

MEMORANDUM

DATE: October 22, 2021

TO: Kent Smutny, Veer Architecture, PLLC

FROM: Michael Read, PE, Principal, TENW

SUBJECT: Lakeview Place Townhomes –Traffic Demand and Site Access Analysis (Updated)
TENW Project No. 2021-238

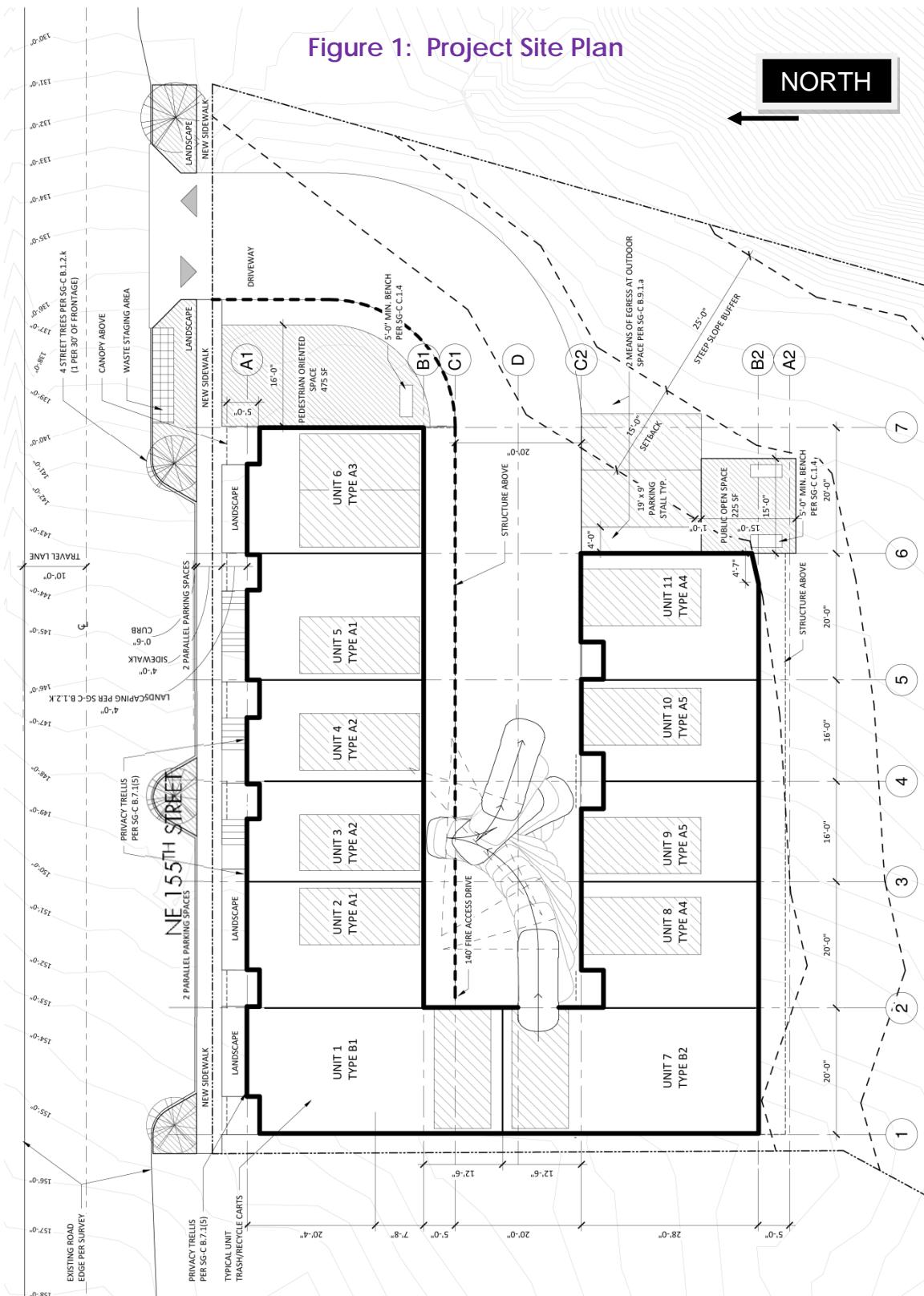
This memorandum summarizes the results of traffic demand and site access analysis associated with a proposed development known as the *Lakeview Place Townhomes* project near the intersection of NE 155 Street and Ballinger Way (SR 104) intersection in Lake Forest Park, WA. Upon completion, the project would remove an existing single family home and garage, and build a residential building with 11 townhome residential units.

The *Southern Gateway Subarea EIS* prepared by the City of Lake Forest Park and adopted in 2013, reviews at a “project-level” traffic operational, safety, circulatory, and other transportation impacts associated with redevelopment of a mixed use subarea bounded by generally by NE 145th Street, Bothell Way (SR 522), NE 158th Street, and the Lake Washington shoreline. Along with the Southern Gateway Subarea Plan EIS, land use zoning, public infrastructure, code amendments, and development regulations were adopted by the City of Lake Forest Park which govern new development within this subarea.

Project Description

The proposed mixed use project is located at 3803 NE 155th Street (within the *Southern Gateway Subarea Plan*), adjacent to the Sheridan Market east of Ballinger Way (SR 104), is proposing 11 townhome residential units. No on-street parking is available in the immediate site vicinity. A single access driveway into a common access roadway would be constructed to serve individual parking garages for each unit and 2 surface parking stalls. A total of 14 parking stalls would be available on-site.

A site design of the overall building is provided in **Figure 1**.



Traffic Demand Analysis

Published trip rate equations compiled by the Institute of Transportation Engineers (ITE) *Trip Generation, 11th Edition*, 2021, were used to estimate daily, a.m. and p.m. peak hour traffic that would be generated by the proposed development assuming new Multifamily Low-Rise units (ITE Land Use Code 220) and removal of the Single-Family Home (ITE Lane Use Code 210).

As shown in **Table 1**, an estimated net increase of approximately 65 daily, 3 a.m. peak hour (1 entering and 2 exiting), and 5 p.m. peak hour vehicular trips (32 entering and 2 exiting) would be generated at full build-out of the project. This level of increased trip generation warrants no formal evaluation of traffic operational impacts.

A detailed summary of trip generation calculations is provided in **Attachment A**.

Table 1
Lakeview Place Townhomes Generation Summary

Time Period	In	Out	Total
(11 Townhome Units)			
Weekday AM Peak Hour	1	2	3
Weekday PM Peak Hour	3	2	5
Weekday Daily	32	33	65

Source: Trip Generation Manual, 11th Edition, ITE, 2021.

Traffic Operational Impacts

Peak hour traffic volumes represent the highest hourly volume of vehicles passing through an intersection during a typical 7-9 a.m. and 4-6 p.m. weekday peak period. Hourly traffic counts were conducted on NE 155th Street immediately east of Bothell Way (SR 522) over a 48-hour period during typical weekdays. These local directional volumes were used to evaluate available gaps in traffic and delay given the restricted access nature of NE 155th Street onto Bothell Way (SR 522) during the peak traffic flow periods of the afternoon peak commute period. **Attachment B** provides the hourly volume data collected on NE 155th Street as well as peak hour counts north of the site on Bothell Way (SR 522). As shown, hourly traffic volumes on NE 155th Street are very limited (given the dead-end nature of this roadway), with peak volumes during the typical commute period of 13 total vehicles in the a.m. peak hour and 18 in the p.m. peak hour. These counts were factored to 2019 conditions (pre-Covid) along the SR 522 corridor.

Intersection Level of Service (LOS) Impacts

LOS refers to the degree of congestion on a roadway or intersection. It is a measure of vehicle operating speed, travel time, travel delays, and driving comfort. A letter scale from A to F generally describes LOS. At signalized intersections, LOS A represents free-flow conditions-motorists experience little or no delays, and LOS F represents forced-flow conditions-motorists experience an average delay in excess of 80 seconds per vehicle. The LOS reported for

signalized intersections represents the average control delay for all vehicles entering the intersection. The LOS reported at stop-controlled intersections is also based on the average control delay (sec/veh), but is reported for stop controlled and yield movements only. **Table 2** outlines the LOS criteria for signalized and unsignalized intersections based on these methodologies. The SR 522 corridor (i.e., Bothell Way) is a Tier 1 Significant Highway managed by WSDOT, with an LOS E standard as designated by the Puget Sound Regional Council and its local member jurisdictions.

Table 2: Level of Service Criteria for Intersections

Level of Service	Signalized Intersection	Unsignalized Intersection
	Average Delay Range (sec)	Delay Range (sec)
A	≤ 10	≤ 10
B	> 10 to ≤ 20	> 10 to ≤ 15
C	> 20 to ≤ 35	> 15 to ≤ 25
D	> 35 to ≤ 55	> 25 to ≤ 35
E	> 55 to ≤ 80	> 35 to ≤ 50
F	> 80	> 50

Source: "Highway Capacity Manual" 6th Edition, Special Report 209, Transportation Research Board, 2016.

Estimated project intersection LOS impacts during the p.m. peak hour in 2019 are summarized in **Table 3**. As shown, the stop controlled approach of NE 155th Street onto Bothell Way (SR 522) would operate at LOS D with or without the project, with averages of approximately 30 seconds per vehicle experienced on the NE 155th Street stop-controlled approach onto Bothell Way (SR 522). Detailed LOS summary worksheets and queuing estimates at the stop controlled study intersection are included in **Attachment C**.

Table 3: PM Peak Hour Intersection Level of Service Impacts

Study Intersection	PM Peak Hour Without Project			PM Peak Hour With Project		
	LOS	Delay (sec)	V/C Ratio	LOS	Delay (sec)	V/C Ratio
<i>Stop Controlled Intersections</i>						
NE 155 th Street at Bothell Way (SR 522) – WB Stop	D	29.3	0.06	D	30.1	0.07

Source: TENW using Synchro 10.0.

Site Access Analysis

The proposed *Lakeview Place* project vehicular access is proposed via NE 155th Street east of Bothell Way (SR 522). This street is a "dead-end" roadway with no other outlet except directly onto Bothell Way (SR 522). The intersection of NE 155th Street onto Bothell Way is restricted to right-in, right-out movements only, with U-turn opportunities within 250 feet to the north (exiting traffic) and 550 feet to the south (entering traffic) that provide full access. Given the net increase in traffic volumes estimated to be generated by the project, a new trip entering or leaving the site approximately every 15 minutes or more would be added to the intersection.

Conclusions

The proposed *Lakeview Place Townhomes* development was evaluated for peak traffic demands and site access. A net increase of approximately 65 new daily, 3 new a.m. peak hour trips, and 5 new p.m. peak hour vehicular trips are estimated. As demonstrated in the analysis of traffic operational/delay impacts, with the limited net increase in traffic that would be generated by the redevelopment no measurable impacts to vehicle delay, queuing, or other traffic impacts would occur as a result of the project.

If you have any questions regarding the information presented in this memo, please call me at (206) 361-7333 x 101 or mikeread@tenw.com.

Attachment A
Trip Generation Demand Estimates

ITE Trip Generation, 11th Edition, 2021

Lakeview Place Townhomes

Proposed	X	LU Code	AM Peak			PM Peak			Daily Trips	Daily Rate	AM Rate	PM Rate
			Enter	Exit	Trips	Enter	Exit	Trips				
Low-Rise Multifamily	11	220	1	3	4	4	2	6	74	6.74	0.40	0.51
		Trip Generation with Project	1	3	4	4	2	6	74			

Removed	X	LU Code	AM Peak			PM Peak			Daily Trips	Daily Rate	AM Rate	PM Rate
			Enter	Exit	Trips	Enter	Exit	Trips				
SF Homes	1	210	0	-1	-1	-1	0	-1	-9	9.43	0.70	0.94
		Net Trip Generation Less Existing Trips	1	2	3	3	2	5	65			

Attachment B
Traffic Counts on NE 155th Street and SR 522

Location: NE 155TH ST E/O SR 522

Date Range: 8/3/2016 - 8/9/2016

Site Code: 01

Time	Wednesday			Thursday			Friday			Saturday			Sunday			Monday			Tuesday					
	8/3/2016			8/4/2016			8/5/2016			8/6/2016			8/7/2016			8/8/2016			8/9/2016			Mid-Week Average		
	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	1	0	1	2	1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	2	
1:00 AM	0	0	0	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	
2:00 AM	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	
3:00 AM	1	0	1	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1	
4:00 AM	0	1	1	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	
5:00 AM	0	4	4	2	4	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4	5	
6:00 AM	0	5	5	0	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	6	6	
7:00 AM	3	8	11	3	3	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	6	9	
8:00 AM	5	14	19	1	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	10	13	
9:00 AM	2	11	13	6	11	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	11	15	
10:00 AM	11	5	16	3	5	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	5	12	
11:00 AM	6	9	15	12	11	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	10	19	
12:00 PM	10	7	17	3	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	4	11	
1:00 PM	8	10	18	10	11	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	11	20	
2:00 PM	9	8	17	10	5	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	7	16	
3:00 PM	6	8	14	4	5	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	7	12	
4:00 PM	10	5	15	9	11	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	8	18	
5:00 PM	9	5	14	8	5	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	5	14	
6:00 PM	7	4	11	9	5	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	5	13	
7:00 PM	5	1	6	6	5	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	3	9	
8:00 PM	9	5	14	5	4	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	5	12	
9:00 PM	3	3	6	4	3	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	3	7	
10:00 PM	7	4	11	8	1	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	3	10	
11:00 PM	0	1	1	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	
Total	112	118	230	108	105	213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	112	222	
Percent	49%	51%	-	51%	49%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50%	50%	-	

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

Peak Hour Summary

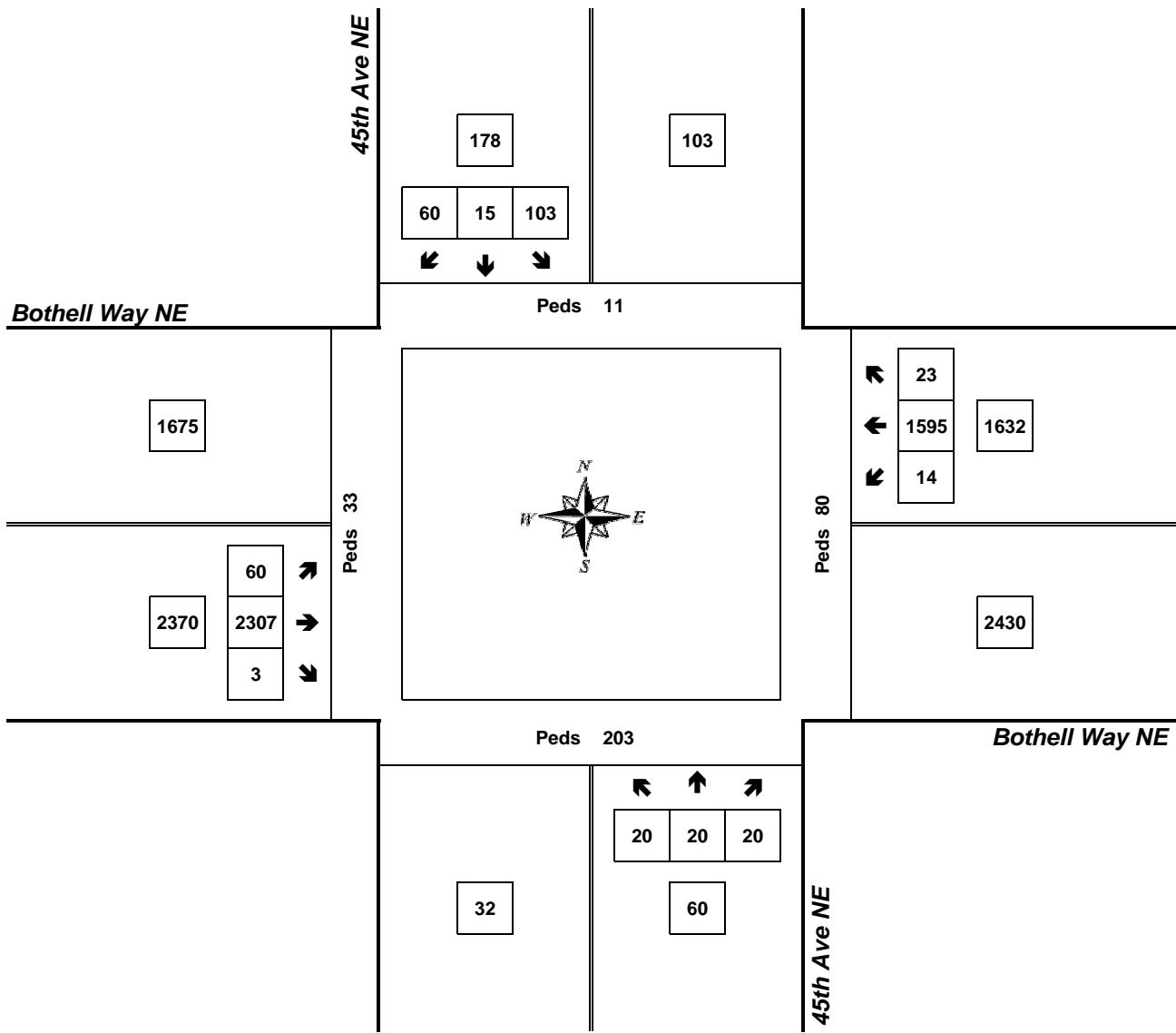


Mark Skaggs
(206) 251-0300

45th Ave NE & Bothell Way NE

5:00 PM to 6:00 PM

Thursday, June 06, 2013



Approach	PHF	HV%	Volume
EB	0.98	1.9%	2,370
WB	0.95	1.5%	1,632
NB	0.60	1.7%	60
SB	0.81	1.1%	178
Intersection	0.98	1.7%	4,240

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

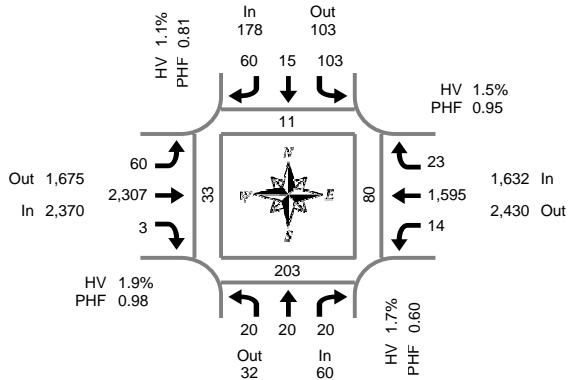
Total Vehicle Summary



Mark Skaggs
(206) 251-0300

45th Ave NE & Bothell Way NE

Thursday, June 06, 2013
4:00 PM to 6:00 PM



Peak Hour Summary 5:00 PM to 6:00 PM

15-Minute Interval Summary

4:00 PM to 6:00 PM

Interval Start Time	Northbound 45th Ave NE				Southbound 45th Ave NE				Eastbound Bothell Way NE				Westbound Bothell Way NE				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	0	0	5	0	27	3	13	0	8	528	4	9	2	335	9	9	9	934	2	39	22	5
4:15 PM	1	1	2	0	14	2	14	0	14	567	2	7	4	367	8	9	9	996	1	34	16	9
4:30 PM	1	2	1	0	15	4	15	1	5	580	2	17	5	382	6	9	9	1,018	1	39	17	5
4:45 PM	2	0	4	2	24	2	12	0	17	551	0	15	4	423	6	3	1,045	0	45	15	6	
5:00 PM	7	10	8	0	22	5	12	1	12	577	1	8	6	370	2	8	1,032	1,077	3	58	15	7
5:15 PM	5	3	6	1	32	2	21	0	12	585	1	11	1	403	6	6	1,077	7	47	32	16	
5:30 PM	3	3	3	0	15	4	13	0	18	587	1	11	2	405	7	5	1,061	1	47	12	8	
5:45 PM	5	4	3	0	34	4	14	1	18	558	0	14	5	417	8	6	1,070	0	51	21	2	
Total Survey	24	23	32	3	183	26	114	3	104	4,533	11	92	29	3,102	52	55	8,233	15	360	150	58	

Peak Hour Summary

5:00 PM to 6:00 PM

By Approach	Northbound 45th Ave NE				Southbound 45th Ave NE				Eastbound Bothell Way NE				Westbound Bothell Way NE				Total	Pedestrians Crosswalk			
	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV		North	South	East	West
Volume	60	32	92	1	178	103	281	2	2,370	1,675	4,045	44	1,632	2,430	4,062	25	4,240	11	203	80	33
%HV	1.7%				1.1%				1.9%				1.5%				1.7%				
PHF	0.60				0.81				0.98				0.95				0.98				

By Movement	Northbound 45th Ave NE				Southbound 45th Ave NE				Eastbound Bothell Way NE				Westbound Bothell Way NE				Total	Pedestrians Crosswalk			
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total		North	South	East	West
Volume	20	20	20	60	103	15	60	178	60	2,307	3	2,370	14	1,595	23	1,632	4,240	4	157	70	25
PHF	0.71	0.50	0.63	0.60	0.76	0.75	0.71	0.81	0.83	0.98	0.75	0.98	0.58	0.96	0.72	0.95	0.98	5	176	63	27

Interval Start Time	Northbound 45th Ave NE				Southbound 45th Ave NE				Eastbound Bothell Way NE				Westbound Bothell Way NE				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	4	3	12	2	80	11	54	1	44	2,226	8	48	15	1,507	29	30	3,993	4	157	70	25
4:15 PM	11	13	15	2	75	13	53	2	48	2,275	5	47	19	1,542	22	29	4,091	5	176	63	27
4:30 PM	15	15	19	3	93	13	60	2	46	2,293	4	51	16	1,578	20	26	4,172	11	189	79	34
4:45 PM	17	16	21	3	93	13	58	1	59	2,300	3	45	13	1,601	21	22	4,215	11	197	74	37
5:00 PM	20	20	20	1	103	15	60	2	60	2,307	3	44	14	1,595	23	25	4,240	11	203	80	33

Peak Hour Summary

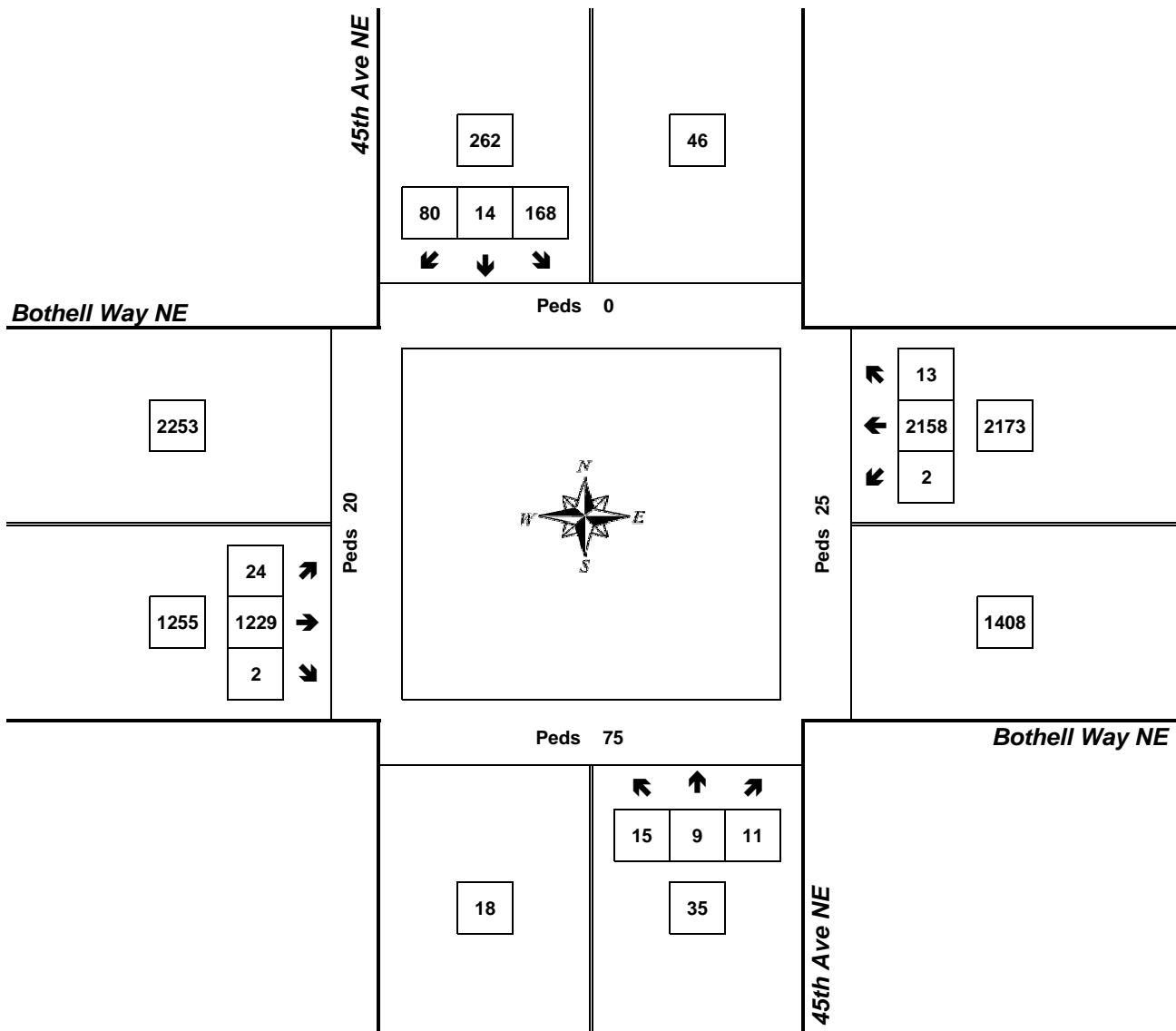


Mark Skaggs
(206) 251-0300

45th Ave NE & Bothell Way NE

7:00 AM to 8:00 AM

Thursday, June 06, 2013



Approach	PHF	HV%	Volume
EB	0.88	3.1%	1,255
WB	0.93	4.4%	2,173
NB	0.80	2.9%	35
SB	0.85	1.5%	262
Intersection	0.96	3.7%	3,725

Count Period: 7:00 AM to 9:00 AM

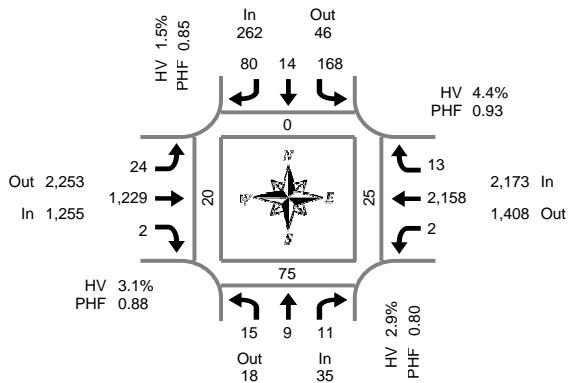
Total Vehicle Summary



Mark Skaggs
(206) 251-0300

45th Ave NE & Bothell Way NE

Thursday, June 06, 2013
7:00 AM to 9:00 AM



Peak Hour Summary
7:00 AM to 8:00 AM

15-Minute Interval Summary

7:00 AM to 9:00 AM

Interval Start Time	Northbound 45th Ave NE				Southbound 45th Ave NE				Eastbound Bothell Way NE				Westbound Bothell Way NE				Interval Total	Pedestrians Crosswalk			
	L	T	R	HV	L	T	R	HV	L	T	R	HV	L	T	R	HV		North	South	East	West
7:00 AM	0	2	1	0	25	1	29	1	1	245	1	8	1	583	3	16	892	0	16	7	3
7:15 AM	4	3	4	1	47	7	13	1	4	301	0	11	0	550	3	28	936	0	20	6	7
7:30 AM	8	2	1	0	54	3	20	2	11	334	0	10	0	534	2	23	969	0	13	3	6
7:45 AM	3	2	5	0	42	3	18	0	8	349	1	10	1	491	5	28	928	0	26	9	4
8:00 AM	0	3	2	1	26	0	17	0	7	314	1	9	1	461	8	17	840	2	15	8	4
8:15 AM	0	0	3	0	36	1	16	0	4	296	1	9	5	451	6	19	819	1	15	4	2
8:30 AM	3	1	4	0	15	5	8	1	6	316	0	5	3	489	6	23	856	0	13	4	2
8:45 AM	3	2	5	1	23	1	19	1	6	250	1	14	4	479	7	17	800	0	13	5	1
Total Survey	21	15	25	3	268	21	140	6	47	2,405	5	76	15	4,038	40	171	7,040	3	131	46	29

Peak Hour Summary

7:00 AM to 8:00 AM

By Approach	Northbound 45th Ave NE				Southbound 45th Ave NE				Eastbound Bothell Way NE				Westbound Bothell Way NE				Total	Pedestrians Crosswalk			
	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV		North	South	East	West
Volume	35	18	53	1	262	46	308	4	1,255	2,253	3,508	39	2,173	1,408	3,581	95	3,725	0	75	25	20
%HV	2.9%				1.5%				3.1%				4.4%				3.7%				
PHF	0.80				0.85				0.88				0.93				0.96				

By Movement	Northbound 45th Ave NE				Southbound 45th Ave NE				Eastbound Bothell Way NE				Westbound Bothell Way NE				Total	Pedestrians Crosswalk			
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total		North	South	East	West
Volume	15	9	11	35	168	14	80	262	24	1,229	2	39	2	2,158	13	95	3,725	0	75	25	20
PHF	0.47	0.75	0.55	0.80	0.78	0.50	0.69	0.85	0.55	0.88	0.50	0.88	0.50	0.93	0.65	0.93	0.96	2	74	26	21

Interval Start Time	Northbound 45th Ave NE				Southbound 45th Ave NE				Eastbound Bothell Way NE				Westbound Bothell Way NE				Interval Total	Pedestrians Crosswalk			
	L	T	R	HV	L	T	R	HV	L	T	R	HV	L	T	R	HV		North	South	East	West
7:00 AM	15	9	11	1	168	14	80	4	24	1,229	2	39	2	2,158	13	95	3,725	0	75	25	20
7:15 AM	15	10	12	2	169	13	68	3	30	1,298	2	40	2	2,036	18	96	3,673	2	74	26	21
7:30 AM	11	7	11	1	158	7	71	2	30	1,293	3	38	7	1,937	21	87	3,556	3	69	24	16
7:45 AM	6	6	14	1	119	9	59	1	25	1,275	3	33	10	1,892	25	87	3,443	3	69	25	12
8:00 AM	6	6	14	2	100	7	60	2	23	1,176	3	37	13	1,880	27	76	3,315	3	56	21	9

Attachment C
Detailed Intersection Level of Service Summary Sheets

Intersection

Int Delay, s/veh 0.1

Movement WBL WBR NBT NBR SBL SBT

Lane Configurations						
Traffic Vol, veh/h	0	10	2345	12	0	1685
Future Vol, veh/h	0	10	2345	12	0	1685
Conflicting Peds, #/hr	0	0	0	0	0	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	95	92	92	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	11	2567	13	0	1845

Major/Minor Minor1 Major1 Major2

Conflicting Flow All	-	1290	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	154	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	154	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach WB NB SB

HCM Control Delay, s	30.1	0	0
HCM LOS	D		

Minor Lane/Major Mvmt NBT NBRWBLn1 SBT

Capacity (veh/h)	-	-	154	-
HCM Lane V/C Ratio	-	-	0.071	-
HCM Control Delay (s)	-	-	30.1	-
HCM Lane LOS	-	-	D	-
HCM 95th %tile Q(veh)	-	-	0.2	-