2030 8th Avenue Development

Seattle, Washington

Traffic Impact Study

September 21, 2010

Prepared for:
Lake Union Partners
2030 Dexter Avenue N
Seattle, WA 98109

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FINDINGS AND CONCLUSIONS

Project Proposal. The proposed 2030 8th Avenue development is located on the east corner Westlake Avenue N/8th Avenue/Lenora Street in Seattle, Washington. The project would include 348 apartment units 4,000 square feet (sf) of miscellaneous retail space, and 350 parking stalls. The year of completion and expected occupancy for the project is 2014. The existing land uses on the site include a 6,000 sf furniture store, a 3,000 sf auto repair shop, 12,000 sf of office space, and 63 parking stalls all of which would be replaced by the proposed development.

Site Access. Vehicular access to the site would be provided via a driveway on 8th Avenue and a driveway located on a private easement off of Lenora Street. Delivery truck loading would access the site via the private easement off of Lenora Street.

Trip Generation. The proposed development is estimated to generate approximately 37 net new trips occurring during the weekday AM peak hour and 51 net new trips during the weekday PM peak hour. The trip generation estimate and analysis included in this report was based on 350 apartment units. Therefore, the results and conclusions included in this study should be considered conservative by one PM peak hour trip.

Intersection LOS. Intersection LOS analyses were conducted at two study intersections: (1) Westlake Ave N/8th Avenue/Lenora Street and (2) Lenora/9th Avenue. Both study intersections are anticipated to operate at LOS C or better in 2014 without or with the project during the weekday AM and PM peak hours.

Concurrency. Transportation concurrency was evaluated for the 2030 8th Avenue development. The calculated v/c ratios for the tested screenlines were determined to remain below the adopted LOS standard with the proposed development. Therefore, the proposed development was determined to meet the City of Seattle concurrency requirements.

Parking. A parking demand/supply analysis was completed for the proposed development. Based on parking demand rates included in ITE *Parking Generation*, the proposed parking supply of 350 parking stalls is expected to accommodate the parking demand of the site.

Project Mitigation. The LOS at the study intersections are expected to remain the same (LOS C or better) without or with the proposed project with increases in delay of up to 1 second. Based upon this traffic impact analysis, no traffic mitigation is proposed for the project.

INTRODUCTION

Project Proposal

This traffic study documents the traffic impacts associated with the proposed 2030 8th Avenue development located on the east corner of the intersection of Westlake Avenue N/8th Avenue/Lenora Street in the City of Seattle (**Figure 1**). The year of completion and expected occupancy of the development is 2014. The existing land uses on the site include a 6,000 sf furniture store, a 3,000 sf auto repair shop, 12,000 sf of office space, and 63 parking stalls all of which would be replaced by the proposed development.

The proposed project would include 348 apartment units, 4,000 square feet (sf) of miscellaneous retail space, and 350 parking stalls. Vehicular access to the site would be provided via a driveway on 8th Avenue and driveway located on a private easement off of Lenora Street. Delivery truck loading would access the site via the private easement off of Lenora Street. A preliminary site plan concept is included in **Figure 2**.

Project Approach

Based on discussions with John Shaw of the Department of Planning and Development (DPD), the following tasks were undertaken to evaluate and disclose the traffic impacts associated with the 2030 8th Avenue development:

- Assessment of existing conditions through field reconnaissance and review of existing planning documents.
- Estimation of weekday AM and PM peak hour trips generated by the project based on guidelines published in the Institute of Transportation Engineers (ITE) *Trip Generation*, 8th Edition, 2008 and local mode-split data.
- Assignment of weekday AM and PM peak hour project trips onto the existing roadway network.
- Evaluation of AM and PM peak hour intersection levels of service (LOS) at two study intersections.
- Assessment of transportation concurrency based on the guidelines outlined in the Director's Rule 2009-5.
- Evaluation of hourly parking demand and a shared parking concept within the parking garage, and comparison to the 350-stall parking supply.

Primary Data and Information Sources

- Institute of Transportation Engineers (ITE) *Trip Generation Manual*, 8th Edition, 2008.
- Institute of Transportation Engineers (ITE) *Parking Generation Manual*, 3rd Edition, 2004.
- Urban Land Institute (ULI) *Shared Parking*, 2nd Edition, 2005.
- City of Seattle Mode Split Data.
- 2000 Update to the *Highway Capacity Manual, Special Report 209*, Transportation Research Board.
- City of Seattle Signal Timing Data.
- Department of Planning and Development (DPD) Director's Rule 2009-5 *Transportation Concurrency Project Review System*, effective 4/13/2009.
- Year 2010 Turning Movement Counts from All Traffic Data.

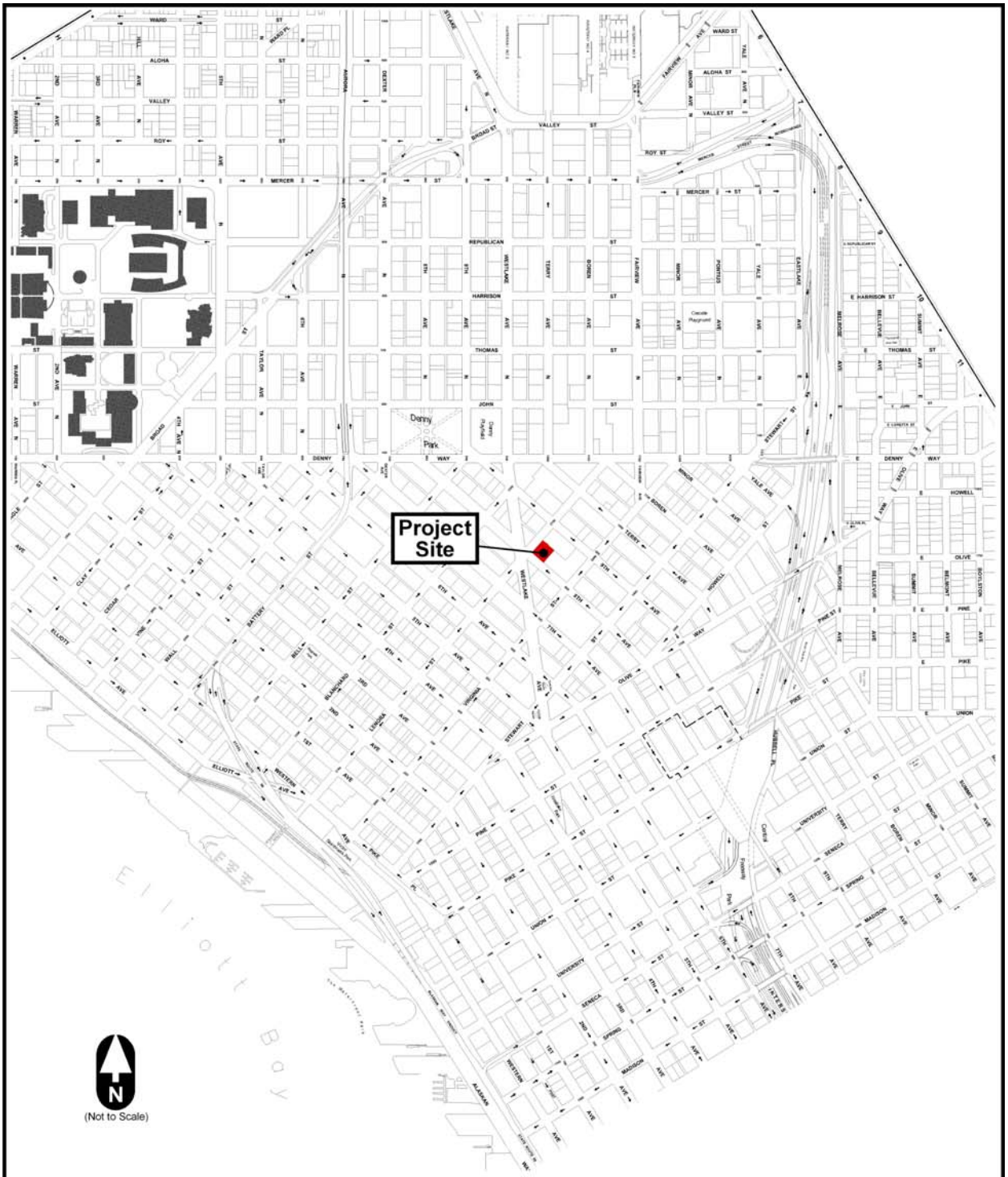

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Figure 1
Vicinity Map

2030 8th Avenue Development

Seattle, WA

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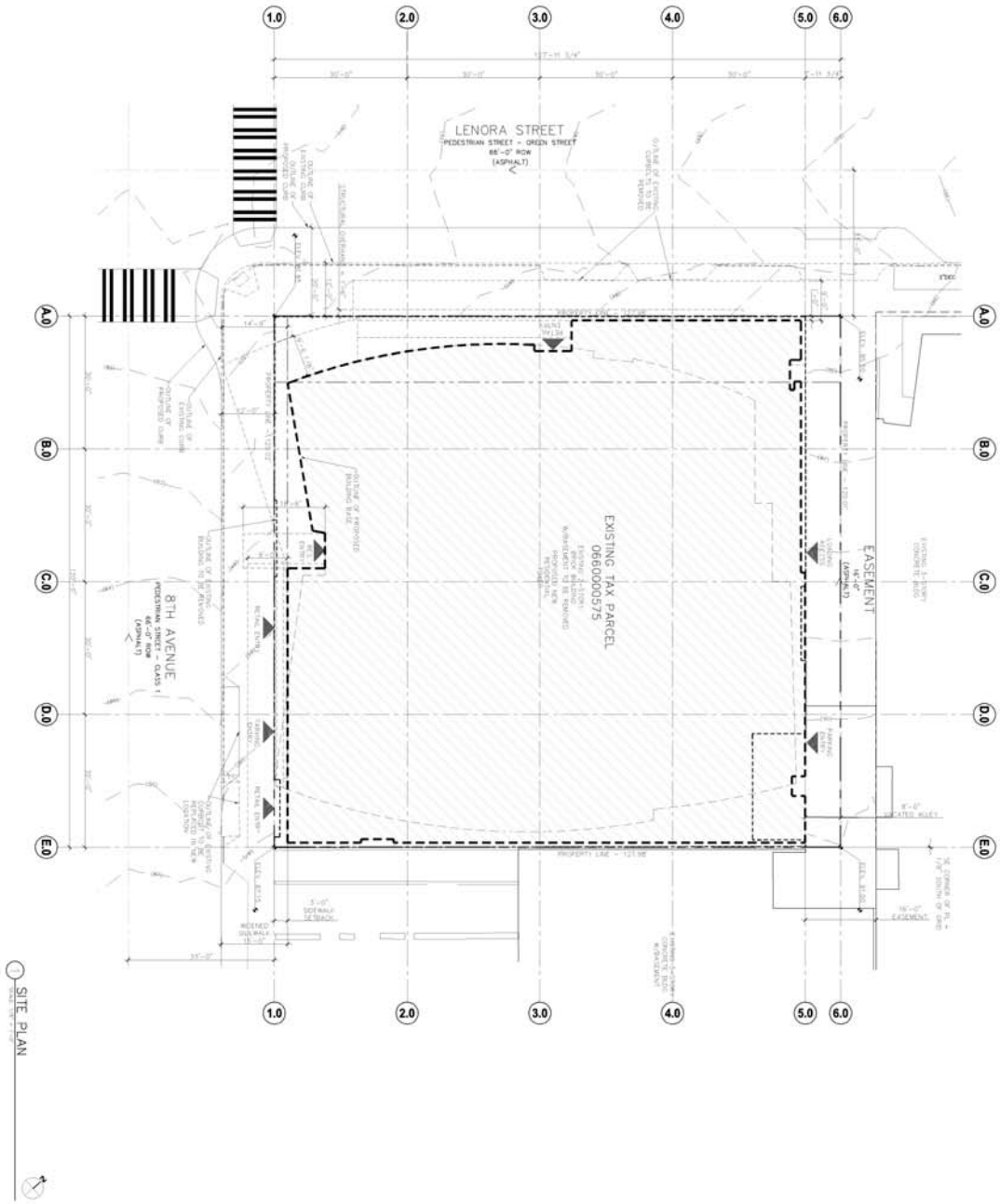

Preliminary site plan provided by Lake Union Partners 6/2/10.

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Figure 2
Preliminary Site Plan

2030 8th Avenue Development

Seattle, WA

7/18/10

EXISTING CONDITIONS

Road Network

Roadways that would serve the project site are described below.

Westlake Avenue N is a north-south Principal Arterial with two travel lanes in the each direction in the project vicinity. Parking, curb, gutter, and sidewalks exist on both sides of the street. Westlake Avenue N provides a link between the downtown CBD to the south and the Fremont Bridge to the north.

8th Avenue generally runs southeast to northwest and is classified as a Collector Arterial. East of Westlake Avenue N, 8th Avenue is a one-way street in the northwest direction. Along the project frontage, 8th Avenue includes two travel lanes with curb, gutter, sidewalk, and parking on both sides of the street.

Lenora Street generally runs southwest to northeast and is classified as a Collector Arterial west of Westlake Avenue N and an Access Street east of Westlake Avenue N. Along the project frontage, Lenora Street includes one travel lane in each direction with curb, gutter, sidewalk, and parking on both sides of the street.

Transit Service

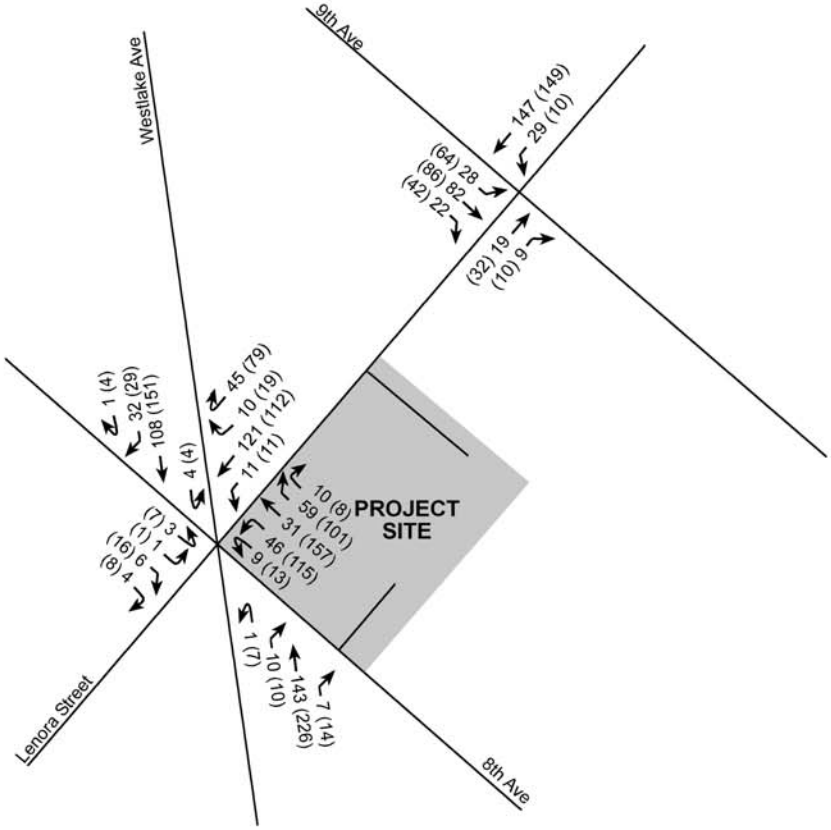
Transit service to and from the project vicinity is provided by King County Metro Transit and the City of Seattle. The site is well served by public transit with transit shelters located on Westlake Avenue N just north of 7th Avenue and south of 9th Avenue. The shelters provide access to both King County Metro transit as well as the City of Seattle Streetcar.

Pedestrian Facilities

In the project vicinity, sidewalks exist on all streets fronting the project site (Lenor Street and 8th Avenue N). Crosswalks are also provided at the signalized intersections in the project vicinity.

Peak-Hour Traffic Volumes

Existing weekday AM and PM peak hour traffic volume data was provided by All Traffic Data (ATD). Turning movement counts were conducted in 2010 at the study intersections. **Figure 3** shows the 2010 AM and PM peak hour traffic volumes at the study intersections.



LEGEND

XX AM Peak Hour Volumes
(XX) PM Peak Hour Volumes

N
(Not to Scale)

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Figure 3
2010 Existing Peak Hour Traffic Volumes

2030 8th Avenue Development
Seattle, WA

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Intersection Levels of Service

Existing (2010) level of service (LOS) analyses were conducted at the study intersections during the weekday AM and PM peak hours. 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 per vehicle entering the intersection.

LOS calculations for both signalized and stop-controlled intersections were calculated using the methodologies and procedures outlined in the 2000 *Highway Capacity Manual (HCM)*, Special Report 209, Transportation Research Board (TRB). Existing signal timing provided by the City of Seattle was used at the signalized study intersections. **Table 1** outlines the LOS criteria for signalized and unsignalized intersections based on these methodologies.

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

Level of Service	Signalized Intersection Delay Range (sec)	Unsignalized Intersection 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", Special Report 209, Transportation Research Board, 2000.

Existing weekday AM and PM peak hour LOS analysis results for the study intersections are summarized in **Table 2**.

Table 2.
2030 8th Avenue Development –
Existing 2010 Intersection LOS Summary

Study Intersection	LOS[1]	Delay (sec)	V/C Ratio
AM PEAK HOUR			
1. Westlake Ave N/8th Ave N/Lenora St	C	22.8	0.34
2. 9th Avenue N / Lenora Street	A	8.59	-
PM PEAK HOUR			
1. Westlake Ave N/8th Ave N/Lenora St	C	30.1	0.64
2. 9th Avenue N / Lenora Street	A	8.75	-

1. Level of service based on methodology outlined in the 2000 Highway Capacity Manual (HCM).

As shown in the above table, both study intersections currently operate at LOS C or better during the weekday AM and PM peak hours. Detailed LOS summary worksheets are provided in **Appendix A**.

TRAFFIC IMPACT ANALYSIS

Trip Generation

The proposed 2030 8th Avenue development includes 348 apartment units and 4,000 square feet (sf) of miscellaneous retail space. The project would replace a 6,000 sf furniture store, a 3,000 sf auto repair shop, and 12,000 sf of office space. The trip generation estimate and analysis included in this report was based on 350 apartment units. Therefore, the results and conclusions included in this study should be considered conservative by one PM peak hour trip.

The trip generation estimate is based on data from the Institute of Transportation Engineers (ITE) *Trip Generation* (8th Edition, 2008), and mode-split data for the downtown Transportation Analysis Zone (TAZ) in which the proposed 2030 8th Avenue development is located (TAZ 271). Three steps were used to calculate weekday AM and PM peak hour trip generation.

First, ITE trip rates were used to determine vehicular trip generation for the existing and proposed uses. Vehicle trip generation was then converted to person trips using an average vehicle occupancy (AVO) factor of 1.13. The AVO assumption is based on a local rate used in the analysis of other recent projects in downtown Seattle.

Second, mode-split data for TAZ 271 was used to estimate local vehicular trip generation for this project. The mode-split data was obtained from the City of

Seattle (Zhong Wang, 6/11/10). The mode-split for TAZ 271 was divided into three categories; home, non-work, and work trips. The mode-split data is summarized in **Appendix B**.

As shown in **Appendix B**, for a residential use (home) in this zone, a 61 percent non-auto mode-split was calculated (which includes transit, bike and walk). The auto related mode-split was calculated to be 39 percent, which reflects both SOV and carpool trips (2 person and 3 person). After adjustments for mode-split were made, the net trip generation was calculated.

Third, adjustments to the gross vehicle trips (after taking mode split reductions) were made to account for both pass-by and internal trips. Pass-by and internal trip calculations were determined based on methodology included in the ITE Trip Generation Handbook, 2nd edition.

Table 3 summarizes the weekday peak hour trip generation for the proposed 2030 8th Avenue development. The proposed project is estimated to generate 37 net new trips during the AM peak hour and 51 net new trips during the PM peak hour. The detailed trip generation calculations are included in **Appendix B**.

Table 3.
2030 8th Avenue Development –
Net Trip Generation Summary

			Vehicle Trip Generation		
Time Period and Land Use	**Size**	**ITE LUC [1]**	**In**	**Out**	**Total**
AM Peak Hour					
Apartments	350 units	220	11	46	57
Miscellaneous Retail	4,000 sf	814	0	1	1
Less Existing Use [2]	-	-	*-17*	*-4*	*-21*
	Net New AM Peak Hour Trips		-6	43	37
PM Peak Hour					
Apartments	350 units	220	45	24	69
Miscellaneous Retail	4,000 sf	814	1	2	3
Less Existing Use [2]	-	-	*-7*	*-14*	*-21*
	Net New PM Peak Hour Trips		39	12	51

1. Institute of Transportation Engineers, Trip Generation Manual, 8th Edition, 2008.
2. Existing uses include a 3,000 sf automobile care center, a 6,000 square foot furniture store, and 12,000 square feet of office space.

Trip Distribution

The trip distribution patterns for the proposed project were calculated separately for the residential and retail land uses based on DPD Director's Rule 2009-5 and general traffic patterns in the vicinity of the site. Based on this methodology, a project's trips are distributed to the street network based on trip distribution tables generated by the City's traffic forecasting model. Once the number of trips between the proposed development and other areas of the City are determined, the trips are assigned to the arterial network using the most likely routes to minimize travel time and distance. The results of the assignment process indicate that the distribution of trips to and from the project is estimated to be as shown in **Table 4**.

Table 4.
2030 8th Avenue Development –
Peak Hour Project Trip Distribution

Direction	Residential Trips	Retail Trips
I-5 to/from the North	5%	20%
I-5 to/from the South	10%	35%
SR-99 to/from the North	5%	5%
Local - to/from the North	25%	15%
Local – to/from the South	25%	5%
Local – to/from the East	15%	15%
Local – to/from the West	15%	5%
TOTAL	**100%**	**100%**

Figures 4-7 illustrate the anticipated inbound and outbound trip distribution patterns of the residential and retail project traffic for the weekday peak hours.

Figure 8 illustrates the net new AM and PM peak hour assignment of project traffic and pass-by project trips at the study intersections.

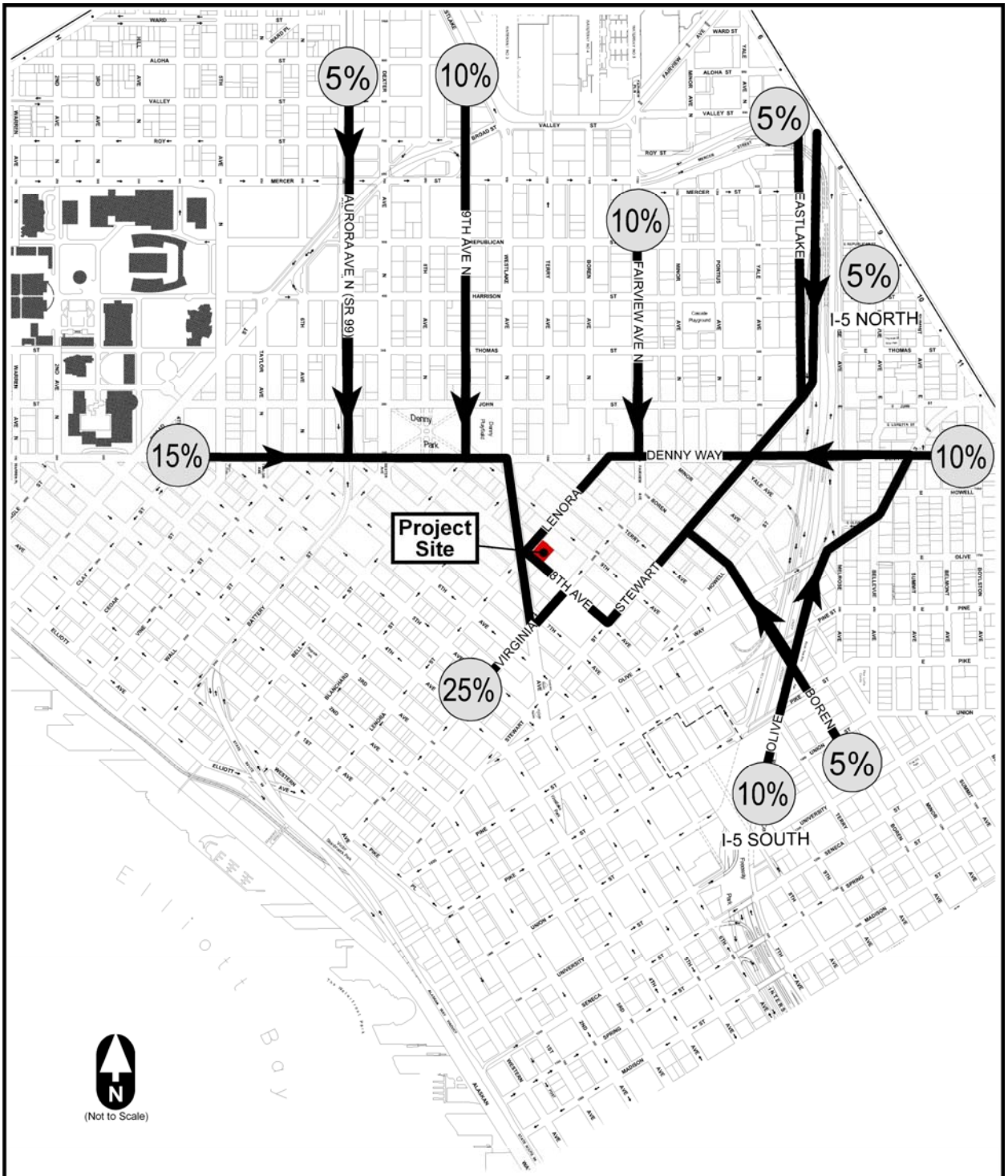

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Figure 4
Residential Trip Distribution - Inbound Direction

2030 8th Avenue Development

Seattle, WA

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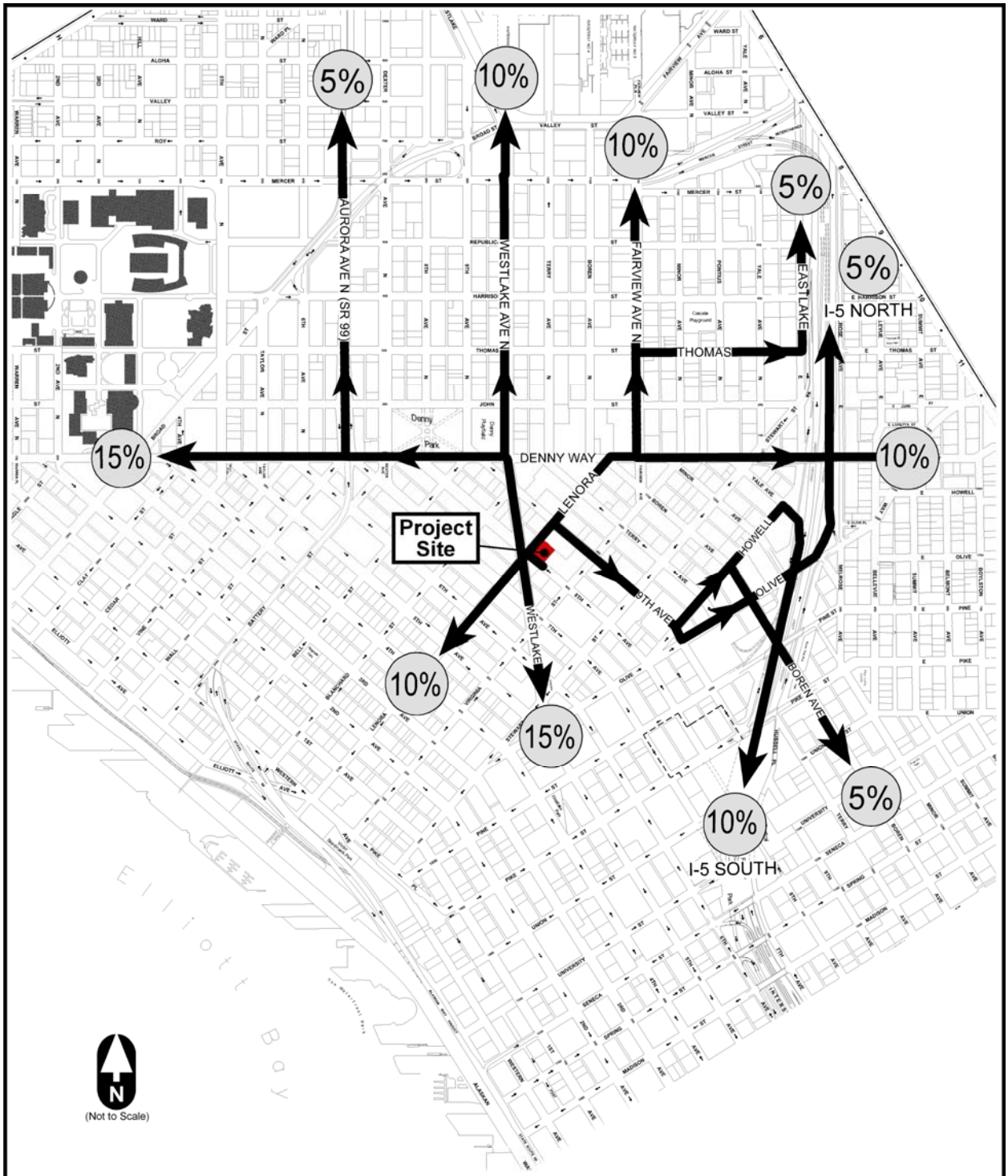

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Figure 5
Residential Trip Distribution - Outbound Direction

2030 8th Avenue Development

Seattle, WA

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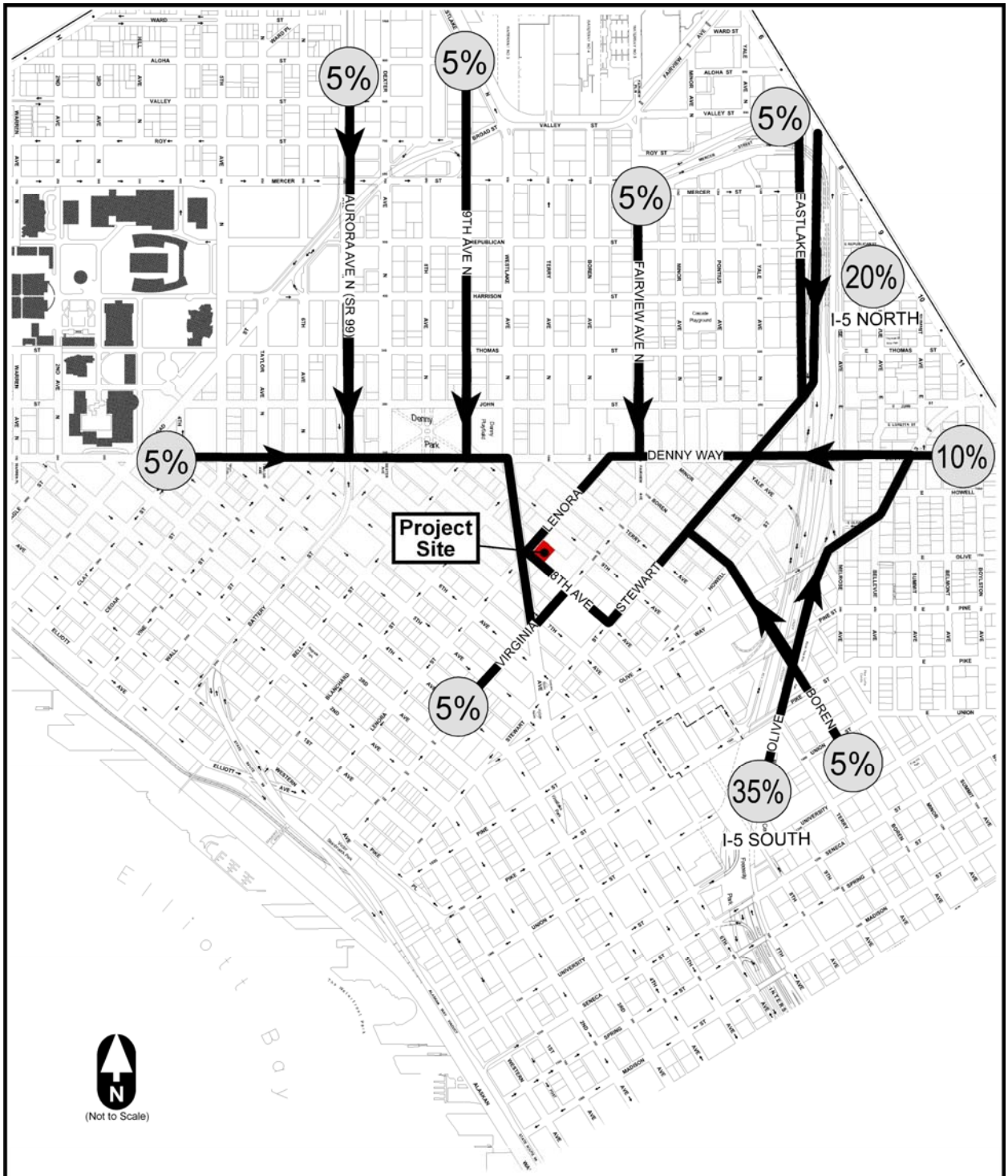

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Figure 6
Retail Trip Distribution - Inbound Direction

2030 8th Avenue Development

Seattle, WA

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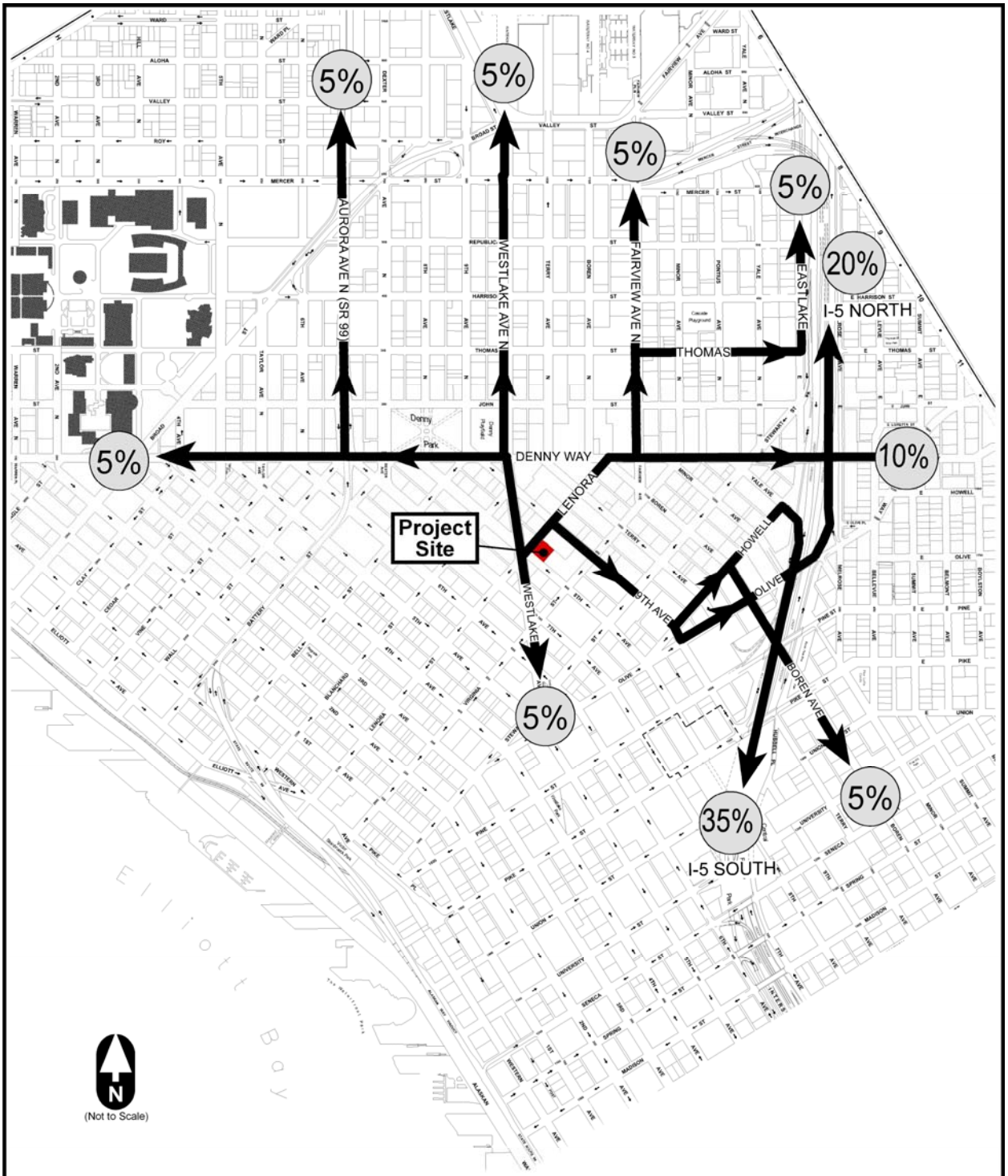

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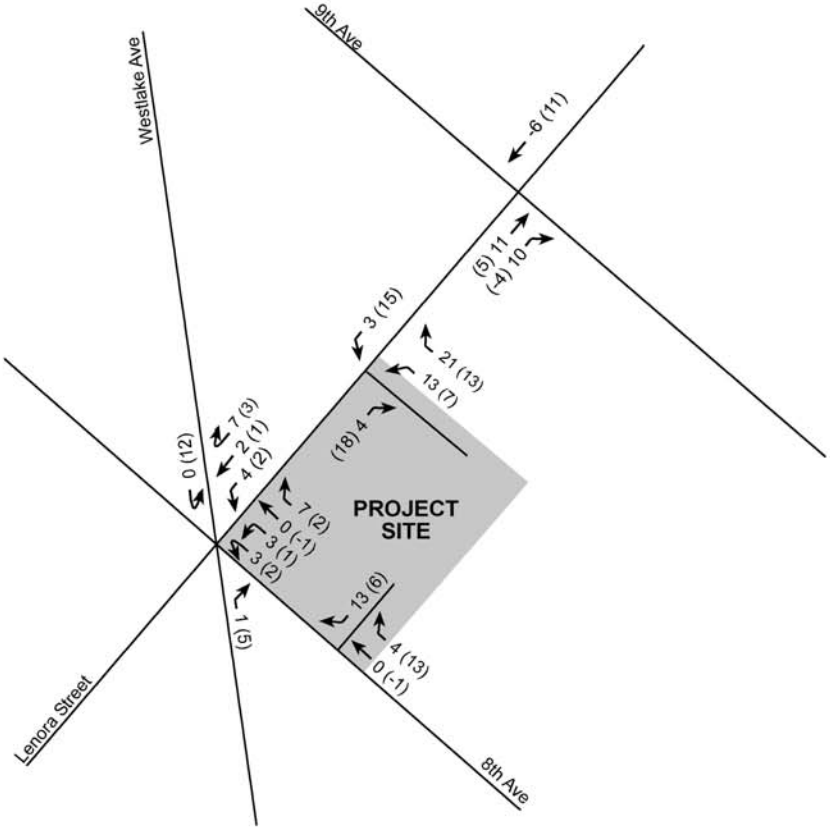
Figure 7
Retail Trip Distribution - Outbound Direction

2030 8th Avenue Development

Seattle, WA

7/18/10



LEGEND

XX AM Peak Hour Volumes
(XX) PM Peak Hour Volumes

N
(Not to Scale)

Notes:
1. Traffic volumes shown at site access locations are gross project trips.
2. Volumes include 1 entering PM peak hour pass-by trip.

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Figure 8
Net Project Trip Assignment

2030 8th Avenue Development

Seattle, WA

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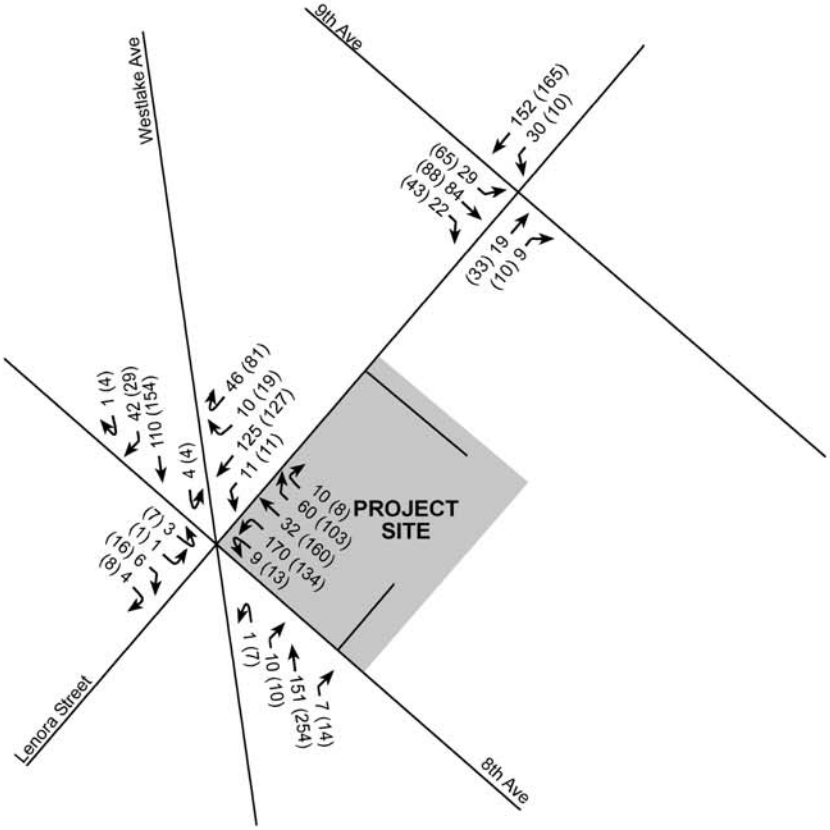
Future Traffic Volume Impacts

Year 2014 baseline traffic volumes without the project were estimated by applying a growth factor of 0.5 percent per year to existing AM and PM peak hour traffic volumes. This growth factor is used to account for new development in the study area.

In addition to the background growth rate, trips from three pipeline projects were included in the future baseline traffic volumes. The following are the three pipeline project included in the analysis:

1. 1200 Stewart Development
2. 2017 7th Avenue Development
3. 2116 4th Avenue Development

Figure 9 illustrates the year 2014 baseline AM and PM peak hour traffic volumes without the project at the study intersections. Project-generated trips (shown in **Figure 8**) were then added to the 2014 baseline volumes to obtain future with-project traffic volumes, shown in **Figure 10** for the AM and PM peak hours.



LEGEND

XX AM Peak Hour Volumes
(XX) PM Peak Hour Volumes

N
(Not to Scale)

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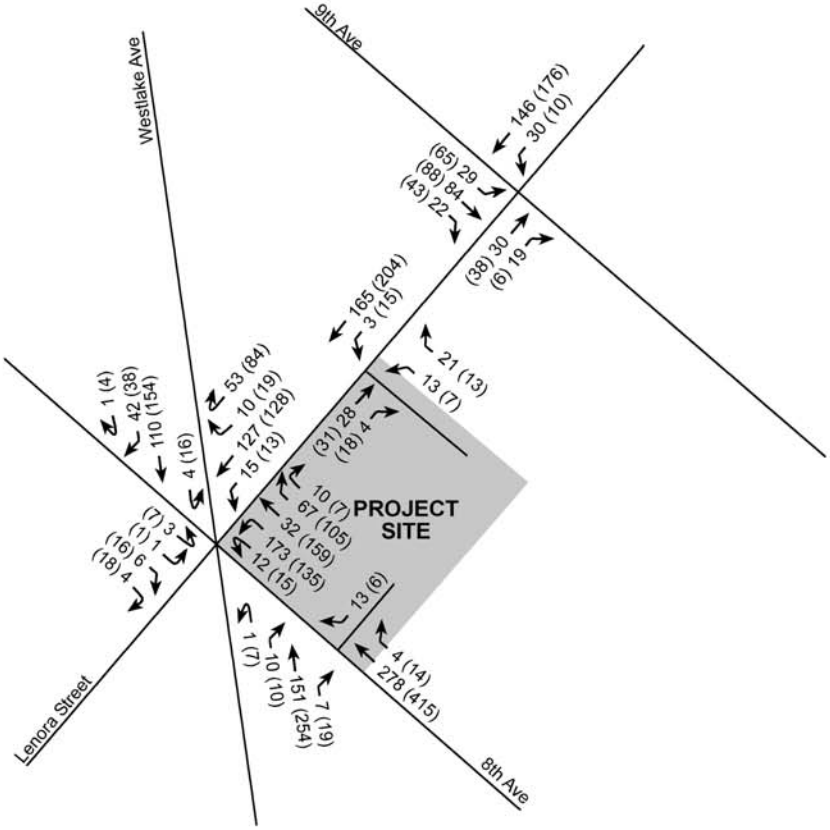
Figure 9
2014 Peak Hour Traffic Volumes Without Project

2030 8th Avenue Development

Seattle, WA

7/18/10



LEGEND

XX AM Peak Hour Volumes
(XX) PM Peak Hour Volumes

N
(Not to Scale)

Transportation Engineering NorthWest

Figure 10
2014 Peak Hour Traffic Volumes With Project

2030 8th Avenue Development

Seattle, WA

7/18/10

Future Intersection Levels of Service

Future LOS were evaluated at the study intersections for the anticipated year of occupancy (2014). The results of the year 2014 LOS analysis with and without the proposed 2030 8th Avenue development for the AM and PM peak hours are summarized in **Table 5**.

Table 5.
2030 8th Avenue Development –
Future 2014 Intersection LOS Summary

Study Intersection	2014 Without–Project			2014 With–Project		
	LOS[1]	Delay	V/C	LOS	Delay	V/C
AM PEAK HOUR						
1. Westlake Ave N/8th Ave N/Lenora St	C	24.4	0.44	C	24.9	0.46
2. 9th Avenue N / Lenora Street	A	8.66	-	A	8.64	-
PM PEAK HOUR						
1. Westlake Ave N/8th Ave N/Lenora St	C	32.9	0.69	C	33.8	0.71
2. 9th Avenue N / Lenora Street	A	8.90	-	A	8.99	-

1. Level of service analyses are based on methodology outlined in the 2000 Highway Capacity Manual (HCM).

As shown in the table above, both study intersections are expected to operate at LOS C or better during the weekday AM and PM peak hours without or with the proposed project.

Site Access Analysis

Vehicular access to the site would be provided via a driveway on 8th Avenue and driveway located on a private easement off of Lenora Street. Delivery truck loading would access the site via the private easement off of Lenora Street.

All turning movements at the proposed access onto Minor Avenue are expected to operate at LOS B or better during the AM and PM peak hours with minimal queues (1 vehicle). The detailed summary worksheets showing operations at the access driveway are included in **Appendix A**.

Transit Service

The existing site is well served by public transit. The site is located within blocks of the link light rail station at Westlake, and the Seattle streetcar. These public transit routes serve employment centers throughout the region with frequent service.

The proposed 2030 8th Avenue development would add several hundred new residents, new retail employees, and retail customers to the vicinity area. While this project would increase the demand for transit service in the area, any increase would be considered positive since this would result in a decrease in passenger cars on the surrounding road network, and is not expected to result in a significant adverse impact.

Pedestrian Facilities

The demand on pedestrian facilities in the project vicinity is expected to increase with the proposed development. While this project would increase the demand on pedestrian facilities in the area, any increase would be considered positive since this would result in a decrease in passenger cars on the surrounding road network, and is not expected to result in a significant adverse impact.

Transportation Concurrency

Prior to development approval, a transportation concurrency analysis is conducted based on DPD Director's Rule 2009-5. Transportation concurrency standards are used to determine the acceptable balance between the demand for use of the arterial systems and the capacity of the transportation system. Total capacity is based on the facilities currently in existence, and known future projects.

Transportation concurrency review in the City of Seattle is evaluated first by determining applicable screenlines. A screenline is an imaginary line drawn across several arterials at a particular place where the volume to-capacity ratio (v/c) is calculated. For the 2030 8th Avenue development, screenlines 8 (South Lake Union) and screenlines 12.12 (east of CBD) were evaluated.

Baseline peak-hour traffic volumes for the screenlines were obtained from Director's Rule 2009-5. Project-generated traffic was then added to baseline traffic volumes at the screenlines. The total traffic volume, including PM peak hour trips from the proposed 2030 8th Avenue development, was then divided by the capacity of all roadways crossing the screenlines to obtain a volume to capacity (v/c) ratio. This ratio was then compared to the LOS standard. **Table 6** summarizes the transportation concurrency review results. As shown, the v/c ratios with the development are well below the adopted LOS standard.

Table 6.
2030 8th Avenue Development –
Transportation Concurrency

Screenline	Description	Capacity[1]	Baseline Peak-Hour Volume	Proposed Project Trips	With Project V/C Ratio	V/C Threshold
8	EB	6,000	4,509	8	0.75	1.20
South Lake Union	WB	3,600	3,020	2	0.84	1.20
12.12	EB	13,300	8,266	2	0.62	1.20
East of CBD	WB	11,736	6,491	1	0.55	1.20

1. Data obtained from Director's Rule 2009-5 *Transportation Concurrency Project Review System*.

Parking Demand Analysis

The following provides an evaluation of the parking supply versus the estimated peak parking demand for the 2030 8th Avenue development.

Parking Supply

The development proposes a parking garage with 350 parking stalls.

Parking Demand

The weekday parking demand for the development was estimated based on the proposed number of apartment units and the square footage of retail space. The demand analysis assumes that the proposed garage parking stalls would be shared between the residential and retail uses.

Weekday peak parking demand rates and hourly variations in weekday parking demand were based on ITE's *Parking Generation* manual, 3rd Edition, 2004 and the Urban Land Institute's *Shared Parking* manual, 2nd Edition, 2005. For the proposed residential use, ITE's Land Use Code 222 High-Rise Apartment was used based on the average of parking demand rates at two study sites located in downtown CBDs. The downtown CBD parking rates reflect the unique characteristics of a downtown CBD location that include abundant transit options and extensive pedestrian sidewalk networks. As result, would produce lower parking demand rates than apartments in non-CBD areas.

A table summarizing the parking demand by hour on a typical weekday is included in **Attachment C**. Based on the ITE parking demand rates, the estimated peak parking demand for the proposed 2030 8th Avenue Development would be 163 occupied stalls at 8:00 PM on a typical weekday. Therefore, the proposed on-site parking supply of 350 stalls is anticipated to accommodate the anticipated peak parking demand.

PROJECT MITIGATION MEASURES

A review was conducted of intersection impacts of the 2030 8th Avenue development. The LOS at the study intersections are expected to remain the same (LOS C or better) without or with the proposed project with increases in delay of up to 1 second. Based upon this traffic impact analysis, no traffic mitigation is proposed for the project.

Appendix A:

Level of Service Calculations at Study Intersections

Analyst CFC
Date 6/4/2010

Multi-Use Development Trip Generation and Internal Capture Summary

Project Name 2030 8th Avenue Development
Time Period PM Peak Hour of Adj. Street

LAND USE A 2 Retail

ITE LU Code 814
Size 4,000 sf

	Total	Internal	External
Enter	2	0	2
Exit	2	0	2
Total	4	0	4
%	100%	0%	100%

Enter from External: 2
Exit to External: 2

LAND USE CODES
1 OFFICE
2 RETAIL
3 RESIDENTIAL

	Demand	Balanced	Demand
A → B	12% 0	0	31% 14
B → A	9% 0	0	53% 13
A → C	20% 0	0	20% 0
C → A	20% 0	0	20% 0

LAND USE B 3 Residential

ITE LU Code 220
Size 350 Units

	Total	Internal	External
Enter	45	0	45
Exit	24	0	24
Total	69	0	69
%	100%	0%	100%

Enter from External: 45
Exit to External: 24

	Demand	Balanced	Demand
B → C	31% 14	0	12% 0
C → B	0% 0	0	9% 0

LAND USE C 2 Retail

ITE LU Code
Size

	Total	Internal	External
Enter	0	0	0
Exit	0	0	0
Total	0	0	0
%	100%	#DIV/0!	#DIV/0!

Enter from External: 0
Exit to External: 0

Net External Trips for Multi-Use Development

	LAND USE A	LAND USE B	LAND USE C	TOTAL
Enter	2	45	0	47
Exit	2	24	0	26
Total	4	69	0	73
Single-Use Trip Gen. Est.	4	69	0	73

INTERNAL CAPTURE
0%

2010 Existing LOS Results

Weekday AM and PM Peak Hours

HCM Signalized Intersection Capacity Analysis
1: Westlake Ave & 8th Ave

7/20/2010

Movement	NBL2	NBL	NBT	NBR	SBL2	SBT	SBR	SBR2	SEL2	SER	SER2	NWL2
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	9	12	12	10	12	12	12	11	12	12
Total Lost time (s)			4.0			4.0			4.0	4.0		
Lane Util. Factor			0.95			0.95			1.00	1.00		
Frpb, ped/bikes			0.99			0.97			1.00	0.88		
Flpb, ped/bikes			0.99			1.00			0.96	1.00		
Frt			0.99			0.97			1.00	0.85		
Flt Protected			1.00			1.00			0.95	1.00		
Satd. Flow (prot)			2407			2404			1286	1025		
Flt Permitted			0.93			0.95			0.64	1.00		
Satd. Flow (perm)			2255			2284			864	1025		
Volume (vph)	1	10	143	7	4	108	32	1	4	6	4	9
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.93	0.93	0.93	0.93	0.70	0.70	0.70	0.86
Adj. Flow (vph)	1	11	152	7	4	116	34	1	6	9	6	10
RTOR Reduction (vph)	0	0	0	0	0	1	0	0	0	5	0	0
Lane Group Flow (vph)	0	0	171	0	0	154	0	0	6	10	0	0
Confl. Peds. (#/hr)	55	41		83	83		55	41	45	34	55	34
Heavy Vehicles (%)	8%	8%	8%	8%	7%	7%	7%	7%	21%	21%	21%	3%
Parking (#/hr)			15			15						
Turn Type	Perm	Perm			Perm				D.Pm	custom		Perm
Protected Phases			1			1						
Permitted Phases	1	1			1				2	2		2
Actuated Green, G (s)			26.0			26.0			15.3	15.3		
Effective Green, g (s)			29.5			29.5			19.8	19.8		
Actuated g/C Ratio			0.37			0.37			0.25	0.25		
Clearance Time (s)			7.5			7.5			8.5	8.5		
Vehicle Extension (s)			3.0			3.0			3.0	3.0		
Lane Grp Cap (vph)			832			842			214	254		
v/s Ratio Prot												
v/s Ratio Perm			c0.08			0.07			0.01	0.01		
v/c Ratio			0.21			0.18			0.03	0.04		
Uniform Delay, d1			17.2			17.1			22.8	22.9		
Progression Factor			1.00			1.00			1.00	1.00		
Incremental Delay, d2			0.6			0.5			0.1	0.1		
Delay (s)			17.8			17.6			22.9	23.0		
Level of Service			B			B			C	C		
Approach Delay (s)			17.8			17.6						
Approach LOS			B			B						

Intersection Summary			
HCM Average Control Delay	22.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NWL	NWT	NWR	NWR2	SWL	SWT	SWR	SWR2
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	9	12	12	12	12	12	12
Total Lost time (s)		4.0				4.0		
Lane Util. Factor		0.95				1.00		
Frpb, ped/bikes		0.88				0.96		
Flpb, ped/bikes		0.96				1.00		
Frt		0.93				0.96		
Flt Protected		0.98				1.00		
Satd. Flow (prot)		1921				1529		
Flt Permitted		0.98				1.00		
Satd. Flow (perm)		1921				1529		
Volume (vph)	46	31	59	10	11	121	10	45
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.90	0.90	0.90	0.90
Adj. Flow (vph)	53	36	69	12	12	134	11	50
RTOR Reduction (vph)	0	7	0	0	0	15	0	0
Lane Group Flow (vph)	0	173	0	0	0	192	0	0
Confl. Peds. (#/hr)	55		45	83	34		41	45
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%
Parking (#/hr)		30						
Turn Type	Perm				Perm			
Protected Phases		2				3		
Permitted Phases	2				3			
Actuated Green, G (s)		15.3				15.2		
Effective Green, g (s)		19.8				18.7		
Actuated g/C Ratio		0.25				0.23		
Clearance Time (s)		8.5				7.5		
Vehicle Extension (s)		3.0				3.0		
Lane Grp Cap (vph)		475				357		
v/s Ratio Prot								
v/s Ratio Perm		0.09				0.13		
v/c Ratio		0.36				0.54		
Uniform Delay, d1		24.9				26.9		
Progression Factor		1.00				1.00		
Incremental Delay, d2		0.5				1.6		
Delay (s)		25.4				28.4		
Level of Service		C				C		
Approach Delay (s)		25.4				28.4		
Approach LOS		C				C		

Intersection Summary

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*TENW*
Agency/Co.	
Date Performed	*07/20/2010*
Analysis Time Period	*AM Peak Hour*

Site Information

Intersection	*Lenora St & 9th Ave*
Jurisdiction	
Analysis Year	*2010 Existing*

Project ID *2030 8th Avenue Development*

East/West Street: *Lenora Street* | North/South Street: *9th Avenue*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume	0	19	9	29	147	0
%Thrus Left Lane	50			50		

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume	0	0	0	28	82	22
%Thrus Left Lane	50			50		

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	TR		LT				LTR	
PHF	0.70		0.85				0.92	
Flow Rate	39		206				142	
% Heavy Vehicles	11		3				6	
No. Lanes	1		1		0		1	
Geometry Group	1		1				1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.0		0.2				0.2	
Prop. Right-Turns	0.3		0.0				0.2	
Prop. Heavy Vehicle								
hLT-adj	0.2	0.2	0.2	0.2			0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6			-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7			1.7	1.7
hadj, computed	4.48		4.48				4.48	

Departure Headway and Service Time

hd, initial value	3.20		3.20				3.20	
x, initial	0.03		0.18				0.13	
hd, final value	4.48		4.48				4.48	
x, final value	0.05		0.25				0.18	
Move-up time, m	2.0		2.0				2.0	
Service Time	2.5		2.5		2.5		2.5	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity	289		456				392	
Delay	7.71		8.83				8.49	
LOS	A		A				A	
Approach: Delay	7.71		8.83				8.49	
LOS	A		A				A	
Intersection Delay	8.59							
Intersection LOS	A							

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Movement	NBL2	NBL	NBT	NBR	SBL2	SBT	SBR	SBR2	SEL2	SER	SER2	NWL2
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	9	12	12	10	12	12	12	11	12	12
Total Lost time (s)			4.0			4.0			4.0	4.0		
Lane Util. Factor			0.95			0.95			1.00	1.00		
Frpb, ped/bikes			0.99			0.96			1.00	0.83		
Flpb, ped/bikes			0.99			1.00			0.97	1.00		
Frt			0.99			0.97			1.00	0.85		
Flt Protected			1.00			1.00			0.95	1.00		
Satd. Flow (prot)			2454			2457			1365	1006		
Flt Permitted			0.92			0.95			0.35	1.00		
Satd. Flow (perm)			2275			2328			506	1006		
Volume (vph)	7	10	226	14	4	151	29	4	8	16	8	13
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.81	0.81	0.81	0.81	0.73	0.73	0.73	0.79
Adj. Flow (vph)	9	12	282	18	5	186	36	5	11	22	11	16
RTOR Reduction (vph)	0	0	0	0	0	2	0	0	0	8	0	0
Lane Group Flow (vph)	0	0	321	0	0	230	0	0	11	25	0	0
Confl. Peds. (#/hr)	69	79		93	93		69	79	55	85	69	85
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	16%	16%	16%	4%
Parking (#/hr)			15			15						
Turn Type	Perm	Perm			Perm				D.Pm	custom		Perm
Protected Phases			1			1						
Permitted Phases	1	1			1				2	2		2
Actuated Green, G (s)			22.7			22.7			18.5	18.5		
Effective Green, g (s)			26.2			26.2			23.0	23.0		
Actuated g/C Ratio			0.33			0.33			0.29	0.29		
Clearance Time (s)			7.5			7.5			8.5	8.5		
Vehicle Extension (s)			3.0			3.0			3.0	3.0		
Lane Grp Cap (vph)			745			762			145	289		
v/s Ratio Prot												
v/s Ratio Perm			c0.14			0.10			0.02	0.03		
v/c Ratio			0.43			0.30			0.08	0.09		
Uniform Delay, d1			21.1			20.1			20.8	20.8		
Progression Factor			1.00			1.00			1.00	1.00		
Incremental Delay, d2			1.8			1.0			0.2	0.1		
Delay (s)			22.9			21.1			21.0	21.0		
Level of Service			C			C			C	C		
Approach Delay (s)			22.9			21.1						
Approach LOS			C			C						

Intersection Summary			
HCM Average Control Delay	30.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	79.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NWL	NWT	NWR	NWR2	SWL	SWT	SWR	SWR2
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	9	12	12	12	12	12	12
Total Lost time (s)		4.0				4.0		
Lane Util. Factor		0.95				1.00		
Frpb, ped/bikes		0.92				0.92		
Flpb, ped/bikes		0.95				0.99		
Frt		0.96				0.94		
Flt Protected		0.98				1.00		
Satd. Flow (prot)		2034				1453		
Flt Permitted		0.98				1.00		
Satd. Flow (perm)		2034				1453		
Volume (vph)	115	157	101	8	11	112	19	79
Peak-hour factor, PHF	0.79	0.79	0.79	0.79	0.86	0.86	0.86	0.86
Adj. Flow (vph)	146	199	128	10	13	130	22	92
RTOR Reduction (vph)	0	1	0	0	0	25	0	0
Lane Group Flow (vph)	0	498	0	0	0	232	0	0
Confl. Peds. (#/hr)	69		55	93	85		79	55
Heavy Vehicles (%)	4%	4%	4%	4%	1%	1%	1%	1%
Parking (#/hr)		30						
Turn Type	Perm				Perm			
Protected Phases		2				3		
Permitted Phases	2				3			
Actuated Green, G (s)		18.5				15.3		
Effective Green, g (s)		23.0				18.8		
Actuated g/C Ratio		0.29				0.24		
Clearance Time (s)		8.5				7.5		
Vehicle Extension (s)		3.0				3.0		
Lane Grp Cap (vph)		585				341		
v/s Ratio Prot								
v/s Ratio Perm		0.24				0.16		
v/c Ratio		0.85				0.68		
Uniform Delay, d1		26.9				27.9		
Progression Factor		1.00				1.00		
Incremental Delay, d2		11.4				5.3		
Delay (s)		38.3				33.2		
Level of Service		D				C		
Approach Delay (s)		38.3				33.2		
Approach LOS		D				C		

Intersection Summary

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*TENW*
Agency/Co.	
Date Performed	*07/20/2010*
Analysis Time Period	*PM Peak*

Site Information

Intersection	*Lenora St & 9th Ave*
Jurisdiction	
Analysis Year	*2010 Existing*

Project ID *2030 8th Avenue Development*

East/West Street: *Lenora Street* | North/South Street: *9th Avenue*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume	0	32	10	10	149	0
%Thrus Left Lane	50			50		

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume	0	0	0	64	86	42
%Thrus Left Lane	50			50		

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	TR		LT				LTR	
PHF	0.70		0.90				0.91	
Flow Rate	59		176				210	
% Heavy Vehicles	5		1				2	
No. Lanes	1		1		0		1	
Geometry Group	1		1				1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.0		0.1				0.3	
Prop. Right-Turns	0.2		0.0				0.2	
Prop. Heavy Vehicle								
hLT-adj	0.2	0.2	0.2	0.2			0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6			-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7			1.7	1.7
hadj, computed	4.56		4.56				4.56	

Departure Headway and Service Time

hd, initial value	3.20		3.20				3.20	
x, initial	0.05		0.16				0.19	
hd, final value	4.56		4.56				4.56	
x, final value	0.07		0.22				0.26	
Move-up time, m	2.0		2.0				2.0	
Service Time	2.6		2.6		2.6		2.6	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity	309		426				460	
Delay	7.92		8.78				8.96	
LOS	A		A				A	
Approach: Delay	7.92		8.78				8.96	
LOS	A		A				A	
Intersection Delay	8.75							
Intersection LOS	A							

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2014 Without–Project LOS Results

Weekday AM and PM Peak Hours

Movement	NBL2	NBL	NBT	NBR	SBL2	SBT	SBR	SBR2	SEL2	SER	SER2	NWL2
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	9	12	12	10	12	12	12	11	12	12
Total Lost time (s)			4.0			4.0			4.0	4.0		
Lane Util. Factor			0.95			0.95			1.00	1.00		
Frpb, ped/bikes			0.99			0.96			1.00	0.89		
Flpb, ped/bikes			0.99			1.00			0.97	1.00		
Frt			0.99			0.96			1.00	0.85		
Flt Protected			1.00			1.00			0.95	1.00		
Satd. Flow (prot)			2404			2370			1302	1034		
Flt Permitted			0.92			0.95			0.50	1.00		
Satd. Flow (perm)			2232			2251			681	1034		
Volume (vph)	1	14	151	7	4	110	42	1	4	6	4	9
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.93	0.93	0.93	0.93	0.70	0.70	0.70	0.86
Adj. Flow (vph)	1	15	161	7	4	118	45	1	6	9	6	10
RTOR Reduction (vph)	0	0	0	0	0	1	0	0	0	4	0	0
Lane Group Flow (vph)	0	0	184	0	0	167	0	0	6	11	0	0
Confl. Peds. (#/hr)	55	41		83	83		55	41	45	34	55	34
Heavy Vehicles (%)	8%	8%	8%	8%	7%	7%	7%	7%	21%	21%	21%	3%
Parking (#/hr)			15			15						
Turn Type	Perm	Perm			Perm				D.Pm	custom		Perm
Protected Phases			1			1						
Permitted Phases	1	1			1				2	2		2
Actuated Green, G (s)			24.3			24.3			16.9	16.9		
Effective Green, g (s)			27.8			27.8			21.4	21.4		
Actuated g/C Ratio			0.35			0.35			0.27	0.27		
Clearance Time (s)			7.5			7.5			8.5	8.5		
Vehicle Extension (s)			3.0			3.0			3.0	3.0		
Lane Grp Cap (vph)			776			782			182	277		
v/s Ratio Prot												
v/s Ratio Perm			c0.08			0.07			0.01	0.01		
v/c Ratio			0.24			0.21			0.03	0.04		
Uniform Delay, d1			18.6			18.4			21.7	21.7		
Progression Factor			1.00			1.00			1.00	1.00		
Incremental Delay, d2			0.7			0.6			0.1	0.1		
Delay (s)			19.3			19.0			21.7	21.7		
Level of Service			B			B			C	C		
Approach Delay (s)			19.3			19.0						
Approach LOS			B			B						

Intersection Summary			
HCM Average Control Delay	24.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NWL	NWT	NWR	NWR2	SWL	SWT	SWR	SWR2
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	9	12	12	12	12	12	12
Total Lost time (s)		4.0				4.0		
Lane Util. Factor		0.95				1.00		
Frpb, ped/bikes		0.94				0.97		
Flpb, ped/bikes		0.94				1.00		
Frt		0.96				0.96		
Flt Protected		0.97				1.00		
Satd. Flow (prot)		2031				1531		
Flt Permitted		0.97				1.00		
Satd. Flow (perm)		2031				1531		
Volume (vph)	170	32	60	10	11	125	10	46
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.90	0.90	0.90	0.90
Adj. Flow (vph)	198	37	70	12	12	139	11	51
RTOR Reduction (vph)	0	4	0	0	0	15	0	0
Lane Group Flow (vph)	0	323	0	0	0	198	0	0
Confl. Peds. (#/hr)	55		45	83	34		41	45
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%
Parking (#/hr)		30						
Turn Type	Perm				Perm			
Protected Phases		2				3		
Permitted Phases	2				3			
Actuated Green, G (s)		16.9				15.3		
Effective Green, g (s)		21.4				18.8		
Actuated g/C Ratio		0.27				0.24		
Clearance Time (s)		8.5				7.5		
Vehicle Extension (s)		3.0				3.0		
Lane Grp Cap (vph)		543				360		
v/s Ratio Prot								
v/s Ratio Perm		0.16				0.13		
v/c Ratio		0.60				0.55		
Uniform Delay, d1		25.5				26.9		
Progression Factor		1.00				1.00		
Incremental Delay, d2		1.8				1.8		
Delay (s)		27.3				28.7		
Level of Service		C				C		
Approach Delay (s)		27.3				28.7		
Approach LOS		C				C		

Intersection Summary

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*TENW*
Agency/Co.	
Date Performed	*07/20/2010*
Analysis Time Period	*AM Peak Hour*

Site Information

Intersection	*Lenora St & 9th Ave*
Jurisdiction	
Analysis Year	*2014 Without Project*

Project ID *2030 8th Avenue Development*

East/West Street: *Lenora Street* | North/South Street: *9th Avenue*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume	0	19	9	30	152	0
%Thrus Left Lane	50			50		

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume	0	0	0	29	84	22
%Thrus Left Lane	50			50		

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	TR		LT				LTR	
PHF	0.70		0.85				0.92	
Flow Rate	39		213				145	
% Heavy Vehicles	11		3				6	
No. Lanes	1		1		0		1	
Geometry Group	1		1				1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.0		0.2				0.2	
Prop. Right-Turns	0.3		0.0				0.2	
Prop. Heavy Vehicle								
hLT-adj	0.2	0.2	0.2	0.2			0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6			-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7			1.7	1.7
hadj, computed	4.50		4.50				4.50	

Departure Headway and Service Time

hd, initial value	3.20		3.20				3.20	
x, initial	0.03		0.19				0.13	
hd, final value	4.50		4.50				4.50	
x, final value	0.05		0.26				0.18	
Move-up time, m	2.0		2.0				2.0	
Service Time	2.5		2.5		2.5		2.5	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity	289		463				395	
Delay	7.73		8.92				8.54	
LOS	A		A				A	
Approach: Delay	7.73		8.92				8.54	
LOS	A		A				A	
Intersection Delay	8.66							
Intersection LOS	A							

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Movement	NBL2	NBL	NBT	NBR	SBL2	SBT	SBR	SBR2	SEL2	SER	SER2	NWL2
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	9	12	12	10	12	12	12	11	12	12
Total Lost time (s)			4.0			4.0			4.0	4.0		
Lane Util. Factor			0.95			0.95			1.00	1.00		
Frpb, ped/bikes			0.99			0.95			1.00	0.83		
Flpb, ped/bikes			0.99			1.00			0.98	1.00		
Frt			0.99			0.97			1.00	0.85		
Flt Protected			1.00			1.00			0.95	1.00		
Satd. Flow (prot)			2463			2427			1367	1007		
Flt Permitted			0.93			0.95			0.33	1.00		
Satd. Flow (perm)			2287			2298			474	1007		
Volume (vph)	7	10	254	14	4	154	38	4	8	16	8	13
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.81	0.81	0.81	0.81	0.73	0.73	0.73	0.79
Adj. Flow (vph)	9	12	318	18	5	190	47	5	11	22	11	16
RTOR Reduction (vph)	0	0	0	0	0	2	0	0	0	8	0	0
Lane Group Flow (vph)	0	0	357	0	0	245	0	0	11	25	0	0
Confl. Peds. (#/hr)	69	79		93	93		69	79	55	85	69	85
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	16%	16%	16%	4%
Parking (#/hr)			15			15						
Turn Type	Perm	Perm			Perm				D.Pm	custom		Perm
Protected Phases			1			1						
Permitted Phases	1	1			1				2	2		2
Actuated Green, G (s)			22.5			22.5			18.6	18.6		
Effective Green, g (s)			26.0			26.0			23.1	23.1		
Actuated g/C Ratio			0.32			0.32			0.29	0.29		
Clearance Time (s)			7.5			7.5			8.5	8.5		
Vehicle Extension (s)			3.0			3.0			3.0	3.0		
Lane Grp Cap (vph)			743			747			137	291		
v/s Ratio Prot												
v/s Ratio Perm			c0.16			0.11			0.02	0.03		
v/c Ratio			0.48			0.33			0.08	0.09		
Uniform Delay, d1			21.6			20.4			20.7	20.8		
Progression Factor			1.00			1.00			1.00	1.00		
Incremental Delay, d2			2.2			1.2			0.3	0.1		
Delay (s)			23.8			21.6			21.0	20.9		
Level of Service			C			C			C	C		
Approach Delay (s)			23.8			21.6						
Approach LOS			C			C						

Intersection Summary			
HCM Average Control Delay	32.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NWL	NWT	NWR	NWR2	SWL	SWT	SWR	SWR2
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	9	12	12	12	12	12	12
Total Lost time (s)		4.0				4.0		
Lane Util. Factor		0.95				1.00		
Frpb, ped/bikes		0.93				0.93		
Flpb, ped/bikes		0.94				0.99		
Frt		0.96				0.94		
Flt Protected		0.98				1.00		
Satd. Flow (prot)		2034				1467		
Flt Permitted		0.98				1.00		
Satd. Flow (perm)		2034				1467		
Volume (vph)	134	160	103	8	11	127	19	81
Peak-hour factor, PHF	0.79	0.79	0.79	0.79	0.86	0.86	0.86	0.86
Adj. Flow (vph)	170	203	130	10	13	148	22	94
RTOR Reduction (vph)	0	1	0	0	0	23	0	0
Lane Group Flow (vph)	0	528	0	0	0	254	0	0
Confl. Peds. (#/hr)	69		55	93	85		79	55
Heavy Vehicles (%)	4%	4%	4%	4%	1%	1%	1%	1%
Parking (#/hr)		30						
Turn Type	Perm				Perm			
Protected Phases		2				3		
Permitted Phases	2				3			
Actuated Green, G (s)		18.6				15.4		
Effective Green, g (s)		23.1				18.9		
Actuated g/C Ratio		0.29				0.24		
Clearance Time (s)		8.5				7.5		
Vehicle Extension (s)		3.0				3.0		
Lane Grp Cap (vph)		587				347		
v/s Ratio Prot								
v/s Ratio Perm		0.26				0.17		
v/c Ratio		0.90				0.73		
Uniform Delay, d1		27.3				28.2		
Progression Factor		1.00				1.00		
Incremental Delay, d2		16.5				7.8		
Delay (s)		43.8				36.0		
Level of Service		D				D		
Approach Delay (s)		43.8				36.0		
Approach LOS		D				D		

Intersection Summary

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*TENW*
Agency/Co.	
Date Performed	*07/20/2010*
Analysis Time Period	*PM Peak Hour*

Site Information

Intersection	*Lenora St & 9th Ave*
Jurisdiction	
Analysis Year	*2014 Without Project*

Project ID *2030 8th Avenue Development*

East/West Street: *Lenora Street* | North/South Street: *9th Avenue*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume	0	33	10	10	165	0
%Thrus Left Lane	50			50		

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume	0	0	0	65	88	43
%Thrus Left Lane	50			50		

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	TR		LT				LTR	
PHF	0.70		0.90				0.91	
Flow Rate	61		194				214	
% Heavy Vehicles	5		1				2	
No. Lanes	1		1		0		1	
Geometry Group	1		1				1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.0		0.1				0.3	
Prop. Right-Turns	0.2		0.0				0.2	
Prop. Heavy Vehicle								
hLT-adj	0.2	0.2	0.2	0.2			0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6			-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7			1.7	1.7
hadj, computed	4.60		4.60				4.60	

Departure Headway and Service Time

hd, initial value	3.20		3.20				3.20	
x, initial	0.05		0.17				0.19	
hd, final value	4.60		4.60				4.60	
x, final value	0.08		0.24				0.27	
Move-up time, m	2.0		2.0				2.0	
Service Time	2.6		2.6		2.6		2.6	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity	311		444				464	
Delay	7.99		8.98				9.09	
LOS	A		A				A	
Approach: Delay	7.99		8.98				9.09	
LOS	A		A				A	
Intersection Delay	8.90							
Intersection LOS	A							

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2014 With–Project LOS Results

Weekday AM and PM Peak Hours

Movement	NBL2	NBL	NBT	NBR	SBL2	SBT	SBR	SBR2	SEL2	SER	SER2	NWL2
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	9	12	12	10	12	12	12	11	12	12
Total Lost time (s)			4.0			4.0			4.0	4.0		
Lane Util. Factor			0.95			0.95			1.00	1.00		
Frpb, ped/bikes			0.99			0.96			1.00	0.89		
Flpb, ped/bikes			0.99			1.00			0.97	1.00		
Frt			0.99			0.96			1.00	0.85		
Flt Protected			1.00			1.00			0.95	1.00		
Satd. Flow (prot)			2402			2370			1303	1035		
Flt Permitted			0.93			0.95			0.48	1.00		
Satd. Flow (perm)			2249			2251			663	1035		
Volume (vph)	1	10	151	8	4	110	42	1	4	6	4	12
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.93	0.93	0.93	0.93	0.70	0.70	0.70	0.86
Adj. Flow (vph)	1	11	161	9	4	118	45	1	6	9	6	14
RTOR Reduction (vph)	0	0	0	0	0	1	0	0	0	4	0	0
Lane Group Flow (vph)	0	0	182	0	0	167	0	0	6	11	0	0
Confl. Peds. (#/hr)	55	41		83	83		55	41	45	34	55	34
Heavy Vehicles (%)	8%	8%	8%	8%	7%	7%	7%	7%	21%	21%	21%	3%
Parking (#/hr)			15			15						
Turn Type	Perm	Perm			Perm				D.Pm	custom		Perm
Protected Phases			1			1						
Permitted Phases	1	1			1				2	2		2
Actuated Green, G (s)			24.1			24.1			17.1	17.1		
Effective Green, g (s)			27.6			27.6			21.6	21.6		
Actuated g/C Ratio			0.35			0.35			0.27	0.27		
Clearance Time (s)			7.5			7.5			8.5	8.5		
Vehicle Extension (s)			3.0			3.0			3.0	3.0		
Lane Grp Cap (vph)			776			777			179	279		
v/s Ratio Prot												
v/s Ratio Perm			c0.08			0.07			0.01	0.01		
v/c Ratio			0.23			0.22			0.03	0.04		
Uniform Delay, d1			18.7			18.5			21.5	21.5		
Progression Factor			1.00			1.00			1.00	1.00		
Incremental Delay, d2			0.7			0.6			0.1	0.1		
Delay (s)			19.4			19.2			21.6	21.6		
Level of Service			B			B			C	C		
Approach Delay (s)			19.4			19.2						
Approach LOS			B			B						

Intersection Summary			
HCM Average Control Delay	24.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	68.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NWL	NWT	NWR	NWR2	SWL	SWT	SWR	SWR2
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	9	12	12	12	12	12	12
Total Lost time (s)		4.0				4.0		
Lane Util. Factor		0.95				1.00		
Frpb, ped/bikes		0.93				0.96		
Flpb, ped/bikes		0.94				1.00		
Frt		0.96				0.96		
Flt Protected		0.97				1.00		
Satd. Flow (prot)		2025				1522		
Flt Permitted		0.97				1.00		
Satd. Flow (perm)		2025				1522		
Volume (vph)	173	32	67	10	15	127	10	53
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.90	0.90	0.90	0.90
Adj. Flow (vph)	201	37	78	12	17	141	11	59
RTOR Reduction (vph)	0	4	0	0	0	16	0	0
Lane Group Flow (vph)	0	338	0	0	0	212	0	0
Confl. Peds. (#/hr)	55		45	83	34		41	45
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%
Parking (#/hr)		30						
Turn Type	Perm				Perm			
Protected Phases		2				3		
Permitted Phases	2				3			
Actuated Green, G (s)		17.1				15.3		
Effective Green, g (s)		21.6				18.8		
Actuated g/C Ratio		0.27				0.24		
Clearance Time (s)		8.5				7.5		
Vehicle Extension (s)		3.0				3.0		
Lane Grp Cap (vph)		547				358		
v/s Ratio Prot								
v/s Ratio Perm		0.17				0.14		
v/c Ratio		0.62				0.59		
Uniform Delay, d1		25.6				27.2		
Progression Factor		1.00				1.00		
Incremental Delay, d2		2.1				2.6		
Delay (s)		27.7				29.8		
Level of Service		C				C		
Approach Delay (s)		27.7				29.8		
Approach LOS		C				C		

Intersection Summary

ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst	*TENW*	Intersection	*Lenora St & 9th Ave*
Agency/Co.		Jurisdiction	
Date Performed	*07/20/2010*	Analysis Year	*2014 With Project*
Analysis Time Period	*AM Peak Hour*		

Project ID *2030 8th Avenue Development*

East/West Street: *Lenora Street* | North/South Street: *9th Avenue*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume	0	30	19	30	146	0
%Thrus Left Lane	50			50		

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume	0	0	0	29	84	22
%Thrus Left Lane	50			50		

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	TR		LT				LTR	
PHF	0.70		0.85				0.92	
Flow Rate	69		206				145	
% Heavy Vehicles	11		3				6	
No. Lanes	1		1		0		1	
Geometry Group	1		1				1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.0		0.2				0.2	
Prop. Right-Turns	0.4		0.0				0.2	
Prop. Heavy Vehicle								
hLT-adj	0.2	0.2	0.2	0.2			0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6			-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7			1.7	1.7
hadj, computed	4.44		4.44				4.44	

Departure Headway and Service Time

hd, initial value	3.20		3.20				3.20	
x, initial	0.06		0.18				0.13	
hd, final value	4.44		4.44				4.44	
x, final value	0.09		0.25				0.18	
Move-up time, m	2.0		2.0				2.0	
Service Time	2.4		2.4		2.4		2.4	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity	319		456				395	
Delay	7.86		8.92				8.62	
LOS	A		A				A	
Approach: Delay	7.86		8.92				8.62	
LOS	A		A				A	
Intersection Delay	8.64							
Intersection LOS	A							

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HCM Signalized Intersection Capacity Analysis
1: Westlake Ave & 8th Ave

7/20/2010

Movement	NBL2	NBL	NBT	NBR	SBL2	SBT	SBR	SBR2	SEL2	SER	SER2	NWL2
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	9	12	12	10	12	12	12	11	12	12
Total Lost time (s)			4.0			4.0			4.0	4.0		
Lane Util. Factor			0.95			0.95			1.00	1.00		
Frpb, ped/bikes			0.98			0.96			1.00	0.83		
Flpb, ped/bikes			0.99			0.99			0.98	1.00		
Frt			0.99			0.97			1.00	0.85		
Flt Protected			1.00			1.00			0.95	1.00		
Satd. Flow (prot)			2449			2415			1368	1007		
Flt Permitted			0.93			0.91			0.33	1.00		
Satd. Flow (perm)			2273			2202			468	1007		
Volume (vph)	7	10	254	19	16	154	38	4	8	16	8	15
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.81	0.81	0.81	0.81	0.73	0.73	0.73	0.79
Adj. Flow (vph)	9	12	318	24	20	190	47	5	11	22	11	19
RTOR Reduction (vph)	0	0	0	0	0	2	0	0	0	8	0	0
Lane Group Flow (vph)	0	0	363	0	0	260	0	0	11	25	0	0
Confl. Peds. (#/hr)	69	79		93	93		69	79	55	85	69	85
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	16%	16%	16%	4%
Parking (#/hr)			15			15						
Turn Type	Perm	Perm			Perm				D.Pm	custom		Perm
Protected Phases			1			1						
Permitted Phases	1	1			1				2	2		2
Actuated Green, G (s)			22.5			22.5			18.6	18.6		
Effective Green, g (s)			26.0			26.0			23.1	23.1		
Actuated g/C Ratio			0.32			0.32			0.29	0.29		
Clearance Time (s)			7.5			7.5			8.5	8.5		
Vehicle Extension (s)			3.0			3.0			3.0	3.0		
Lane Grp Cap (vph)			739			716			135	291		
v/s Ratio Prot												
v/s Ratio Perm			c0.16			0.12			0.02	0.03		
v/c Ratio			0.49			0.36			0.08	0.09		
Uniform Delay, d1			21.7			20.7			20.7	20.8		
Progression Factor			1.00			1.00			1.00	1.00		
Incremental Delay, d2			2.3			1.4			0.3	0.1		
Delay (s)			24.0			22.1			21.0	20.9		
Level of Service			C			C			C	C		
Approach Delay (s)			24.0			22.1						
Approach LOS			C			C						

Intersection Summary			
HCM Average Control Delay	33.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NWL	NWT	NWR	NWR2	SWL	SWT	SWR	SWR2
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	9	12	12	12	12	12	12
Total Lost time (s)		4.0				4.0		
Lane Util. Factor		0.95				1.00		
Frpb, ped/bikes		0.93				0.92		
Flpb, ped/bikes		0.94				0.99		
Frt		0.96				0.94		
Flt Protected		0.98				1.00		
Satd. Flow (prot)		2029				1464		
Flt Permitted		0.98				1.00		
Satd. Flow (perm)		2029				1464		
Volume (vph)	135	159	105	8	13	128	19	84
Peak-hour factor, PHF	0.79	0.79	0.79	0.79	0.86	0.86	0.86	0.86
Adj. Flow (vph)	171	201	133	10	15	149	22	98
RTOR Reduction (vph)	0	1	0	0	0	24	0	0
Lane Group Flow (vph)	0	533	0	0	0	260	0	0
Confl. Peds. (#/hr)	69		55	93	85		79	55
Heavy Vehicles (%)	4%	4%	4%	4%	1%	1%	1%	1%
Parking (#/hr)		30						
Turn Type	Perm				Perm			
Protected Phases		2				3		
Permitted Phases	2				3			
Actuated Green, G (s)		18.6				15.4		
Effective Green, g (s)		23.1				18.9		
Actuated g/C Ratio		0.29				0.24		
Clearance Time (s)		8.5				7.5		
Vehicle Extension (s)		3.0				3.0		
Lane Grp Cap (vph)		586				346		
v/s Ratio Prot								
v/s Ratio Perm		0.26				0.18		
v/c Ratio		0.91				0.75		
Uniform Delay, d1		27.4				28.4		
Progression Factor		1.00				1.00		
Incremental Delay, d2		17.9				8.9		
Delay (s)		45.3				37.3		
Level of Service		D				D		
Approach Delay (s)		45.3				37.3		
Approach LOS		D				D		

Intersection Summary

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*TENW*
Agency/Co.	
Date Performed	*07/20/2010*
Analysis Time Period	*PM Peak Hour*

Site Information

Intersection	*Lenora St & 9th Ave*
Jurisdiction	
Analysis Year	*2014 With Project*

Project ID *2030 8th Avenue Development*

East/West Street: *Lenora Street*

North/South Street: *9th Avenue*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume	0	38	6	10	176	0
%Thrus Left Lane	50			50		

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume	0	0	0	65	88	43
%Thrus Left Lane	50			50		

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	TR		LT				LTR	
PHF	0.70		0.90				0.91	
Flow Rate	62		206				214	
% Heavy Vehicles	5		1				2	
No. Lanes	1		1		0		1	
Geometry Group	1		1				1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.0		0.1				0.3	
Prop. Right-Turns	0.1		0.0				0.2	
Prop. Heavy Vehicle								
hLT-adj	0.2	0.2	0.2	0.2			0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6			-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7			1.7	1.7
hadj, computed	4.68		4.68				4.68	

Departure Headway and Service Time

hd, initial value	3.20		3.20				3.20	
x, initial	0.06		0.18				0.19	
hd, final value	4.68		4.68				4.68	
x, final value	0.08		0.26				0.27	
Move-up time, m	2.0		2.0				2.0	
Service Time	2.7		2.7		2.7		2.7	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity	312		456				464	
Delay	8.09		9.11				9.15	
LOS	A		A				A	
Approach: Delay	8.09		9.11				9.15	
LOS	A		A				A	
Intersection Delay	8.99							
Intersection LOS	A							

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*TENW*	Intersection	*Lenora St & Private Easement*
Agency/Co.		Jurisdiction	
Date Performed	*07/20/2010*	Analysis Year	*2014 With Project*
Analysis Time Period	*AM Peak Hour*		

Project Description *2030 8th Avenue Development*	
East/West Street: *Lenora Street*	North/South Street:
Intersection Orientation: *East-West*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*0*	*28*	*4*	*3*	*165*	*0*
Peak-hour factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate (veh/h)	*0*	*30*	*4*	*3*	*179*	*0*
Proportion of heavy vehicles, P_{HV}	*0*	--	--	*2*	--	--
Median type	*Undivided*					
RT Channelized?			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*1*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*13*	*0*	*21*	*0*	*0*	*0*
Peak-hour factor, PHF	*0.92*	*1.00*	*0.92*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate (veh/h)	*14*	*0*	*22*	*0*	*0*	*0*
Proportion of heavy vehicles, P_{HV}	*2*	*0*	*2*	*0*	*0*	*0*
Percent grade (%)		*0*			*0*	
Flared approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized?			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
Volume, v (vph)		*3*		*36*				
Capacity, c_m (vph)		*1578*		*916*				
v/c ratio		*0.00*		*0.04*				
Queue length (95%)		*0.01*		*0.12*				
Control Delay (s/veh)		*7.3*		*9.1*				
LOS		*A*		*A*				
Approach delay (s/veh)	--	--	*9.1*					
Approach LOS	--	--	*A*					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*TENW*	Intersection	*8th Ave Dwy & 8th Ave*
Agency/Co.		Jurisdiction	
Date Performed	*07/20/2010*	Analysis Year	*2014 With Project*
Analysis Time Period	*AM Peak Hour*		
Project Description	*2030 8th Avenue Development*		
East/West Street:	*8th Avenue Driveway*	North/South Street:	*8th Avenue*
Intersection Orientation:	*North-South*	Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*278*	*4*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate, HFR	*0*	*302*	*4*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*2*	*0*	*0*	*0*	*0*
Configuration		*T*	*TR*			
Upstream Signal		*0*			*1*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*13*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.92*	*1.00*	*0.92*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR	*0*	*0*	*14*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*0*
Configuration			*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration					*R*			
v (vph)					*14*			
C (m) (vph)					*893*			
v/c					*0.02*			
95% queue length					*0.05*			
Control Delay					*9.1*			
LOS					*A*			
Approach Delay	--	--	*9.1*					
Approach LOS	--	--	*A*					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*TENW*	Intersection	*Lenora St & Private Easement*
Agency/Co.		Jurisdiction	
Date Performed	*07/20/2010*	Analysis Year	*2014 With Project*
Analysis Time Period	*PM Peak Hour*		

Project Description	*2030 8th Avenue Development*
East/West Street: *Lenora Street*	North/South Street: *Private Easement*
Intersection Orientation: *East-West*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*0*	*28*	*4*	*3*	*165*	*0*
Peak-hour factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate (veh/h)	*0*	*30*	*4*	*3*	*179*	*0*
Proportion of heavy vehicles, P_{HV}	*0*	--	--	*2*	--	--
Median type	*Undivided*					
RT Channelized?			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*1*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*13*	*0*	*21*	*0*	*0*	*0*
Peak-hour factor, PHF	*0.92*	*1.00*	*0.92*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate (veh/h)	*14*	*0*	*22*	*0*	*0*	*0*
Proportion of heavy vehicles, P_{HV}	*2*	*0*	*2*	*0*	*0*	*0*
Percent grade (%)		*0*			*0*	
Flared approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized?			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
Volume, v (vph)		*3*		*36*				
Capacity, c_m (vph)		*1578*		*916*				
v/c ratio		*0.00*		*0.04*				
Queue length (95%)		*0.01*		*0.12*				
Control Delay (s/veh)		*7.3*		*9.1*				
LOS		*A*		*A*				
Approach delay (s/veh)	--	--	*9.1*					
Approach LOS	--	--	*A*					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*TENW*	Intersection	*8th Ave Dwy & 8th Ave*
Agency/Co.		Jurisdiction	
Date Performed	*07/20/2010*	Analysis Year	*2014 With Project*
Analysis Time Period	*PM Peak Hour*		
Project Description	*2030 8th Avenue Development*		
East/West Street:	*8th Avenue Driveway*	North/South Street:	*8th Avenue*
Intersection Orientation:	*North-South*	Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*415*	*14*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate, HFR	*0*	*451*	*15*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*0*	*0*
Configuration			*TR*			
Upstream Signal		*0*			*1*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*6*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.92*	*1.00*	*0.92*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR	*0*	*0*	*6*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*0*
Configuration			*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration					*R*			
v (vph)					*6*			
C (m) (vph)					*603*			
v/c					*0.01*			
95% queue length					*0.03*			
Control Delay					*11.0*			
LOS					*B*			
Approach Delay	--	--	*11.0*					
Approach LOS	--	--	*B*					

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Appendix B:

Detailed Trip Generation Calculations

2030 8th Avenue Development
Based on data provided by City of Seattle 6-11-10
TENW Project No. 4381

2008 Mode Split

Home

		HOV					
zone	SOV	2	3+	Transit	Bike	Walk	Total
271	229	127	63	159	20	481	1,079

	HOV				
SOV	**2**	**3+**	**Transit**	**Bike**	**Walk**
21%	**12%**	**6%**	**15%**	**2%**	**44%**

Non-Work

		HOV					
zone	SOV	2	3+	Transit	Bike	Walk	Total
271	545	458	244	199	15	680	2,140

	HOV				
SOV	**2**	**3+**	**Transit**	**Bike**	**Walk**
26%	**21%**	**11%**	**9%**	**1%**	**32%**

Work

		HOV					
zone	SOV	2	3+	Transit	Bike	Walk	Total
271	521	82	18	326	29	156	1,132

	HOV				
SOV	**2**	**3+**	**Transit**	**Bike**	**Walk**
46%	**7%**	**2%**	**29%**	**2%**	**14%**

2030 8th Avenue Development
Trip Generation Estimate
TENW Project No. 4381

2030 8th Avenue Development

AM Peak Hour Trip Generation Estimate

Land Use	Size (sf)	ITE LUC No.[1]	ITE Trip Rate	ITE Auto Trips	AVO[2]	Person Trips	Mode-Split [3] Non-Auto	SOV	Carpool (2 person)	Carpool (3 person)	Total Auto Trips	Vehicle Trip Generation Enter	Exit
AM PEAK HOUR													
Proposed Uses:													
Apartment	350 units	220	equation	175	1.13	198	61%	21%	12%	6%	57	11	46
Internal Trips [4]											0	0	0
											57	11	46
Specialty Retail [5]	4,000 sf	814	0.73	3	1.00	3	42%	26%	21%	11%	1	0	1
Internal Trips [4]											0	0	0
Pass-by [4]	*34%*										0	0	0
											1	0	1
										Gross Trips	58	11	47
										Internal Trips	0	0	0
										Pass-By Trips	0	0	0
										Proposed Net Trips (Gross - Internal - Pass-by)	58	11	47
Less Existing Uses:													
Automobile Care	3,000 sf	942	2.94	9	1.00	9	No Mode-Split Adjustments				9	6	3
Furniture Store	6,000 sf	890	0.17	1	1.00	1	42%	26%	21%	11%	1	1	0
Office	12,000 sf	710	1.55	19	1.13	21	45%	46%	7%	2%	11	10	1
										Net Existing Trips	21	17	4
										NET NEW AM PEAK HOUR TRIP GENERATION	**37**	**-6**	**43**

Notes:
1. Institute of Transportation Engineers (ITE) Trip Generation manual, 8th Edition, 2008 Land Use Code.
2. AVO = Average Vehicle Occupancy. Based on local rates.
3. Mode-split data is based on information provided by the City of Seattle for TAZ 271 on 6/11/10.
4. Pass-by and internal trips determined based on methodology included in the ITE Trip Generation Handbook, 2nd edition.
5. AM trip rate based on PM rate for Specialty Retail (LUC 814) factored by ratio of AM to PM trip rate for Shopping Center (LUC 820). 0.73 = 2.71 (1.00/3.73).

Analyst CFC
Date 6/4/2010

Multi-Use Development Trip Generation and Internal Capture Summary

Project Name 2030 8th Avenue Development
Time Period AM Peak Hour of Adj. Street

LAND USE A 2 Retail

ITE LU Code 814
Size 4,000 sf

	Total	Internal	External
Enter	0	0	0
Exit	1	0	1
Total	1	0	1
%	100%	0%	100%

Enter from External: 0
Exit to External: 1

LAND USE CODES
1 OFFICE
2 RETAIL
3 RESIDENTIAL

	Demand	Balanced
A → B	12% 0	0
B → A	31% 3	0
A → C	20% 0	0
C → A	20% 0	0
B → C	9% 0	0
C → B	0% 0	0
B → A	53% 24	0
C → B	9% 0	0
C → A	20% 0	0
A → C	20% 0	0

LAND USE B 3 Residential

ITE LU Code 220
Size 350 Units

	Total	Internal	External
Enter	11	0	11
Exit	46	0	46
Total	57	0	57
%	100%	0%	100%

Enter from External: 11
Exit to External: 46

LAND USE C 2 Retail

ITE LU Code
Size

	Total	Internal	External
Enter	0	0	0
Exit	0	0	0
Total	0	0	0
%	100%	#DIV/0!	#DIV/0!

Enter from External: 0
Exit to External: 0

Net External Trips for Multi-Use Development

	LAND USE A	LAND USE B	LAND USE C	TOTAL
Enter	0	11	0	11
Exit	1	46	0	47
Total	1	57	0	58
Single-Use Trip Gen. Est.	1	57	0	58

INTERNAL CAPTURE
0%

2030 8th Avenue Development
Trip Generation Estimate
TENW Project No. 4381

2030 8th Avenue Development

PM Peak Hour Trip Generation Estimate

Land Use	Size (sf)	ITE LUC No.[1]	ITE Trip Rate	ITE Auto Trips	AVO[2]	Person Trips	Mode-Split [3] Non-Auto	SOV	Carpool (2 person)	Carpool (3 person)	Total Auto Trips	Vehicle Trip Generation Enter	Exit
PM PEAK HOUR													
Proposed Uses:													
Apartment	350 units	220	equation	210	1.13	237	61%	21%	12%	6%	69	45	24
Internal Trips [4]											0	0	0
											69	45	24
Specialty Retail	4,000 sf	814	2.71	11	1.00	11	42%	26%	21%	11%	4	2	2
Internal Trips [4]											0	0	0
Pass-by [4]	*34%*										-1	-1	0
											3	1	2
										Gross Trips	73	47	26
										Internal Trips	0	0	0
										Pass-By Trips	-1	-1	0
							Proposed Net Trips (Gross - Internal - Pass-by)				72	46	26
Less Existing Uses:													
Automobile Care	3,000 sf	942	3.38	10	1.00	10	No Mode-Split Adjustments				10	5	5
Furniture Store	6,000 sf	890	0.45	3	1.00	3	42%	26%	21%	11%	1	0	1
Office	12,000 sf	710	1.49	18	1.13	20	45%	46%	7%	2%	10	2	8
										Net Existing Trips	21	7	14
										NET NEW PM PEAK HOUR TRIP GENERATION	**51**	**39**	**12**

Notes:
1. Institute of Transportation Engineers (ITE) Trip Generation manual, 8th Edition, 2008 Land Use Code.
2. AVO = Average Vehicle Occupancy. Based on local rates.
3. Mode-split data is based on information provided by the City of Seattle for TAZ 271 on 6/11/10.
4. Pass-by and internal trips determined based on methodology included in the ITE Trip Generation Handbook, 2nd edition.

Appendix C:

Detailed Parking Demand Calculations

2030 8th Avenue Development
Parking Assessment - Weekday Parking Demand

Weekday Parking Demand Estimate

Supply = 350 stalls

Use	Apartment (LUC 222) [2]		Retail (LUC 820)		Total Site	
Size	Units	350	Square Feet	4,000		
Peak Demand Rate [1]		0.45		2.65		
Peak Parking Demand		158		11		
Start Time	Hourly Variation [3]	Hourly Parking Demand	Hourly Variation [3]	Hourly Parking Demand	Total Hourly Parking Demand	Deficiency or Excess
6:00 AM	91%	144	3%	0	144	206
7:00 AM	83%	131	5%	1	132	218
8:00 AM	79%	125	18%	2	127	223
9:00 AM	75%	119	38%	4	123	227
10:00 AM	70%	111	53%	6	117	233
11:00 AM	65%	103	86%	9	112	238
12:00 PM	61%	96	100%	11	107	243
1:00 PM	65%	103	98%	11	114	236
2:00 PM	65%	103	91%	10	113	237
3:00 PM	65%	103	86%	9	112	238
4:00 PM	70%	111	81%	9	120	230
5:00 PM	81%	128	57%	6	134	216
6:00 PM	87%	137	69%	8	145	205
7:00 PM	97%	153	82%	9	162	188
8:00 PM	98%	155	70%	8	163	187
9:00 PM	99%	156	42%	5	161	189
10:00 PM	100%	158	10%	1	159	191
11:00 PM	98%	155	10%	1	156	194
12:00 AM	95%	150	0%	0	150	200

Notes:

1. Per ITE's *Parking Generation* , 3rd Edition, 2004.

2. Parking demand rate for LUC 222 (High-Rise Apartment) based on average of parking demand rates for two study sites located in downtown CBDs.

3. The hourly variation in peak parking utilization based on studies for similar uses documented in ITE *Parking Generation* , 3rd Edition, 2004. Where ITE data was not available, the Urban Land Institute's (ULI) Shared Parking 2nd Edition, 2005