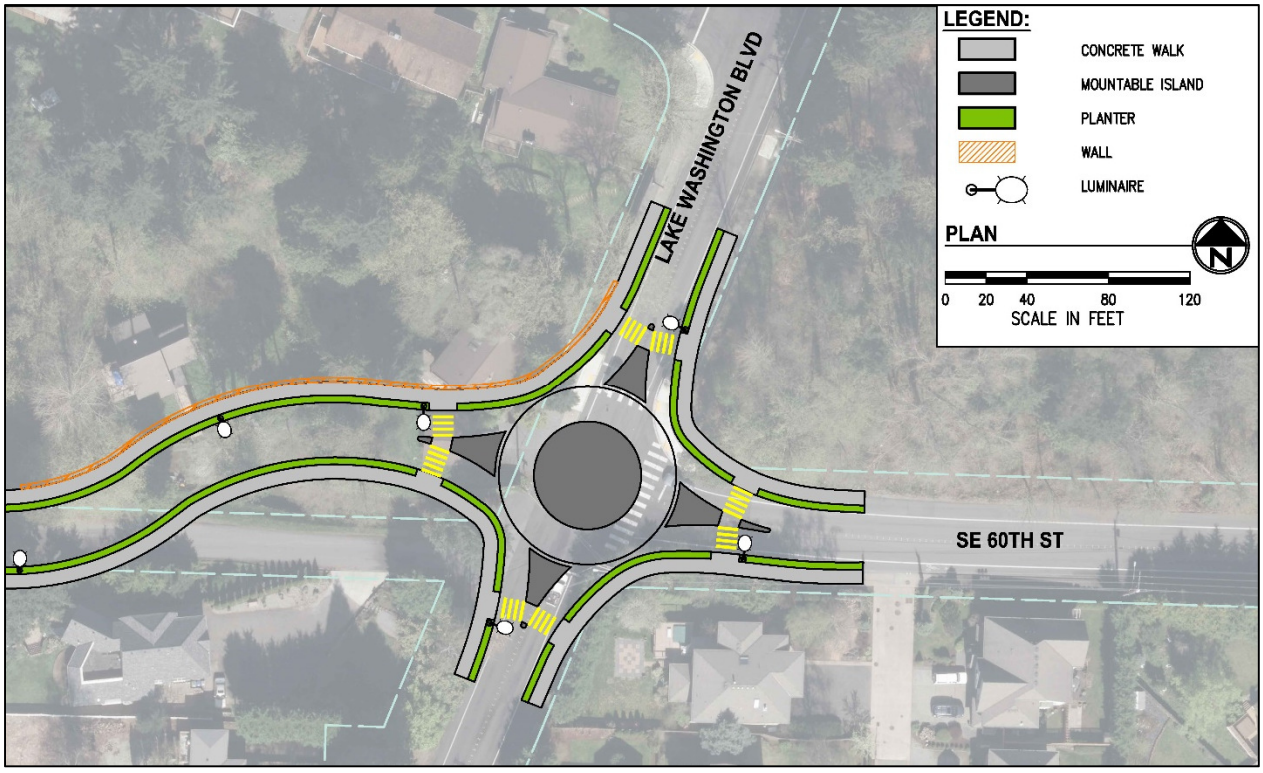


Figure 5. Roundabout Alternative and Impacts to Adjacent Properties

Recommended Alternative

The recommended alternative is a signal with single lane approaches, except the southbound approach will include a left turn lane. The signal phasing for the southbound left turn movement will be protected-permitted phasing using the flashing yellow arrow treatment. To maximize efficiency and safety, the eastbound and westbound approaches will have split phasing (eastbound and westbound traffic movements will not occur simultaneously). This is because of the high westbound left turn volumes and because the eastbound volumes are low and this phase will regularly be skipped. **Figure 6** shows a conceptual design of the signal and a full-sized conceptual design is included in Appendix D.

The improvement will consolidate the three access points at the west side of the intersection into a single access point. This will require relocating the two private driveways to tie into SE 60th Street before connecting to Lake Washington Boulevard SE. The west leg of SE 60th Street will be relocated to the north to create a fourth approach at the signalized intersection. This will simplify and improve access for residents living west of the intersection. The improvement will require right of way from the two properties west of the intersection and relocation of the garage just west of the intersection.

Non-motorized improvements include marked crosswalks at all legs of the intersection and bicycle lanes on the north, east and south legs of the intersection. New street and pedestrian lighting will be included on all four of the signal poles. The City will coordinate with adjacent property owners and the broader community regarding the recommended alternative.

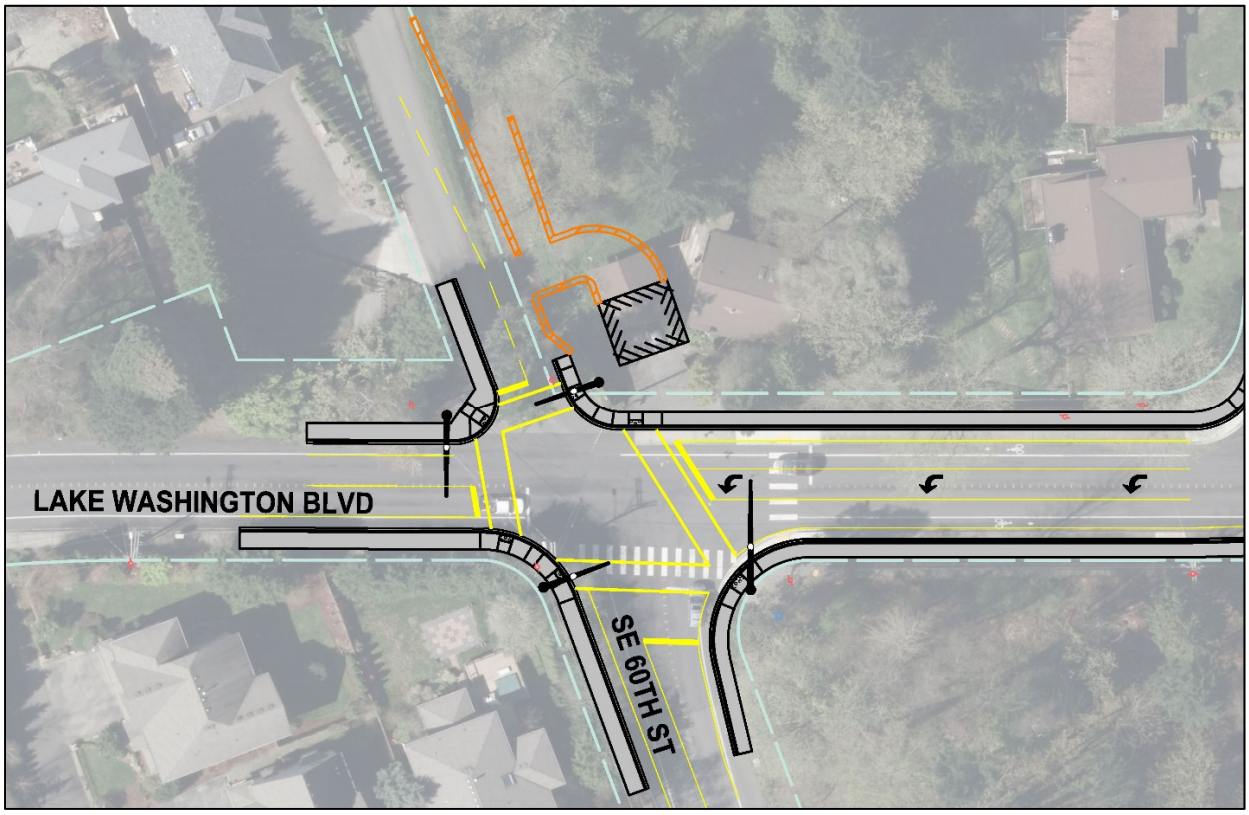


Figure 6. Conceptual Design for a Four-Leg Traffic Signal

Cost Estimate

The cost estimate for the recommended alternative is $2,588,000. The detailed cost estimate is included in Appendix E.

For comparison, higher level cost estimates were performed for the other two intersection control alternatives. The cost estimate for the roundabout alternative is $6,111,000 and the cost estimate for the enhanced all-way stop alternative is $72,000.

Risk Factors

The risk factors related to the recommended alternative include:

- Impacts to adjacent properties and driveways may require the purchase of additional right of way.
- Steep grades may increase construction costs.
- A new traffic signal may increase the number and severity of collisions.
- Additional vehicle capacity at the intersection may increase north-south traffic.
- Additional vehicle capacity at the intersection may increase delays and queuing at the I-405 northbound on-ramp.
- The I-405 - Renton to Bellevue Widening and Express Toll Lanes Project will add a new travel lane in each direction of I-405 and may reduce the need for capacity improvements at the study intersection.

Appendix A: Intersection Counts

Prepared for: **KPG**

Traffic Count Consultants, Inc.

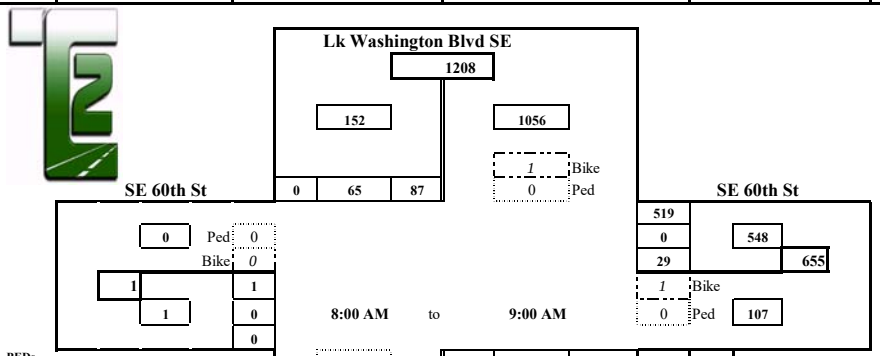
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Lake Washington Blvd SE & SE 60th St **Date of Count:** Wed 11/07/2018

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

Time Interval	From North on (SB) Lk Washington Blvd SE				From South on (NB) Lk Washington Blvd SE				From East on (WB) SE 60th St				From West on (EB) SE 60th St				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
8:15 A	0	15	18	0	1	0	154	3	2	5	0	147	0	0	0	0	342
8:30 A	7	32	20	0	0	0	138	7	2	4	0	141	0	0	0	0	342
8:45 A	0	27	12	0	0	0	132	7	9	8	0	135	0	0	0	0	321
9:00 A	1	13	15	0	0	0	112	3	6	12	0	96	0	1	0	0	252
9:15 A	0	18	22	2	3	0	99	7	1	12	0	57	0	1	0	0	218
9:30 A	3	13	19	1	0	1	73	5	0	0	0	81	0	0	1	0	194
9:45 A	1	16	18	0	0	0	77	5	3	5	0	59	0	0	0	1	181
10:00 A	2	13	20	0	1	0	67	7	0	8	0	47	0	1	0	0	163
10:15 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	14	147	144	3	5	1	852	44	23	54	0	763	0	3	1	1	2013
Peak Hour: 8:00 AM to 9:00 AM																	
Total	8	87	65	0	1	0	536	20	19	29	0	519	0	1	0	0	1257
Approach	152				556				548				1				1257
%HV	5.3%				0.2%				3.5%				n/a				2.2%
PHF	0.73				0.89				0.90				0.25				0.92



PEDs Across:

	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08			2		2
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	2	0	**2**

Bicycles From:

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

1368 *1.0 PHF Peak Hour Volume*

		PHF	%HV
	EB	0.25	n/a
Check	WB	0.90	3.5%
In: 1257	NB	0.89	0.2%
Out: 1257	SB	0.73	5.3%
	T Int.	0.92	2.2%

Conditions:

Special Notes

KPG18137TM_04a

Prepared for: **KPG**

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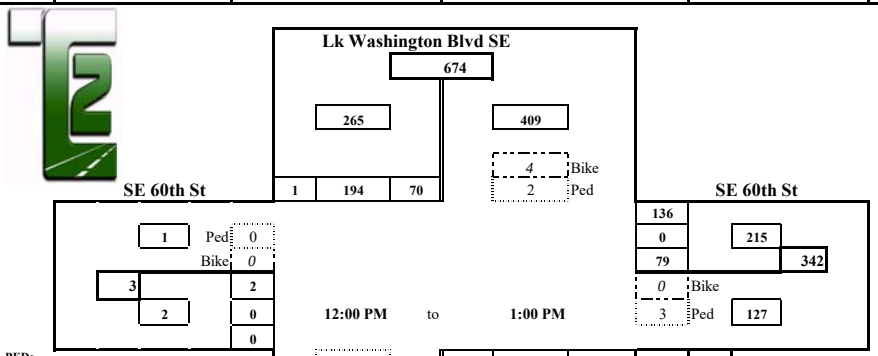
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
12:15 P	1	15	37	0	0	0	104	16	1	10	0	36	0	1	0	0	219
12:30 P	0	26	39	1	0	0	66	15	0	15	0	38	0	0	0	0	200
12:45 P	1	9	72	0	0	0	65	14	0	16	0	37	0	1	0	0	214
1:00 P	0	20	46	0	0	0	36	12	0	38	0	25	0	0	0	0	177
1:15 P	0	17	58	0	0	0	44	19	0	21	0	20	0	0	1	0	180
1:30 P	0	17	31	0	0	0	47	21	0	26	1	34	0	0	0	0	177
1:45 P	0	9	32	0	0	1	44	9	0	17	0	28	0	0	0	0	140
2:00 P	0	17	43	0	0	0	46	15	1	23	2	25	0	1	0	1	173
2:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	2	130	358	1	0	1	452	121	2	166	3	243	0	3	1	1	1480
	Peak Hour: 12:00 PM to 1:00 PM																
Total	2	70	194	1	0	0	271	57	1	79	0	136	0	2	0	0	810
Approach	265				328				215				2				810
%HV	0.8%				n/a				0.5%				n/a				0.4%
PHF	0.82				0.68				0.85				0.50				0.92



PEDs Across:	N	S	E	W	
INT 01					0
INT 02	1		1		2
INT 03	1		2		3
INT 04					0
INT 05			2		2
INT 06					0
INT 07					0
INT 08	1		4		5
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	3	0	9	0	12

Bicycles From:	N	S	E	W	
INT 01	3	1			4
INT 02	1				1
INT 03					0
INT 04		1			1
INT 05	1	1			2
INT 06	2				2
INT 07	1	1	1		3
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	8	4	1	0	13

876 *1.0 PHF Peak Hour Volume*

		PHF	%HV
	EB	0.50	n/a
Check	WB	0.85	0.5%
In: 810	NB	0.68	n/a
Out: 810	SB	0.82	0.8%
	T Int.	0.92	0.4%

Conditions:

Special Notes

KPG18137TM_04m

Prepared for: **KPG**

Traffic Count Consultants, Inc.

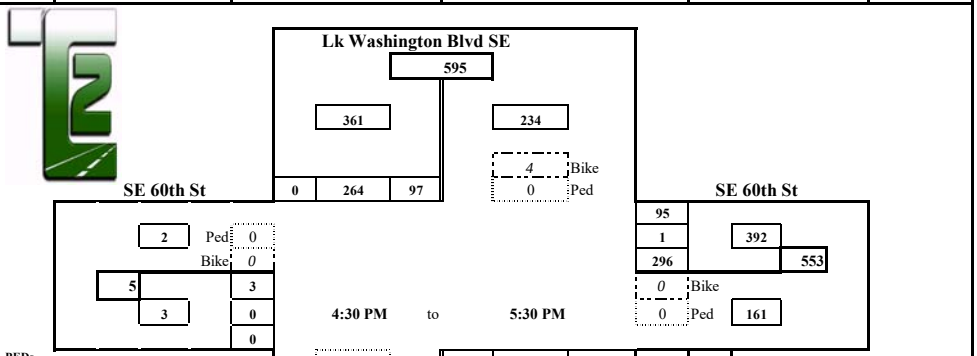
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Lake Washington Blvd SE & SE 60th St **Date of Count:** Wed 11/07/2018

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

Time Interval	From North on (SB) Lk Washington Blvd SE				From South on (NB) Lk Washington Blvd SE				From East on (WB) SE 60th St				From West on (EB) SE 60th St				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	0	16	49	0	1	0	38	16	0	77	0	33	0	1	0	0	230
4:30 P	0	12	57	0	1	0	33	15	1	66	0	26	0	0	0	0	209
4:45 P	0	25	63	0	0	1	32	15	0	87	0	16	0	0	0	0	239
5:00 P	2	25	51	0	0	0	29	25	0	76	1	29	0	0	0	0	236
5:15 P	0	26	81	0	0	0	33	12	1	73	0	30	0	0	0	0	255
5:30 P	0	21	69	0	0	0	42	12	0	60	0	20	0	3	0	0	227
5:45 P	0	16	70	0	0	0	32	15	1	60	0	26	0	0	1	1	221
6:00 P	0	16	64	0	0	0	32	13	0	74	0	32	0	0	0	0	231
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	2	157	504	0	2	1	271	123	3	573	1	212	0	4	1	1	1848
Peak Hour: 4:30 PM to 5:30 PM																	
Total	2	97	264	0	0	1	136	64	1	296	1	95	0	3	0	0	957
Approach	361				201				392				3				957
%HV	0.6%				n/a				0.3%				n/a				0.3%
PHF	0.84				0.93				0.92				0.25				0.94



1020 *1.0 PHF Peak Hour Volume*

	PHF	%HV
EB	0.25	n/a
WB	0.92	0.3%
NB	0.93	n/a
SB	0.84	0.6%
T Int.	0.94	0.3%

Check In: 957 Out: 957

Conditions:

PEDs Across:

	N	S	E	W	
INT 01					0
INT 02			1		1
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08			1		1
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	2	0	**2**

Bicycles From:

	N	S	E	W	
INT 01					0
INT 02	1				1
INT 03	1	1			2
INT 04					0
INT 05					0
INT 06	3				3
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	5	1	0	0	6

Special Notes

KPG18137TM_04p

Appendix B: Traffic Operations Reports

Intersection	
Intersection Delay, s/veh	52.5
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	0	0	29	0	519	0	536	20	87	65	0
Future Vol, veh/h	1	0	0	29	0	519	0	536	20	87	65	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	4	4	4	0	0	0	5	5	5
Mvmt Flow	1	0	0	32	0	564	0	583	22	95	71	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	11.2	46.6	69	13.6
HCM LOS	B	E	F	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	100%	5%	57%
Vol Thru, %	96%	0%	0%	43%
Vol Right, %	4%	0%	95%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	556	1	548	152
LT Vol	0	1	29	87
Through Vol	536	0	0	65
RT Vol	20	0	519	0
Lane Flow Rate	604	1	596	165
Geometry Grp	1	1	1	1
Degree of Util (X)	1.028	0.002	0.939	0.323
Departure Headway (Hd)	6.123	8.161	5.821	7.23
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	598	441	625	501
Service Time	4.123	6.161	3.821	5.23
HCM Lane V/C Ratio	1.01	0.002	0.954	0.329
HCM Control Delay	69	11.2	46.6	13.6
HCM Lane LOS	F	B	E	B
HCM 95th-tile Q	16.1	0	12.6	1.4

Intersection	
Intersection Delay, s/veh	16
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	0	0	296	1	95	1	136	64	97	264	0
Future Vol, veh/h	3	0	0	296	1	95	1	136	64	97	264	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	1	1	1
Mvmt Flow	3	0	0	315	1	101	1	145	68	103	281	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.7	18.1	11.4	16.4
HCM LOS	A	C	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	100%	76%	27%
Vol Thru, %	68%	0%	0%	73%
Vol Right, %	32%	0%	24%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	201	3	392	361
LT Vol	1	3	296	97
Through Vol	136	0	1	264
RT Vol	64	0	95	0
Lane Flow Rate	214	3	417	384
Geometry Grp	1	1	1	1
Degree of Util (X)	0.331	0.006	0.642	0.593
Departure Headway (Hd)	5.579	6.607	5.543	5.56
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	641	538	651	649
Service Time	3.638	4.695	3.59	3.61
HCM Lane V/C Ratio	0.334	0.006	0.641	0.592
HCM Control Delay	11.4	9.7	18.1	16.4
HCM Lane LOS	B	A	C	C
HCM 95th-tile Q	1.4	0	4.6	3.9

Intersection	
Intersection Delay, s/veh	72.2
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	1	1	30	1	520	2	580	30	90	75	1
Future Vol, veh/h	9	1	1	30	1	520	2	580	30	90	75	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	4	4	4	0	0	0	5	5	5
Mvmt Flow	10	1	1	33	1	565	2	630	33	98	82	1
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	11.7	52.5	106.6	14.6
HCM LOS	B	F	F	B

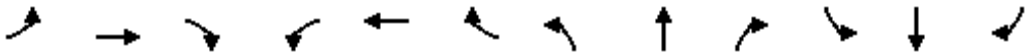
Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	82%	5%	54%
Vol Thru, %	95%	9%	0%	45%
Vol Right, %	5%	9%	94%	1%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	612	11	551	166
LT Vol	2	9	30	90
Through Vol	580	1	1	75
RT Vol	30	1	520	1
Lane Flow Rate	665	12	599	180
Geometry Grp	1	1	1	1
Degree of Util (X)	1.143	0.026	0.961	0.357
Departure Headway (Hd)	6.188	8.477	6.107	7.486
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	585	425	599	484
Service Time	4.248	6.477	4.107	5.486
HCM Lane V/C Ratio	1.137	0.028	1	0.372
HCM Control Delay	106.6	11.7	52.5	14.6
HCM Lane LOS	F	B	F	B
HCM 95th-tile Q	21.7	0.1	13.2	1.6

Intersection	
Intersection Delay, s/veh	39
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	1	4	370	4	150	2	155	80	180	270	3
Future Vol, veh/h	1	1	4	370	4	150	2	155	80	180	270	3
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	1	1	1
Mvmt Flow	1	1	4	394	4	160	2	165	85	191	287	3
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.6	51.7	15.3	37
HCM LOS	B	F	C	E

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	1%	17%	71%	40%
Vol Thru, %	65%	17%	1%	60%
Vol Right, %	34%	67%	29%	1%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	237	6	524	453
LT Vol	2	1	370	180
Through Vol	155	1	4	270
RT Vol	80	4	150	3
Lane Flow Rate	252	6	557	482
Geometry Grp	1	1	1	1
Degree of Util (X)	0.463	0.013	0.955	0.859
Departure Headway (Hd)	6.61	7.547	6.165	6.42
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	545	477	591	564
Service Time	4.671	5.547	4.209	4.47
HCM Lane V/C Ratio	0.462	0.013	0.942	0.855
HCM Control Delay	15.3	10.6	51.7	37
HCM Lane LOS	C	B	F	E
HCM 95th-tile Q	2.4	0	12.9	9.4



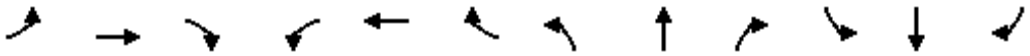
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	1	1	30	1	520	2	580	30	90	75	1
Future Volume (veh/h)	9	1	1	30	1	520	2	580	30	90	75	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		0.98
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1841	1841	1841	1900	1900	1900	1826	1826	1826
Adj Flow Rate, veh/h	10	1	1	33	1	413	2	630	30	98	82	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	4	4	4	0	0	0	5	5	5
Cap, veh/h	22	2	2	36	1	447	47	693	33	314	898	11
Arrive On Green	0.01	0.01	0.01	0.31	0.31	0.31	0.39	0.39	0.39	0.06	0.50	0.50
Sat Flow, veh/h	1498	150	150	114	3	1425	1	1798	85	1739	1799	22
Grp Volume(v), veh/h	12	0	0	447	0	0	662	0	0	98	0	83
Grp Sat Flow(s),veh/h/ln	1798	0	0	1542	0	0	1884	0	0	1739	0	1821
Q Serve(g_s), s	0.5	0.0	0.0	21.9	0.0	0.0	1.3	0.0	0.0	2.5	0.0	1.9
Cycle Q Clear(g_c), s	0.5	0.0	0.0	21.9	0.0	0.0	26.1	0.0	0.0	2.5	0.0	1.9
Prop In Lane	0.83		0.08	0.07		0.92	0.00		0.05	1.00		0.01
Lane Grp Cap(c), veh/h	26	0	0	484	0	0	772	0	0	314	0	909
V/C Ratio(X)	0.45	0.00	0.00	0.92	0.00	0.00	0.86	0.00	0.00	0.31	0.00	0.09
Avail Cap(c_a), veh/h	368	0	0	512	0	0	852	0	0	361	0	1036
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	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	38.3	0.0	0.0	26.0	0.0	0.0	22.8	0.0	0.0	11.8	0.0	10.3
Incr Delay (d2), s/veh	11.7	0.0	0.0	22.0	0.0	0.0	8.1	0.0	0.0	0.6	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	0.3	0.0	0.0	10.5	0.0	0.0	12.4	0.0	0.0	0.9	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.0	0.0	0.0	47.9	0.0	0.0	30.9	0.0	0.0	12.3	0.0	10.3
LnGrp LOS	D	A	A	D	A	A	C	A	A	B	A	B
Approach Vol, veh/h		12			447			662			181	
Approach Delay, s/veh		50.0			47.9			30.9			11.4	
Approach LOS		D			D			C			B	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	8.9	34.7		5.6		43.6		29.1				
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s	6.5	33.5		16.0		44.5		26.0				
Max Q Clear Time (g_c+I1), s	4.5	28.1		2.5		3.9		23.9				
Green Ext Time (p_c), s	0.0	2.1		0.0		0.5		0.6				

Intersection Summary			
HCM 6th Ctrl Delay		34.2	
HCM 6th LOS		C	

Notes

User approved pedestrian interval to be less than phase max green.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	1	4	370	4	150	2	155	80	180	270	3
Future Volume (veh/h)	1	1	4	370	4	150	2	155	80	180	270	3
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		0.98	1.00		0.98
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	1	1	2	394	4	139	2	165	69	191	287	3
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	1	1	1
Cap, veh/h	2	2	5	481	5	170	67	227	94	523	698	7
Arrive On Green	0.01	0.01	0.01	0.37	0.37	0.37	0.18	0.18	0.18	0.11	0.38	0.38
Sat Flow, veh/h	431	431	862	1287	13	454	4	1261	523	1795	1862	19
Grp Volume(v), veh/h	4	0	0	537	0	0	236	0	0	191	0	290
Grp Sat Flow(s),veh/h/ln	1723	0	0	1754	0	0	1789	0	0	1795	0	1881
Q Serve(g_s), s	0.1	0.0	0.0	15.2	0.0	0.0	0.0	0.0	0.0	4.4	0.0	6.3
Cycle Q Clear(g_c), s	0.1	0.0	0.0	15.2	0.0	0.0	6.8	0.0	0.0	4.4	0.0	6.3
Prop In Lane	0.25		0.50	0.73		0.26	0.01		0.29	1.00		0.01
Lane Grp Cap(c), veh/h	9	0	0	656	0	0	388	0	0	523	0	705
V/C Ratio(X)	0.43	0.00	0.00	0.82	0.00	0.00	0.61	0.00	0.00	0.37	0.00	0.41
Avail Cap(c_a), veh/h	517	0	0	1069	0	0	764	0	0	662	0	1249
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	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.3	0.0	0.0	15.5	0.0	0.0	21.3	0.0	0.0	13.8	0.0	12.7
Incr Delay (d2), s/veh	28.5	0.0	0.0	2.6	0.0	0.0	1.5	0.0	0.0	0.4	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	0.1	0.0	0.0	5.7	0.0	0.0	2.8	0.0	0.0	1.6	0.0	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	55.8	0.0	0.0	18.2	0.0	0.0	22.8	0.0	0.0	14.3	0.0	13.1
LnGrp LOS	E	A	A	B	A	A	C	A	A	B	A	B
Approach Vol, veh/h		4			537			236			481	
Approach Delay, s/veh		55.8			18.2			22.8			13.5	
Approach LOS		E			B			C			B	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	10.7	14.4		4.8		25.1		25.1				
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s	10.5	21.5		16.5		36.5		33.5				
Max Q Clear Time (g_c+I1), s	6.4	8.8		2.1		8.3		17.2				
Green Ext Time (p_c), s	0.2	1.1		0.0		1.8		3.4				

Intersection Summary			
HCM 6th Ctrl Delay		17.4	
HCM 6th LOS		B	

Notes

User approved pedestrian interval to be less than phase max green.

MOVEMENT SUMMARY

Site: 101 [Lake Washington Blvd / SE 60th Street - Roundabout]

AM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	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	Aver. No. Cycles	Average Speed mph
South: Lake Washington Blvd												
8	T1	604	0.0	0.515	2.4	LOS A	3.8	95.6	0.37	0.35	0.37	24.6
18	R2	31	0.0	0.515	2.8	LOS A	3.8	95.6	0.37	0.35	0.37	24.1
Approach		635	0.0	0.515	2.4	LOS A	3.8	95.6	0.37	0.35	0.37	24.5
East: SE 60th St												
1	L2	31	4.0	0.703	14.8	LOS B	8.1	208.7	0.91	1.13	1.28	22.7
16	R2	542	4.0	0.703	11.3	LOS B	8.1	208.7	0.91	1.13	1.28	22.2
Approach		573	4.0	0.703	11.5	LOS B	8.1	208.7	0.91	1.13	1.28	22.2
North: Lake Washington Blvd												
7	L2	94	5.0	0.137	5.8	LOS A	0.9	24.0	0.19	0.43	0.19	24.4
4	T1	78	5.0	0.137	1.9	LOS A	0.9	24.0	0.19	0.43	0.19	24.3
Approach		172	5.0	0.137	4.0	LOS A	0.9	24.0	0.19	0.43	0.19	24.4
All Vehicles		1380	2.3	0.703	6.4	LOS A	8.1	208.7	0.57	0.68	0.72	23.5

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Lake Washington Blvd / SE 60th Street - Roundabout]

PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	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	Aver. No. Cycles	Average Speed mph
South: Lake Washington Blvd												
8	T1	164	0.0	0.220	2.6	LOS A	1.3	32.3	0.42	0.40	0.42	24.5
18	R2	83	0.0	0.220	3.0	LOS A	1.3	32.3	0.42	0.40	0.42	24.1
Approach		247	0.0	0.220	2.7	LOS A	1.3	32.3	0.42	0.40	0.42	24.4
East: SE 60th St												
1	L2	390	0.0	0.454	6.6	LOS A	3.3	81.5	0.46	0.57	0.46	24.0
16	R2	156	0.0	0.454	3.1	LOS A	3.3	81.5	0.46	0.57	0.46	23.5
Approach		546	0.0	0.454	5.6	LOS A	3.3	81.5	0.46	0.57	0.46	23.8
North: Lake Washington Blvd												
7	L2	188	1.0	0.502	9.0	LOS A	4.0	100.6	0.74	0.73	0.76	23.8
4	T1	284	1.0	0.502	5.1	LOS A	4.0	100.6	0.74	0.73	0.76	23.7
Approach		472	1.0	0.502	6.6	LOS A	4.0	100.6	0.74	0.73	0.76	23.7
All Vehicles		1265	0.4	0.502	5.4	LOS A	4.0	100.6	0.56	0.60	0.56	23.9

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix C: MUTCD Signal Warrants Analysis

City of Bellevue Transportation Department

Memorandum

To: File

From: Jeremy Chin, P.E., Senior Transportation Engineer

Megan Eide, Transportation Engineering Intern

Date: February 28, 2017

Re: Lake Washington Blvd SE and SE 60th St Signal Warrant Study

---

A signal warrant study at the intersection of Lake Washington Blvd SE and SE 60th St was conducted in February 2017 in accordance to the guidelines set forth in the Manual on Uniform Traffic Control Devices (MUTCD). The north, east, and south legs of the intersection are clearly defined and are currently stop controlled. The west leg is less defined but consists of two private driveways and a stop controlled public road. See Figure 1, below:

Figure 1: Site Map

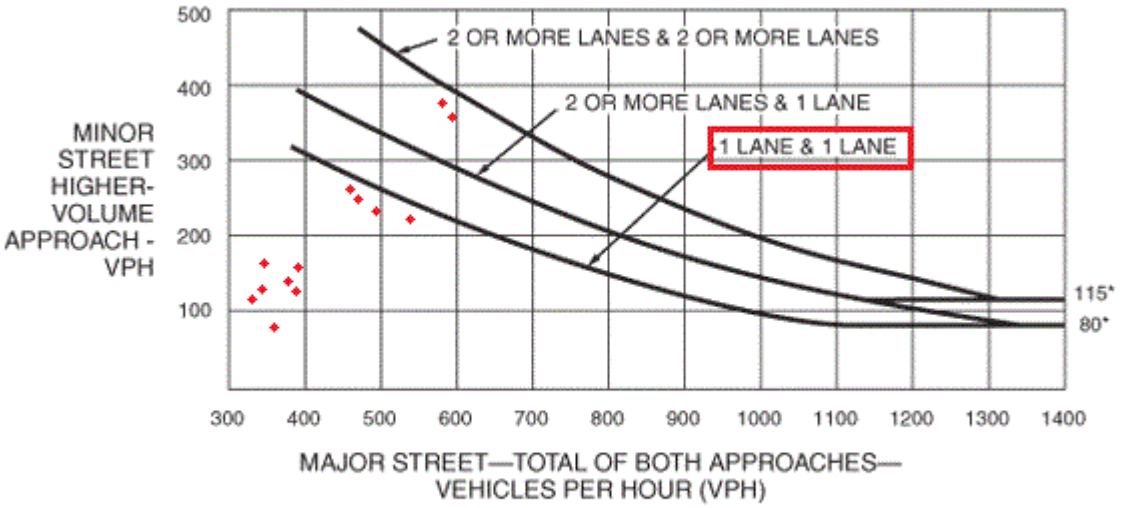
The MUTCD contains eight signal warrants to evaluate when justifying the installation of a traffic signal. Per the MUTCD, "The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal." The current warrants are elaborated on, here: https://mutcd.fhwa.dot.gov/htm/2009/part4/part4c.htm , and are evaluated below:

WARRANTS

Warrant 1: Eight-Hour Vehicular Volume
According to the volumes recorded on January 26, 2017 (Thursday), Condition A was 63% satisfied and Condition B was 0% satisfied. This concludes that Warrant 1 was not satisfied. See Attachment A for traffic volumes and Attachment B for Warrant 1 worksheet.

Warrant 2: Four-Hour Vehicular Volume
Using the same volume count in Warrant 1 (January 26, 2017), the hourly counts were plotted on Figure 4C-1, shown below:

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



Two hours (7-8AM and 8-9AM) had traffic counts that were too high to show on Figure 4C-1. The values for those hours were (658/544) and (689/537). Additionally, two other hours were also above the threshold for 1 Lane & 1 Lane approaches, 4-5PM and 5-6PM, as plotted. With that, at least 4 hours are above the threshold, thus satisfying this warrant.

Warrant 3: Peak Hour
This warrant does not apply as the current intersection is stop controlled so the minor street does not suffer undue delay when entering or crossing the major street. Furthermore, the warrant is typically for "unusual cases, such as office complexes, manufacturing plants,

industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time".

Warrant 4: Pedestrian Volume
This warrant is not applicable as the intersection is currently stop controlled. Regardless of how heavy vehicle volumes are, pedestrians do not experience excessive delay in crossing Lake Washington Blvd.

Warrant 5: School Crossing
Although there is a school approximately ¼ mile to the east of Lake Washington Blvd on SE 60th St, this warrant is not applicable to this study as the crossings at this intersection are not an established school crossing. Furthermore, school children crossing is not the principle reason for installing a traffic control signal here. And lastly, the intersection is currently stop controlled which creates the necessary opportunities for pedestrians to cross.

Warrant 6: Coordinated Signal System
This warrant is not applicable as the there are no adjacent traffic signals.

Warrant 7: Crash Experience
From 2014-2016, there were 2 reported crashes at this intersection. See Attachment C. Per Warrant 7, "five or more reported crashes, of susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash". This warrant is not satisfied.

Warrant 8: Roadway Network
Warrant 8 must be met by two criteria to be satisfied.

Criteria 1: Signalization is warranted if the intersection 1) experiences over 1,000 vehicles in the current peak hour conditions and 2) meets warrants 1, 2, or 3 based on 5-year predicted volumes.

Currently, the peak hour volume is 1,232 vehicles, which satisfies part 1 of this criteria. Part 2 is also met (Warrants 2 is satisfied as shown above) in existing conditions. 5-year predicted volumes are expected to meet or exceed current volumes.

Criteria 2: One or both of the streets intersecting is a "part of the street or highway system that serves as the principal roadway network for through traffic flow".

Lake Washington Blvd is classified as a minor arterial and SE 60th St is classified as a collector arterial. Both serve to connect the neighborhoods to Interstate-405. This criteria is satisfied.

Both criteria for Warrant 8 are met, therefore Warrant 8 is satisfied.

Warrant 9: Intersection Near a Grade Crossing
This warrant is not applicable as the intersection is not in close proximity to a grade crossing.

Other Considerations:

Resident Concerns: The City has heard from residents about the need to reduce congestion at this intersection as well as difficulty in exiting nearby side streets onto Lake Washington Blvd SE due to the queue of vehicles. This study was largely based on these requests.

Conclusion
The intersection of Lake Washington Blvd SE and SE 60th St warrants a traffic signal based on the satisfaction of Warrants 2 and 8, of the MUTCD. A traffic signal could reduce current AM and PM congestion on both arterials.

Factors to consider in installing a traffic signal is potential increase of right-angle and rear-end collision that are more common in traffic signal applications. There is also the challenge of signalizing the two private driveways on the west leg of the intersection. Another factor to consider is the neighborhood's desire of a traffic signal and the perception that more traffic will follow the installation. Lastly, traffic patterns may be altogether impacted with the future installation of Washington State Department of Transportations I-405 Bellevue-to-Renton Express Toll Lane project, scheduled to be completed in 2024.

There are currently no existing plans to signalize this intersection nor allocated funding for design and construction.

Signalization and/or other alternative congestion improvements will need to be reviewed further.

Attachments:
Attachment A – Traffic Volumes
Attachment B – Signal Warrant 1
Attachment C – Crash Data

ATTACHMENT A

Location: LAKE WASHINGTON BLVD SE N/O SE 60TH ST
Date Range: 1/24/2017 - 1/30/2017
Site Code: N

	Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday			Monday			Mid-Week Average		
	1/24/2017			1/25/2017			1/26/2017			1/27/2017			1/28/2017			1/29/2017			1/30/2017					
Time	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total
12:00 AM	9	23	32	5	30	35	12	28	40	-	-	-	-	-	-	-	-	-	-	-	-	9	27	36
1:00 AM	9	17	26	4	7	11	10	14	24	-	-	-	-	-	-	-	-	-	-	-	-	8	13	20
2:00 AM	5	11	16	5	11	16	12	13	25	-	-	-	-	-	-	-	-	-	-	-	-	7	12	19
3:00 AM	11	7	18	11	12	23	13	12	25	-	-	-	-	-	-	-	-	-	-	-	-	12	10	22
4:00 AM	47	5	52	47	8	55	39	4	43	-	-	-	-	-	-	-	-	-	-	-	-	44	6	50
5:00 AM	184	31	215	181	30	211	165	27	192	-	-	-	-	-	-	-	-	-	-	-	-	177	29	206
6:00 AM	650	43	693	636	37	673	628	45	673	-	-	-	-	-	-	-	-	-	-	-	-	638	42	680
7:00 AM	1,044	141	1,185	1,016	158	1,174	1,012	139	1,151	-	-	-	-	-	-	-	-	-	-	-	-	1,024	146	1,170
8:00 AM	1,047	195	1,242	975	199	1,174	955	194	1,149	-	-	-	-	-	-	-	-	-	-	-	-	992	196	1,188
9:00 AM	629	130	759	629	99	728	583	108	691	-	-	-	-	-	-	-	-	-	-	-	-	614	112	726
10:00 AM	369	130	499	376	117	493	333	154	487	-	-	-	-	-	-	-	-	-	-	-	-	359	134	493
11:00 AM	284	168	452	274	187	461	257	152	409	-	-	-	-	-	-	-	-	-	-	-	-	272	169	441
12:00 PM	233	196	429	266	186	452	215	209	424	-	-	-	-	-	-	-	-	-	-	-	-	238	197	435
1:00 PM	211	181	392	231	193	424	235	215	450	-	-	-	-	-	-	-	-	-	-	-	-	226	196	422
2:00 PM	217	207	424	274	200	474	223	194	417	-	-	-	-	-	-	-	-	-	-	-	-	238	200	438
3:00 PM	274	221	495	204	208	412	255	262	517	-	-	-	-	-	-	-	-	-	-	-	-	244	230	475
4:00 PM	274	278	552	231	275	506	289	347	636	-	-	-	-	-	-	-	-	-	-	-	-	265	300	565
5:00 PM	213	363	576	228	358	586	240	390	630	-	-	-	-	-	-	-	-	-	-	-	-	227	370	597
6:00 PM	173	372	545	151	331	482	212	322	534	-	-	-	-	-	-	-	-	-	-	-	-	179	342	520
7:00 PM	126	285	411	152	332	484	136	260	396	-	-	-	-	-	-	-	-	-	-	-	-	138	292	430
8:00 PM	85	242	327	131	278	409	106	276	382	-	-	-	-	-	-	-	-	-	-	-	-	107	265	373
9:00 PM	80	194	274	90	192	282	129	201	330	-	-	-	-	-	-	-	-	-	-	-	-	100	196	295
10:00 PM	59	94	153	34	106	140	52	97	149	-	-	-	-	-	-	-	-	-	-	-	-	48	99	147
11:00 PM	16	59	75	27	57	84	27	79	106	-	-	-	-	-	-	-	-	-	-	-	-	23	65	88
Total	**6,249**	**3,593**	**9,842**	**6,178**	**3,611**	**9,789**	**6,138**	**3,742**	**9,880**	-	-	-	-	-	-	-	-	-	-	-	-	**6,188**	**3,649**	**9,837**
Percent	**63%**	**37%**	-	**63%**	**37%**	-	**62%**	**38%**	-	-	-	-	-	-	-	-	-	-	-	-	-	**63%**	**37%**	-

1. Mid-week average includes data between Tuesday and Thursday.

Mark Skaggs:425-250-0777
mark.skaggs@idaxdata.com

ATTACHMENT A

Location: SE 60TH ST E/O LAKE WASHINGTON BLVD SE
Date Range: 1/24/2017 - 1/30/2017
Site Code: E

	Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday			Monday					
	1/24/2017			1/25/2017			1/26/2017			1/27/2017			1/28/2017			1/29/2017			1/30/2017			Mid-Week Average		
Time	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total
12:00 AM	19	9	28	21	7	28	15	9	24	-	-	-	-	-	-	-	-	-	-	-	-	18	8	27
1:00 AM	7	6	13	5	4	9	8	11	19	-	-	-	-	-	-	-	-	-	-	-	-	7	7	14
2:00 AM	7	6	13	10	3	13	4	5	9	-	-	-	-	-	-	-	-	-	-	-	-	7	5	12
3:00 AM	9	6	15	5	9	14	11	9	20	-	-	-	-	-	-	-	-	-	-	-	-	8	8	16
4:00 AM	6	19	25	9	21	30	4	19	23	-	-	-	-	-	-	-	-	-	-	-	-	6	20	26
5:00 AM	13	88	101	13	87	100	12	80	92	-	-	-	-	-	-	-	-	-	-	-	-	13	85	98
6:00 AM	34	245	279	29	245	274	26	249	275	-	-	-	-	-	-	-	-	-	-	-	-	30	246	276
7:00 AM	60	523	583	80	522	602	68	542	610	-	-	-	-	-	-	-	-	-	-	-	-	69	529	598
8:00 AM	78	547	625	102	465	567	77	537	614	-	-	-	-	-	-	-	-	-	-	-	-	86	516	602
9:00 AM	79	250	329	90	253	343	55	221	276	-	-	-	-	-	-	-	-	-	-	-	-	75	241	316
10:00 AM	72	167	239	74	136	210	69	154	223	-	-	-	-	-	-	-	-	-	-	-	-	72	152	224
11:00 AM	74	145	219	86	137	223	75	123	198	-	-	-	-	-	-	-	-	-	-	-	-	78	135	213
12:00 PM	91	113	204	95	156	251	78	127	205	-	-	-	-	-	-	-	-	-	-	-	-	88	132	220
1:00 PM	76	115	191	98	135	233	84	137	221	-	-	-	-	-	-	-	-	-	-	-	-	86	129	215
2:00 PM	97	147	244	106	229	335	77	159	236	-	-	-	-	-	-	-	-	-	-	-	-	93	178	272
3:00 PM	114	250	364	98	234	332	137	263	400	-	-	-	-	-	-	-	-	-	-	-	-	116	249	365
4:00 PM	111	381	492	134	321	455	129	378	507	-	-	-	-	-	-	-	-	-	-	-	-	125	360	485
5:00 PM	130	374	504	119	366	485	136	364	500	-	-	-	-	-	-	-	-	-	-	-	-	128	368	496
6:00 PM	145	234	379	125	273	398	126	227	353	-	-	-	-	-	-	-	-	-	-	-	-	132	245	377
7:00 PM	127	117	244	124	151	275	121	131	252	-	-	-	-	-	-	-	-	-	-	-	-	124	133	257
8:00 PM	100	61	161	104	129	233	127	81	208	-	-	-	-	-	-	-	-	-	-	-	-	110	90	201
9:00 PM	82	52	134	92	91	183	82	80	162	-	-	-	-	-	-	-	-	-	-	-	-	85	74	160
10:00 PM	40	50	90	47	20	67	45	25	70	-	-	-	-	-	-	-	-	-	-	-	-	44	32	76
11:00 PM	28	12	40	29	19	48	29	18	47	-	-	-	-	-	-	-	-	-	-	-	-	29	16	45
Total	**1,599**	**3,917**	**5,516**	**1,695**	**4,013**	**5,708**	**1,595**	**3,949**	**5,544**	-	-	-	-	-	-	-	-	-	-	-	-	**1,630**	**3,960**	**5,589**
Percent	**29%**	**71%**	-	**30%**	**70%**	-	**29%**	**71%**	-	-	-	-	-	-	-	-	-	-	-	-	-	**29%**	**71%**	-

1. Mid-week average includes data between Tuesday and Thursday.

Mark Skaggs:425-250-0777
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ATTACHMENT A

Location: LAKE WASHINGTON BLVD SE S/O SE 60TH ST
Date Range: 1/24/2017 - 1/30/2017
Site Code: S

	Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday			Monday			Mid-Week Average		
	1/24/2017			1/25/2017			1/26/2017			1/27/2017			1/28/2017			1/29/2017			1/30/2017					
Time	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total
12:00 AM	14	17	31	10	21	31	10	19	29	-	-	-	-	-	-	-	-	-	-	-	-	11	19	30
1:00 AM	4	12	16	3	5	8	3	10	13	-	-	-	-	-	-	-	-	-	-	-	-	3	9	12
2:00 AM	6	10	16	6	4	10	8	10	18	-	-	-	-	-	-	-	-	-	-	-	-	7	8	15
3:00 AM	8	2	10	6	8	14	8	5	13	-	-	-	-	-	-	-	-	-	-	-	-	7	5	12
4:00 AM	32	4	36	31	6	37	26	6	32	-	-	-	-	-	-	-	-	-	-	-	-	30	5	35
5:00 AM	122	39	161	115	37	152	103	35	138	-	-	-	-	-	-	-	-	-	-	-	-	113	37	150
6:00 AM	438	55	493	424	58	482	430	62	492	-	-	-	-	-	-	-	-	-	-	-	-	431	58	489
7:00 AM	541	104	645	548	89	637	519	108	627	-	-	-	-	-	-	-	-	-	-	-	-	536	100	636
8:00 AM	540	100	640	533	111	644	495	103	598	-	-	-	-	-	-	-	-	-	-	-	-	523	105	627
9:00 AM	478	140	618	473	116	589	427	128	555	-	-	-	-	-	-	-	-	-	-	-	-	459	128	587
10:00 AM	257	128	385	302	103	405	243	152	395	-	-	-	-	-	-	-	-	-	-	-	-	267	128	395
11:00 AM	194	144	338	205	161	366	186	135	321	-	-	-	-	-	-	-	-	-	-	-	-	195	147	342
12:00 PM	164	164	328	178	162	340	180	208	388	-	-	-	-	-	-	-	-	-	-	-	-	174	178	352
1:00 PM	175	182	357	180	174	354	172	201	373	-	-	-	-	-	-	-	-	-	-	-	-	176	186	361
2:00 PM	174	211	385	175	196	371	166	198	364	-	-	-	-	-	-	-	-	-	-	-	-	172	202	373
3:00 PM	205	277	482	175	318	493	209	328	537	-	-	-	-	-	-	-	-	-	-	-	-	196	308	504
4:00 PM	176	465	641	219	445	664	234	509	743	-	-	-	-	-	-	-	-	-	-	-	-	210	473	683
5:00 PM	197	539	736	194	567	761	204	554	758	-	-	-	-	-	-	-	-	-	-	-	-	198	553	752
6:00 PM	156	431	587	129	447	576	175	382	557	-	-	-	-	-	-	-	-	-	-	-	-	153	420	573
7:00 PM	94	228	322	105	296	401	90	220	310	-	-	-	-	-	-	-	-	-	-	-	-	96	248	344
8:00 PM	72	190	262	84	232	316	84	197	281	-	-	-	-	-	-	-	-	-	-	-	-	80	206	286
9:00 PM	56	140	196	53	143	196	84	150	234	-	-	-	-	-	-	-	-	-	-	-	-	64	144	209
10:00 PM	37	77	114	30	76	106	51	77	128	-	-	-	-	-	-	-	-	-	-	-	-	39	77	116
11:00 PM	15	40	55	23	39	62	22	61	83	-	-	-	-	-	-	-	-	-	-	-	-	20	47	67
Total	**4,155**	**3,699**	**7,854**	**4,201**	**3,814**	**8,015**	**4,129**	**3,858**	**7,987**	-	-	-	-	-	-	-	-	-	-	-	-	**4,162**	**3,790**	**7,952**
Percent	**53%**	**47%**	-	**52%**	**48%**	-	**52%**	**48%**	-	-	-	-	-	-	-	-	-	-	-	-	-	**52%**	**48%**	-

1. Mid-week average includes data between Tuesday and Thursday.

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ATTACHMENT A

Location: SE 60TH ST W/O LAKE WASHINGTON BLVD SE
Date Range: 1/24/2017 - 1/30/2017
Site Code: W

	Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday			Monday			Mid-Week Average		
	1/24/2017			1/25/2017			1/26/2017			1/27/2017			1/28/2017			1/29/2017			1/30/2017					
Time	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total
12:00 AM	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
1:00 AM	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
2:00 AM	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
3:00 AM	0	0	0	1	1	2	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1
4:00 AM	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
5:00 AM	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
6:00 AM	0	0	0	1	0	1	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1
7:00 AM	0	0	0	4	1	5	2	0	2	-	-	-	-	-	-	-	-	-	-	-	-	2	0	2
8:00 AM	0	0	0	2	0	2	6	4	10	-	-	-	-	-	-	-	-	-	-	-	-	3	1	4
9:00 AM	0	1	1	5	1	6	3	1	4	-	-	-	-	-	-	-	-	-	-	-	-	3	1	4
10:00 AM	1	2	3	1	4	5	3	1	4	-	-	-	-	-	-	-	-	-	-	-	-	2	2	4
11:00 AM	3	1	4	4	3	7	1	5	6	-	-	-	-	-	-	-	-	-	-	-	-	3	3	6
12:00 PM	1	3	4	0	2	2	0	5	5	-	-	-	-	-	-	-	-	-	-	-	-	0	3	4
1:00 PM	1	2	3	3	5	8	8	4	12	-	-	-	-	-	-	-	-	-	-	-	-	4	4	8
2:00 PM	2	0	2	3	3	6	4	3	7	-	-	-	-	-	-	-	-	-	-	-	-	3	2	5
3:00 PM	2	3	5	2	2	4	5	7	12	-	-	-	-	-	-	-	-	-	-	-	-	3	4	7
4:00 PM	5	6	11	1	4	5	2	3	5	-	-	-	-	-	-	-	-	-	-	-	-	3	4	7
5:00 PM	0	4	4	4	2	6	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	2	2	4
6:00 PM	2	5	7	1	2	3	0	4	4	-	-	-	-	-	-	-	-	-	-	-	-	1	4	5
7:00 PM	2	1	3	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1
8:00 PM	2	0	2	1	0	1	0	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1
9:00 PM	1	0	1	0	1	1	3	1	4	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2
10:00 PM	0	0	0	0	0	0	0	1	1	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
11:00 PM	0	2	2	0	2	2	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1
Total	**22**	**30**	**52**	**33**	**33**	**66**	**40**	**43**	**83**	-	-	-	-	-	-	-	-	-	-	-	-	**32**	**35**	**67**
Percent	**42%**	**58%**	-	**50%**	**50%**	-	**48%**	**52%**	-	-	-	-	-	-	-	-	-	-	-	-	-	**47%**	**53%**	-

1. Mid-week average includes data between Tuesday and Thursday.

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ATTACHMENT B

City of Bellevue - Traffic Engineering Division
Signal Warrant 1 Analysis Worksheet

Jeremy Chin 02-08-2017

24HR Tube Counts Completed by IDAX Tue 1/24/17 - Thu 1/26/17

112th Ave SE is sometimes known as Lake Washington Blvd SE

Volume Input

Major Street 85th Percentile Speed = **35**
Date of Data = **Thu 1/26/17**

Hour Ending	MAJOR STREET Lake Washington Blvd SE # of Approach Lanes = 1 SB	NB	Total	MINOR STREET SE 60th St # of Approach Lanes = 1 WB	EB	Total	
1:00 AM	28	10	38	9	0	9	
2:00 AM	14	3	17	11	0	11	
3:00 AM	13	8	21	5	0	5	
4:00 AM	12	8	20	9	1	10	
5:00 AM	4	26	30	19	0	19	
6:00 AM	27	103	130	80	0	80	
7:00 AM	45	430	475	249	1	250	
8:00 AM	139	519	658	542	2	544	
9:00 AM	194	495	689	537	6	543	PEAK
10:00 AM	108	427	535	221	3	224	
11:00 AM	154	243	397	154	3	157	
12:00 PM	152	186	338	123	1	124	
1:00 PM	209	180	389	127	0	127	
2:00 PM	215	172	387	137	8	145	
3:00 PM	194	166	360	159	4	163	
4:00 PM	262	209	471	263	5	268	
5:00 PM	347	234	581	378	2	380	
6:00 PM	390	204	594	364	1	365	
7:00 PM	322	175	497	227	0	227	
8:00 PM	260	90	350	131	0	131	
9:00 PM	276	84	360	81	0	81	
10:00 PM	201	84	285	80	3	83	
11:00 PM	97	51	148	25	0	25	
12:00 AM	79	22	101	18	0	18	
TOTAL	3,742	4,129	**7,871**	3,949	40	**3,989**	

Warrant Info

Hour Ending	Section for 85th Percentile Speed **< 40 mph** Condition A Running Total	Condition B Running Total
1:00 AM	0	0
2:00 AM	0	0
3:00 AM	0	0
4:00 AM	0	0
5:00 AM	0	0
6:00 AM	0	0
7:00 AM	0	0
8:00 AM	1	0
9:00 AM	2	0
10:00 AM	3	0
11:00 AM	3	0
12:00 PM	3	0
1:00 PM	3	0
2:00 PM	3	0
3:00 PM	3	0
4:00 PM	3	0
5:00 PM	4	0
6:00 PM	5	0
7:00 PM	5	0
8:00 PM	5	0
9:00 PM	5	0
10:00 PM	5	0
11:00 PM	5	0
12:00 AM	5	0

Condition A is NOT SATISFIED!!

Condition B is NOT SATISFIED!!

85th Percentile Speed < 40 mph
% of Condition A = 63
% of Condition B = 0

100% Minimum Vehicular Volumes for Condition A

# of Lanes for Moving Traffic on Each Approach: Major Street	Minor Street	Vehicles per hour on major street (total of both approaches)	Vehicles per hour on higher-volume **minor-street** approach (one direction only)
1	1	500	150
2 or more	1	600	150
2 or more	2 or more	600	200
1	2 or more	500	200

100% Minimum Vehicular Volumes for Condition B

# of Lanes for Moving Traffic on Each Approach: Major Street	Minor Street	Vehicles per hour on major street (total of both approaches)	Vehicles per hour on higher-volume **minor-street** approach (one direction only)
1	1	750	75
2 or more	1	900	75
2 or more	2 or more	900	100
1	2 or more	750	100

ATTACHMENT C

Intersection Accidents by Specific Location

E05

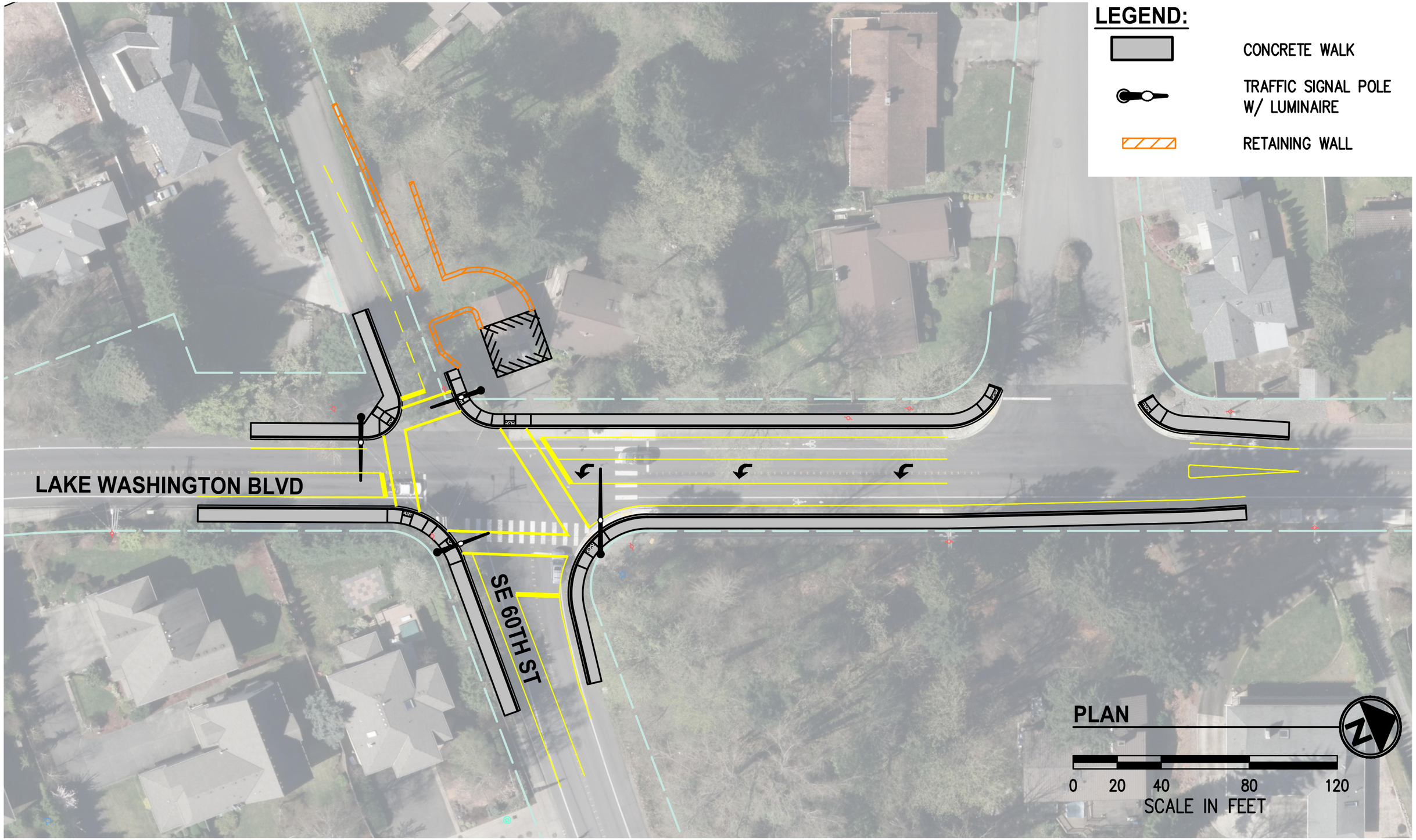
Date Range - From	01/01/2014	- Through	12/31/2016
East / West Street	SE 60TH ST	North / South Street	112TH AV SE

Case	Date	Time	Acc Type	Veh	Dir	Injuries Possible	Injuries Non-Dis	Injuries Disable	Fatal	PDO	Hit Run	Comments
1543708	08/29/2015	6:10	Right Angle	1	E-W	0	0	0	0	☑	☐	
				2	N-S							
1549719	09/29/2015	9:25	Other	1	S-E	0	1	0	0	☐	☐	
				2	E-W							
				3	E-W							

Total Number of Accidents:	2
Total Number of Injury Accidents:	1
Possible Injuries:	0
Non-Disabling:	1
Disabling:	0
Total Number of fatal Accidents:	0
Fatalities:	0
Total Number of PDO Accidents:	1

Comments	

Appendix D: Conceptual Design



INTERSECTION STUDY: LAKE WASHINGTON BLVD

City of Bellevue
Transportation Department

KPG

Appendix E: Cost Estimate

KPG
SEATTLE · TACOMA

City of Bellevue
SE 60th St & Lake Washington Blvd
Signalized Intersection Cost Estimate

Item No.	Description	Unit	Unit Price	Quantity	Amount
GENERAL					***$ 333,000.00***
1	Construction Surveying (2% of Const. Subtotal)	LS	$ 34,000.00	1	$ 34,000.00
2	Mobilization (8% of Const. Subtotal)	LS	$ 133,000.00	1	$ 133,000.00
3	Project Temporary Vehicle & Pedestrian Traffic Control (10% of Sub.)	LS	$ 166,000.00	1	$ 166,000.00
REMOVALS AND EARTHWORK					***$ 445,700.00***
4	Earthwork - light (0-2' Grading)	SF	$ 1.00		$ -
5	Earthwork - Heavy (2'+ Grading)	CY	$ 50.00	1,500	$ 75,000.00
5	Removals of Structures or Obstructions	LS	$ 50,000.00	1	$ 50,000.00
6	Significant Tree Removal	EA	$ 5,000.00	5	$ 25,000.00
7	Gravel Borrow	TON	$ 25.00		$ -
8	Structural Fill Wall (More than 4' tall)	SF	$ 120.00	1,700	$ 204,000.00
9	Temporary Erosion Control & Water Pollution Prevention	LS	$ 20,000.00	1	$ 20,000.00
10	Remove Concrete Curb & Gutter	LF	$ 20.00	1,110	$ 22,200.00
11	Remove Sidewalk	SY	$ 30.00	900	$ 27,000.00
12	Remove HMA	SY	$ 40.00	500	$ 20,000.00
13	Remove/Abandon Pipe (Storm, Water)	LF	$ 5.00	200	$ 1,000.00
14	Remove/Abandon Storm Structure	EA	$ 500.00	3	$ 1,500.00
ROADWAY					***$ 278,600.00***
15	Full Depth HMA Replacement	SY	$ 80.00	1,130	$ 90,400.00
16	HMA Grind and Overlay	SY	$ 30.00	3,500	$ 105,000.00
17	Stamped Concrete Crossing Treatment	SF	$ 22.00	-	$ -
18	CSBC	TON	$ 35.00		$ -
19	Utility Trench Repair	LF	$ 40.00		$ -
20	Channelization & Signage	LS	$ 22,000.00	1	$ 22,000.00
21	Cement Concrete Curb & Gutter	LF	$ 45.00	1,360	$ 61,200.00
22	Traffic Islands	EA	$ 6,000.00	-	$ -
UNDERGROUND UTILITES (Water, Sewer, Gas)					***$ 33,000.00***
23	Water Main Replacement (incl. fittings, trench, bedding, backfill)	LF	$ 140.00	200	$ 28,000.00
24	Fire Hydrant	EA	$ 5,000.00	1	$ 5,000.00
25	Relocate/Adjust Water Service	EA	$ 2,500.00		$ -
26	PSE Gas Coordination	LS	$ 5,000.00		$ -
27	Adjust Utility Structure to Grade	EA	$ 750.00		$ -
OVERHEAD UTILITIES, UNDERGROUNDING					***$ -***
28	Undergrounding & Modifications to Existing OH Utilities & Services	LS	$ 830,000.00		$ -
SIDEWALK ITEMS					***$ 100,000.00***
29	Cement Concrete Sidewalk with LID Treatment	SY	$ 120.00	600	$ 72,000.00
30	Curb Ramp	EA	$ 3,500.00	8	$ 28,000.00
31	Driveway Approaches	EA	$ 2,000.00	-	$ -
32	Urban Design Elements (Street Furniture, Trash/Recycle Receptacles)	LS	$ 5,000.00	-	$ -
STORMWATER SYSTEM					***$ 108,500.00***
33	Storm Drain Pipe	LF	$ 100.00	300	$ 30,000.00
34	Storm Drain Inlet	EA	$ 1,500.00	5	$ 7,500.00
35	Storm Drain CB/MH	EA	$ 3,000.00	5	$ 15,000.00
36	Biorention System	LS	$ 50,000.00	1	$ 50,000.00
37	Connection to Existing Structures	EA	$ 1,000.00	6	$ 6,000.00
38	Adjust Structure to Grade	EA	$ 750.00		$ -
RESTORATION/LANDSCAPING					***$ 112,100.00***
39	Landscape Strip	SY	$ 100.00	-	$ -
40	Replace/Relocate Irrigation System at NW Corner	LS	$ 6,000.00	-	$ -
41	Driveway Restoration	EA	$ 1,500.00	2	$ 3,000.00
42	Fencing	LF	$ 35.00	260	$ 9,100.00
43	Business Sign Relocation	EA	$ 10,000.00		$ -
44	Remove and Replace Garage	EA	$ 100,000.00	1	$ 100,000.00
SIGNALIZATION ITEMS, STREET LIGHTING					***$ 580,000.00***
45	New Signal System	LS	$ 400,000.00	1	$ 400,000.00
46	Street Lighting	LS	$ 180,000.00	1	$ 180,000.00
			Subtotal Estimated Construction Items		***$ 1,990,900.00***
			Design/Est Contingency (30% Subtotal)		$ 597,300.00
			Subtotal Est. Construction 2020		***$ 2,588,200.00***