OREGON CONVENTION CENTER HOTEL DEVELOPMENT

BUILD OPTIONS TRAFFIC ANALYSIS FINAL REPORT

Prepared for:

City of Portland
Office of Transportation

Prepared by:

David Evans and Associates, Inc.

December 2003

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SUMMARY

This analysis is part of the study for an 800-room Oregon Convention Center Headquarters Hotel site that potentially would be located south of NE Holladay Street, and between NE Martin Luther King, Jr. Boulevard (MLK) and NE Grand Avenue. This technical memorandum discusses traffic impacts and traffic operations for the MLK and Grand Avenue couplet, between NE Broadway and E Burnside Street. Of special review and analysis was the area adjacent to the Oregon Convention Center, between NE Holladay Street and NE Lloyd Boulevard.

At issue is the ability to maximize the transportation connections to the hotel site, maintain the integrity of the transportation system, and determine if there are alternatives to make the couplet less intimidating for pedestrians, especially the crossing of MLK. Pedestrian and on-street options/opportunities are discussed and potential improvements are recommended.

The majority of this report documents the impacts to the street system in year 2008 (anticipated time a hotel would be operating) under the traffic lane/traffic signal operations options as noted below:

- A four-lane section along MLK with three additional traffic signals: at NE Pacific, Hoyt, and Irving Streets, and additional on-street parking on the eastside of MLK between NE Holladay Street and NE Lloyd Boulevard.

- A three-lane section along MLK (from south of Weidler Street to Oregon Street) was modeled, but after discussions with PDOT staff, this option was discarded. The results of the Level of Service (LOS) and Volume to Capacity (V/C) ratio are shown in the Appendix.

The future year 2008 traffic volumes were determined by using METRO's 2020 traffic volumes and interpolating for 2008, and adding trip generation estimates for a convention center hotel on top of these numbers. Using the Synchro/SimTraffic Model, the options were then modeled to determine the LOS and V/C ratio at the signalized intersections.

PEDESTRIAN/PARKING OPTIONS

As stated, the key issue is making the access to the Oregon Convention Center, and indeed this entire area, more accessible to transit and pedestrian activity while still maintaining the integrity of the transportation system. The Oregon Convention Hotel site is within the Central City District, and the classifications for the MLK/NE Grand Avenue couple are numerous and at times seem to conflict. MLK and NE Grand Avenue are classified as Major City Traffic Streets, Major Transit Priority, Minor Truck Street, Major Emergency Response, Pedestrian Street/Walkways and Bikeways, and both are designated as Regional Main Streets.

DEA reviewed a range of possible pedestrian amenities and on-street parking possibilities to determine potential improvements to the pedestrian environment and pedestrian connections:

- curb extensions
- median refuge areas
- lane reductions
- additional traffic signals
- on-street parking areas

The body of the report discusses these options in greater detail. There are options that appear reasonable to build that will enhance the pedestrian environment while still maintaining a reasonable transportation LOS. **Sketch A** shows the existing pedestrian crossing and on-street parking location situation. **Sketch B** indicates potential sidewalk modifications, on-street parking, curb extensions, and traffic signal installations that could significantly enhance the pedestrian safety and environment in this area.

SYNCHO/SIMTRAFFIC MODEL

Options Modeled

- Build Scenario 1: Analysis of installing additional traffic signals along MLK between NE Holladay Street and NE Lloyd Boulevard. This option includes traffic generated from an 800-room hotel in year 2008 (the estimated time for a hotel to be designed and operating). The new signal locations include:
    - NE Pacific Street
    - NE Irving Street
    - NE Hoyt Street
- Build Scenario 2: Analyzed reducing MLK from four travel lanes to three travel lanes on a section of this arterial in the study area (south of NE Weidler Street to NE Oregon Street). This analysis also included an 800-room hotel in operation in the year 2008.

Model Results

- Build Scenario 1: Adding signals at NE Pacific Street, NE Hoyt Street, and NE Irving Street is feasible. There is some queuing back from the new signals to the adjacent signals, but the model indicates this occurs to a minor extent and does not cause undo issues at the signalized locations. The model indicates that to the south of the proposed Convention Center Hotel site, MLK and NE Grand Avenue have serious capacity constraints in the E. Burnside Street/NE Couch Street area, and that NE Lloyd Boulevard has significant queuing under the existing and build option traffic conditions.

- Build Scenario 2: The modeling of this scenario indicated that three lanes could operate on MLK (north of NE Oregon Street) during a typical PM peak hour. However, the V/C ratio increases significantly at some intersections and caution is necessary in assuming that a three-lane section along MLK is satisfactory, as this scenario leaves little capacity for peak event traffic. Observations indicate that events at the Convention Center and Rose Garden significantly increase congestion due to heavy pedestrian activity, and especially queuing for parking that effect flow and capacity in the curb lanes of MLK. Finally, the analysis was for 2008 (not 2020 or beyond) and does not consider the high potential for additional high-density development in the immediate area.

MOVE THE EXISTING MAX LIGHT RAIL (LRT) STATION ONE BLOCK EAST BETWEEN MLK AND GRAND AVENUE

The question of moving the existing LRT station on Holladay Street one block east was not modeled as part of this study. The Synchro/SimTraffic model does not have the capability of analyzing the impacts of the LRT signal pre-emption on signal operation. However, in discussions among DEA and PDOT staff, it is felt that the LRT operation with a station relocated one block to the east would have little additional impacts to the signal system operation along MLK and NE Grand Avenue couplet. No additional impacts above the impacts already experienced by the current LRT preemption along NE Holladay Street at MLK and NE Grand Avenue. What is not as clear is the impacts of additional pedestrians having to cross MLK from the relocated station to the Convention Center site.

CONCLUSIONS

- The pedestrian environment can be significantly improved by reducing the pedestrian crossing distance with the installation of curb extensions and by "buffering" the pedestrian areas with additional on-street parking.

- These improvements can be accomplished while still maintaining the vehicular and transit operations at a reasonable LOS at the key intersections adjacent to the Oregon Convention Center Hotel site during the PM peak hours of traffic operation.

- A future year scenario was modeled that included a new 800 room convention center hotel, the current four lanes of traffic with curb extensions and on-street parking, and with additional signals along MLK (at Pacific, Hoyt, Irving). This scenario would function at an acceptable LOS at the key intersections adjacent to the Oregon Convention Center during the PM peak hour in year 2008. The NE MLK Boulevard/NE Grand Avenue couplet is breaking down south of the hotel site, in the E Burnside Street/NE Couch Street vicinity, under existing and future year PM peak hour volumes.

- A three-lane section along NE MLK Boulevard (north of NE Oregon Street) could operate at an acceptable LOS during a typical PM peak hour, but this scenario did not include event conditions at the Convention Center and Rose Garden facilities. This option is shown in the Appendix but was not discussed as an option in the report.

The analysis of existing conditions is contained in a separate report. **Table 1** is a summary of the LOS, the V/C ratio, and the 95% queue length for the key intersections comparing existing conditions (year 2003) for Build Scenario 1 (year 2008).

Table 1. Summary of Existing Conditions & Build Alternative 1

	Existing 2003			Scenario 1– Year 2008 With Hotel, and Additional signals		
Intersection	**INTERSECTION LOS**	**V/C Ratio**	**95% Queue**	**Intersection LOS**	**V/C Ratio**	**95% Queue**
1 - MLK @ Broadway	**B**	0.64		**B**	0.72	
2 - MLK @ Weidler	**B**	0.66		**D**	0.78	
Weidler Thru	B		450’	D		1100’
Weidler Right	B		300’	E		1175’
3 - MLK @ Clackamas	**A**	0.42		**A**	0.47	
4 - MLK @ Multnomah	**B**	0.66		**C**	0.74	
5 - MLK @ Holladay	**A**	0.56		**B**	0.62	
31 - MLK @ Pacific	-	-		**A**	0.79	225’
6 - MLK @ Oregon	**A**	0.47		**B**	0.52	225’
32 - MLK @ Irving	-	-		**B**	0.53	250’
33 - MLK @ Hoyt	-	-		**B**	0.53	275’
7 - MLK @ Lloyd	**D**	0.99		**F****	1.09	
Sbd MLK	B		350’	B		275’
Ebd Lloyd/Thru	F		1000’	F		>1200’
Ebd Lloyd/Right	F		1000’	F		>1200’
8 - MLK @ Everett *MLK Queue from Couch	**B***			**D***		
9 - MLK @ Couch	**F**	0.73		**F**	0.78	
MLK Sbd	F		925’	F		950’
Couch Ebd	D		300’	D		275’
10 - MLK @ Burnside	**F**	0.88		**F**	0.96	
MLK Sbd	F			F		
11 - Grand @ Broadway	**B**	0.70		**B**	0.79	
12 - Grand @ Weidler	**B**	0.76		**C**	0.84	
13 - Grand @ Halsey	**A**	0.53		**C**	0.59	
14 - Grand @ Clackamas	**A**	0.51		**B**	0.60	
15 - Grand @ Multnomah	**B**	0.75		**C**	0.84	
16 - Grand @ Holladay	**A**	0.43		**B**	0.50	
17 - Grand @ Oregon	**A**	0.47		**B**	0.54	
18 - Grand @ Lloyd	**B**	0.76		**B**	0.86	
19 - Grand @ Everett	**B**	0.60		**B**	0.67	
20 - Grand @ Couch	**A**	0.78		**A**	0.85	
21 - Grand @ Burnside	**C**	0.82		**D**	0.90	
Grand Nbd Thru/Lt	Approach D		700’	Approach F		1500’
Grand Nbd 2 Cntr			625’			1425’
Grand Nbd Thru/Rt			400’			875’

**The queue on MLK, back from the Burnside/Couch intersections goes beyond Everett Street and impacts the MLK @ Everett intersection*
*** The signal timing at NE MLK Boulevard/Lloyd Boulevard is timed in favor of southbound MLK Boulevard, while Eastbound Lloyd Boulevard queues back at times to the Steel Bridge. The purpose of this timing is to queue the traffic where it will have fewer impacts to the overall system (rather than queuing from the Everett Street/I-84 ramp meters back through MLK Boulevard).*

INTRODUCTION

This report presents traffic analysis of year 2008 PM peak hour traffic operations in the vicinity of the proposed Oregon Convention Center Headquarters Hotel site under future design scenarios. The proposed hotel site is located adjacent to the Oregon Convention Center between NE Oregon Street and NE Holladay Street. **Figure 1** illustrates the study area and location of the intersections analyzed. This report outlines the build condition traffic operations only. Traffic analysis of the existing conditions around the hotel site is discussed in a separate report.

POTENTIAL ENHANCEMENTS TO THE PEDESTRIAN ENVIRONMENT

Pedestrian Improvements

Today the MLK/Grand Avenue couplet is a barrier to a safe and effective pedestrian network that will enhance pedestrian activity. **Sketch A** shows the existing lane arrangement, parking and streetscape for the MLK/Grand Avenue couplet, between NE Holladay Street and NE Lloyd Boulevard. The Central City District Transportation Element classifies the study area as a Pedestrian District. Pedestrian and on-street options/opportunities are discussed and potential improvements are recommended that reflect the following issues:

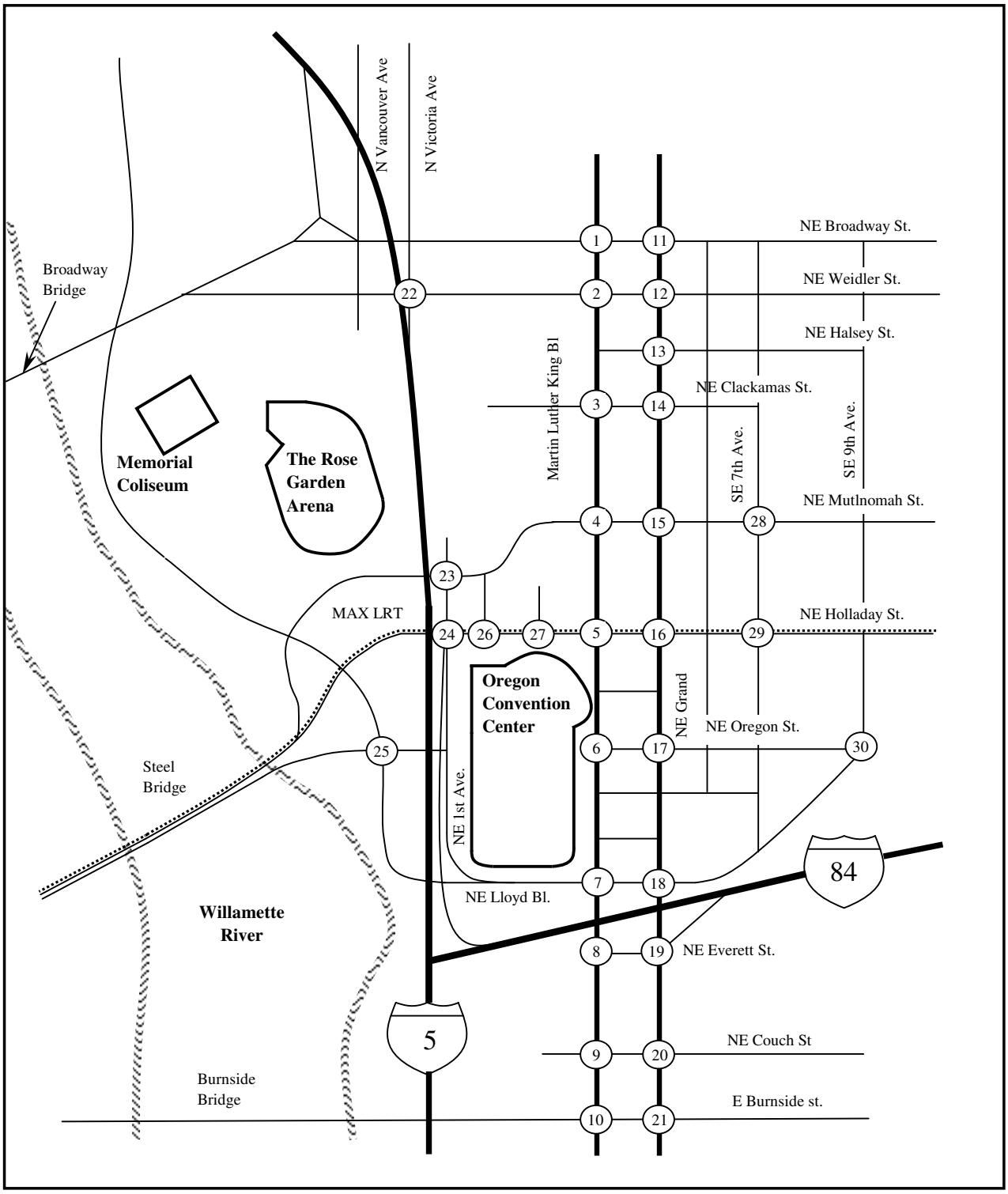
- How to make the MLK/Grand Avenue couplet more pedestrian friendly and spur adjacent development;
- How to improve the connection between the proposed new Convention Center Headquarters Hotel site on the east side of MLK to the Oregon Convention Center site on the west side of MLK;
- How to tie the Convention Center Hotel site across NE Grand Avenue to the east to the Lloyd Center area.

According to the Central City District Transportation Element, the MLK/Grand Avenue couplet has several transportation classifications. These classifications are noted below in **Table 2** and at times the classifications may seem to clash, but are a guide for future design. A key issue is how to meet the Regional Main Street design and still maintain the operation of the MLK/Grand couplet as a Major City Traffic Street and Major Transit Priority Street, Major Emergency Response Route and Minor Truck Street.

Table 2. MLK/Grand Avenue Transportation Classifications

	Traffic Classification	Transit Classification	* Pedestrian Classification	Bicycle Classification	Freight Classification	Emergency Response	Street Design
NE MLK Jr. Boulevard	Major City Traffic Street	Major Transit Priority	City Walkway	City Bikeway	Minor Truck Street	Major Emergency Response	Regional Main Street
NE Grand Avenue	Major City Traffic Street	Major Transit Priority	Transit/ Pedestrian Street	City Bikeway	Minor Truck Street	Major Emergency Response	Regional Main Street

**The Convention Center Hotel site is within a Pedestrian District*



DAVID EVANS AND ASSOCIATES INC.

Not to Scale

FIGURE 1

Vicinity Map

Oregon Cenvention Center Hotel

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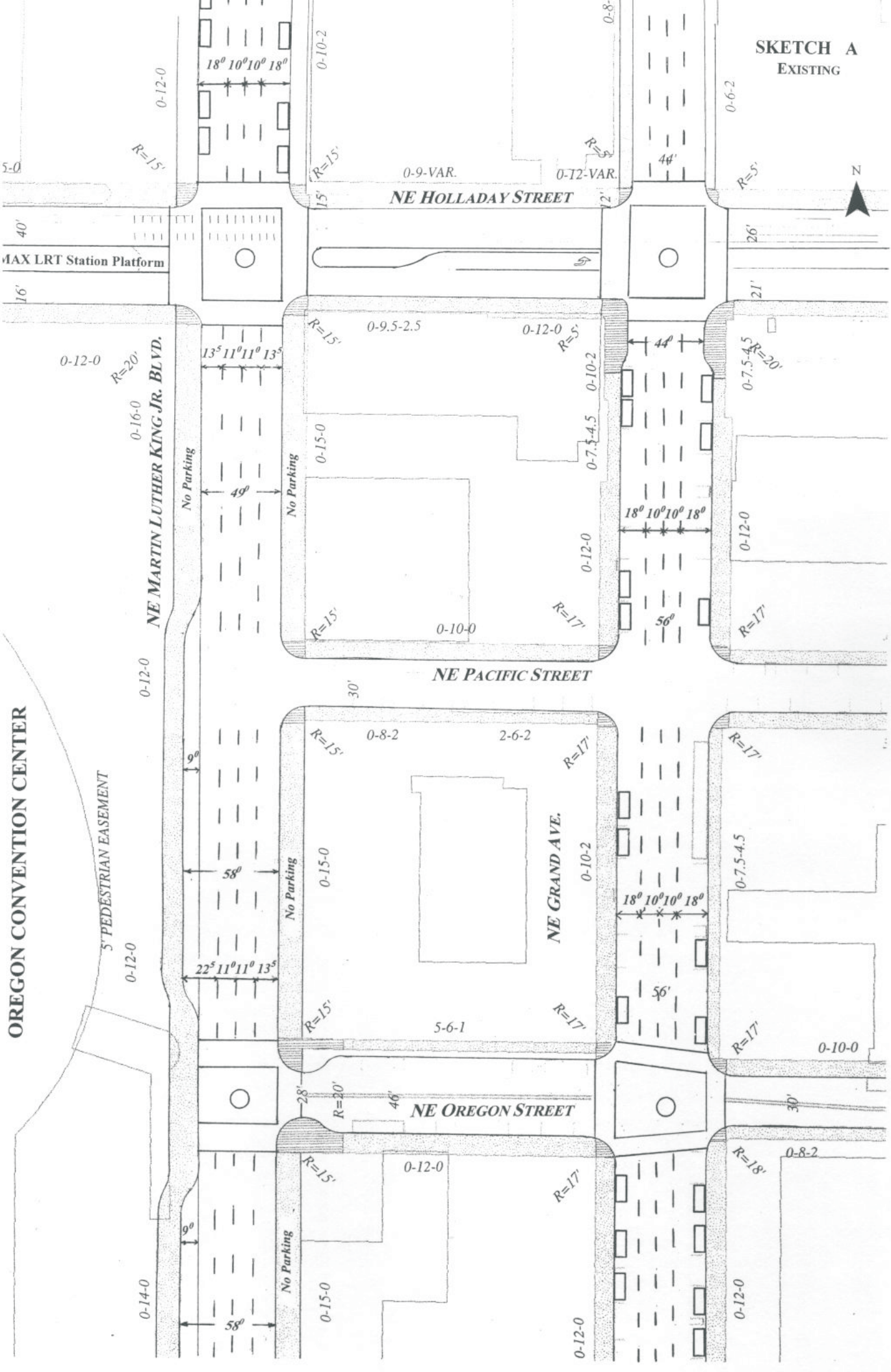
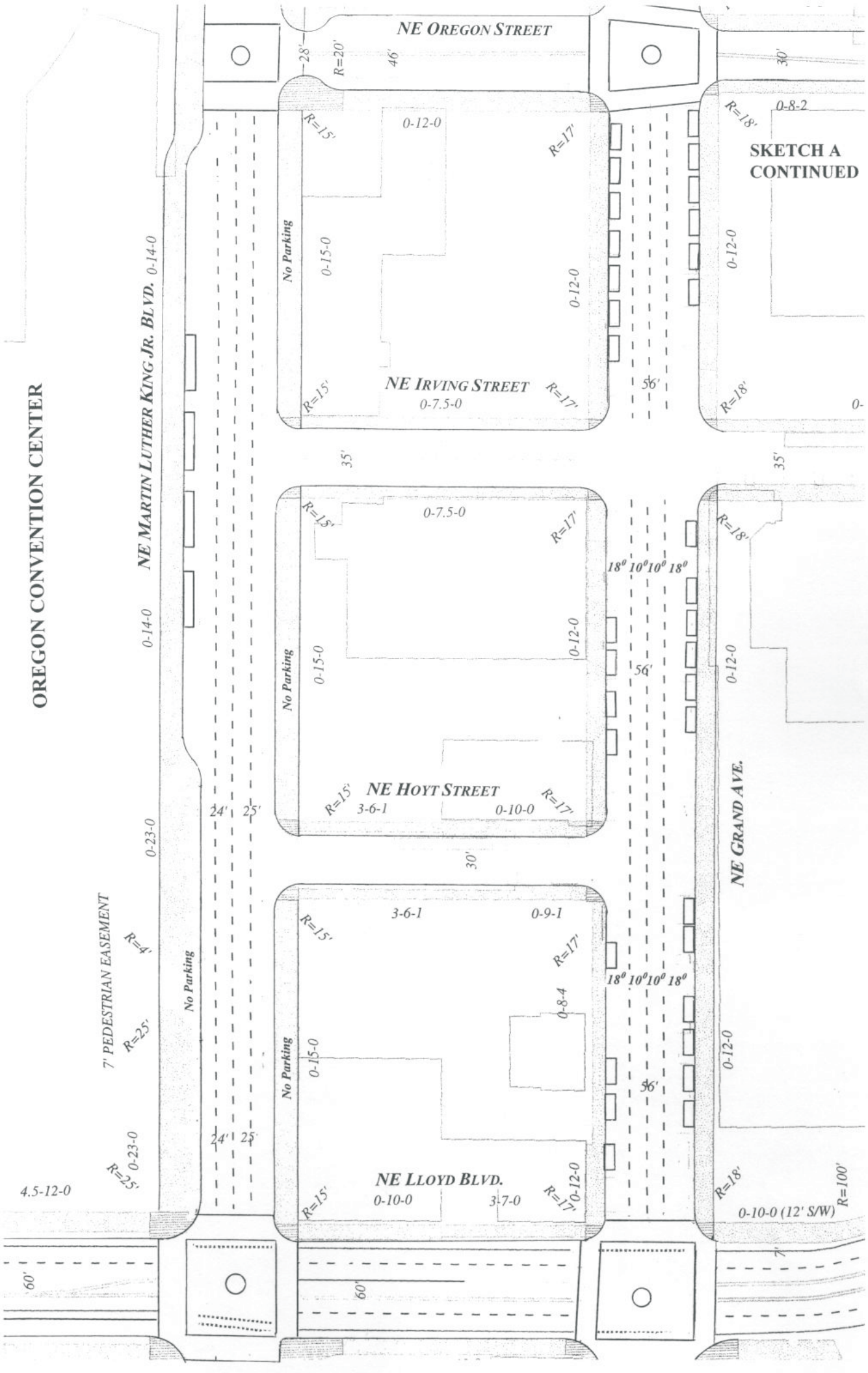

SKETCH A
EXISTING
N
NE HOLLADAY STREET
NE MARTIN LUTHER KING JR. BLVD.
NE PACIFIC STREET
NE GRAND AVE.
NE OREGON STREET
OREGON CONVENTION CENTER
5' PEDESTRIAN EASEMENT
MAX LRT Station Platform
No Parking
0-9-VAR.
0-12-VAR.
0-9.5-2.5
0-8-2
2-6-2
5-6-1
0-10-0


OREGON CONVENTION CENTER
NE MARTIN LUTHER KING JR. BLVD.
NE OREGON STREET
NE IRVING STREET
NE HOYT STREET
NE LLOYD BLVD.
NE GRAND AVE.
SKETCH A CONTINUED
7' PEDESTRIAN EASEMENT
No Parking
0-14-0
0-23-0
0-12-0
0-15-0
0-7.5-0
0-10-0
0-9-1
0-8-4
3-6-1
3-7-0
4.5-12-0
0-10-0 (12' S/W)
R=15'
R=17'
R=18'
R=20'
R=25'
R=4'
R=100'
18° 10° 10° 18°
24'
25'
28'
46'
30'
35'
56'
60'

There are several pedestrian/on-street parking techniques that are used to enhance the pedestrian environment. These include reducing street crossing distance, improving the pedestrian visibility, and reducing traffic vehicular speed. The following are typical designs used throughout the country:

Median Refuge Areas: These are typically raised or marked islands in the middle of two-way traffic flows. They allow the pedestrian to cross only half the street at a time, allowing pedestrians a refuge area to wait for gaps in traffic to cross the remaining traffic lanes. In this area with the one-way couplet on MLK/Grand, medians would not be appropriate.

Curb Extensions: These devices are typically constructed at intersection corners where there is on-street parking (the on-street parking is eliminated in the area of the curb extensions). This type of device improves pedestrian visibility by a combination of pulling parking away from the pedestrian crossing location and by moving the pedestrians closer to the vehicular flow at the crossing. These devices reduce the pedestrian crossing distance and allow additional room for pedestrian storage and American Disability Act (ADA) ramp requirements.

DEA recommends the construction of curb extensions as shown on **Sketch B,** the proposed Pedestrian Enhancement Plan.

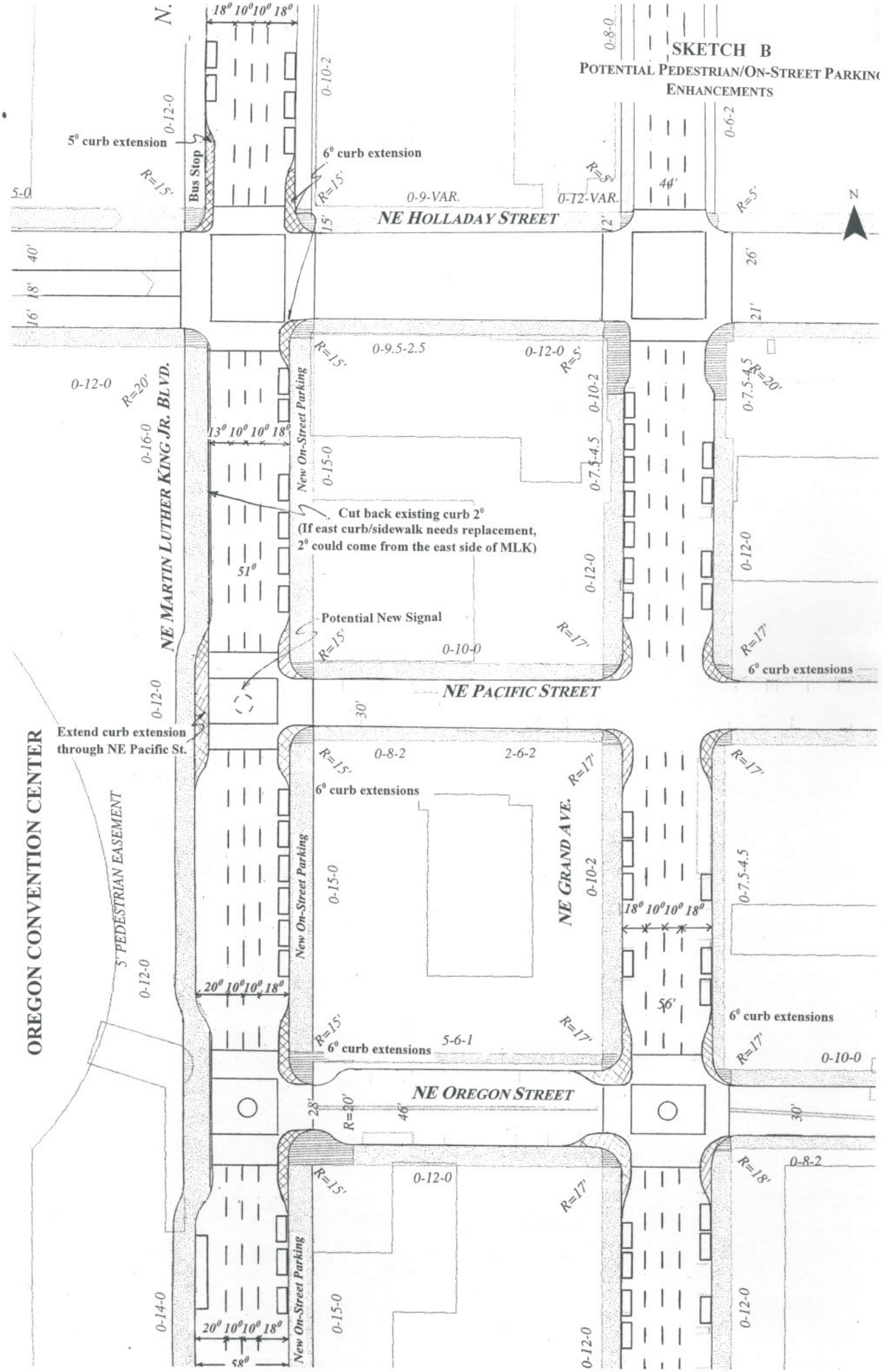
On-Street Parking: On-street parking can actually do a great deal to enhance the pedestrian environment. Not only do the parked vehicles provide a "buffer" for the sidewalk pedestrian area; on-street parking puts a pedestrian vitality/activity at the street level. While there are some issues with on-street parking (parking maneuvers interrupt traffic flow, a potential issue with doors opening into traffic lanes and people entering/exiting the vehicle), in an urban environment this is an anticipated and understood situation for drivers. While on-street parking is extensive along both sides of NE Grand Avenue south of Holladay Street, currently on-street parking has been eliminated on the east side of MLK in the study area.

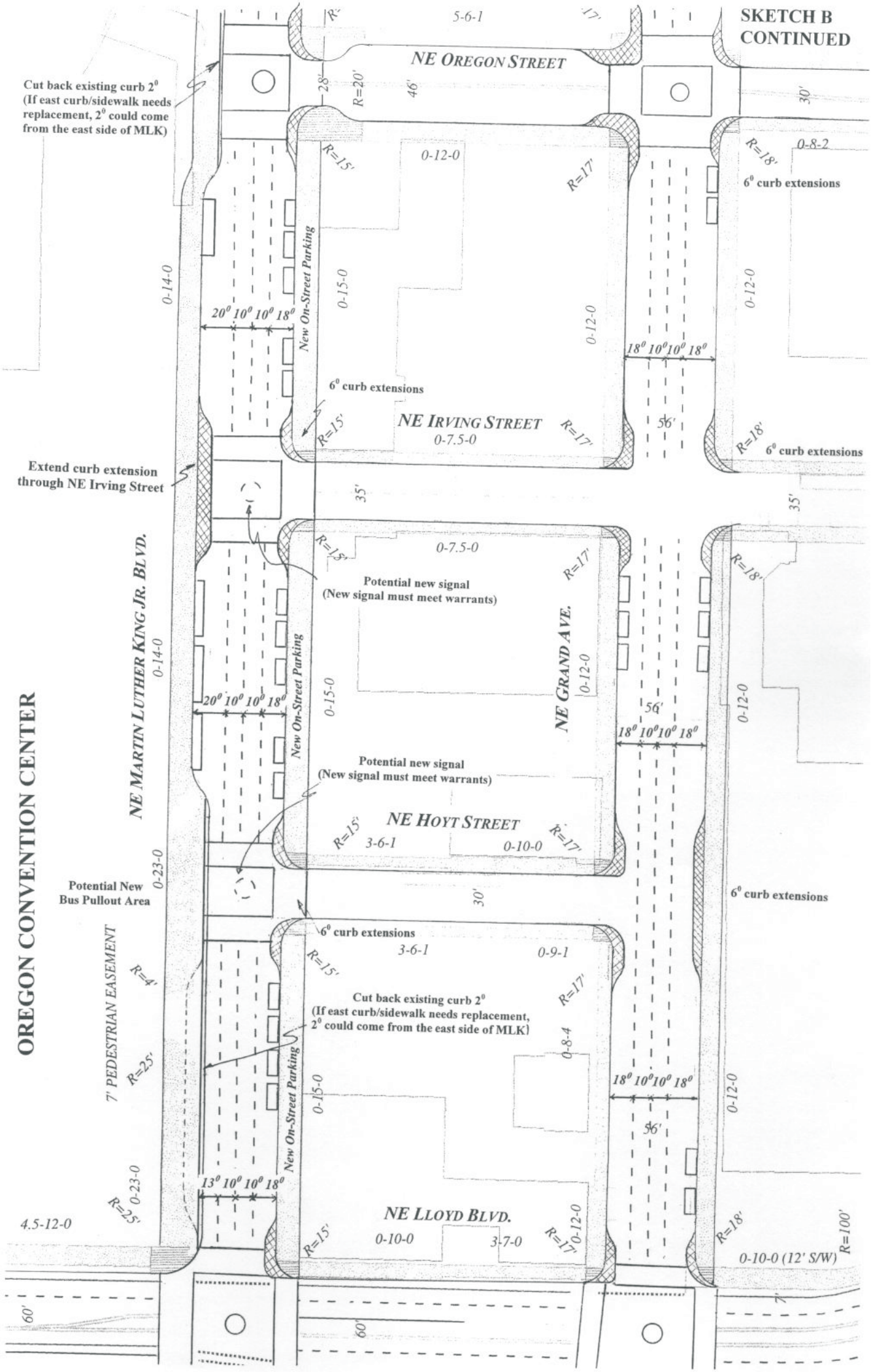
DEA recommends on-street parking be placed on the east side of MLK, south of NE Holladay Street, eventually to NE Lloyd Boulevard. The recommended additional on-street parking areas are shown on Sketch B. To install on-street parking in this section of MLK will require the widening of the existing curb to curb width by two feet. From an engineering standpoint, it is feasible to gain the two feet of roadway from either side of the street:

Westside (Convention Center side): DEA recommends that widening be performed on the west side due to the existing wide sidewalks (16 feet), plus the existing additional five to seven feet of pedestrian easement. This would require cutting the curb back in the following sections:

- south of Holladay Street, approximately 170 feet
- at Oregon Street, approximately 100 feet
- eventually from just north of Hoyt Street to Lloyd Boulevard, approximately 280 feet

Eastside (Proposed Hotel Site): This side of MLK could also be widened by two feet. However, this would have a higher construction cost (over 1,100 ft from Holladay to Lloyd Boulevard), would cause the removal of over two dozen mature trees, and could require an additional two feet of right-of-way to maintain 15-foot sidewalks.


SKETCH B
POTENTIAL PEDESTRIAN/ON-STREET PARKING ENHANCEMENTS
N.
NE HOLLADAY STREET
NE MARTIN LUTHER KING JR. BLVD.
NE PACIFIC STREET
NE GRAND AVE.
NE OREGON STREET
OREGON CONVENTION CENTER
5' PEDESTRIAN EASEMENT
5⁰ curb extension
6⁰ curb extension
Bus Stop
Cut back existing curb 2⁰
(If east curb/sidewalk needs replacement,
2⁰ could come from the east side of MLK)
Potential New Signal
Extend curb extension
through NE Pacific St.
6⁰ curb extensions
New On-Street Parking
18⁰ 10⁰ 10⁰ 18⁰
13⁰ 10⁰ 10⁰ 18⁰
20⁰ 10⁰ 10⁰ 18⁰
0-9-VAR.
0-12-VAR.
0-9.5-2.5
0-8-2
2-6-2
5-6-1
0-7.5-4.5
0-10-2
0-12-0
0-15-0
0-16-0
0-14-0
0-10-0
R=15'
R=17'
R=18'
R=20'
R=5'
44'
56'
51⁰
58⁰
N


SKETCH B
CONTINUED
NE OREGON STREET
Cut back existing curb 2⁰
(If east curb/sidewalk needs
replacement, 2⁰ could come
from the east side of MLK)
6⁰ curb extensions
NE IRVING STREET
Extend curb extension
through NE Irving Street
NE MARTIN LUTHER KING JR. BLVD.
NE GRAND AVE.
Potential new signal
(New signal must meet warrants)
NE HOYT STREET
Potential New
Bus Pullout Area
OREGON CONVENTION CENTER
7' PEDESTRIAN EASEMENT
Cut back existing curb 2⁰
(If east curb/sidewalk needs replacement,
2⁰ could come from the east side of MLK)
NE LLOYD BLVD.
New On-Street Parking
0-10-0 (12' S/W)

SYNCHRO SIMTRAFFIC MODELING EFFORT

TRAFFIC VOLUMES

Historical PM peak hour turning movement counts were obtained from the City of Portland at 30 study area intersections. The historical turning movement counts and road tube counts were collected between November 1999 and August 2003. All turning movement counts were adjusted to August 2003 using a 1.5-percent per year growth. The 2003 volumes were then increased to year 2008 volumes using Metro EMME/2, year 2000 to year 2020 traffic forecasts. Review of the EMME/2 data indicates an average 20-year linear growth rate of 1.4% to 1.7% per year. To be conservative, a 2% per year linear growth rate was applied to the year 2003 volumes to obtain year 2008 background traffic volumes. The 2008 background traffic volumes for the 30 study area intersections are shown in **Figure 2**. Detailed volume worksheets are presented in **Appendix 1**.

TRIP GENERATION

In discussions with the Portland Development Commission (PDC) and the Portland Office of Transportation (PDOT), it was determined that the analysis for a future Oregon Convention Center Hotel site should include a facility that would contain 800 rooms, with some retail (15,000 to 20,000 square feet). It was assumed this facility would be constructed and in operation by year 2008.

DEA used the Institute of Transportation Engineers (ITE) *Trip Generation*, 6th Edition manual for the basis of the trip generation rates. There were hotel categories within the ITE Trip Generation manual and DEA chose category 310 as we determined this best fit the type of facility discussed by PDC and included retail services within the hotel facility. The trip generation rate is based on the findings from 13 studies.

Using Institute of Transportation Engineers (ITE) Trip Generation Rates

Hotel (ITE 310): "Hotels are places of lodging that provide sleeping accommodations, restaurants, cocktail lounges, meeting and banquet rooms or convention facilities, and other retail and service shops….". **Table 3** indicates the vehicle trips that would be generated by a hotel using the ITE trip rates.

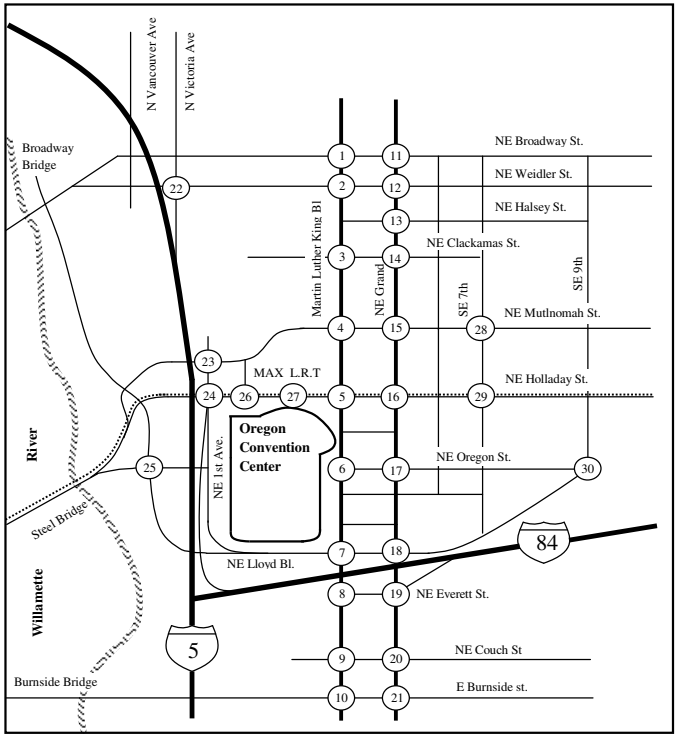
Table 3. ITE Trip Generation Rate

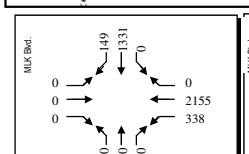
Oregon Convention Center Hotel	Number Rooms	Trip Rate PM Peak	PM Trips	% Enter	# Enter	% Exit	# Exit
ITE Hotel 310	800	0.71	568	49%	278	51%	290

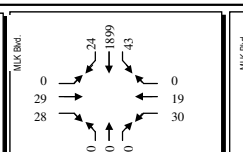
There are few hotels in the United States that are adjacent to a transit facility that connects directly to and from the regional airport and other regional facilities. It was assumed that the ITE trip generation rates did not account for the high use of the adjacent MAX LRT line that would serve the hotel site at the Oregon Convention Center. Therefore, an assumption was made that approximately 20% of the trips generated in the PM peak to/from the hotel site would be made on the MAX LRT facility. Since the model runs were completed, information has come from some hotel sites that would indicate the 20% is conservative.

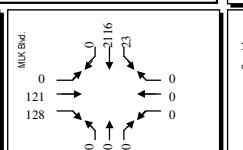
Table 4. Number of Trips Arriving by Vehicle

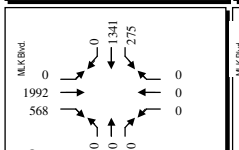
Assumptions	Trips Arriving by Vehicle	PM Trips	% Enter	# Enter	% Exit	# Exit
20 % Trips by LRT (MAX)	568 trips x 80% = 454 trips by Veh	454	49%	222	51%	232

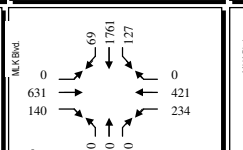


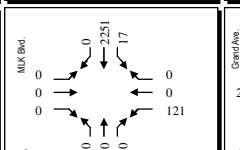


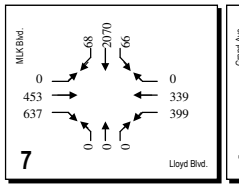


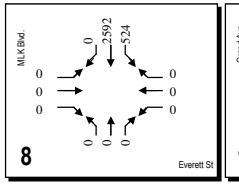


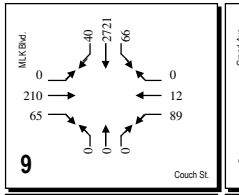


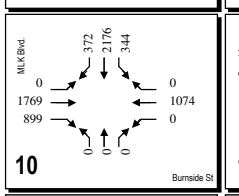


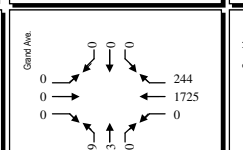


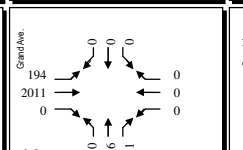


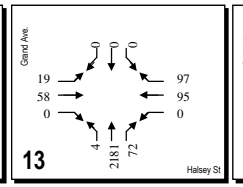


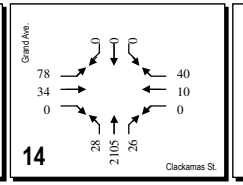


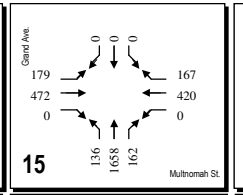


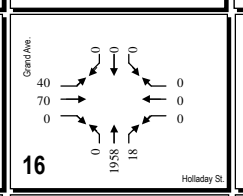


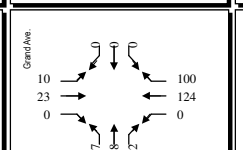


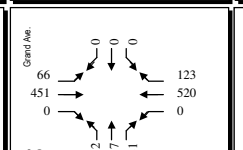


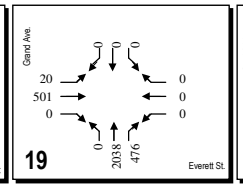


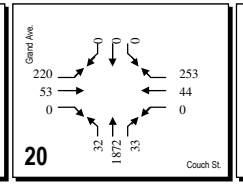


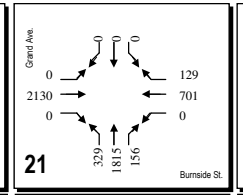


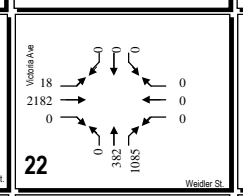


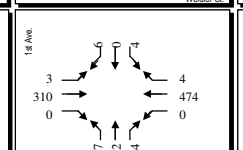


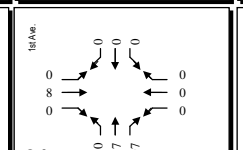


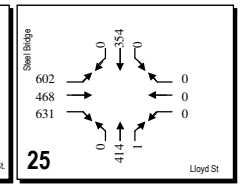


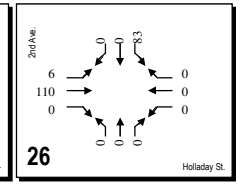


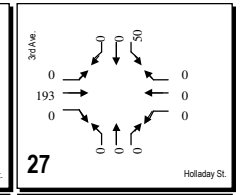


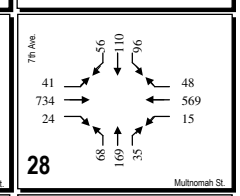


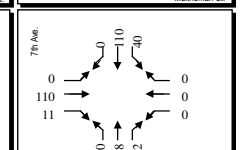


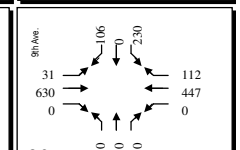












DAVID EVANS AND ASSOCIATES INC.

NOT TO SCALE

LEGEND

000 = PM Peak Hour Turning Movement Volume

= Turning Movement

4 = Intersection Number

..... = MAX LRT

FIGURE 2

2008 Background Volumes

(PM Peak Hour)

Oregon Convention Center Hotel

TRIP DISTRIBUTION CALCULATIONS

After determining the number of new vehicle trips a new 800-room hotel site would generate, an estimate of the routes the trips would be using coming to/from the hotel site was determined.

Assumptions

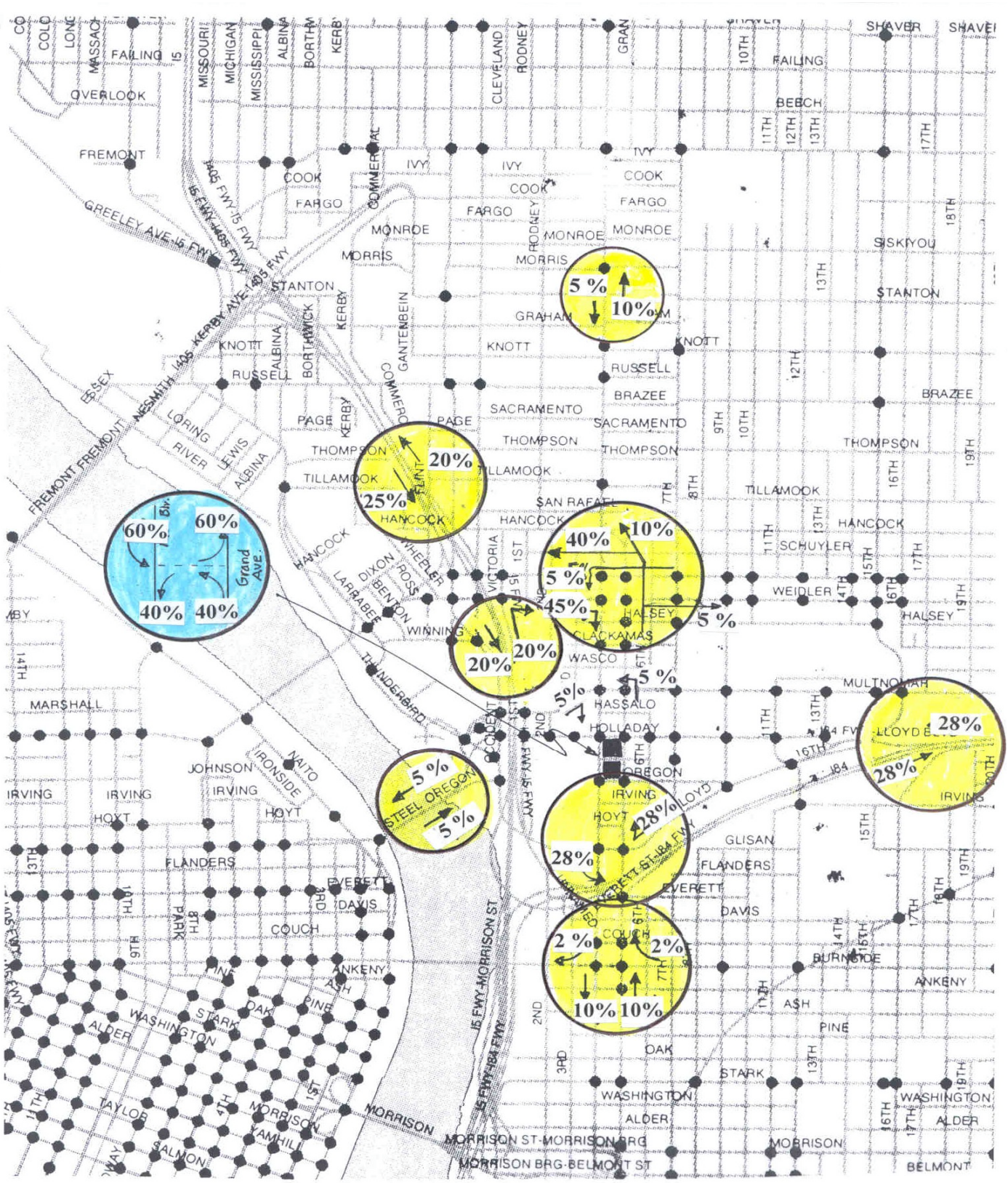
- 60% of vehicle trips to and from the North via MLK and NE Grand Avenue
- 40% of vehicle trips to and from the South via MLK and NE Grand Avenue

Table 5 indicates the trip volume distribution as estimated from the new Convention Center Hotel site and used at the key intersections noted. **Map A** visually indicates the estimated trip distribution.

Table 5. Distribution of Trips Generated from Hotel

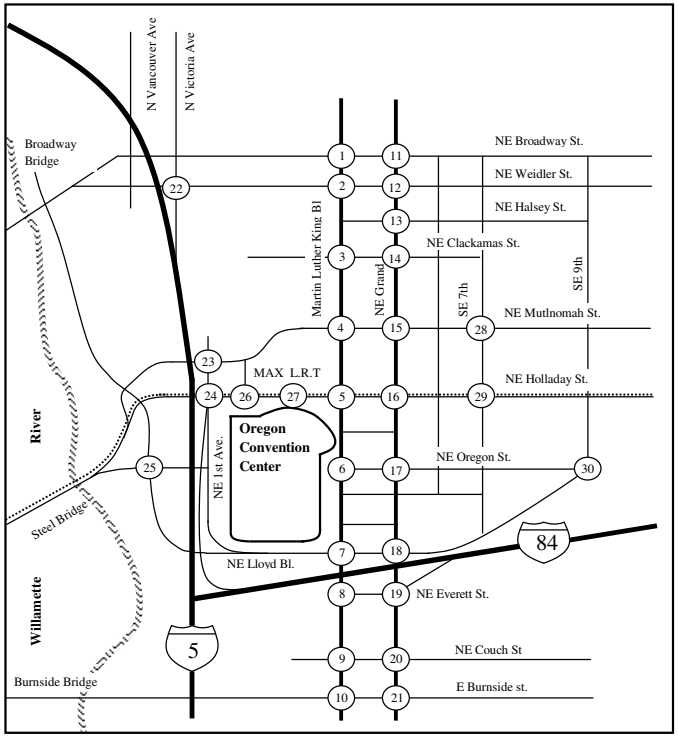
Distribution at Key Intersections To/From the South	
MLK @ Oregon (exit) Sbd through (40%) = 93 veh	**Grand @ Oregon (enter)** Nbd through (40%) = 89
MLK @ Lloyd (exit) Sbd through (40%) = 93 veh	**@ Lloyd (enter)** Wbd right (28%) = 62 veh Nbd through (12%) = 27 veh
MLK @ Everett (exit) Sbd left turn (28%) = 65 veh Sbd through (12%) = 28 veh	**Grand @ Everett (exit)** Ebd through = 65 veh
MLK @ Couch (exit) Sbd through (10%) = 28 veh	**Grand @ Couch (enter)** Nbd through (12%) = 27 veh
MLK @ W Burnside St. (exit) Sbd right turn (2 %) = 5 veh Sbd through (10%) = 23 veh	**Grand @ W Burnside (enter)** Nbd through (10%) = 22 veh Westbound right (2%) = 5 veh
Distribution at Key Intersections To/From the North	
MLK @ Holladay St. (enter) Sbd through (60%) = 133 veh	**Grand @ Holladay (exit)** Nbd through (60%) = 139 veh
MLK @ Multnomah St. (enter) Sbd through (55%) = 122 veh Ebd right (5%) = 11 veh Wbd through (exit – 5%) = 11 veh	**Grand @ Multnomah (exit)** Nbd through (55 %) = 128 veh Nbd left (5%) = 11 veh
MLK @ Clackamas St. (enter) Sbd through (55%) = 122 veh	**Grand @ Clackamas/Halsey (exit)** Nbd through (55%) = 128 veh
MLK @ Weidler St. (enter) Ebd right (45%) = 100 veh Sbd through (10%) = 22 veh	**Grand @ Weidler St. (exit)** Nbd through (50%) =116 veh Nbd right (5%) = 12 veh
MLK @ Broadway (enter/exit) Sbd through (5% enter) = 11 veh Wbd through (40% exit) = 93 veh Wbd right (5% enter) = 11 veh	**Grand @ Broadway (exit)** Nbd through (10%) = 23 veh Nbd left (40%) = 93 veh Wbd through (5% enter) = 11 veh

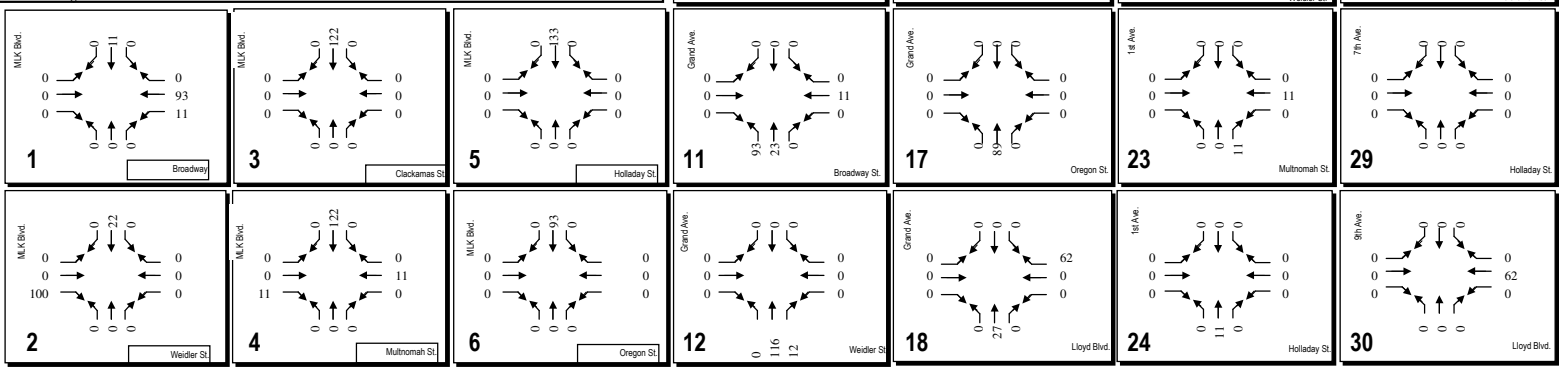
The vehicle trip assignment for the proposed Oregon Convention Center Hotel is show in **Figure 3.** The total traffic volume (background volume plus site trips) is shown in **Figure 4**.



ESTIMATES OF TRIP DISTRIBUTION FROM CONVENTION CENTER HOTEL SITE

MAP A





DAVID EVANS AND ASSOCIATES INC.

NOT TO SCALE

LEGEND

000 = PM Peak Hour Turning Movement Volume

= Turning Movement

4 = Intersection Number

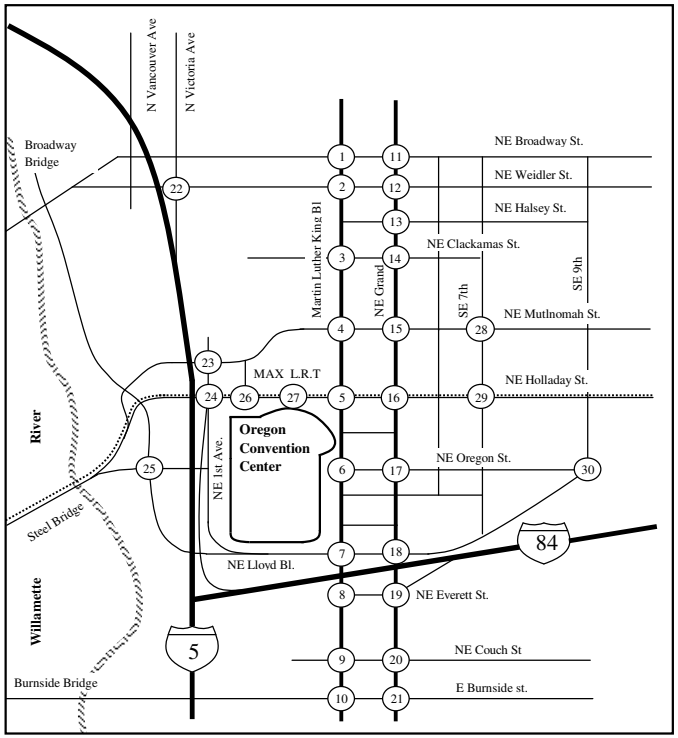
= MAX LRT

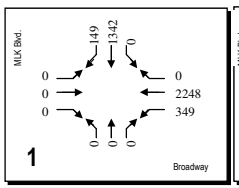
FIGURE 3

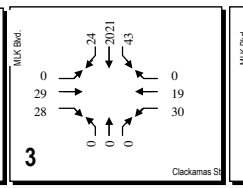
Site Trips

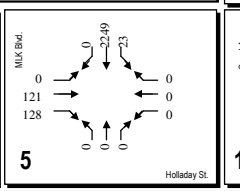
(PM Peak Hour)

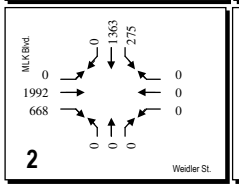
Oregon Convention Center Hotel

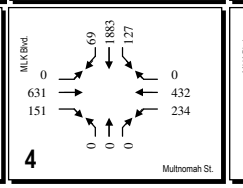


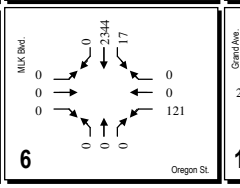


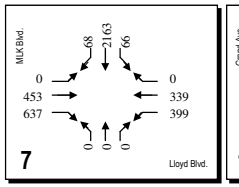


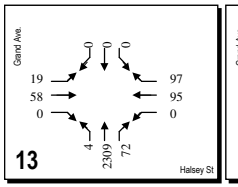


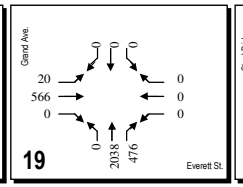


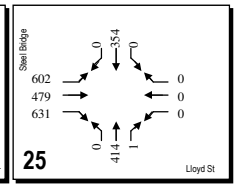


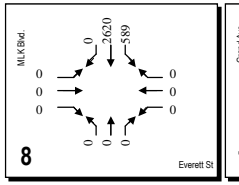


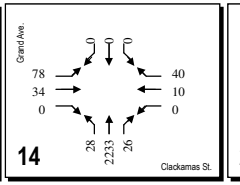


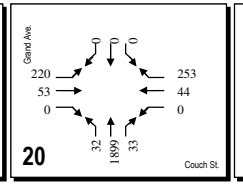


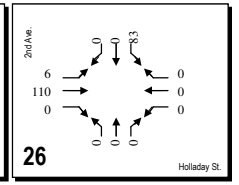


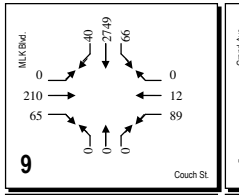


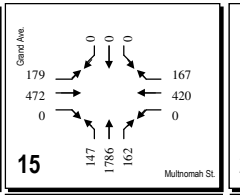


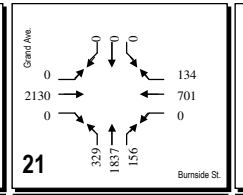


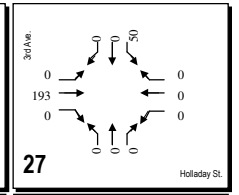


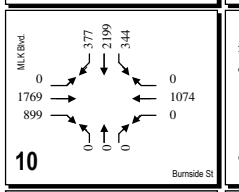


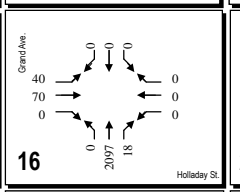


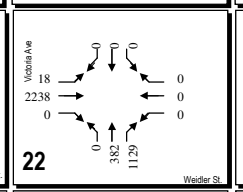


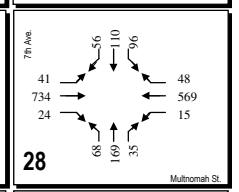


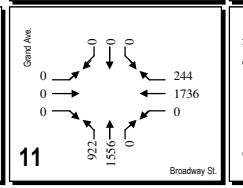


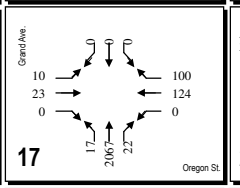


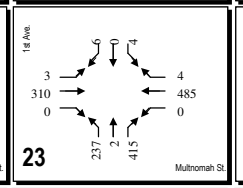


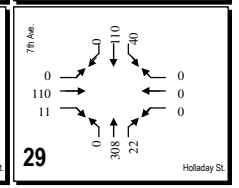


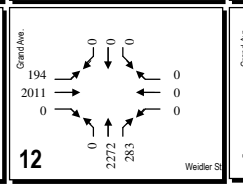


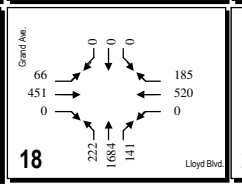


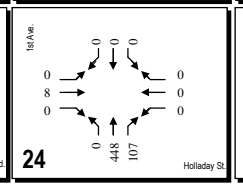


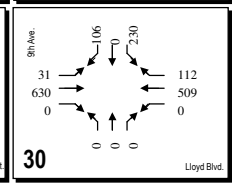












DAVID EVANS AND ASSOCIATES INC.

NOT TO SCALE

LEGEND

000 = PM Peak Hour Turning Movement Volume

= Turning Movement

4 = Intersection Number

= MAX LRT

FIGURE 4

2008 Total Traffic

(PM Peak Hour)

Oregon Convention Center Hotel

INTERSECTION LANE CONFIGURATIONS AND TRAFFIC CONTROL

Build Scenario 1 adds new traffic signals along MLK at NE Pacific Street, NE Irving Street, and NE Hoyt Street. The analysis of Build Scenario 1 includes the three new traffic signals for a total of 33 intersections. The lane configurations and traffic control for Build Scenario 1 are shown in **Figure 5**.

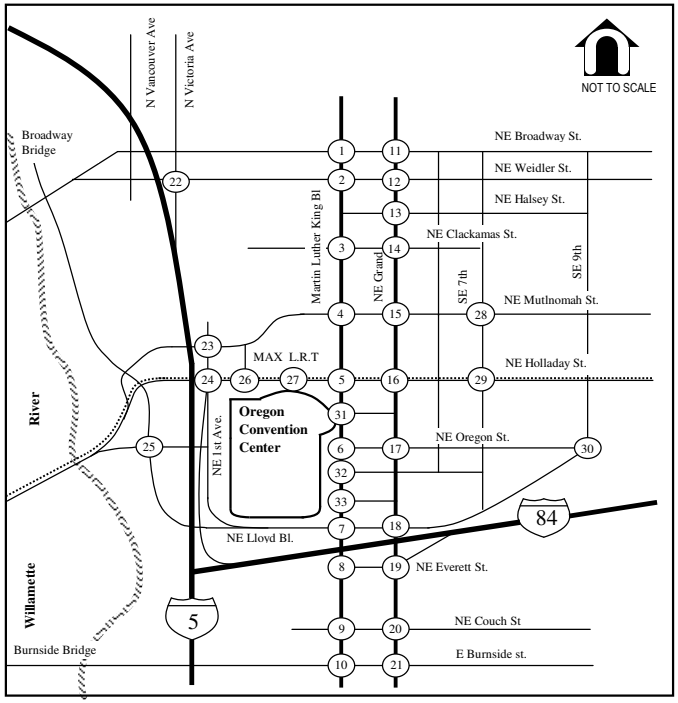
The signalized intersections within the study area are all actuated, which means the signals can vary the green time for each movement (based on a maximum green extension) depending on the volume of traffic at the intersection. The signalized intersections along MLK and NE Grand Avenue are also synchronized to create a coordinated signal system. The signal coordination creates a bandwidth of time in which a vehicle can travel the corridor without stopping at a red light. PDOT operates the signal coordination along both MLK and NE Grand Avenue. To accurately replicate the actuated signals and coordinated signal system within the study area, a microscopic simulation model of the 30 study area intersections was created using the SimTraffic analysis software. The SimTraffic software program is capable of replicating both signal actuation and signal coordination and unlike Highway Capacity Manual based macroscopic programs, SimTraffic can model the over-saturated traffic operations found within the study area.

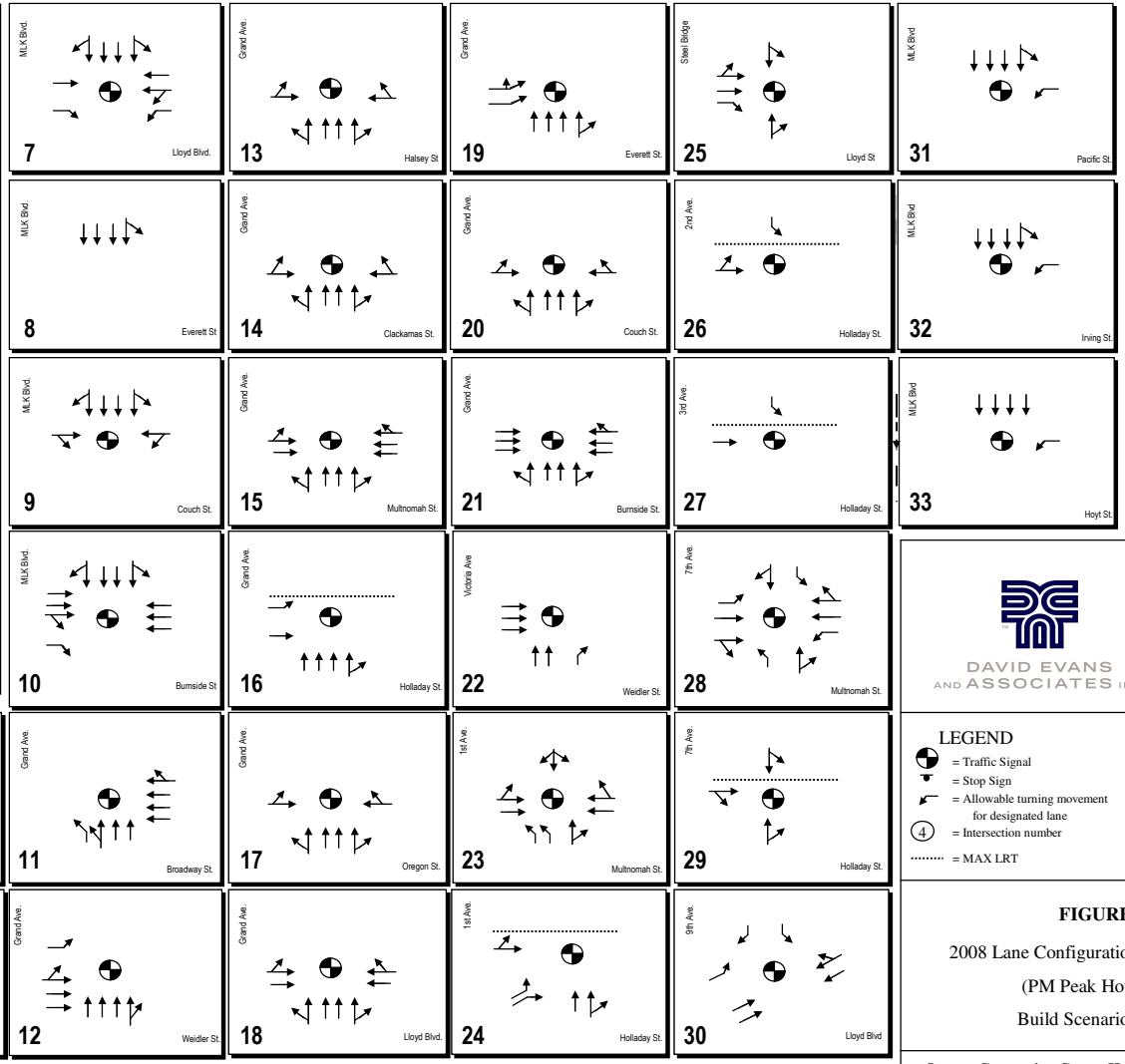
A limitation of the SimTraffic program is its inability to model signal preemption for fire/emergencies and transit operations. Along MLK and NE Grand Avenue, signal coordination is preempted at the intersection of NE Holladay Street for the MAX LRT. Signal preemption overrides the signal coordination allowing the MAX LRT trains to pass through the signalized intersection without stopping. However, as a consequence of the signal preemption, the signal is temporarily thrown out of synchronization with the other signals in the coordinated signal system. After a preemption event, the signal will artificially extend or truncate the green time for each approach until it regains synchronization with the other signals in the coordinated signal system. The SimTraffic program is not able to directly model the complicated process of preemption and recoordination that is occurring at the NE Holladay Street signalized intersections. However, the timing within the SimTraffic model was calibrated at the NE Holladay Street intersections to closely match the average green times from the actual signal controller actuation (obtained from PDOT) during the PM peak hour.

OPERATIONAL CRITERIA

LOS is a widely recognized and accepted measure of traffic operations. Transportation engineers have established various standards for measuring traffic operations at intersections. Each standard is associated with a particular LOS. Six standards have been established to define LOS. They range from LOS A, where traffic is relatively free flowing, to LOS F, where the intersection is totally saturated and traffic movement is very difficult.

Another important consideration for traffic operations is the queue length. A queue is the number of vehicles that accumulate in a travel lane during either the red light portion of a traffic signal or while waiting at a STOP sign for a gap in traffic. The 95th percentile queue is used to estimate whether storage lanes can adequately accommodate typical queue length variations over a one-hour period without spilling over into an adjacent through lane or into another intersection. It represents a distance for which 95 percent of all queues will be shorter than or equal to.





DAVID EVANS AND ASSOCIATES INC.

LEGEND

- = Traffic Signal
- = Stop Sign
- = Allowable turning movement for designated lane
- (4) = Intersection number
- ..... = MAX LRT

FIGURE 5

2008 Lane Configurations

(PM Peak Hour)

Build Scenario 1

Oregon Convention Center Hotel

* Delay casued by downstream queuing

INTERSECTION OPERATIONS

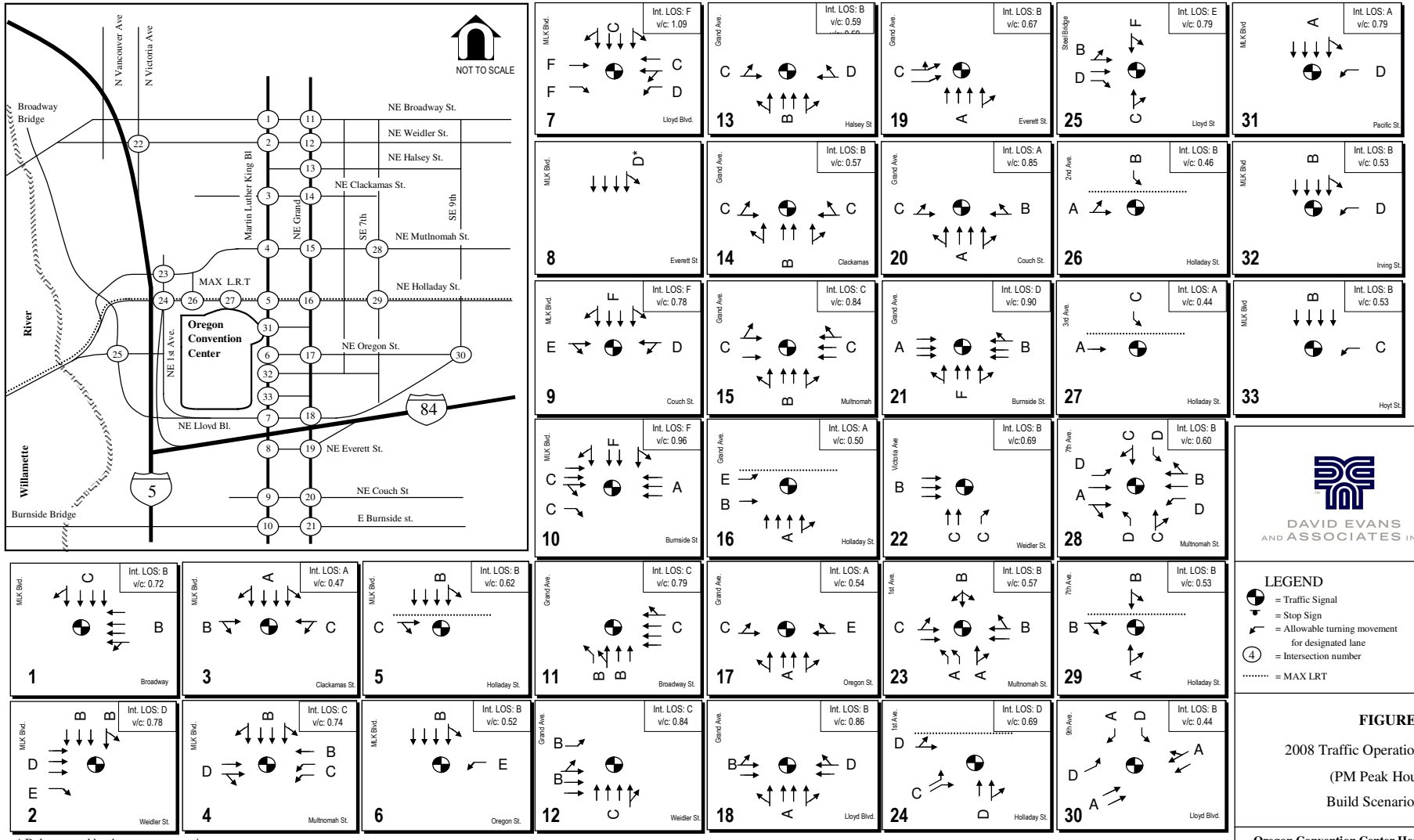
PM peak hour LOS results for Build Scenario 1 are summarized in **Figure 6**. Thirty of the thirty-three intersections operate with an overall intersection LOS of D or better during the PM peak hour. The intersection of NE Lloyd Boulevard and MLK operates with an overall LOS of F with the eastbound approach operating at LOS F. The issue at this intersection is the access to the I-84 eastbound on-ramp at NE Everett Street. The Oregon Department of Transportation (ODOT) operates ramp meters on the on-ramp, and this ramp can not handle the volume of traffic that wants to access eastbound I-84 in the PM peak hour. To avoid a breakdown on MLK, the eastbound NE Lloyd Boulevard approach is purposefully given a shorter cycle length, in order to queue traffic where it will cause the least amount of disruption to overall traffic flow.

The intersection of E Burnside Street and MLK operates at LOS F during the PM peak hour with the southbound approach operating at LOS F. The intersection of NE Couch Street and MLK also operates at LOS F during the PM peak hour with the southbound approach operating at LOS F. The operations at the NE Couch Street and MLK intersection are significantly deteriorated by the close proximity of the signal at E Burnside Street. Queuing on MLK from the E Burnside signal spills back through the NE Couch Street signal creating a significant loss of effective green time for vehicles on MLK attempting to travel through the Couch Street signal. These intersections operate at a LOS of F under existing conditions. Detailed LOS worksheets for Build Scenario 1 are presented in **Appendix 2**.

QUEUE LENGTHS

Existing PM peak hour 95th percentile queue lengths for Build Scenario 1 are summarized in **Figure 7**. Significant queuing was observed at several locations within the study area. Queuing on MLK was found to consistently extend from the E Burnside Street and NE Couch Street signals back through the unsignalized NE Everett Street intersection during the PM peak Hour. The 95th percentile queue length on MLK at the NE Couch Street intersection is 1150 feet, which is approximately 700 feet beyond the NE Everett Street intersection. The queuing blocks southbound access to NE Everett Street 32 percent of the PM peak hour resulting in what should be a free southbound left turn from MLK to NE Everett Street operating at LOS C.

The three new traffic signals on MLK at NE Pacific Street, NE Irving Street, and NE Hoyt Street all experience blocking problems. However, the blocking is minor and does not significantly effect operations along MLK as all three intersections operate with an overall intersection LOS of A. Detailed queuing analysis worksheets for Build Scenario 1 are presented in **Appendix 3**.



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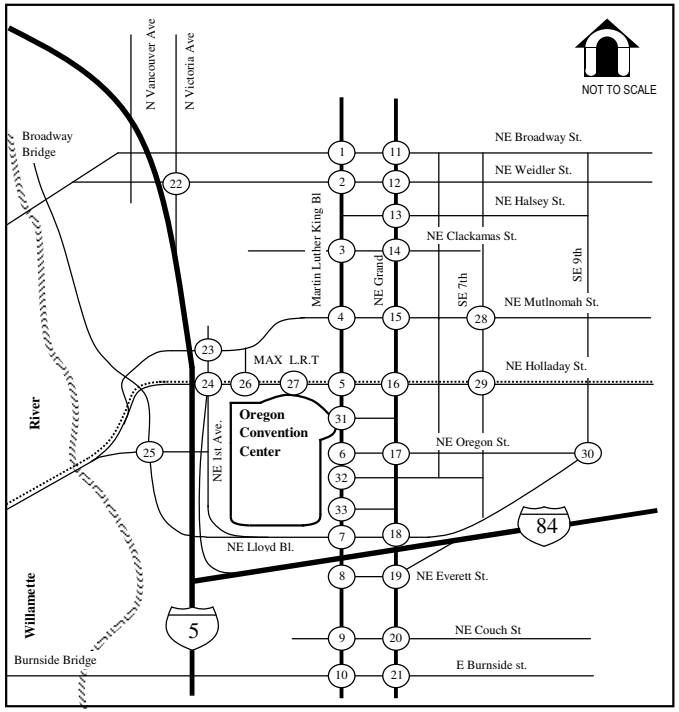

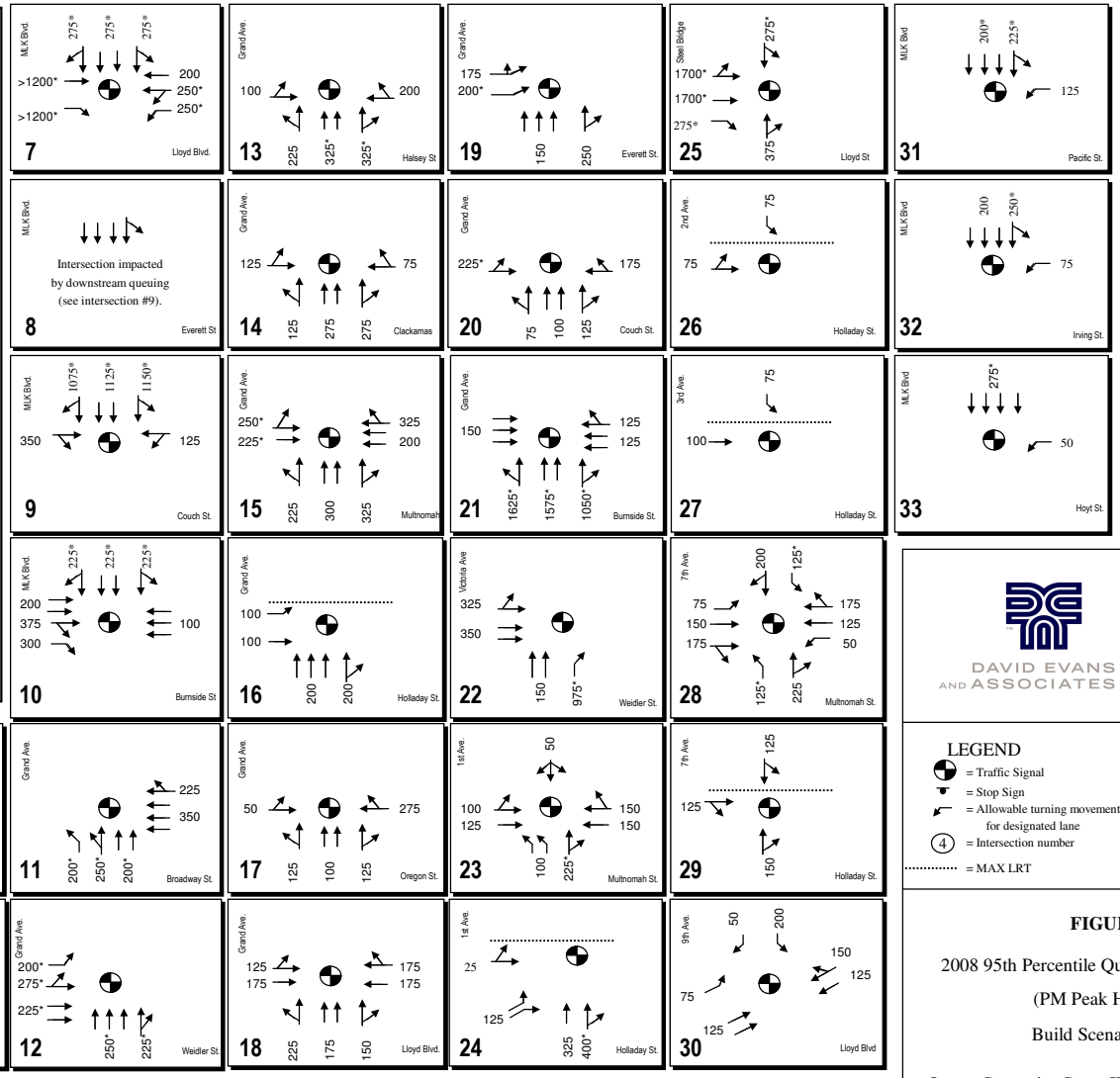

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LEGEND
- = Traffic Signal
- = Stop Sign
- = Allowable turning movement for designated lane
- (4) = Intersection number
- ..... = MAX LRT

FIGURE 7

2008 95th Percentile Queues

(PM Peak Hour)

Build Scenario 1

Oregon Convention Center Hotel

*Exceeds Storage Length (Queue spills out of turn bay or spills back through upstream signalized intersection)

CONVENTION CENTER MAX LRT STATION

A separate study is analyzing the cost and potential of moving the existing Convention Center LRT station, now located on NE Holladay west of MLK, to the east side of MLK (between MLK and NE Grand Avenue). This will be a tight fit and will require special design treatments for the center platform. **Sketch C** indicates the maximum shift in traffic that would be allowed for relocating the LRT platform and still maintain four lanes of traffic.

The impacts to the signal operation of moving the existing LRT station on NE Holladay Street one block east was not specifically modeled as part of this study. The Synchro/SimTraffic model does not have the capability of analyzing the impacts of the LRT signal pre-emption on signal operation.

Based on discussions with PDOT signal operations staff, DEA concluded that the LRT operation with a station relocated one block to the east would have little additional impacts to the signal system operation along MLK and NE Grand Avenue. The impacts would be similar to the impacts already experienced by the current LRT pre-emption along NE Holladay Street at MLK and NE Grand Avenue.

What is not as clear are the impacts of additional pedestrians having to cross MLK from the relocated MAX LRT station to the Convention Center facility. There will be an impact to the pedestrian phase across MLK and NE Grand Avenue due to the signal operation. When there is a LRT preemption, the next phase that is called is the main arterial phase (MLK/NE Grand Avenue). The pedestrians will have to wait for the signals to get back "in step" with the corridor signal operation, which will delay the pedestrians wishing to cross MLK and NE Grand Avenue.

BUILD SCENARIO 2 – THREE LANES ON MLK NORTH OF OREGON

This build scenario is not discussed in detail in this report. It was believed this scenario should not be brought forward. While the modeling of this scenario indicated that three lanes could operate on MLK (north of Oregon Street), there were several concerns:

- The V/C ratio increases significantly at some intersections;

- Build Scenario 2 leaves little capacity for peak event traffic loads. Observations indicate that events at the Convention Center and Rose Garden facilities significantly increase congestion due to heavy pedestrian activity, and especially to queuing for parking that effect flow and capacity in the curb lanes of MLK/Grand Avenue. Also, MLK/Grand Avenue are important when there is an incident on I-5, as this couplet is the only available major arterial that can handle traffic that will shift during an incident. With the LRT alignment on N Interstate Avenue, the MLK/Grand Avenue couplet is more important than ever before to handle event traffic.

- The analysis was for year 2008 (not year 2020 or beyond) and does not consider the high potential for additional high-density development in the immediate area.

Detailed queuing analysis worksheets, LOS worksheets, and maps of Build Scenario 2 lane configurations (**Figure 8**), Traffic Operations (**Figure 9**), and 95th Percentile Queues (**Figure 10**) are presented in **Appendix 4**.

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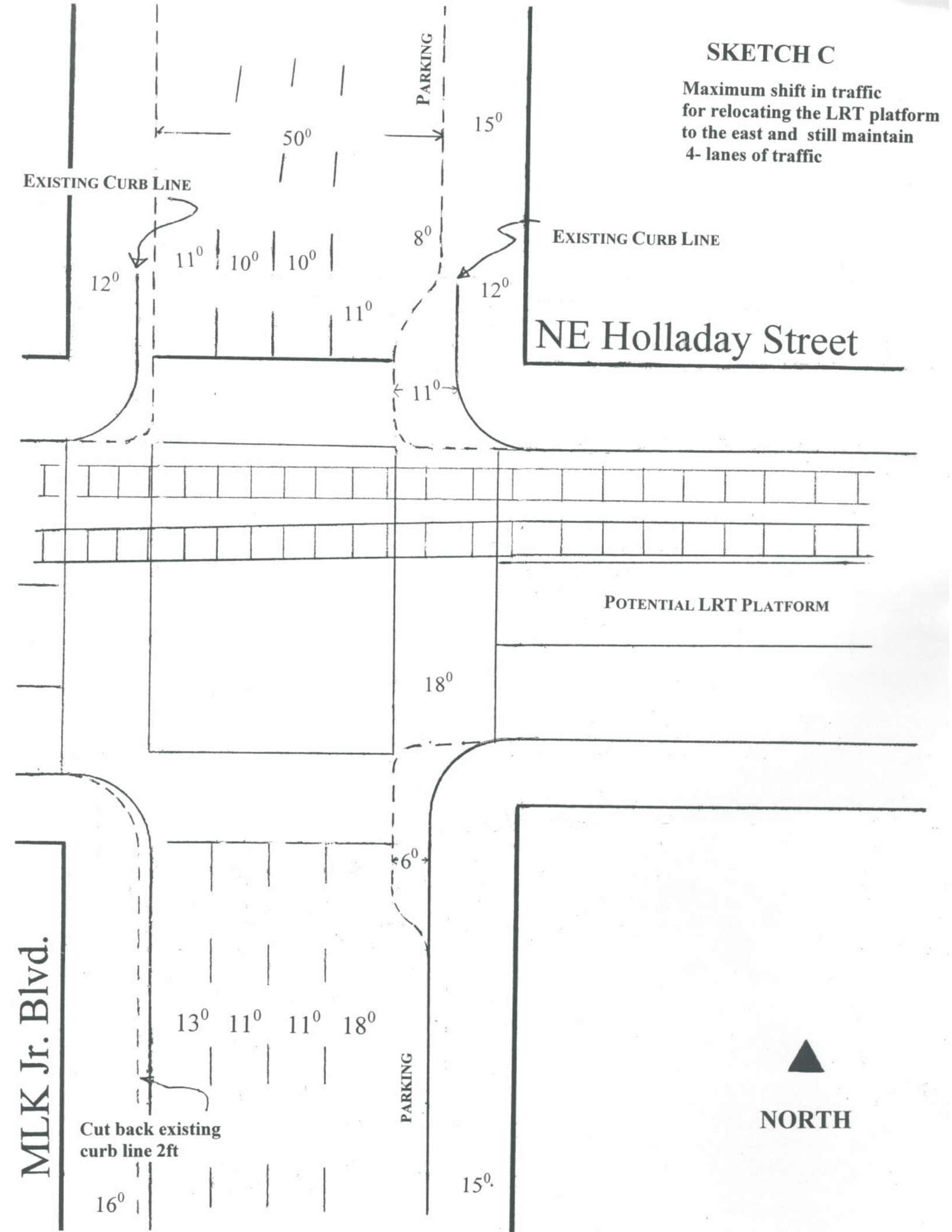

SKETCH C
Maximum shift in traffic for relocating the LRT platform to the east and still maintain 4- lanes of traffic
PARKING
50⁰
15⁰
EXISTING CURB LINE
8⁰
EXISTING CURB LINE
12⁰
11⁰ 10⁰ 10⁰
12⁰
11⁰
NE Holladay Street
11⁰
POTENTIAL LRT PLATFORM
18⁰
6⁰
MLK Jr. Blvd.
13⁰ 11⁰ 11⁰ 18⁰
PARKING
NORTH
Cut back existing curb line 2ft
16⁰
15⁰.

OREGON CONVENTION CENTER HOTEL DEVELOPMENT
BUILD OPTIONS TRAFFIC ANALYSIS
FINAL REPORT

TECHNICAL APPENDIX

Prepared for

City of Portland Department of Transportation

Prepared by

David Evans and Associates, Inc.
2100 SW River Parkway
Portland, Oregon 97201

December 2003

APPENDICES

Appendix 1: 2008 PM Peak Hour Turning Movement Count Data

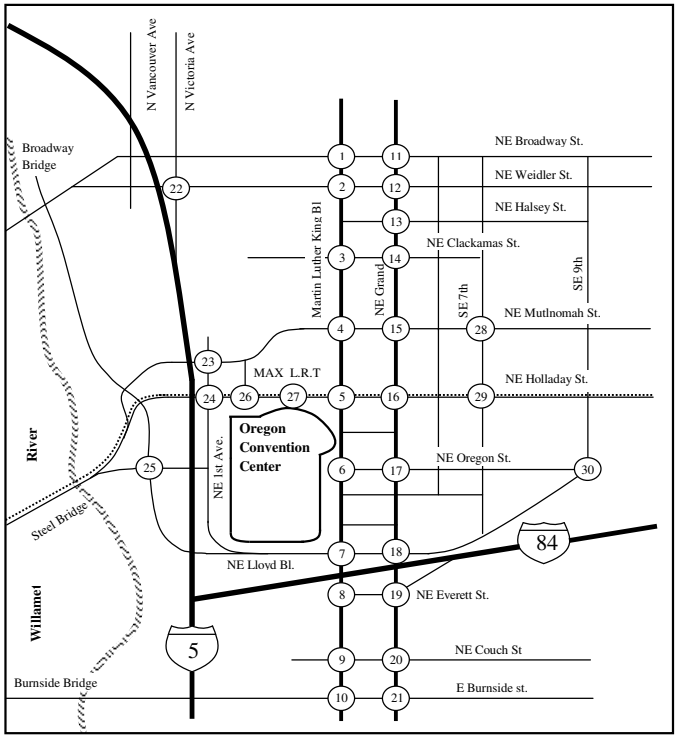
Appendix 2: 2008 Build Scenario 1 PM Peak Hour Intersection Operation Worksheets

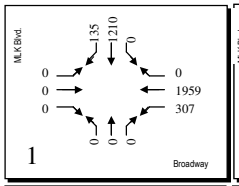
Appendix 3: 2008 Build Scenario 1 Queue Calculation Worksheets

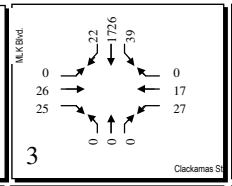
Appendix 4: 2008 Build Scenario 2

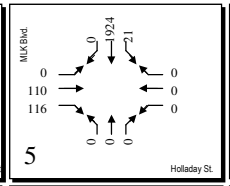
- **Figure 8: Lane Configurations**
- **Figure 9: PM Peak Hour Intersection Operations and Worksheets**
- **Figure 10: 95th Percentile Queues and Worksheets**

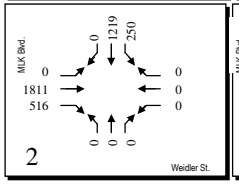
APPENDIX 1: 2008 PM PEAK HOUR TURNING MOVEMENT COUNT DATA

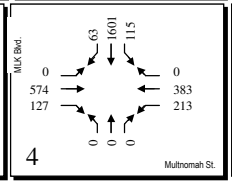


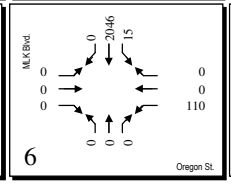


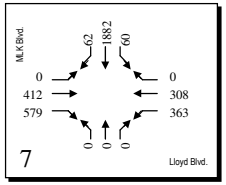


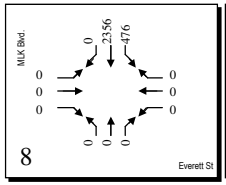


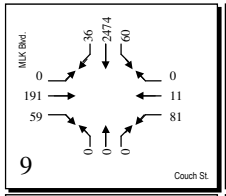


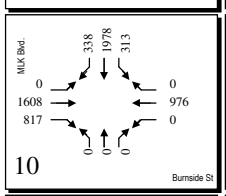


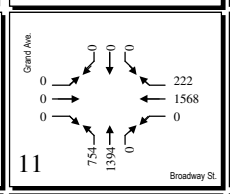


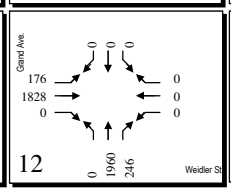


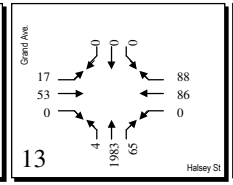


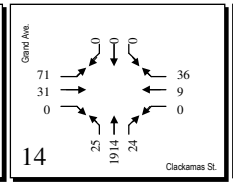


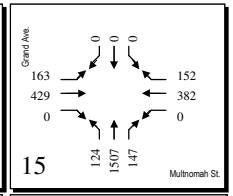


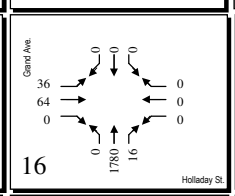


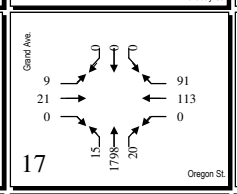


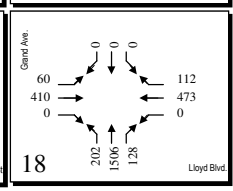


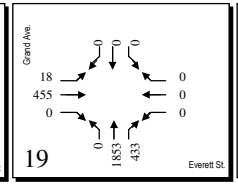


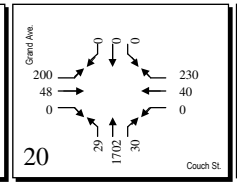


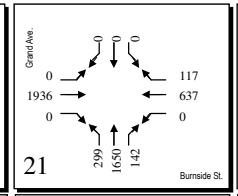


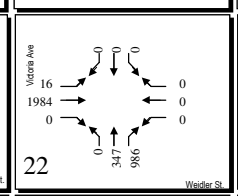


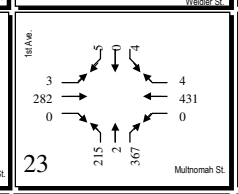


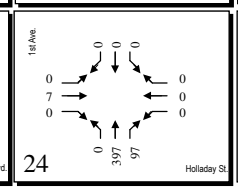


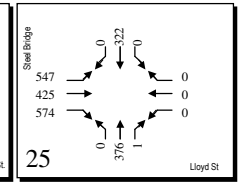


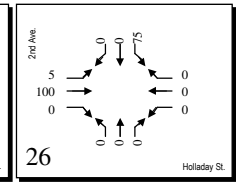


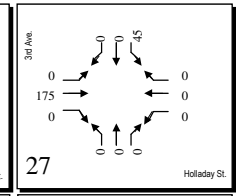


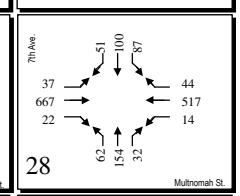


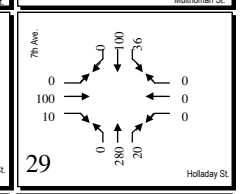


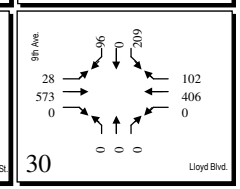












DAVID EVANS AND ASSOCIATES INC.

NOT TO SCALE

LEGEND

000 = PM Peak Hour Turning Movement Volume

= Turning Movement

4 = Intersection number

2003 Volumes

(PM Peak Hour)

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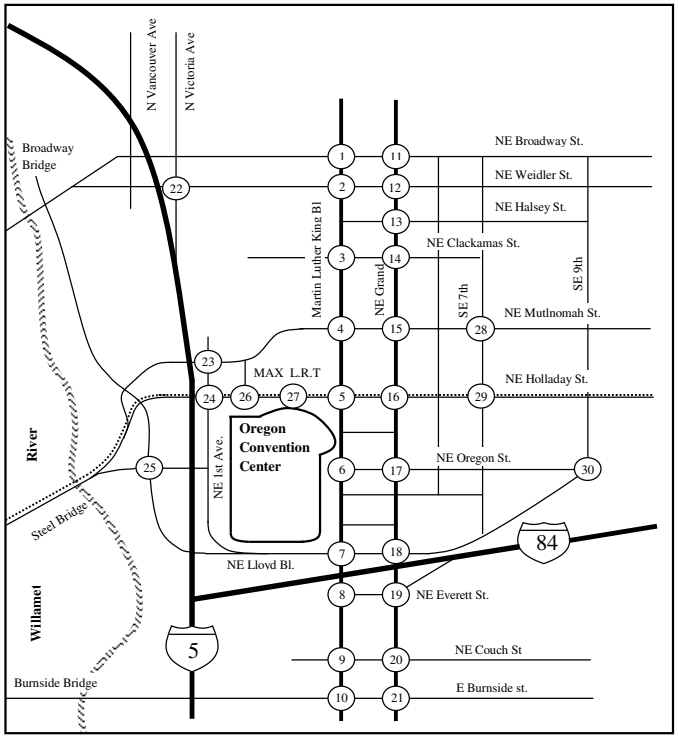

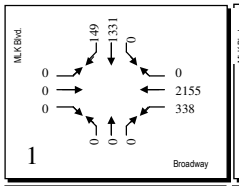

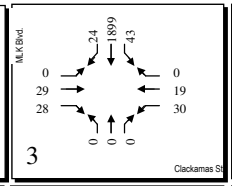

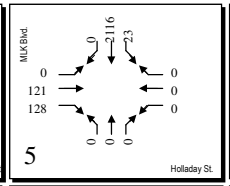

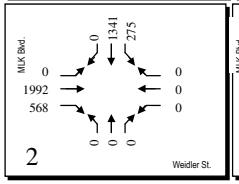

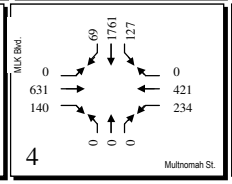

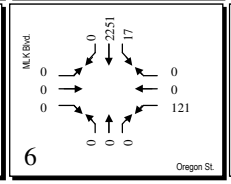

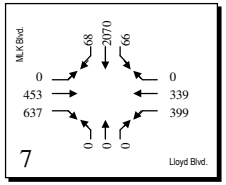

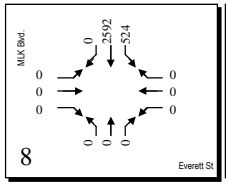

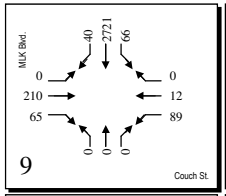

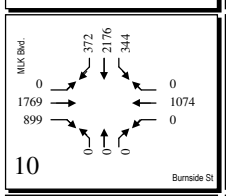

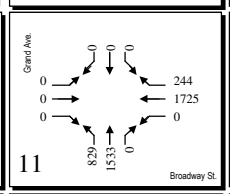

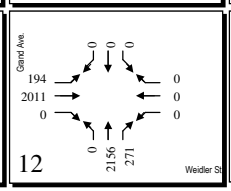

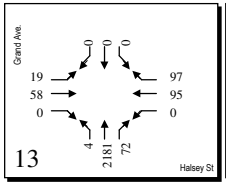

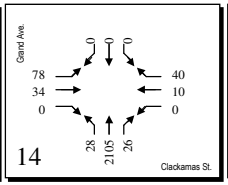

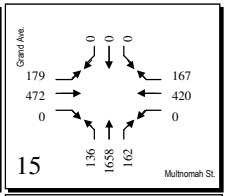

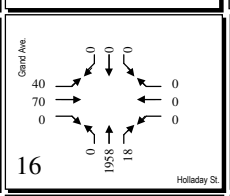

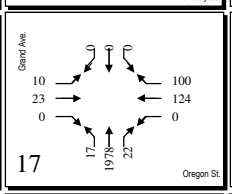

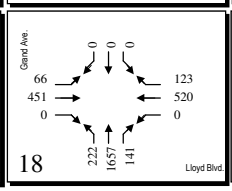

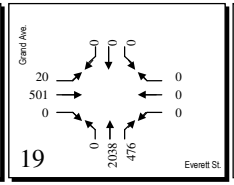

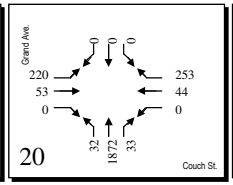

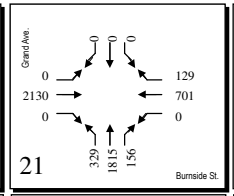

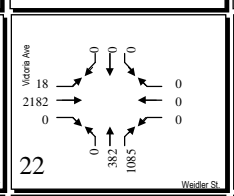

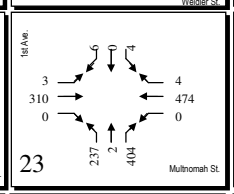

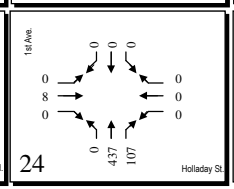

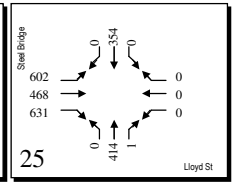

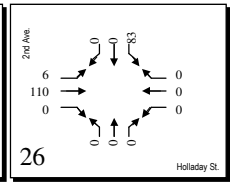

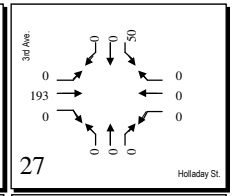

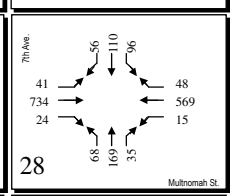

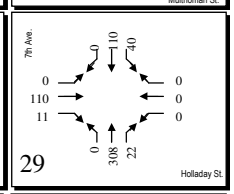

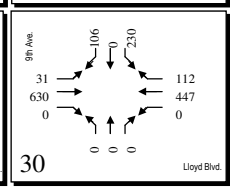

DAVID EVANS AND ASSOCIATES INC.

NOT TO SCALE

LEGEND

000 = PM Peak Hour Turning Movement Volume

= Turning Movement

4 = Intersection number

2003 to 2008 Volume Growth (PM Peak Hour)

APPENDIX 2: 2008 BUILD SCENARIO 1 PM PEAK HOUR INTERSECTIONS OPERATIONS WORKSHEETS

Project: Convention Center Hotel
Job #: PDXX0000-0107
Subject: Calculation of Average Delays from SimTraffic Runs - **Scenario 1 2008 PM Peak Hour**
4 Lanes on MLK with Signals

12/12/2003

NE Broadway @	Delay by Movement			
NE MLK	WBL	WBT	SBT	SBR
Seed 1	16.7	10.3	20.2	24.5
2	16	11	20.6	23.1
3	15.7	10.3	18.8	21.6
4	21.3	10.1	19.7	21.6
5	16.3	10.3	19.8	22.2
Volume	349	2248	1342	149
Average	17.2	10.4	19.8	22.6
Signalized LOS	B	B	B	C

#120

Delay by Lane		Total
WB	SB	Int.
LT	TR	Delay
2597	**1491**	**4088**
11.3	**20.1**	**14.5**
B	**C**	**B**

NE Weidler @	Delay by Movement			
NE MLK	EBR	EBT	SBL	SBT
Seed 1	67.6	48.4	26	14
2	88	47.7	23.8	13.2
3	76	57.9	23.1	13.9
4	63.2	64.9	25.8	14.7
5	69.6	38.4	23.4	13.2
Volume	668	1992	275	1363
Average	72.9	51.5	24.4	13.8
Signalized LOS	E	D	C	B

#130

Delay by Lane			Total
EB	EB	SB	Int.
R	T	LT	Delay
668	**1992**	**1638**	**4298**
72.9	**51.5**	**15.6**	**41.1**
E	**D**	**B**	**D**

NE Halsey @	Delay by Movement		
NE MLK	WBL	SBL	SBT
Seed 1	9.6	2.5	1
2	10.1	2.5	1
3	12	2.7	1
4	8.1	2.5	1.1
5	7.7	2.5	1.1
Volume	95	70	1665
Average	9.5	2.5	1.0
unsignalized LOS	A	A	A

#140

Delay by Lane		Total
WB	SB	Int.
L	LT	Delay
95	**1735**	**1830**
9.5	**1.1**	**1.5**
A	**A**	**A**

NE Clackamas @	Delay by Movement						
NE MLK	EBT	EBR	WBL	WBT	SBL	SBT	SBR
Seed 1	34.8	12.4	36.2	30.8	3.1	2.2	4.6
2	29.8	9.3	39.8	35.5	3.8	2	4.4
3	31.9	12.4	31.5	34.7	4.1	2	4.8
4	27.1	11.3	30.9	33.3	6.7	3.4	6
5	17.6	11.7	34.9	34	5	2.4	5
Volume	29	28	30	19	43	2021	24
Average	28	11	35	34	5	2	5
Signalized LOS	C	B	C	C	A	A	A

#150

Delay by Lane			Total
EB	WB	SB	Int.
TR	LT	LTR	Delay
57	**49**	**2088**	**2194**
20.0	**34.3**	**2.5**	**4**
B	**C**	**A**	**A**

NE Multnomah @	Delay by Movement						
NE MLK	EBT	EBR	WBL	WBT	SBL	SBT	SBR
Seed 1	51.3	68.6	26.3	17.5	19.4	11.8	13.1
2	42.1	40.8	27.3	18.4	21	12.4	12.9
3	51.9	47.7	31.1	20.5	33	15.9	12.9
4	44.2	47.6	31.4	18.2	26.4	20.5	20.1
5	43	55.9	28.8	18.5	16.2	11.5	11.7
Volume	631	151	234	432	127	1883	69
Average	47	52	29	19	23	14	14
Signalized LOS	D	D	C	B	C	B	B

#160

Delay by Lane				Total
EB	WB	WB	SB	Int.
TR	L	T	LTR	Delay
782	**234**	**432**	**2079**	**3527**
47.6	**29.0**	**18.6**	**14.9**	**24**
D	**C**	**B**	**B**	**C**

Project: Convention Center Hotel
Job #: PDXX0000-0107
Subject: Calculation of Average Delays from SimTraffic Runs - **Scenario 1 2008 PM Peak Hour**
4 Lanes on MLK with Signals

12/12/2003

NE Holladay @ NE MLK	Delay by Movement							
	EBT	EBR	SBL	SBT				
Seed 1	33.9	26.4	12.8	10.1	#170			
2	30.9	25.5	13.1	10.2				
3	33.1	29.8	56.8	25.9	**Delay by Lane**		**Total**	
4	36.9	36.9	33.1	26	**EB**	**SB**	**Int.**	
5	36	21.2	16.8	9.8	**TR**	**LT**	**Delay**	
Volume	121	128	23	2249	**249**	**2272**	**2521**	
Average	34.2	28.0	26.5	16.4	**31.0**	**16.5**	**17.9**	
Signalized LOS	C	C	C	B	**C**	**B**	**B**	

Pacific @ MLK	Delay by Movement						
	WBL	SBL	SBT	#19			Check Formulas
Seed 1	33.5	7.1	3.2				
2	41.1	6.7	5.5				
3	39.7	17.5	13.1	**Delay by Lane**		**Total**	
4	44.9	16.7	12.3	**WB**	**SB**	**Int.**	
5	33.8	5.9	3.2	**L**	**LTR**	**Delay**	
Volume	103	150	2272	**103**	**2422**	**2525**	
Average	38.6	10.8	7.5	**38.6**	**7.7**	**8.9**	
Signalized LOS	E	B	A	**D**	**A**	**A**	

NE Oregon @ NE MLK	Delay by Movement					
	WBL	SBL	SBT	#180		
Seed 1	29.9	7.4	4.6			
2	35.1	20.8	10.3			
3	125.6	20.4	19.8	**Delay by Lane**		**Total**
4	77	20.1	17.2	**WB**	**SB**	**Int.**
5	35.5	7.3	4.6	**L**	**LT**	**Delay**
Volume	121	17	2344	**121**	**2361**	**2482**
Average	60.6	15.2	11.3	**60.6**	**11.3**	**13.7**
Signalized LOS	E	B	B	**E**	**B**	**B**

NE MLK @ NE Irving	Delay by Movement						
	WBL	SBL	SBT	#32			Check Calcs
Seed 1	34.7	9	4.3				
2	36.4	11.9	12.3				
3	35.2	34.5	18.1	**Delay by Lane**		**Total**	
4	34.7	23.7	15.4	**WB**	**SB**	**Int.**	
5	37.8	11.8	4.8	**L**	**LT**	**Delay**	
Volume	47	30	2396	**47**	**2426**	**2473**	
Average	35.8	18.2	11.0	**35.8**	**11.1**	**11.5**	
Signalized LOS	E	C	B	**D**	**B**	**B**	

NE MLK @ NE Hoyt	Delay by Movement					
	WBL	SBT	#185			Check Calcs
Seed 1	18.6	8				
2	27.9	12.2				
3	25.2	16.9	**Delay by Lane**		**Total**	
4	25.4	14.4	**WB**	**SB**	**Int.**	
5	17.2	8.3	**L**	**T**	**Delay**	
Volume	32	2354	**32**	**2354**	**2386**	
Average	22.9	12.0	**22.9**	**12.0**	**12.1**	
Signalized LOS	C	B	**C**	**B**	**B**	

NE Lloyd @ NE MLK	Delay by Movement												
	EBT	EBR	WBL	WBT	SBL	SBT	SBR	#190					
Seed 1	162.9	237.4	46.5	25.4	29.5	20.2	25						
2	245.5	371.1	52	26.6	29.1	21.9	23.5						
3	302.5	273.2	46.3	28.6	31.3	28.8	30.8	**Delay by Lane**					**Total**
4	377	508	372	333	53	2095	65	**EB**	**EB**	**WB**	**WB**	**SB**	**Int.**
5	277.6	268.6	46.5	21.2	27.6	21.9	19.5	**T**	**R**	**L**	**LT**	**LTR**	**Delay**
Volume	453	637	399	369	66	2163	68	**453**	**637**	**363.09**	**404.91**	**2297**	**4155**
Average	273	332	113	87	34	438	33	**273.1**	**331.7**	**111.4**	**89.2**	**414.0**	**328**
Signalized LOS	F	F	F	F	C	F	C	**F**	**F**	**F**	**F**	**F**	**F**

Project: Convention Center Hotel
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4 Lanes on MLK with Signals

12/12/2003

NE Everett @	Delay by Movemen	
NE MLK	SBL	SBT
Seed 1	22.9	27.3
2	33.6	35.2
3	36.3	42.5
4	34.5	40.6
5	25.8	25.7
Volume	589	2620
Average	30.6	34.3
unsignalized LOS	D	D

#200

Delay by Lane		Total
SB	SB	Int.
L	T	Delay
589	**2620**	**3209**
30.6	**34.3**	**33.6**
D	**D**	**D**

NE Couch @	Delay by Movement						
NE MLK	EBT	EBR	WBL	WBT	SBL	SBT	SBR
Seed 1	106.7	123.1	38	33.6	163.5	158.4	145.5
2	46	45.7	40.3	32.7	251.4	254.7	274.3
3	29	28.2	42.1	20.4	219.2	239.9	126.1
4	67.2	66.4	41.1	30	152.9	294.8	326.4
5	34	35.1	40.7	41.1	348.8	264.7	138
Volume	210	65	89	12	66	2749	40
Average	57	60	40	32	227	243	202
Signalized LOS	E	E	D	C	F	F	F

#210

Delay by Lane			Total
EB	WB	SB	Int.
TR	LT	LTR	Delay
275	**101**	**2855**	**3231**
57.3	**39.4**	**241.6**	**220**
E	**D**	**F**	**F**

NE Burnside @	Delay by Movement					
NE MLK	EBT	EBR	WBT	SBL	SBT	SBR
Seed 1	24.8	22.1	7.6	31.6	18.5	21.4
2	25	20.9	7.8	32.5	19.2	24.9
3	28.6	21.6	7.8	34.3	20.5	24.2
4	23.3	20.8	7.6	30.2	19.5	25.9
5	24.8	20.4	8.3	32.7	19.9	23.9
Volume	1769	899	1074	344	2199	377
Average	25	21	8	259	262	226
Signalized LOS	C	C	A	F	F	F

#220

Delay by Lane				Total
EB	EB	WB	SB	Int.
TR	R	T	LTR	Delay
1895	**773.14**	**1074**	**2920**	**6662**
25.0	**21.2**	**7.8**	**257.1**	**124**
C	**C**	**A**	**F**	**F**

	EBL	EBT	EBR	NBT	SBT
NE Steel Bridge @	Delay by Movement				
NE Lloyd	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Seed 1	16.3	12.9	38.8	32	0	0	196.2
2	17.5	12.9	27.6	28.2	18	0	156.7
3	17.6	14.3	61.9	36.4	29.7	0	311.9
4	17.9	15	53.5	36.3	0	0	374.9
5	19.8	16.6	61.7	38.5	0	0	479.1
Volume	602	479	631	414	1	0	354
Average	18	14	49	34	10	0	304
Signalized LOS	B	B	D	C	A	A	F

#230

Delay by Lane				Total
EB	EB	NB	SB	Int.
LT	R	TR	LT	Delay
1081	**631**	**414**	**355**	**2481**
16.3	**48.7**	**34.3**	**302.9**	**69**
B	**D**	**C**	**F**	**E**

Indicates not shown in report

	EBL	EBT	WBT	WBR	NBL	NBR	SBL	SBR
NE Multnomah @	by Movement							
NE 1st Ave	EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Seed 1	13.8	21.4	19.4	4	8	9.3	12.2	46.9	8.7
2	54.6	17.1	19.8	4.8	8.4	16.1	10	31.7	5
3	22.3	17.1	21.2	33.2	8.2	11.9	9.7	16.7	3.3
4	17.8	22	18.4	35.8	9.5	18.2	0	18.3	4.2
5	25.5	22.1	19.2	6.9	8.4	24.5	13.6	23.8	7.6
Volume	3	310	485	4	237	2	415	4	6
Average	27	20	20	17	9	16	9	27	6
Signalized LOS	C	B	B	B	A	B	A	C	A

#240

Delay by Lane					Total
EB	WB	NB	NB	SB	Int.
LT	TR	L	TR	LR	Delay
313	**489**	**237**	**417**	**10**	**1466**
20.0	**19.6**	**8.5**	**9.1**	**14.4**	**15**
C	**B**	**A**	**A**	**B**	**B**

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Subject: Calculation of Average Delays from SimTraffic Runs - **Scenario 1 2008 PM Peak Hour**
4 Lanes on MLK with Signals

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NE Holladay @ NE 1st Ave	Delay by Movement					Delay by Lane			Total Int. Delay
	EBL	EBT	NBT	NBR	NEL	EB	NB	NE	
Seed 1	6.3	53	37.8	31.9	17.3				
2	27	43	35.7	35.5	15.6				
3	19.6	57.4	30.1	27.4	15.7				
4	13.9	59	52.8	70.3	16.9				
5	20.7	61.4	72.2	81.1	16.1	LT	TR	LR	
Volume	0	7	448	107	191	**7**	**555**	**191**	**753**
Average	17.5	54.8	45.7	49.2	16.3	**54.8**	**46.4**	**27.6**	**41.7**
Signalized LOS	B	D	D	D	B	**D**	**D**	**C**	**D**

#250

NE Holladay @ NE 2nd Ave	Delay by Movement			Delay by Lane		Total Int. Delay
	EBL	EBT	SBL	EB	SB	
Seed 1	30.7	6.8	17.8			
2	40.2	6.1	16.4			
3	24.8	3.9	20			
4	30.7	3.9	17.4			
5	10.9	2.2	19.4	LT	L	
Volume	6	110	83	**116**	**83**	**199**
Average	27.5	4.6	18.2	**5.8**	**18.2**	**11.0**
Signalized LOS	C	A	B	**A**	**B**	**B**

#255

NE Holladay @ NE 3rd Ave	Delay by Movement		Delay by Lane		Total Int. Delay
	EBT	SBL	EB	SB	
Seed 1	3.7	23.4			
2	7.2	19.2			
3	4.6	24.5			
4	5.3	19.7			
5	3.9	24.5	T	L	
Volume	193	50	**193**	**50**	**243**
Average	4.9	22.3	**4.9**	**22.3**	**8.5**
Signalized LOS	A	C	**A**	**C**	**A**

#175

NE Multnomah @ NE 7th Ave	Delay by Movement												Delay by Lane								Total Int. Delay
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EB	EB	WB	WB	NB	NB	SB	SB	
Seed 1	41.4	9.3	12.2	38.5	10.9	13.6	40.4	24.3	25.9	44.5	22.7	18.8									
2	46.4	9.2	9.9	51.8	9.5	10.4	43	28.9	22.3	39.4	25.3	13.1									
3	47.3	9.2	11.7	42.7	8.5	10.5	37.2	26.4	27	49.8	26.8	17.6									
4	42.2	9.1	11.5	44.5	10.7	10.5	34.5	20.2	20.2	36	24.2	16.3									
5	34.7	10.6	11.2	43.7	17	24.9	45.7	20.1	18.9	50.4	33.3	37	L	TR	L	TR	L	TR	L	TR	
Volume	41	734	24	15	569	48	68	169	35	96	110	56	**41**	**758**	**15**	**617**	**68**	**204**	**96**	**166**	**1965**
Average	42	9	11	44	11	14	40	24	23	44	26	21	**42.4**	**9.5**	**44.2**	**11.5**	**40.2**	**23.8**	**44.0**	**24.5**	**17**
Signalized LOS	D	A	B	D	B	B	D	C	C	D	C	C	**D**	**A**	**D**	**B**	**D**	**C**	**D**	**C**	**B**

#260

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Subject: Calculation of Average Delays from SimTraffic Runs - **Scenario 1 2008 PM Peak Hour**
4 Lanes on MLK with Signals

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NE Broadway @	Delay by Movement			
NE MLK	WBL	WBT	SBT	SBR
Seed 1	16.7	10.3	20.2	24.5
2	16	11	20.6	23.1
3	15.7	10.3	18.8	21.6
4	21.3	10.1	19.7	21.6
5	16.3	10.3	19.8	22.2
Volume	349	2248	1342	149
Average	17.2	10.4	19.8	22.6
Signalized LOS	B	B	B	C

#120

Delay by Lane		Total
WB	SB	Int.
LT	TR	Delay
2597	**1491**	**4088**
11.3	**20.1**	**14.5**
B	**C**	**B**

NE Weidler @	Delay by Movement			
NE MLK	EBR	EBT	SBL	SBT
Seed 1	67.6	48.4	26	14
2	88	47.7	23.8	13.2
3	76	57.9	23.1	13.9
4	63.2	64.9	25.8	14.7
5	69.6	38.4	23.4	13.2
Volume	668	1992	275	1363
Average	72.9	51.5	24.4	13.8
Signalized LOS	E	D	C	B

#130

Delay by Lane			Total
EB	EB	SB	Int.
R	T	LT	Delay
668	**1992**	**1638**	**4298**
72.9	**51.5**	**15.6**	**41.1**
E	**D**	**B**	**D**

NE Halsey @	Delay by Movement		
NE MLK	WBL	SBL	SBT
Seed 1	9.6	2.5	1
2	10.1	2.5	1
3	12	2.7	1
4	8.1	2.5	1.1
5	7.7	2.5	1.1
Volume	95	70	1665
Average	9.5	2.5	1.0
unsignalized LOS	A	A	A

#140

Delay by Lane		Total
WB	SB	Int.
L	LT	Delay
95	**1735**	**1830**
9.5	**1.1**	**1.5**
A	**A**	**A**

NE Clackamas @	Delay by Movement						
NE MLK	EBT	EBR	WBL	WBT	SBL	SBT	SBR
Seed 1	34.8	12.4	36.2	30.8	3.1	2.2	4.6
2	29.8	9.3	39.8	35.5	3.8	2	4.4
3	31.9	12.4	31.5	34.7	4.1	2	4.8
4	27.1	11.3	30.9	33.3	6.7	3.4	6
5	17.6	11.7	34.9	34	5	2.4	5
Volume	29	28	30	19	43	2021	24
Average	28	11	35	34	5	2	5
Signalized LOS	C	B	C	C	A	A	A

#150

Delay by Lane			Total
EB	WB	SB	Int.
TR	LT	LTR	Delay
57	**49**	**2088**	**2194**
20.0	**34.3**	**2.5**	**4**
B	**C**	**A**	**A**

NE Multnomah @	Delay by Movement						
NE MLK	EBT	EBR	WBL	WBT	SBL	SBT	SBR
Seed 1	51.3	68.6	26.3	17.5	19.4	11.8	13.1
2	42.1	40.8	27.3	18.4	21	12.4	12.9
3	51.9	47.7	31.1	20.5	33	15.9	12.9
4	44.2	47.6	31.4	18.2	26.4	20.5	20.1
5	43	55.9	28.8	18.5	16.2	11.5	11.7
Volume	631	151	234	432	127	1883	69
Average	47	52	29	19	23	14	14
Signalized LOS	D	D	C	B	C	B	B

#160

Delay by Lane				Total
EB	WB	WB	SB	Int.
TR	L	T	LTR	Delay
782	**234**	**432**	**2079**	**3527**
47.6	**29.0**	**18.6**	**14.9**	**24**
D	**C**	**B**	**B**	**C**

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NE Holladay @ NE MLK	Delay by Movement							
	EBT	EBR	SBL	SBT				
Seed 1	33.9	26.4	12.8	10.1	#170			
2	30.9	25.5	13.1	10.2				
3	33.1	29.8	56.8	25.9	**Delay by Lane**		**Total**	
4	36.9	36.9	33.1	26	**EB**	**SB**	**Int.**	
5	36	21.2	16.8	9.8	**TR**	**LT**	**Delay**	
Volume	121	128	23	2249	**249**	**2272**	**2521**	
Average	34.2	28.0	26.5	16.4	**31.0**	**16.5**	**17.9**	
Signalized LOS	C	C	C	B	**C**	**B**	**B**	

Pacific @ MLK	Delay by Movement						
	WBL	SBL	SBT	#19			Check Formulas
Seed 1	33.5	7.1	3.2				
2	41.1	6.7	5.5				
3	39.7	17.5	13.1	**Delay by Lane**		**Total**	
4	44.9	16.7	12.3	**WB**	**SB**	**Int.**	
5	33.8	5.9	3.2	**L**	**LTR**	**Delay**	
Volume	103	150	2272	**103**	**2422**	**2525**	
Average	38.6	10.8	7.5	**38.6**	**7.7**	**8.9**	
Signalized LOS	E	B	A	**D**	**A**	**A**	

NE Oregon @ NE MLK	Delay by Movement					
	WBL	SBL	SBT	#180		
Seed 1	29.9	7.4	4.6			
2	35.1	20.8	10.3			
3	125.6	20.4	19.8	**Delay by Lane**		**Total**
4	77	20.1	17.2	**WB**	**SB**	**Int.**
5	35.5	7.3	4.6	**L**	**LT**	**Delay**
Volume	121	17	2344	**121**	**2361**	**2482**
Average	60.6	15.2	11.3	**60.6**	**11.3**	**13.7**
Signalized LOS	E	B	B	**E**	**B**	**B**

NE MLK @ NE Irving	Delay by Movement						
	WBL	SBL	SBT	#32			Check Calcs
Seed 1	34.7	9	4.3				
2	36.4	11.9	12.3				
3	35.2	34.5	18.1	**Delay by Lane**		**Total**	
4	34.7	23.7	15.4	**WB**	**SB**	**Int.**	
5	37.8	11.8	4.8	**L**	**LT**	**Delay**	
Volume	47	30	2396	**47**	**2426**	**2473**	
Average	35.8	18.2	11.0	**35.8**	**11.1**	**11.5**	
Signalized LOS	E	C	B	**D**	**B**	**B**	

NE MLK @ NE Hoyt	Delay by Movement					
	WBL	SBT	#185			Check Calcs
Seed 1	18.6	8				
2	27.9	12.2				
3	25.2	16.9	**Delay by Lane**		**Total**	
4	25.4	14.4	**WB**	**SB**	**Int.**	
5	17.2	8.3	**L**	**T**	**Delay**	
Volume	32	2354	**32**	**2354**	**2386**	
Average	22.9	12.0	**22.9**	**12.0**	**12.1**	
Signalized LOS	C	B	**C**	**B**	**B**	

NE Lloyd @ NE MLK	Delay by Movement												
	EBT	EBR	WBL	WBT	SBL	SBT	SBR	#190					
Seed 1	162.9	237.4	46.5	25.4	29.5	20.2	25						
2	245.5	371.1	52	26.6	29.1	21.9	23.5						
3	302.5	273.2	46.3	28.6	31.3	28.8	30.8	**Delay by Lane**					**Total**
4	377	508	372	333	53	2095	65	**EB**	**EB**	**WB**	**WB**	**SB**	**Int.**
5	277.6	268.6	46.5	21.2	27.6	21.9	19.5	**T**	**R**	**L**	**LT**	**LTR**	**Delay**
Volume	453	637	399	369	66	2163	68	**453**	**637**	**363.09**	**404.91**	**2297**	**4155**
Average	273	332	113	87	34	438	33	**273.1**	**331.7**	**111.4**	**89.2**	**414.0**	**328**
Signalized LOS	F	F	F	F	C	F	C	**F**	**F**	**F**	**F**	**F**	**F**

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NE Everett @	Delay by Movemen	
NE MLK	SBL	SBT
Seed 1	22.9	27.3
2	33.6	35.2
3	36.3	42.5
4	34.5	40.6
5	25.8	25.7
Volume	589	2620
Average	30.6	34.3
unsignalized LOS	D	D

#200

Delay by Lane		Total
SB	SB	Int.
L	T	Delay
589	**2620**	**3209**
30.6	**34.3**	**33.6**
D	**D**	**D**

NE Couch @	Delay by Movement						
NE MLK	EBT	EBR	WBL	WBT	SBL	SBT	SBR
Seed 1	106.7	123.1	38	33.6	163.5	158.4	145.5
2	46	45.7	40.3	32.7	251.4	254.7	274.3
3	29	28.2	42.1	20.4	219.2	239.9	126.1
4	67.2	66.4	41.1	30	152.9	294.8	326.4
5	34	35.1	40.7	41.1	348.8	264.7	138
Volume	210	65	89	12	66	2749	40
Average	57	60	40	32	227	243	202
Signalized LOS	E	E	D	C	F	F	F

#210

Delay by Lane			Total
EB	WB	SB	Int.
TR	LT	LTR	Delay
275	**101**	**2855**	**3231**
57.3	**39.4**	**241.6**	**220**
E	**D**	**F**	**F**

NE Burnside @	Delay by Movement					
NE MLK	EBT	EBR	WBT	SBL	SBT	SBR
Seed 1	24.8	22.1	7.6	31.6	18.5	21.4
2	25	20.9	7.8	32.5	19.2	24.9
3	28.6	21.6	7.8	34.3	20.5	24.2
4	23.3	20.8	7.6	30.2	19.5	25.9
5	24.8	20.4	8.3	32.7	19.9	23.9
Volume	1769	899	1074	344	2199	377
Average	25	21	8	259	262	226
Signalized LOS	C	C	A	F	F	F

#220

Delay by Lane				Total
EB	EB	WB	SB	Int.
TR	R	T	LTR	Delay
1895	**773.14**	**1074**	**2920**	**6662**
25.0	**21.2**	**7.8**	**257.1**	**124**
C	**C**	**A**	**F**	**F**

	EBL	EBT	EBR	NBT	SBT
NE Steel Bridge @	Delay by Movement				
NE Lloyd	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Seed 1	16.3	12.9	38.8	32	0	0	196.2
2	17.5	12.9	27.6	28.2	18	0	156.7
3	17.6	14.3	61.9	36.4	29.7	0	311.9
4	17.9	15	53.5	36.3	0	0	374.9
5	19.8	16.6	61.7	38.5	0	0	479.1
Volume	602	479	631	414	1	0	354
Average	18	14	49	34	10	0	304
Signalized LOS	B	B	D	C	A	A	F

#230

Delay by Lane				Total
EB	EB	NB	SB	Int.
LT	R	TR	LT	Delay
1081	**631**	**414**	**355**	**2481**
16.3	**48.7**	**34.3**	**302.9**	**69**
B	**D**	**C**	**F**	**E**

Indicates not shown in report

	EBL	EBT	WBT	WBR	NBL	NBR	SBL	SBR
NE Multnomah @	by Movement							
NE 1st Ave	EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Seed 1	13.8	21.4	19.4	4	8	9.3	12.2	46.9	8.7
2	54.6	17.1	19.8	4.8	8.4	16.1	10	31.7	5
3	22.3	17.1	21.2	33.2	8.2	11.9	9.7	16.7	3.3
4	17.8	22	18.4	35.8	9.5	18.2	0	18.3	4.2
5	25.5	22.1	19.2	6.9	8.4	24.5	13.6	23.8	7.6
Volume	3	310	485	4	237	2	415	4	6
Average	27	20	20	17	9	16	9	27	6
Signalized LOS	C	B	B	B	A	B	A	C	A

#240

Delay by Lane					Total
EB	WB	NB	NB	SB	Int.
LT	TR	L	TR	LR	Delay
313	**489**	**237**	**417**	**10**	**1466**
20.0	**19.6**	**8.5**	**9.1**	**14.4**	**15**
C	**B**	**A**	**A**	**B**	**B**

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NE Holladay @ NE 1st Ave	Delay by Movement					Delay by Lane			Total Int. Delay
	EBL	EBT	NBT	NBR	NEL	EB	NB	NE	
Seed 1	6.3	53	37.8	31.9	17.3				
2	27	43	35.7	35.5	15.6				
3	19.6	57.4	30.1	27.4	15.7				
4	13.9	59	52.8	70.3	16.9				
5	20.7	61.4	72.2	81.1	16.1	LT	TR	LR	
Volume	0	7	448	107	191	**7**	**555**	**191**	**753**
Average	17.5	54.8	45.7	49.2	16.3	**54.8**	**46.4**	**27.6**	**41.7**
Signalized LOS	B	D	D	D	B	**D**	**D**	**C**	**D**

#250

NE Holladay @ NE 2nd Ave	Delay by Movement			Delay by Lane		Total Int. Delay
	EBL	EBT	SBL	EB	SB	
Seed 1	30.7	6.8	17.8			
2	40.2	6.1	16.4			
3	24.8	3.9	20			
4	30.7	3.9	17.4			
5	10.9	2.2	19.4	LT	L	
Volume	6	110	83	**116**	**83**	**199**
Average	27.5	4.6	18.2	**5.8**	**18.2**	**11.0**
Signalized LOS	C	A	B	**A**	**B**	**B**

#255

NE Holladay @ NE 3rd Ave	Delay by Movement		Delay by Lane		Total Int. Delay
	EBT	SBL	EB	SB	
Seed 1	3.7	23.4			
2	7.2	19.2			
3	4.6	24.5			
4	5.3	19.7			
5	3.9	24.5	T	L	
Volume	193	50	**193**	**50**	**243**
Average	4.9	22.3	**4.9**	**22.3**	**8.5**
Signalized LOS	A	C	**A**	**C**	**A**

#175

NE Multnomah @ NE 7th Ave	Delay by Movement												Delay by Lane								Total Int. Delay
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EB	EB	WB	WB	NB	NB	SB	SB	
Seed 1	41.4	9.3	12.2	38.5	10.9	13.6	40.4	24.3	25.9	44.5	22.7	18.8									
2	46.4	9.2	9.9	51.8	9.5	10.4	43	28.9	22.3	39.4	25.3	13.1									
3	47.3	9.2	11.7	42.7	8.5	10.5	37.2	26.4	27	49.8	26.8	17.6									
4	42.2	9.1	11.5	44.5	10.7	10.5	34.5	20.2	20.2	36	24.2	16.3									
5	34.7	10.6	11.2	43.7	17	24.9	45.7	20.1	18.9	50.4	33.3	37	L	TR	L	TR	L	TR	L	TR	
Volume	41	734	24	15	569	48	68	169	35	96	110	56	**41**	**758**	**15**	**617**	**68**	**204**	**96**	**166**	**1965**
Average	42	9	11	44	11	14	40	24	23	44	26	21	**42.4**	**9.5**	**44.2**	**11.5**	**40.2**	**23.8**	**44.0**	**24.5**	**17**
Signalized LOS	D	A	B	D	B	B	D	C	C	D	C	C	**D**	**A**	**D**	**B**	**D**	**C**	**D**	**C**	**B**

#260

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4 Lanes on MLK with Signals

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NE Holladay @ NE 7th Ave	Delay by Movement						#270			
	EBT	EBR	NBT	NBR	SBL	SBT				
Seed 1	19.3	10.8	8.2	5.2	13.4	10				
2	21.3	7.3	9.2	11.3	19	12.5				
3	21.9	9.4	8.3	7.8	13.4	10.1	**Delay by Lane**			**Total**
4	19	7.5	8	6.7	13.1	10.6	**EB**	**NB**	**SB**	**Int.**
5	20.8	12	8.6	6.6	14.9	10.2	**TR**	**TR**	**LT**	**Delay**
Volume	110	11	308	22	40	110	**121**	**330**	**150**	**601**
Average	20.5	9.4	8.5	7.5	14.8	10.7	**19.5**	**8.4**	**11.8**	**11.5**
Signalized LOS	C	A	A	A	B	B	**B**	**A**	**B**	**B**

NE Lloyd @ NE 9th Ave	Delay by Movement						#280					
	EBL	EBT	WBT	WBR	SBL	SBR						
Seed 1	33.9	5.1	9.3	9.5	39.6	4						
2	32.8	3.8	7.8	9.3	39.4	4.1						
3	38.4	4.1	7.4	7.5	35.7	3.8	**Delay by Lane**					**Total**
4	32.4	4.4	7.4	8	43.9	4.9	**EB**	**EB**	**WB**	**SB**	**SB**	**Int.**
5	39	4.7	8.4	9.7	39.7	4.1	**L**	**T**	**TR**	**L**	**R**	**Delay**
Volume	31	630	509	112	230	106	**31**	**630**	**621**	**230**	**106**	**1618**
Average	35	4	8	9	40	4	**35.3**	**4.4**	**8.2**	**39.7**	**4.2**	**11**
Signalized LOS	D	A	A	A	D	A	**D**	**A**	**A**	**D**	**A**	**B**

NE Weidler @ NE Victoria	Delay by Movement				#14			
	EBL	EBT	NBT	NBR				
Seed 1	11.1	13	20.4	14.5				
2	26.3	32.3	23.3	28.8				
3	10.2	17.5	20.4	22.5	**Delay by Lane**			**Total**
4	12	14.4	23	26.3	**EB**	**NB**	**NB**	**Int.**
5	10.6	12.4	20.2	12.2	**LT**	**T**	**R**	**Delay**
Volume	18	2238	382	1129	**2256**	**382**	**1129**	**3767**
Average	14.0	17.9	21.5	20.9	**17.9**	**21.5**	**20.9**	**19.1**
Signalized LOS	B	B	C	C	**B**	**C**	**C**	**B**

NE Holladay @ NE 6th Ave	Delay by Movement					#65				
	EBT	EBR	WBT	NBR	SBL					
Seed 1	2	3.6	35.7	3.9	15.9					
2	59.6	14.3	181.3	7.3	8.1					
3	2.5	5.5	16.4	3.6	17.9	**Delay by Lane**				**Total**
4	2.1	4	19.6	3	32.2	**EB**	**WB**	**NB**	**SB**	**Int.**
5	1.4	4.6	17.9	3.1	26.3	**TR**	**T**	**R**	**L**	**Delay**
Volume	88	5	75	15	5	**93**	**75**	**15**	**5**	**188**
Average	13.5	6.4	54.2	4.2	20.1	**13.1**	**54.2**	**4.2**	**20.1**	**29.0**
Signalized LOS	B	A	D	A	C	**B**	**D**	**A**	**C**	**C**

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NE Holladay @ NE 7th Ave	Delay by Movement						#270			
	EBT	EBR	NBT	NBR	SBL	SBT				
Seed 1	19.3	10.8	8.2	5.2	13.4	10				
2	21.3	7.3	9.2	11.3	19	12.5				
3	21.9	9.4	8.3	7.8	13.4	10.1	**Delay by Lane**			**Total**
4	19	7.5	8	6.7	13.1	10.6	**EB**	**NB**	**SB**	**Int.**
5	20.8	12	8.6	6.6	14.9	10.2	**TR**	**TR**	**LT**	**Delay**
Volume	110	11	308	22	40	110	**121**	**330**	**150**	**601**
Average	20.5	9.4	8.5	7.5	14.8	10.7	**19.5**	**8.4**	**11.8**	**11.5**
Signalized LOS	C	A	A	A	B	B	**B**	**A**	**B**	**B**

NE Lloyd @ NE 9th Ave	Delay by Movement						#280					
	EBL	EBT	WBT	WBR	SBL	SBR						
Seed 1	33.9	5.1	9.3	9.5	39.6	4						
2	32.8	3.8	7.8	9.3	39.4	4.1						
3	38.4	4.1	7.4	7.5	35.7	3.8	**Delay by Lane**					**Total**
4	32.4	4.4	7.4	8	43.9	4.9	**EB**	**EB**	**WB**	**SB**	**SB**	**Int.**
5	39	4.7	8.4	9.7	39.7	4.1	**L**	**T**	**TR**	**L**	**R**	**Delay**
Volume	31	630	509	112	230	106	**31**	**630**	**621**	**230**	**106**	**1618**
Average	35	4	8	9	40	4	**35.3**	**4.4**	**8.2**	**39.7**	**4.2**	**11**
Signalized LOS	D	A	A	A	D	A	**D**	**A**	**A**	**D**	**A**	**B**

NE Weidler @ NE Victoria	Delay by Movement				#14			
	EBL	EBT	NBT	NBR				
Seed 1	11.1	13	20.4	14.5				
2	26.3	32.3	23.3	28.8				
3	10.2	17.5	20.4	22.5	**Delay by Lane**			**Total**
4	12	14.4	23	26.3	**EB**	**NB**	**NB**	**Int.**
5	10.6	12.4	20.2	12.2	**LT**	**T**	**R**	**Delay**
Volume	18	2238	382	1129	**2256**	**382**	**1129**	**3767**
Average	14.0	17.9	21.5	20.9	**17.9**	**21.5**	**20.9**	**19.1**
Signalized LOS	B	B	C	C	**B**	**C**	**C**	**B**

NE Holladay @ NE 6th Ave	Delay by Movement					#65				
	EBT	EBR	WBT	NBR	SBL					
Seed 1	2	3.6	35.7	3.9	15.9					
2	59.6	14.3	181.3	7.3	8.1					
3	2.5	5.5	16.4	3.6	17.9	**Delay by Lane**				**Total**
4	2.1	4	19.6	3	32.2	**EB**	**WB**	**NB**	**SB**	**Int.**
5	1.4	4.6	17.9	3.1	26.3	**TR**	**T**	**R**	**L**	**Delay**
Volume	88	5	75	15	5	**93**	**75**	**15**	**5**	**188**
Average	13.5	6.4	54.2	4.2	20.1	**13.1**	**54.2**	**4.2**	**20.1**	**29.0**
Signalized LOS	B	A	D	A	C	**B**	**D**	**A**	**C**	**C**

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NE Broadway @	Delay by Movement			
NE Grand	WBT	WBR	NBL	NBT
Seed 1	30.7	20.5	12.9	10.2
2	31.3	21.5	14.4	10.8
3	30.7	21.2	15.1	10.7
4	32.7	19.8	14.3	10
5	32.2	19.3	15.1	10.6
Volume	1736	244	922	1556
Average	31.5	20.5	14.4	10.5
Signalized LOS	C	C	B	B

#10

Delay by Lane			Total
WB	NB	NB	Int.
TR	L	LT	Delay
1980	608.52	1869.5	4458
30.2	14.4	11.1	20.0
C	B	B	C

NE Weidler @	Delay by Movement			
NE Grand	EBL	EBT	NBT	NBR
Seed 1	15	13.1	31.8	41.2
2	19.6	14.9	27.4	33.1
3	17.4	14.9	30.4	36.8
4	16.6	14.1	26.3	36.4
5	18.1	14.4	23.1	32.1
Volume	194	2001	2272	283
Average	17.3	14.3	27.8	35.9
Signalized LOS	B	B	C	D

#20

Delay by Lane			Total
EB	EB	NB	Int.
L	LT	TR	Delay
166.84	2028.2	2555	4750
17.3	14.3	28.7	22.2
B	B	C	C

NE Halsey @	Delay by Movement						
NE Grand	EBL	EBT	WBT	WBR	NBL	NBT	NBR
Seed 1	22.7	19.9	37	48.4	5.3	15.9	20.6
2	21.6	18.4	50.7	45.7	2.1	20	28.2
3	32.4	22.2	37	41.7	6.9	21.6	36.2
4	21.6	20.2	33.9	32.4	7.1	14.6	21.8
5	31	17.3	35	33.4	3.2	14.9	19.9
Volume	19	58	95	97	4	2309	72
Average	26	20	39	40	5	17	25
Signalized LOS	C	B	D	D	A	B	C

30

Delay by Lane			Total
EB	WB	NB	Int.
LT	TR	LTR	Delay
77	192	2385	2654
21.1	39.5	17.6	19
C	D	B	B

NE Clackamas @	Delay by Movement						
NE Grand	EBL	EBT	WBT	WBR	NBL	NBT	NBR
Seed 1	35.3	38.7	22.6	17.7	5.5	16.1	67.8
2	35.9	32.2	29.2	21	5.7	11.9	22.9
3	28.8	30.1	31.3	23.2	7.5	14.3	36.4
4	37.4	32.8	37.6	18.9	7	8.6	18.2
5	30.8	32.2	29.9	16.1	6.3	5.7	11.5
Volume	78	34	10	40	28	2233	26
Average	34	33	30	19	6	11	31
Signalized LOS	C	C	C	B	A	B	C

#40

Delay by Lane			Total
EB	WB	NB	Int.
LT	TR	LTR	Delay
112	50	2287	2449
33.5	21.5	11.5	13
C	C	B	B

NE Multnomah @	Delay by Movement						
NE Grand	EBL	EBT	WBT	WBR	NBL	NBT	NBR
Seed 1	46.6	14.7	32.8	61.2	18.4	16.3	23.3
2	42.2	12.6	22.8	31	19.2	16	23.1
3	43.9	14.1	23.4	27.4	18.4	14.8	18.7
4	42	12.8	25.6	34.6	19.4	14.6	15.7
5	48.6	13.4	44.4	85.8	22	15.5	20.7
Volume	179	472	420	167	147	1786	162
Average	45	14	30	48	19	15	20
Signalized LOS	D	B	C	D	B	B	C

#50

Delay by Lane			Total
EB	WB	NB	Int.
LT	TR	LTR	Delay
651	587	2095	3333
22.1	35.0	16.1	21
C	C	B	C

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NE Holladay @ NE Grand	Delay by Movement EBL	EBT	NBT	NBR
Seed 1	51	19.6	7.5	6
2	59.6	14.3	7.3	8.1
3	78.7	14.4	6.7	7.6
4	50.5	20.8	6.8	8.7
5	54.5	19.8	6.6	9.4
Volume	40	70	2098	18
Average	58.9	17.8	7.0	8.0
Signalized LOS	E	B	A	A

#60

Delay by Lane EB L	EB T	NB TR	Total Int. Delay
40	**70**	**2116**	**2226**
58.9	**17.8**	**7.0**	**8.3**
E	**B**	**A**	**A**

Pacific @ NE Grand Ave	Delay by Movement EBL	EBT	WBT	WBR	NBL	NBT	NBR
Seed 1	18.2	16.8	70.9	37.7	3	1.5	5
2	22.5	24.2	21.8	12.2	2.9	1.6	5.9
3	20.3	25.8	29.7	8	3.3	1.8	5.4
4	27.1	23.2	23.7	13.2	2.9	1.7	5.2
5	26.5	28.2	29.7	9.9	2.9	1.4	5
Volume	139	14	14	15	99	2023	30
Average	23	24	35	16	3	2	5
Unsignalized LOS	C	C	E	C	A	A	A

#21

Delay by Lane EB LT	EB TR	WB LTR	NB Int. Delay
153	**29**	**2152**	**2334**
23.0	**25.4**	**1.7**	**3**
C	**D**	**A**	**A**

NE Oregon @ NE Grand	Delay by Movement EBL	EBT	WBT	WBR	NBL	NBT	NBR
Seed 1	30.1	21.9	28.3	17	5.4	3.3	4.8
2	33.2	11	23.5	14.4	5.9	3.7	5.9
3	30.3	7.1	183.7	218.5	79.7	7.1	6.6
4	22.5	8.3	47.1	31.6	4.2	3.8	5.6
5	34.1	32.4	24.8	18.6	6.1	3.3	5.1
Volume	15	12	124	80	17	2067	22
Average	30	16	61	60	20	4	6
Signalized LOS	C	B	E	E	C	A	A

#70

Delay by Lane EB LT	EB TR	WB LTR	NB Int. Delay
27	**204**	**2106**	**2337**
23.9	**60.9**	**4.4**	**10**
C	**E**	**A**	**A**

NE Irving @ NE Grand	Delay by Movement EBL	EBT	WBT	WBR	NBL	NBT	NBR
Seed 1	16.9	18	21.4	8	2.4	0.7	4.9
2	15.1	21.2	16.1	10.2	2.8	0.8	4.8
3	17.3	25.5	27.8	14.4	2.6	1.3	4.8
4	17.2	24.3	25.8	10.2	2.9	0.9	4.8
5	11.9	19.3	27.1	9.4	2.9	0.8	3.9
Volume	40	20	20	40	10	1930	2
Average	15	23	24	11	3	1	5
Unsignalized LOS	C	C	C	B	A	A	A

#24

Delay by Lane EB LT	EB TR	WB LTR	NB Int. Delay
60	**60**	**1942**	**2062**
17.8	**15.4**	**1.0**	**2**
C	**C**	**A**	**A**

NE Grand @ NE Hoyt	elay by Moveme NBL	NBT
Seed 1	3.7	1.3
2	3.4	1.3
3		1.4
4	3	1.4
5	4	1.3
Volume	2	1930
Average	3.5	1.3
Signalized LOS	A	A

#34

Delay by Lane NB L	NB T	Total Int. Delay
2	**1930**	**1932**
3.5	**1.3**	**1.3**
A	**A**	**A**

NE Lloyd @ NE Grand	Delay by Movement EBL	EBT	WBT	WBR	NBL	NBT	NBR
Seed 1	34.2	14.5	24.1	20.2	13.6	6.5	9.3
2	41.7	10.3	61.2	57.3	25.5	8.8	10
3	31.3	12.8	37.1	34	14.1	7.6	10.3
4	42.8	10.1	48.7	42.5	15.4	7.6	9.8
5	54.4	16.5	32	24.9	13.1	6.7	9.5
Volume	66	451	520	185	222	1684	141
Average	41	13	41	36	16	7	10
Signalized LOS	D	B	D	D	B	A	A

#80

Delay by Lane EB LT	EB TR	WB LTR	NB Int. Delay
517	**705**	**2047**	**3269**
16.4	**39.3**	**8.6**	**16**
B	**D**	**A**	**B**

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NE Everett @ NE Grand	Delay by Movement			
	EBL	EBT	NBT	NBR
Seed 1	21.3	28	6.1	15.4
2	21.2	25.9	6.8	18
3	25.9	24.5	6.7	16.8
4	20.1	24.8	6.3	15.6
5	17.9	26	6.2	15.6
Volume	20	566	1853	433
Average	21.3	25.8	6.4	16.3
Signalized LOS	C	C	A	B

#90

Delay by Lane		Total
EB	NB	Int.
LT	TR	Delay
25.7	**8.3**	**11.8**
C	**A**	**B**

NE Couch @ NE Grand	Delay by Movement						
	EBL	EBT	WBT	WBR	NBL	NBT	NBR
Seed 1	35.1	33.5	17.2	12.1	11	5.6	8.4
2	35.4	29.6	27.8	17.8	12.4	6.3	9.5
3	20.8	14	23.3	12.1	6.1	5.8	8
4	39.3	28.6	28	17.2	14.2	5.9	8.6
5	19.6	18.3	22.4	12.4	12.7	6.2	7.1
Volume	220	53	44	253	32	1899	33
Average	30	25	24	14	11	6	8
Signalized LOS	C	C	C	B	B	A	A

#100

Delay by Lane			Total
EB	WB	NB	Int.
LT	TR	LTR	Delay
273	**297**	**1964**	**2534**
29.0	**15.7**	**6.1**	**10**
C	**B**	**A**	**A**

NE Burnside @ NE Grand	Delay by Movement					
	EBT	WBT	WBR	NBL	NBT	NBR
Seed 1	7.6	11.9	13.6	207.4	105.3	146.5
2	8	12.1	12.3	282.1	110.4	117.9
3	8.4	12.2	13.2	217.8	100.7	106.8
4	7	11.8	12.5	145.8	53.8	68.6
5	7.7	11.8	14.1	254	64	78.8
Volume	2130	701	134	329	1837	156
Average	8	12	13	221	87	104
Signalized LOS	A	B	B	F	F	F

#110

Delay by Lane			Total
EB	WB	NB	Int.
T	TR	LTR	Delay
2130	**835**	**2322**	**5287**
7.7	**12.1**	**107.0**	**52**
A	**B**	**F**	**D**

APPENDIX 3: 2008 BUILD SCENARIO 1 QUEUE CALCULATION WORKSHEETS

Scenario 1 2008 PM - Build Conditions
Oregon Convention Center Hotel

Exceeds Model Link Length, Actual Queue Unknown
Queue Spill Back or Blocking
Value Not Used

95% Queue Calculations

Intersection: 2:	Direction	NW	NW	NW
Martin Luther King Blvd. & Grand Avenue	Lanes	L	R	R
Seed 1		0	50	83
2		49	135	87
3		0	169	125
4		0	0	45
5		54	156	146
Average		**21**	**102**	**97**
Model Storage Length		240	240	240

Intersection: 10:	Direction	WB	WB	WB	WB	NB	NB	NB	NB
Broadway & Grand Avenue	Lanes	T	T	T	TR	L	LT	T	T
Seed 1		312	298	249	216	184	221	183	119
2		321	270	222	222	173	231	182	131
3		320	271	213	202	188	233	179	133
4		381	327	227	239	183	216	162	157
5		370	360	292	216	201	229	172	109
Average		**341**	**305**	**241**	**219**	**186**	**226**	**176**	**130**
Model Storage Length		2509	2509	2509	2509	168	168	168	168

Intersection: 14:	Direction	EB	EB	EB	NB	NB	NB	B18
Weidler & Victoria	Lanes	LT	T	T	T	T	R	T
Seed 1		217	229	264	117	115	698	207
2		591	633	644	254	108	1434	671
3		261	287	330	107	106	1071	440
4		219	221	276	127	131	1282	537
5		231	220	227	119	101	334	0
Average		**304**	**318**	**348**	**145**	**112**	**964**	
Model Storage Length		868	868	868	515	515	515	581
						1096		

Intersection: 19:	Direction	WB	SB	SB	SB	SB
Pacific & MLK	Lanes	L	LT	T	T	T
Seed 1		89	167	72	75	122
2		100	213	146	155	154
3		99	296	274	289	284
4		112	274	238	251	251
5		107	165	104	79	116
Average		**101**	**223**	**167**	**170**	**185**
Model Storage Length		178	216	216	216	216

Scenario 1 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 20:	Direction	EB	EB	EB	EB	NB	NB	NB	NB
Weidler & Grand Avenue	Lanes	L	LT	T	T	T	T	T	TR
Seed 1		167	282	214	164	224	241	247	218
2		178	260	208	181	233	229	236	229
3		207	262	217	150	239	236	242	222
4		169	273	228	145	218	233	242	218
5		182	279	223	180	238	223	212	207
Average		**181**	**271**	**218**	**164**	**230**	**232**	**236**	**219**
Model Storage Length		178	178	178	178	181	181	181	181

Intersection: 21:	Direction	EB	WB	NB	NB
Pacific St. & Grand Avenue	Lanes	LT	TR	T	TR
Seed 1		99	65	0	0
2		114	49	19	37
3		96	47	0	11
4		142	45	21	29
5		109	51	0	0
Average		**112**	**51**	**8**	**15**
Model Storage Length		178	209	209	209

Intersection: 24:	Direction	EB	WB	NB	NB	NB	NB
Irving & Grand Avenue	Lanes	LT	TR	LT	T	T	TR
Seed 1		69	62	0	0	0	0
2		58	58	0	0	0	0
3		59	77	71	16	0	0
4		70	64	0	0	0	0
5		63	62	7	0	0	0
Average		**64**	**65**	**16**	**3**	**0**	**0**
Model Storage Length		181	730	226	226	226	226

Intersection: 30:	Direction	EB	WB	NB	NB	NB	NB
Halsey & Grand Avenue	Lanes	LT	TR	LT	T	T	TR
Seed 1		84	194	218	255	303	293
2		82	244	250	282	336	313
3		101	181	234	272	314	315
4		73	173	193	234	302	293
5		89	183	200	268	307	307
Average		**86**	**195**	**219**	**262**	**312**	**304**
Model Storage Length		181	730	226	226	226	226

Scenario 1 2008 PM - Build Conditions

Intersection: 32:	Direction	WB	SB	SB	SB	SB
Irving & Martin Luther King Blvd.	Lanes	L	LT	T	T	T
Seed 1		79	202	147	121	123
2		75	232	222	214	232
3		77	264	256	249	252
4		82	258	227	237	242
5		63	202	132	128	129
Average		**75**	**232**	**197**	**190**	**196**
Model Storage Length		182	190	190	190	190

Intersection: 34:	Direction	NB	NB	NB	NB
Hoyt & Grand Avenue	Lanes	LT	T	T	T
Seed 1					
2					
3		No Information for intersection			
4					
5					
Average		**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**
Model Storage Length		207	207	207	207

Intersection: 40:	Direction	EB	WB	NB	NB	NB	NB
Clackamas & Grand Avenue	Lanes	LT	TR	LT	T	T	TR
Seed 1		117	72	134	265	340	363
2		116	58	109	193	271	261
3		109	74	127	221	332	342
4		125	69	81	164	226	241
5		119	67	65	100	128	153
Average		**117**	**68**	**103**	**189**	**259**	**272**
Model Storage Length		182	370	423	423	423	423

Scenario 1 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 50:	Direction	EB	EB	WB	WB	WB	NB	NB	NB	NB
Multnomah & Grand Avenue	Lanes	LT	T	T	T	TR	LT	T	T	TR
Seed 1		241	224	77	188	399	192	198	257	313
2		222	195	87	113	240	228	228	315	347
3		225	224	84	115	211	231	207	225	265
4		222	211	99	110	234	217	195	300	277
5		243	231	76	377	512	222	251	286	327
Average		**231**	**217**	**85**	**181**	**319**	**218**	**216**	**277**	**306**
Model Storage Length		179	179	440	440	440	440	440	440	440

Intersection: 60:	Direction	EB	EB	WB	NB	NB	NB	NB
Holladay & Grand Avenue	Lanes	L	T	T	T	T	T	TR
Seed 1		66	73	167	146	138	193	210
2		110	101	188	138	167	199	211
3		105	65	130	153	162	196	187
4		76	64	185	140	169	197	205
5		69	93	148	133	147	175	164
Average		**85**	**79**	**164**	**142**	**157**	**192**	**195**
Model Storage Length		150	183	171	478	478	478	478

Intersection: 65:	Direction	EB	WB	NB	SB
Holladay & NE 6th Avenue	Lanes	TR	T	R	L
Seed 1		16	114	35	23
2		29	120	35	23
3		39	78	37	32
4		21	104	42	15
5		0	79	41	27
Average		**21**	**99**	**38**	**24**
Model Storage Length		171	208	224	257

Scenario 1 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 70:	Direction	EB	WB	NB	NB	NB	NB
Oregon & Grand Avenue	Lanes	LT	TR	LT	T	T	TR
Seed 1		44	133	86	77	78	89
2		52	145	87	86	86	107
3		47	707	187	150	106	115
4		37	215	96	101	86	101
5		56	149	83	82	75	95
Average		**47**	**270**	**108**	**99**	**86**	**101**
Model Storage Length		183	863	690	690	690	690

Intersection: 80:	Direction	EB	EB	WB	WB	B81	B81	NB	NB	NB	NB
LLoyd & Grand Avenue	Lanes	LT	T	T	TR	T	T	LT	T	T	TR
Seed 1		114	99	166	163	84	124	171	130	97	112
2		120	79	173	169	386	390	323	246	237	133
3		105	77	169	163	170	231	200	148	135	138
4		125	62	178	169	340	386	204	151	120	136
5		128	104	168	165	83	128	153	117	101	141
Average		**118**	**84**	**171**	**166**			**210**	**158**	**138**	**132**
Model Storage Length		213	213	95	95	338	338	401	401	401	401
				433	433						

Intersection: 90:	Direction	EB	EB	NB	NB	NB	NB
Everett & Grand Avenue	Lanes	<L	L	T	T	T	TR
Seed 1		182	184	97	90	112	249
2		171	191	112	122	160	298
3		161	175	110	88	160	254
4		171	179	111	112	137	201
5		163	188	103	92	102	210
Average		**170**	**183**	**107**	**101**	**134**	**242**
Model Storage Length		192	192	477	477	477	477

Scenario 1 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 100:	Direction	EB	WB	NB	NB	NB	NB
Couch & Grand Avenue	Lanes	LT	TR	LT	T	T	TR
Seed 1		230	128	76	61	65	91
2		224	204	81	67	121	126
3		210	124	69	75	87	93
4		248	197	79	64	78	99
5		191	142	64	66	81	101
Average		**221**	**159**	**74**	**67**	**86**	**102**
Model Storage Length		204	472	177	177	177	177

Intersection: 110:	Direction	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Burnside & Grand Avenue	Lanes	T	T	T	T	T	TR	LT	T	T	TR
Seed 1		125	119	104	119	105	98	1669	1590	1316	1174
2		133	124	127	111	103	115	2016	1967	1811	1396
3		150	128	120	121	112	121	1578	1545	1150	1099
4		106	112	98	117	103	98	1000	921	636	515
5		119	120	120	113	96	118	1837	1775	1356	1000
Average		**127**	**121**	**114**	**116**	**104**	**110**	**1620**	**1560**	**1254**	**1037**
Model Storage Length		199	199	199	1472	1472	1472	1821	1821	1821	1821

Intersection: 120:	Direction	WB	WB	WB	WB	SB	SB	SB	SB
Broadway & Martin Luther King Blvd.	Lanes	LT	T	T	T	T	T	T	TR
Seed 1		208	172	169	182	153	152	186	238
2		202	175	174	194	165	145	178	207
3		203	172	165	178	163	151	154	197
4		225	197	171	184	175	148	175	209
5		203	173	185	189	161	154	173	200
Average		**208**	**178**	**173**	**185**	**163**	**150**	**173**	**210**
Model Storage Length		181	181	181	181	471	471	471	471

Scenario 1 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 130:	Direction	EB	EB	EB	EB	SB	SB	SB	SB
Weidler & Martin Luther King Blvd.	Lanes	T	T	T	R	LT	T	T	T
Seed 1		974	1054	1129	1195	212	161	118	110
2		924	1028	1089	1112	182	126	98	95
3		963	1092	1158	1241	200	119	114	101
4		973	1069	1239	1212	214	142	115	97
5		813	856	966	1112	172	112	105	104
Average		**929**	**1020**	**1116**	**1174**	**196**	**132**	**110**	**101**
Model Storage Length		938	938	938	938	199	199	199	199

Intersection: 140:	Direction	WB	SB	SB	SB
Halsey & Martin Luther King Blvd.	Lanes	L	LT	T	T
Seed 1		75	0	0	0
2		81	0	0	0
3		133	0	0	0
4		65	0	0	0
5		76	0	0	0
Average		**86**	**0**	**0**	**0**
Model Storage Length		182	177	177	177

Not Included in the report

Intersection: 150:	Direction	EB	WB	SB	SB	SB	SB
Clackamas & Martin Luther King Blvd.	Lanes	TR	LT	LT	T	T	TR
Seed 1		77	96	102	81	76	100
2		61	82	89	62	59	89
3		70	77	87	51	69	82
4		57	84	121	91	92	109
5		66	83	111	83	68	93
Average		**66**	**84**	**102**	**74**	**73**	**95**
Model Storage Length		448	182	223	223	223	223

Scenario 1 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 160:	Direction	EB	EB	B165	B165	B245	B245	WB	WB	WB	SB	SB	SB	SB
Multnomah & Martin Luther King Blvd.	Lanes	T	TR	T	T	T	T	L	L	T	LT	T	T	TR
Seed 1		801	851	517	541	137	184	112	104	161	261	168	164	221
2		681	756	467	529	69	99	115	106	178	332	242	205	193
3		716	735	467	490	97	119	117	103	183	342	290	268	242
4		894	953	550	587	204	242	144	111	198	367	325	279	310
5		928	941	573	572	208	236	129	120	176	264	194	163	187
Average		**804**	**847**					**123**	**109**	**179**	**313**	**244**	**216**	**231**
Model Storage Length		73	73	420	420	204	179	179	179	432	432	432	432	432
		697	672											

Intersection: 170:	Direction	EB	WB	SB	SB	SB	SB
Holladay & Martin Luther King Blvd.	Lanes	TR	T	LT	T	T	T
Seed 1		171	0	274	237	225	209
2		187	0	303	226	218	219
3		180	52	457	455	464	444
4		179	0	457	429	426	427
5		181	0	296	216	234	242
Average		**180**	**10**	**357**	**313**	**313**	**308**
Model Storage Length		152	183	442	442	442	442

Intersection: 175:	Direction	EB	WB	SB
Holladay & 3rd Avenue	Lanes	T	T	L
Seed 1		72	120	69
2		119	114	55
3		93	125	71
4		91	139	61
5		74	121	65
Average		**90**	**124**	**64**
Model Storage Length		258	152	214

Scenario 1 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 180:	Direction	WB	SB	SB	SB	SB
Oregon & Martin Luther King Blvd.	Lanes	L	LT	T	T	T
Seed 1		129	152	112	123	146
2		123	233	195	211	207
3		219	266	259	267	261
4		188	259	254	255	261
5		161	187	133	142	161
Average		**164**	**219**	**191**	**200**	**207**
Model Storage Length		183	480	480	480	480

Intersection: 185:	Direction	WB	SB	SB	SB	SB
Hoyt & Martin Luther King Blvd.	Lanes	L	T	T	T	T
Seed 1		44	249	194	181	189
2		50	240	245	220	217
3		45	265	279	278	273
4		55	259	250	252	252
5		55	246	187	195	205
Average		**50**	**252**	**231**	**225**	**227**
Model Storage Length		190	187	187	187	187

Now signal @ Hoyt

Intersection: 190:	Direction	EB	EB	B8	B8	WB	WB	WB	SB	SB	SB	SB	B185	B185	B185	B185
LLoyd & Martin Luther King Blvd.	Lanes	T	R	T	T	L	LT	T	LT	T	T	TR	T	T	T	T
Seed 1		1507	1519	214	221	248	251	176	247	259	249	259				
2		1823	1806	279	293	243	243	159	266	248	254	257				
3		1455	1473	208	222	245	248	189	251	261	265	268				
4		1461	1470	200	219	256	266	217	250	262	269	280				
5		1455	1483	209	232	245	243	179	244	261	266	269				
Average		**1540**	**1550**			**247**	**250**	**184**	**252**	**258**	**261**	**267**				
Model Storage Length		404	404	202	202	213	213	213	195	195	195	195	427	427	427	427
		1297	1297													

Intersection: 191:	Direction	SB	SE	B232
LLoyd &	Lanes	LR	L	T
Seed 1		38	829	405
2		58	1016	418
3		42	782	357
4		41	782	357
5		44	782	357
Average		**45**	**838**	
Model Storage Length		286	364	327
			691	

Scenario 1 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 200:	Direction	SB	SB	SB	SB
Everett & Martin Luther King Blvd.	Lanes	LT	T	T	T
Seed 1		525	502	496	499
2		561	521	536	532
3		641	602	604	603
4		634	618	606	605
5		542	538	516	517
Average		**581**	**556**	**552**	**551**
Model Storage Length		455	455	455	455

Intersection: 210:	Direction	EB	WB	SB	SB	SB	SB	
Couch & Martin Luther King Blvd.	Lanes	TR	LT	LT	T	T	TR	
Seed 1		496	95	539	563	539	531	
2		293	111	560	564	543	527	
3		204	97	551	552	539	506	
4		400	111	565	567	546	527	
5		277	126	534	547	519	505	
Average		**334**	**108**	**1130**	**1115**	**1089**	**1070**	Everett & MLK queues added to this row
Model Storage Length		448	204	472	472	472	472	

Intersection: 220:	Direction	EB	EB	EB	EB	B221	B221	B221	WB	WB	WB	SB	SB	SB	SB
Burnside & Martin Luther King Blvd.	Lanes	T	T	TR	R	T	T	T	T	T	T	LT	T	T	TR
Seed 1		415	394	346	296	59	41	11	96	100	81	199	205	197	211
2		352	346	379	271	11	0	35	107	101	91	204	201	201	202
3		433	407	343	268	34	39	7	99	100	93	198	214	186	213
4		364	322	334	279	31	0	0	88	90	92	205	209	189	204
5		399	401	337	274	16	36	7	109	99	82	200	217	189	199
Average		**391**	**367**	**351**	**278**				**100**	**98**	**88**	**201**	**209**	**192**	**206**
Model Storage Length		316	316	316	316	1743	1743	1743	199	199	199	163	163	163	163
		2059	2059	2059	Upstream Signals?										

Scenario 1 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 230:	Direction	EB	EB	EB	B231	B231	NB	B232	SB
LLoyd & Steel Bridge	Lanes	LT	T	R	T	T	TR	T	LT
Seed 1		1613	1642	267	1241	1249	366	10	281
2		1526	1557	265	1166	1186	304		270
3		1784	1767	255	1434	1412	403	33	247
4		1756	1735	249	1379	1365	384	39	247
5		1797	1765	235	1437	1406	352	13	257
Average		**1695**	**1693**	**254**			**362**		**260**
Model Storage Length		244	244	200	1084	1084	327	364	212
		1328	1328				691		

Intersection: 240:	Direction	EB	EB	WB	WB	NB	NB	NB	SB
Multnomah & 1st Avenue	Lanes	LT	T	T	TR	L	L	TR	LR
Seed 1		101	127	146	146	72	73	222	43
2		77	86	145	141	63	59	202	34
3		74	88	159	160	87	75	166	26
4		94	110	148	138	99	92	222	30
5		89	116	132	133	81	73	218	35
Average		**87**	**105**	**146**	**144**	**80**	**74**	**206**	**34**
Model Storage Length		365	365	204	204	177	177	177	264

Intersection: 250:	Direction	EB	WB	NB	NB	NE
Holladay & 1st Avenue	Lanes	LT	T	T	TR	<L
Seed 1		19	135	279	377	130
2		23	135	287	367	131
3		18	120	158	332	107
4		31	146	364	413	127
5		26	118	445	442	122
Average		**23**	**131**	**307**	**386**	**123**
Model Storage Length		310	191	376	376	386

Scenario 1 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 255:	Direction	EB	WB	SB
Holladay & 2nd Avenue	Lanes	LT	T	L
Seed 1		102	131	65
2		78	112	90
3		68	122	85
4		67	102	69
5		53	107	78
Average		**74**	**115**	**77**
Model Storage Length		191	258	141

Intersection: 260:	Direction	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Multnomah & 7th Avenue	Lanes	L	T	TR	L	T	TR	L	TR	L	TR
Seed 1		72	138	144	48	112	146	123	194	107	173
2		67	151	160	50	108	142	97	273	108	161
3		65	162	152	34	101	135	97	245	118	194
4		66	139	142	38	118	153	102	151	111	157
5		59	156	162	33	146	237	99	168	113	251
Average		**66**	**149**	**152**	**41**	**117**	**163**	**104**	**206**	**111**	**187**
Model Storage Length		440	440	440	994	994	994	100	457	75	611

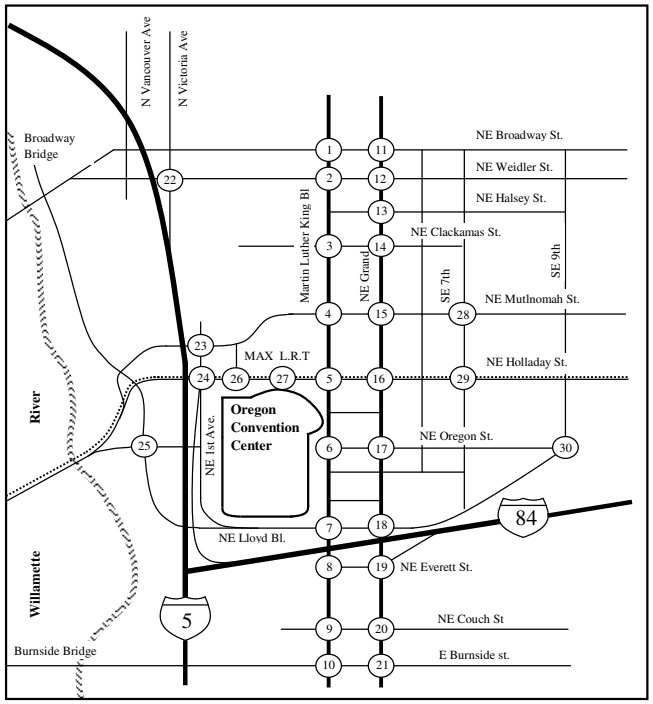
Intersection:	Direction	EB	WB	NB	SB
270: Holladay & 7th Avenue	Lanes	TR	T	TR	LT
Seed 1		84	193	136	101
2		113	171	138	98
3		114	147	135	104
4		99	160	118	121
5		113	143	121	87
Average		**105**	**163**	**130**	**102**
Model Storage Length		208	360	412	457

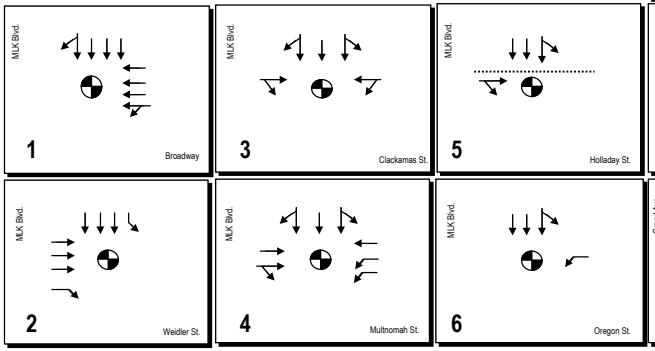
Intersection: 280:	Direction	EB	EB	EB	WB	WB	SB	SB
LLoyd & 9th Avenue	Lanes	L	T	T	T	TR	L	R
Seed 1		66	128	135	128	160	191	28
2		57	88	99	108	144	163	34
3		59	92	90	121	149	151	33
4		52	96	89	100	114	229	40
5		61	89	104	109	171	187	32
Average		**59**	**99**	**103**	**113**	**148**	**184**	**33**
Model Storage Length		150	653	653	611	611	486	486

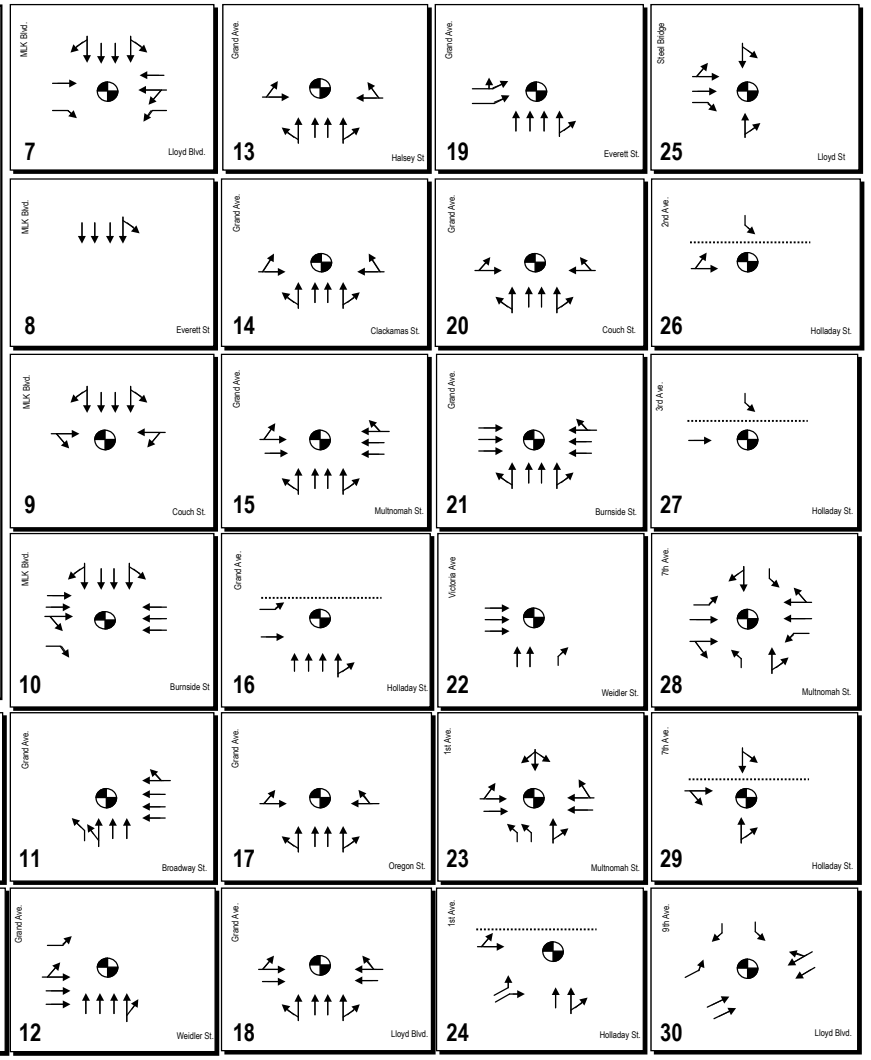
APPENDIX 4: 2008 BUILD SCENARIO 2

- **Figure 8: Lane Configurations**
- **Figure 9: PM Peak Hour Intersection Operations and Worksheets**
- **Figure 10: 95th Percentile Queues and Worksheets**

APPENDIX 4: FIGURE 8: LANE CONFIGURATIONS







* Delay casued by downstream queuing

DAVID EVANS AND ASSOCIATES INC.

NOT TO SCALE

LEGEND
- = Traffic Signal
- = Stop Sign
- = Allowable turning movement for designated lane
- (4) = Intersection number
- ..... = MAX LRT

FIGURE 8

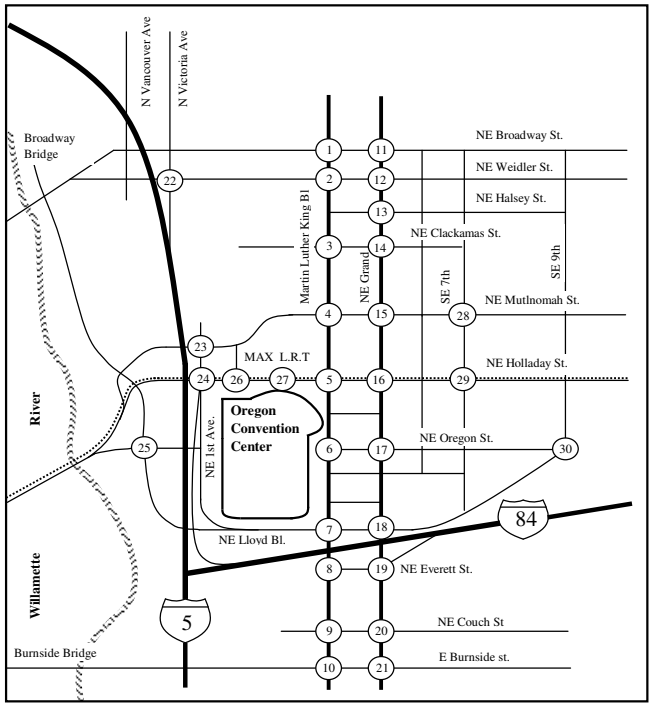
2008 Lane Configurations

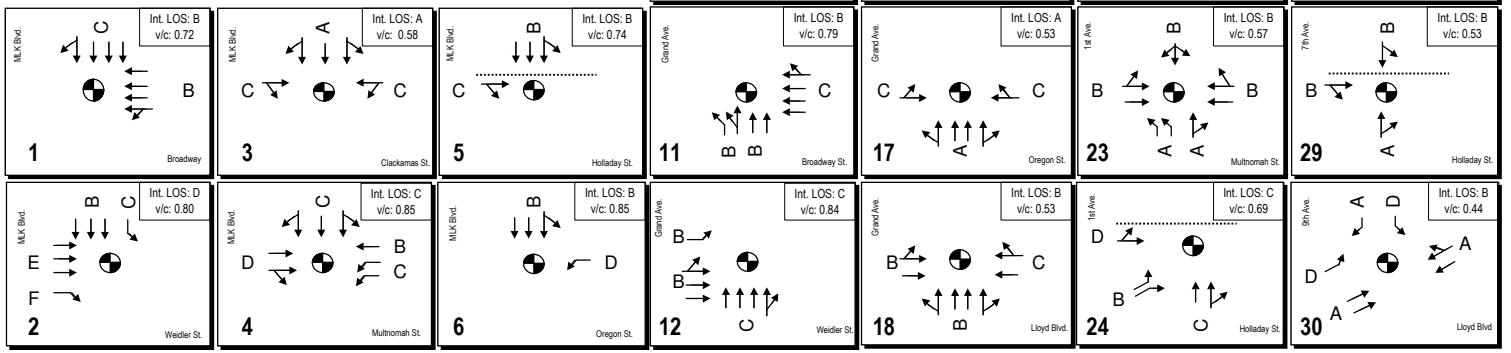
(PM Peak Hour)

Build Scenario 2

Oregon Convention Center Hotel

APPENDIX 4: FIGURE 9: PM PEAK HOUR INTERSECTION OPERATIONS AND WORKSHEETS





* Delay casued by downstream queuing

DAVID EVANS AND ASSOCIATES INC.

NOT TO SCALE

LEGEND
- = Traffic Signal
- = Stop Sign
- = Allowable turning movement for designated lane
- (4) = Intersection number
- ..... = MAX LRT

FIGURE 9

2008 Traffic Operations

(PM Peak Hour)

Build Scenario 2

Oregon Convention Center Hotel

Project: Convention Center Hotel
Job #: PDXX0000-0107
Subject: Calculation of Average Delays from SimTraffic Runs - **Scenario 2 2008 PM Peak Hour**

12/12/2003

NE Broadway @	Delay by Movement			
NE MLK	WBL	WBT	SBT	SBR
Seed 1	15.2	9.8	19.8	22.6
2	17.8	10.6	21.2	23.6
3	16.9	10.2	19.6	22
4	24.2	9.7	26.5	24.2
5	14.8	10.1	21.2	23.4
Volume	349	2248	1342	149
Average	17.8	10.1	21.7	23.2
Signalized LOS	B	B	C	C

Delay by Lane		Total
WB	SB	Int.
LT	TR	Delay
11.1	**21.8**	**15.0**
B	**C**	**B**

NE Weidler @	Delay by Movement			
NE MLK	EBR	EBT	SBL	SBT
Seed 1	84.3	64	19.8	18.6
2	114.2	62.1	23.9	19.2
3	106.6	73.5	19.3	18.1
4	101.5	65.4	21.1	18.4
5	90.6	60.6	19.6	16.6
Volume	668	1992	275	1363
Average	99.4	65.1	20.7	18.2
Signalized LOS	F	E	C	B

Delay by Lane			Total
EB	EB	SB	Int.
R	T	LT	Delay
668	**1992**	**1638**	**4298**
99.4	**65.1**	**18.6**	**52.7**
F	**E**	**B**	**D**

NE Halsey @	Delay by Movement		
NE MLK	WBL	SBL	SBT
Seed 1	11.9	2.9	1.7
2	11.4	4.4	2.4
3	9.3	2.9	1.4
4	15.9	2.8	1.5
5	10.9	2.7	1.4
Volume	95	70	1665
Average	11.9	3.1	1.7
unsignalized LOS	B	A	A

Delay by Lane		Total
WB	SB	Int.
L	LT	Delay
95	**1735**	**1830**
11.9	**1.7**	**2.3**
B	**A**	**A**

NE Clackamas @	Delay by Movement						
NE MLK	EBT	EBR	WBL	WBT	SBL	SBT	SBR
Seed 1	34.3	14.7	30.3	32.8	8.2	4.8	5.5
2	26.6	13.8	33.3	35.4	6.7	6.6	9.7
3	36.3	17.7	32.9	33.6	5.5	3.8	6.1
4	33.9	12.2	35.1	30.9	5.4	3.3	4.9
5	30.7	15.3	42.1	34.6	5.1	2.6	5.8
Volume	29	28	30	19	43	2021	24
Average	32	15	35	33	6	4	6
Signalized LOS	C	B	C	C	A	A	A

Delay by Lane			Total
EB	WB	SB	Int.
TR	LT	LTR	Delay
57	**49**	**2088**	**2194**
23.7	**34.2**	**4.3**	**5**
C	**C**	**A**	**A**

NE Multnomah @	Delay by Movement						
NE MLK	EBT	EBR	WBL	WBT	SBL	SBT	SBR
Seed 1	41.4	43.1	24.7	15.3	37.1	25.4	27
2	61.3	59.6	33.6	17.9	34.5	22.4	20.4
3	42.6	54.4	27.4	16.3	35.7	24.4	21
4	47.5	62.2	25	17.1	26.7	22.2	20
5	46.7	40.8	24.6	15	32	21	21.7
Volume	631	151	234	432	127	1883	69
Average	48	52	27	16	33	23	22
Signalized LOS	D	D	C	B	C	C	C

Delay by Lane				Total
EB	WB	WB	SB	Int.
TR	L	T	LTR	Delay
782	**234**	**432**	**2079**	**3527**
48.7	**27.1**	**16.3**	**23.7**	**29**
D	**C**	**B**	**C**	**C**

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NE Holladay @ NE MLK	Delay by Movement EBT	EBR	SBL	SBT
Seed 1	29.7	28.2	26.8	18.3
2	30.5	29.9	11.9	9.8
3	27.8	24.4	17.8	10
4	30.4	25.4	27.2	16.1
5	34	24.5	11.7	9.4
Volume	121	128	23	2249
Average	30.5	26.5	19.1	12.7
Signalized LOS	C	C	B	B

Delay by Lane EB	SB	Total Int.
TR	LT	Delay
249	**2272**	**2521**
28.4	**12.8**	**14.3**
C	**B**	**B**

NE Oregon @ NE MLK	Delay by Movement WBL	SBL	SBT
Seed 1	79.9	34.7	20.8
2	29.8	21.8	8.5
3	28.3	11.5	6.9
4	62.4	20.3	16.1
5	28.9	7.8	7.7
Volume	121	17	2344
Average	45.9	19.2	12.0
Signalized LOS	D	B	B

Delay by Lane WB	SB	Total Int.
L	LT	Delay
121	**2361**	**2482**
45.9	**12.1**	**13.7**
D	**B**	**B**

NE Lloyd @ NE MLK	Delay by Movement EBT	EBR	WBL	WBT	SBL	SBT	SBR
Seed 1	287.5	338.4	61.7	39.8	56.9	36.1	34.5
2	311.6	301.4	50.3	29.8	45.7	29.9	29.3
3	214.4	219.2	46	27.3	32.4	21.3	19
4	199	257.2	48.1	31.4	42.5	30.9	34.8
5	263.6	393.5	38	22	42.2	26.4	24.8
Volume	453	637	399	369	66	2163	68
Average	255	302	49	30	44	29	28
Signalized LOS	F	F	D	C	D	C	C

Delay by Lane EB	EB	WB	WB	SB	Total Int.
T	R	L	LT	LTR	Delay
453	**637**	**363.09**	**404.91**	**2297**	**4155**
255.2	**301.9**	**48.3**	**31.7**	**29.3**	**98**
F	**F**	**D**	**C**	**C**	**F**

NE Everett @ NE MLK	Delay by Movement SBL	SBT
Seed 1	38.2	39.4
2	27	28.8
3	25.7	27.2
4	33	32
5	39.9	40.9
Volume	589	2620
Average	32.8	33.7
unsignalized LOS	D	D

Delay by Lane SB	SB	Total Int.
L	T	Delay
589	**2620**	**3209**
32.8	**33.7**	**33.5**
D	**D**	**D**

NE Couch @ NE MLK	Delay by Movement EBT	EBR	WBL	WBT	SBL	SBT	SBR
Seed 1	95.7	79.8	37.9	22.4	318.1	262.5	241.9
2	49.7	49	36.7	37.5	424.7	319.3	134.2
3	77.2	83.5	36.2	24.7	229.8	290.6	448.2
4	32.8	29.2	33.2	36.5	188.53	229	316.1
5	29.1	30.8	40.2	31.2	355.2	286.7	220.4
Volume	210	65	89	12	66	2749	40
Average	47	54	37	30	303	278	272
Signalized LOS	D	D	D	C	F	F	F

Delay by Lane EB	WB	SB	Total Int.
TR	LT	LTR	Delay
275	**101**	**2855**	**3231**
48.9	**36.1**	**278.1**	**251**
D	**D**	**F**	**F**

NE Burnside @ NE MLK	Delay by Movement EBT	EBR	WBT	SBL	SBT	SBR
Seed 1	37	28.7	8.5	35.4	19.7	23.5
2	24.2	20.2	7.3	32.4	19.8	25
3	26.1	24.2	7.7	29.9	18.2	21.5
4	21.9	18.4	7.5	34.3	19.5	22.1
5	29.1	23.2	7.9	34.5	19.7	21.1
Volume	1769	899	1074	344	2199	377
Average	28	23	8	337	297	295
Signalized LOS	C	C	A	F	F	F

Delay by Lane EB	EB	WB	SB	Total Int.
TR	R	T	LTR	Delay
1895	**773.14**	**1074**	**2920**	**6662**
27.3	**22.9**	**7.8**	**301.4**	**144**
C	**C**	**A**	**F**	**F**

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NE Steel Bridge @ NE Lloyd	EBL	EBT	EBR	NBT	SBT		
	Delay by Movement						
	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Seed 1	15.6	9.5	36.8	32.3	0	0	190.1
2	15.1	12.8	39.5	35.9	0	0	186.4
3	15.9	10.6	31	28.5	40.8	0	88.3
4	15.9	10.7	37.3	30.6	0	0	110.8
5	17.2	11.9	32.5	27	26.7	0	151.6
Volume	602	479	631	414	1	0	354
Average	16	11	35	31	14	0	145
Signalized LOS	B	B	D	C	B	A	F

Delay by Lane				Total
EB	EB	NB	SB	Int.
LT	R	TR	LT	Delay
1081	631	414	355	2481
13.8	35.4	30.9	145.1	41
B	D	C	F	D

NE Multnomah @ NE 1st Ave	EBL	EBT	WBT	WBR	NBL	NBR	SBL	SBR	
	by Movement								
	EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Seed 1	42	18.4	20.1	14.7	8.1	7.6	9.3	31.8	5.7
2	36.7	19.4	19.8	28.4	8.3	5.5	9.3	40.6	2.6
3	14.7	17.6	19.6	18.4	8.3	9.7	10.3	20.7	7.1
4	37.7	20.2	19	17.8	8	0	8.6	33.5	7.1
5	44.5	19.8	19.7	9.2	8.2	0	9.5	38.5	6.3
Volume	3	310	485	4	237	2	415	4	6
Average	35	19	20	18	8	5	9	33	6
Signalized LOS	D	B	B	B	A	A	A	C	A

Delay by Lane					Total
EB	WB	NB	NB	SB	Int.
LT	TR	L	TR	LR	Delay
313	489	237	417	10	1466
19.2	19.6	8.2	9.4	16.7	15
B	B	A	A	B	B

NE Holladay @ NE 1st Ave	EBL	EBT	NBT	NBR	NEL
	Delay by Movement				
Seed 1	27.1	49.6	30.5	28	12.8
2	22.4	54.7	31.2	26.8	13.9
3	35.1	41	29.3	29.3	12.8
4	12.7	54.5	28.7	24.3	12.1
5	10.8	67.4	33.8	34.3	15.7
Volume	0	7	448	107	191
Average	21.6	53.4	30.7	28.5	13.5
Signalized LOS	C	D	C	C	B

Delay by Lane			Total
EB	NB	NE	Int.
LT	TR	LR	Delay
7	555	191	753
53.4	30.3	16.0	26.9
D	C	B	C

NE Holladay @ NE 2nd Ave	EBL	EBT	SBL
	Delay by Movement		
Seed 1	39.5	6.6	22.1
2	50.5	3.1	18.4
3	37.9	5.4	16.7
4	24.9	5.3	17.2
5	24.8	9.9	16.6
Volume	6	110	83
Average	35.5	6.1	18.2
Signalized LOS	D	A	B

Delay by Lane		Total
EB	SB	Int.
LT	L	Delay
116	83	199
7.6	18.2	12.0
A	B	B

NE Holladay @ NE 3rd Ave	EBT	SBL
	Delay by Movement	
Seed 1	4.5	21.1
2	4.5	23
3	3.7	19.1
4	4.2	21.9
5	5.6	18.9
Volume	193	50
Average	4.5	20.8
Signalized LOS	A	C

Delay by Lane		Total
EB	SB	Int.
T	L	Delay
193	50	243
4.5	20.8	7.9
A	C	A

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NE Multnomah @ NE 7th Ave	Delay by Movement												Delay by Lane								Total Int. Delay
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EB	EB	WB	WB	NB	NB	SB	SB	
Seed 1	41.2	9.5	10.3	50.2	10.4	12.2	31.4	24.1	21.9	41.3	25.2	14.8									
2	41.7	10.4	12	46.3	9.2	14.6	28.5	21.2	23.4	34.7	19.6	12.9									
3	48.1	10.3	5.1	50.9	11.7	13.1	44.8	20.6	15.9	37.2	27.7	22									
4	34.9	8.9	10.9	46.9	10.5	11.4	34.3	23.7	28.8	37.2	23.9	15.4	L	TR	L	TR	L	TR	L	TR	
5	44.4	9.2	7.4	42	9.3	11.5	31.6	19.3	25.1	36.9	22.1	13.7									
Volume	41	734	24	15	569	48	68	169	35	96	110	56	**41**	**758**	**15**	**617**	**68**	**204**	**96**	**166**	**1965**
Average	42	10	9	47	10	13	34	22	23	37	24	16	**42.1**	**9.6**	**47.3**	**10.4**	**34.1**	**22.0**	**37.5**	**21.0**	**15**
Signalized LOS	D	A	A	D	B	B	C	C	C	D	C	B	**D**	**A**	**D**	**B**	**C**	**C**	**D**	**C**	**B**

NE Holladay @ NE 7th Ave	Delay by Movement						Delay by Lane			Total Int. Delay
	EBT	EBR	NBT	NBR	SBL	SBT	EB	NB	SB	
Seed 1	17.5	10.6	10.4	9.6	17	9.6				
2	19.9	12.9	7.6	7.5	11.2	10.4				
3	22.6	11.4	8.1	6.5	17.2	10.1				
4	20.2	13.2	9.5	9.5	19.1	14.9				
5	17.9	8.2	9.6	7.6	14.1	9.5	TR	TR	LT	
Volume	110	11	308	22	40	110	**121**	**330**	**150**	**601**
Average	19.6	11.3	9.0	8.1	15.7	10.9	**18.9**	**9.0**	**12.2**	**11.8**
Signalized LOS	B	B	A	A	B	B	**B**	**A**	**B**	**B**

NE Lloyd @ NE 9th Ave	Delay by Movement						Delay by Lane					Total Int. Delay
	EBL	EBT	WBT	WBR	SBL	SBR	EB	EB	WB	SB	SB	
Seed 1	46	4.7	13.1	13.1	37.9	12.8						
2	41.6	4.5	9.5	11.5	39.9	5.5						
3	47.8	4.1	7.8	8.1	40.1	3.9						
4	42.6	4.3	7.2	8.5	36	4.1						
5	41.5	4.1	8.2	7.9	41.5	4.3	L	T	TR	L	R	
Volume	31	630	509	112	230	106	**31**	**630**	**621**	**230**	**106**	**1618**
Average	44	4	9	10	39	6	**43.9**	**4.3**	**9.3**	**39.1**	**6.1**	**12**
Signalized LOS	D	A	A	A	D	A	**D**	**A**	**A**	**D**	**A**	**B**

NE Weidler @ NE Victoria	Delay by Movement				Delay by Lane			Total Int. Delay
	EBL	EBT	NBT	NBR	EB	NB	NB	
Seed 1	14	16.1	21.4	20.1				
2	48.5	69.6	24	57.6				
3	20.4	42	24.8	43.5				
4	18.3	32.1	24.8	49.2				
5	14.2	28.3	23.1	37.9	LT	T	R	
Volume	18	2238	382	1129	**2256**	**382**	**1129**	**3767**
Average	23.1	37.6	23.6	41.7	**37.5**	**23.6**	**41.7**	**37.3**
Signalized LOS	C	D	C	D	**D**	**C**	**D**	**D**

NE Holladay @ NE 6th Ave	Delay by Movement					Delay by Lane				Total Int. Delay
	EBT	EBR	WBT	NBR	SBL	EB	WB	NB	SB	
Seed 1	1.8	4.4	20.9	4	11.7					
2	2.8	5.8	24.8	3.9	27.9					
3	1.5	4	17.3	4.2	17.5					
4	1.6	4.5	30.4	2.8	10.4					
5	1.6	5.2	21.6	3.2	17.7	TR	T	R	L	
Volume	88	5	75	15	5	**93**	**75**	**15**	**5**	**188**
Average	1.9	4.8	23.0	3.6	17.0	**2.0**	**23.0**	**3.6**	**17.0**	**10.9**
Signalized LOS	A	A	C	A	B	**A**	**C**	**A**	**B**	**B**

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NE Broadway @	Delay by Movement			
NE Grand	WBT	WBR	NBL	NBT
Seed 1	29.3	23.7	13.6	10.1
2	32.5	20.4	16.2	10.9
3	31.8	19.4	15.6	10
4	30.5	21.6	14.7	11
5	29.3	19.5	13	10.1
Volume	1736	244	922	1556
Average	30.7	20.9	14.6	10.4
Signalized LOS	C	C	B	B

Delay by Lane			Total
WB	NB	NB	Int.
TR	L	LT	Delay
1980	**608.52**	**1869.5**	**4458**
29.5	**14.6**	**11.1**	**19.8**
C	**B**	**B**	**B**

NE Weidler @	Delay by Movement			
NE Grand	EBL	EBT	NBT	NBR
Seed 1	17.1	14.3	25.9	40.3
2	19.2	15.8	30.5	32
3	17.9	14.2	23.3	33.4
4	16.3	15.5	34	44.8
5	15.7	14.1	24.6	33.9
Volume	194	2001	2272	283
Average	17.2	14.8	27.7	36.9
Signalized LOS	B	B	C	D

Delay by Lane			Total
EB	EB	NB	Int.
L	LT	TR	Delay
166.84	**2028.2**	**2555**	**4750**
17.2	**14.8**	**28.7**	**22.4**
B	**B**	**C**	**C**

NE Halsey @	Delay by Movement						
NE Grand	EBL	EBT	WBT	WBR	NBL	NBT	NBR
Seed 1	27.5	14.9	30.8	26.3	2.9	13.3	16.7
2	82.7	66.5	64.8	63	15.4	20	28.2
3	22.7	20.3	37.1	36.4	13.4	15.8	25.5
4	16.4	19.1	70.1	63.1	19.7	24.4	34.8
5	18.2	15.6	45.3	50.6	1.5	17.7	21.4
Volume	19	58	95	97	4	2309	72
Average	34	27	50	48	11	18	25
Signalized LOS	C	C	D	D	B	B	C

Delay by Lane			Total
EB	WB	NB	Int.
LT	TR	LTR	Delay
77	**192**	**2385**	**2654**
28.8	**48.7**	**18.4**	**21**
C	**D**	**B**	**C**

NE Clackamas @	Delay by Movement						
NE Grand	EBL	EBT	WBT	WBR	NBL	NBT	NBR
Seed 1	32	26.6	21.4	14.7	5.1	5.8	9.3
2	33.1	27.6	32.5	16.6	9.2	23.7	53.2
3	34.9	34.1	33.6	18.7	9.4	12.3	15.3
4	37.5	43.4	29.3	30.1	7.4	17.6	30.4
5	39.3	36.7	27.1	21.3	5.2	13.9	18.7
Volume	78	34	10	40	28	2233	26
Average	35	34	29	20	7	15	25
Signalized LOS	D	C	C	C	A	B	C

Delay by Lane			Total
EB	WB	NB	Int.
LT	TR	LTR	Delay
112	**50**	**2287**	**2449**
34.9	**22.0**	**14.7**	**16**
C	**C**	**B**	**B**

NE Multnomah @	Delay by Movement						
NE Grand	EBL	EBT	WBT	WBR	NBL	NBT	NBR
Seed 1	40	13.9	24.2	30.3	17.2	14.1	17.2
2	54.5	14.6	28.8	56.7	19.5	23.6	30.3
3	48.4	13.7	36.4	66.4	23.9	16.4	19.3
4	38.8	11.3	28.9	47.7	18.2	15	20.9
5	51.8	13	23.5	35.7	15.7	16.1	21.4
Volume	179	472	420	167	147	1786	162
Average	47	13	28	47	19	17	22
Signalized LOS	D	B	C	D	B	B	C

Delay by Lane			Total
EB	WB	NB	Int.
LT	TR	LTR	Delay
651	**587**	**2095**	**3333**
22.5	**33.8**	**17.5**	**21**
C	**C**	**B**	**C**

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NE Holladay @ NE Grand	Delay by Movement				Delay by Lane			Total Int. Delay
	EBL	EBT	NBT	NBR	EB	EB	NB	
Seed 1	80.6	20	7.8	7.9				
2	44.5	18.1	8.5	11.9				
3	48.4	17.2	8.1	11.4				
4	58.1	18.9	7.9	9.3				
5	42.8	20.7	8.1	14.4	L	T	TR	
Volume	40	70	2097	18	**40**	**70**	**2115**	**2225**
Average	54.9	19.0	8.1	11.0	**54.9**	**19.0**	**8.1**	**9.3**
Signalized LOS	D	B	A	B	**D**	**B**	**A**	**A**

NE Oregon @ NE Grand	Delay by Movement							Delay by Lane			Total Int. Delay
	EBL	EBT	WBT	WBR	NBL	NBT	NBR	EB	WB	NB	
Seed 1	25	19.1	47	33.5	41.8	6.7	7.9				
2	34.1	16.9	28.6	17.9	8	5.1	8.7				
3	23	21.7	23.5	17.7	7.4	5	7.7				
4	31.7	21.1	42.2	24.6	24.4	5.4	8.1				
5	35.3	16.6	27.9	18.6	6.7	4.8	8.6	LT	TR	LTR	
Volume	23	10	124	100	17	2067	22	**33**	**224**	**2106**	**2363**
Average	30	19	34	22	18	5	8	**26.6**	**28.8**	**5.5**	**8**
Signalized LOS	C	B	C	C	B	A	A	**C**	**C**	**A**	**A**

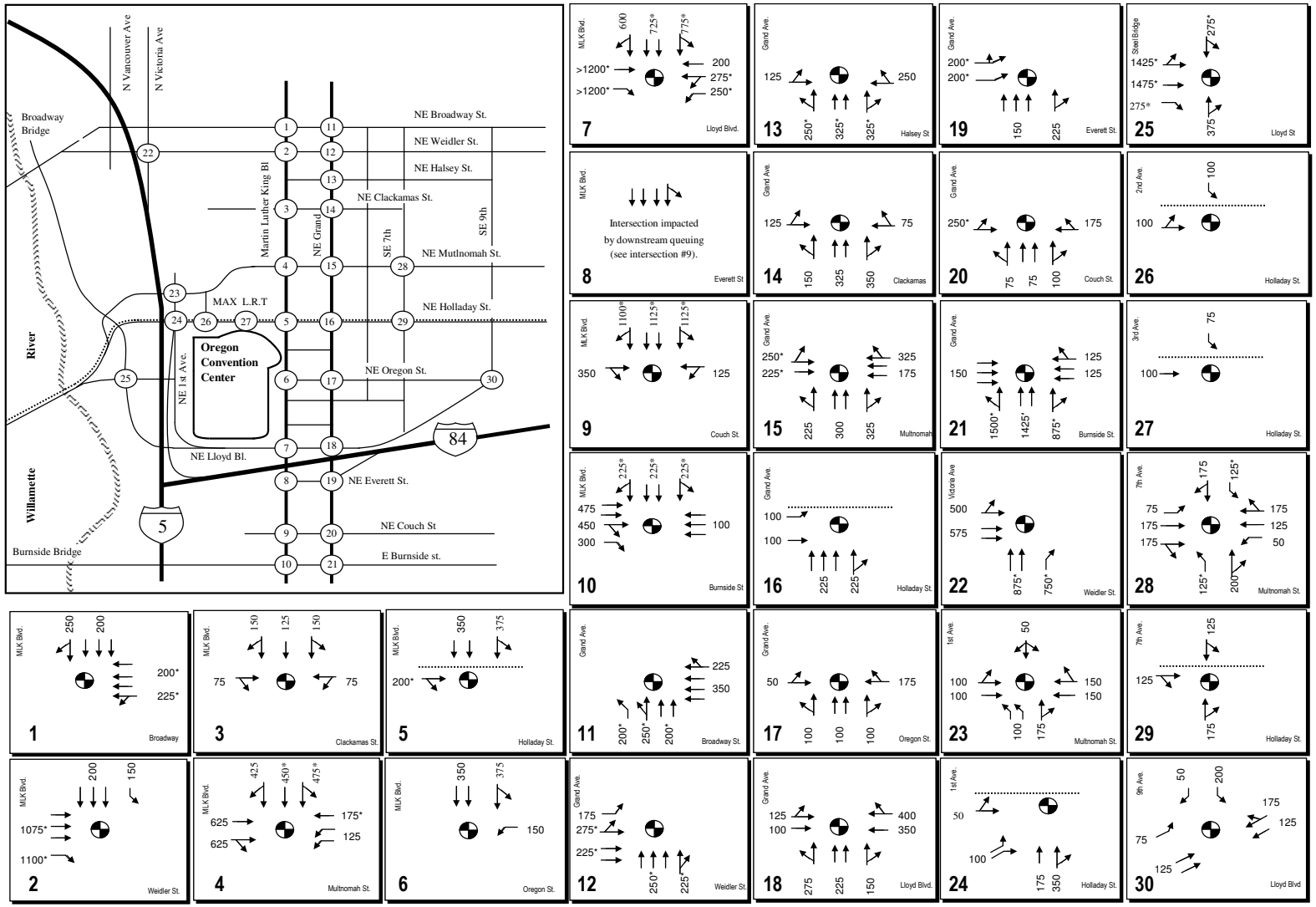
NE Lloyd @ NE Grand	Delay by Movement							Delay by Lane			Total Int. Delay
	EBL	EBT	WBT	WBR	NBL	NBT	NBR	EB	WB	NB	
Seed 1	37.6	18	59.7	52.4	34.3	12.5	9.4				
2	52.9	17.6	35.5	41.5	17.9	8.8	10.9				
3	38.3	13.1	27	23.6	14.6	7.7	11				
4	40.8	13	29	28.5	18.6	8.1	10.9				
5	31	13.8	23.1	20.4	10.9	7.1	11.1	LT	TR	LTR	
Volume	66	451	520	185	222	1684	141	**517**	**705**	**2047**	**3269**
Average	40	15	35	33	19	9	11	**18.3**	**34.4**	**10.1**	**17**
Signalized LOS	D	B	C	C	B	A	B	**B**	**C**	**B**	**B**

NE Everett @ NE Grand	Delay by Movement				Delay by Lane		Total Int. Delay
	EBL	EBT	NBT	NBR	EB	NB	
Seed 1	19.3	27.1	7.7	16.8			
2	19.6	25.7	7.6	18.1			
3	17.7	26	7.1	16.6			
4	22.3	27.3	6.6	15.2			
5	18.4	23.9	7	16.5	LT	TR	
Volume	20	566	1853	433	**586**	**2286**	**2872**
Average	19.5	26.0	7.2	16.6	**25.8**	**9.0**	**12.4**
Signalized LOS	B	C	A	B	**C**	**A**	**B**

NE Couch @ NE Grand	Delay by Movement							Delay by Lane			Total Int. Delay
	EBL	EBT	WBT	WBR	NBL	NBT	NBR	EB	WB	NB	
Seed 1	47.5	30.6	28.7	15.6	8.2	6	8.5				
2	35.7	37.3	21.8	14.1	7.6	6.4	8.9				
3	40	41.1	23.9	15.5	10.4	5.6	6.9				
4	23.8	32.3	21.7	13.6	7.7	5.9	7.9				
5	23.2	21.8	14.5	11.4	8.6	5.9	8.9	LT	TR	LTR	
Volume	220	53	44	253	32	1899	33	**273**	**297**	**1964**	**2534**
Average	31	33	22	14	9	6	8	**31.1**	**15.2**	**6.0**	**10**
Signalized LOS	C	C	C	B	A	A	A	**C**	**B**	**A**	**A**

NE Burnside @ NE Grand	Delay by Movement						Delay by Lane			Total Int. Delay
	EBT	WBT	WBR	NBL	NBT	NBR	EB	WB	NB	
Seed 1	8.2	11	10.8	198.6	62.4	86.3				
2	7.7	11.3	12.3	202.9	55.5	53.6				
3	7.8	11.6	10.4	199.7	98.4	154.6				
4	7.1	13.2	13.9	269.1	87.1	132.4				
5	8.8	12	15.7	154.7	76.1	118.3	T	TR	LTR	
Volume	2130	701	134	329	1837	156	**2130**	**835**	**2322**	**5287**
Average	8	12	13	205	76	109	**7.9**	**11.9**	**96.4**	**47**
Signalized LOS	A	B	B	F	E	F	**A**	**B**	**F**	**D**

APPENDIX 4: FIGURE 10: 95TH PERCENTILE QUEUES AND WORKSHEETS



*Exceeds Storage Length (Queue spills out of turn bay or spills back through upstream signalized intersection)

DAVID EVANS AND ASSOCIATES INC.

NOT TO SCALE

LEGEND
- = Traffic Signal
- = Stop Sign
- = Allowable turning movement for designated lane
- (4) = Intersection number
- ..... = MAX LRT

FIGURE 10

2008 95th Percentile Queues

(PM Peak Hour)

Build Scenario 2

Oregon Convention Center Hotel

Scenario 2 2008 PM - Build Conditions
Oregon Convention Center Hotel

Exceeds Model Link Length, Actual Queue Unknown
Queue Spill Back or Blocking
Value Not Used

95% Queue Calculations

Intersection: 2:	Direction	NW	NW
Martin Luther King Blvd. & Grand Avenue	Lanes	R	R
Seed 1		87	68
2		130	95
3		70	54
4		86	106
5		94	67
Average		**93**	**78**
Model Storage Length		240	240

Intersection: 10:	Direction	WB	WB	WB	WB	NB	NB	NB	NB
Broadway & Grand Avenue	Lanes	T	T	T	TR	L	LT	T	T
Seed 1		296	279	217	224	129	200	194	123
2		356	308	242	235	223	253	227	140
3		319	298	236	200	198	243	202	111
4		331	298	218	210	181	242	193	122
5		331	284	206	201	168	201	157	120
Average		**327**	**293**	**224**	**214**	**180**	**228**	**195**	**123**
Model Storage Length		2509	2509	2509	2509	168	168	168	168

Intersection: 14:	Direction	EB	EB	EB	NB	NB	NB	B18
Weidler & Victoria	Lanes	LT	T	T	T	T	R	T
Seed 1		250	285	300	121	464	618	360
2		827	843	852	108	944	701	840
3		521	602	642	252	928	744	821
4		401	450	490	253	954	748	854
5		419	454	489	255	972	820	859
Average		**484**	**527**	**555**	**198**	**852**	**726**	
Model Storage Length		868	868	868	515	515	515	581
						1096		

Scenario 2 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 20:	Direction	EB	EB	EB	EB	NB	NB	NB	NB
Weidler & Grand Avenue	Lanes	L	LT	T	T	T	T	T	TR
Seed 1		167	272	201	127	222	232	233	213
2		177	264	233	187	236	227	225	228
3		150	274	204	162	225	252	220	212
4		174	254	229	144	243	242	244	232
5		175	280	204	141	230	226	240	224
Average		**169**	**269**	**214**	**152**	**231**	**236**	**232**	**222**
Model Storage Length		178	178	178	178	181	181	181	181

Intersection: 30:	Direction	EB	WB	NB	NB	NB	NB
Halsey & Grand Avenue	Lanes	LT	TR	LT	T	T	TR
Seed 1		67	152	167	242	281	286
2		153	307	250	278	327	311
3		87	175	232	266	292	301
4		106	322	266	306	328	306
5		92	244	231	256	302	306
Average		**101**	**240**	**229**	**270**	**306**	**302**
Model Storage Length		181	730	226	226	226	226

Intersection: 40:	Direction	EB	WB	NB	NB	NB	NB
Clackamas & Grand Avenue	Lanes	LT	TR	LT	T	T	TR
Seed 1		108	70	67	83	158	154
2		117	61	187	348	424	436
3		124	75	151	263	286	308
4		118	60	191	316	383	380
5		132	75	96	244	368	383
Average		**120**	**68**	**138**	**251**	**324**	**332**
Model Storage Length		182	370	423	423	423	423

Scenario 2 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 50:	Direction	EB	EB	WB	WB	WB	NB	NB	NB	NB
Multnomah & Grand Avenue	Lanes	LT	T	T	T	TR	LT	T	T	TR
Seed 1		232	222	76	97	238	180	174	231	244
2		243	226	101	113	317	298	357	387	424
3		228	234	81	230	398	249	229	281	287
4		206	206	88	177	327	204	215	269	285
5		233	235	82	147	254	168	180	222	263
Average		**228**	**225**	**86**	**153**	**307**	**220**	**231**	**278**	**301**
Model Storage Length		179	179	440	440	440	440	440	440	440

Intersection: 60:	Direction	EB	EB	WB	NB	NB	NB	NB
Holladay & Grand Avenue	Lanes	L	T	T	T	T	T	TR
Seed 1		85	96	143	135	154	200	196
2		87	99	188	176	203	236	247
3		66	94	129	158	188	212	224
4		86	85	214	163	162	205	192
5		79	104	196	137	155	195	196
Average		**81**	**96**	**174**	**154**	**172**	**210**	**211**
Model Storage Length		150	183	171	478	478	478	478

Intersection: 65:	Direction	EB	WB	NB	SB
Holladay & NE 6th Avenue	Lanes	TR	T	R	L
Seed 1		17	85	28	23
2		37	124	29	23
3		0	84	34	31
4		0	122	41	19
5		15	130	33	17
Average		**14**	**109**	**33**	**23**
Model Storage Length		171	208	224	257

Scenario 2 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 70:	Direction	EB	WB	NB	NB	NB	NB
Oregon & Grand Avenue	Lanes	LT	TR	LT	T	T	TR
Seed 1		41	227	156	135	76	96
2		46	151	79	70	86	95
3		57	133	77	72	82	92
4		47	196	95	80	88	78
5		54	169	72	71	89	108
Average		**49**	**175**	**96**	**86**	**84**	**94**
Model Storage Length		183	863	690	690	690	690

Intersection: 80:	Direction	EB	EB	WB	WB	B81	B81	NB	NB	NB	NB
LLoyd & Grand Avenue	Lanes	LT	T	T	TR	T	T	LT	T	T	TR
Seed 1		124	104	642	649	464	478	401	367	239	138
2		127	107	347	404	177	233	252	222	190	141
3		119	70	208	304	50	136	198	132	122	130
4		125	85	229	332	55	165	244	188	147	145
5		105	82	207	262	48	93	174	134	129	136
Average		**120**	**90**	**327**	**390**			**254**	**209**	**165**	**138**
Model Storage Length		213	213	95	95	338	338	401	401	401	401
				433	433						

Intersection: 90:	Direction	EB	EB	NB	NB	NB	NB
Everett & Grand Avenue	Lanes	<L	L	T	T	T	TR
Seed 1		148	173	137	134	129	236
2		169	175	121	114	138	276
3		187	207	104	113	173	249
4		203	177	64	69	75	97
5		182	205	108	113	162	235
Average		**178**	**187**	**107**	**109**	**135**	**219**
Model Storage Length		192	192	477	477	477	477

Scenario 2 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 100:	Direction	EB	WB	NB	NB	NB	NB
Couch & Grand Avenue	Lanes	LT	TR	LT	T	T	TR
Seed 1		248	189	62	70	65	93
2		243	150	68	57	71	108
3		258	149	69	65	77	91
4		203	177	64	69	75	97
5		202	114	81	73	80	101
Average		**231**	**156**	**69**	**67**	**74**	**98**
Model Storage Length		204	472	177	177	177	177

Intersection: 110:	Direction	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Burnside & Grand Avenue	Lanes	T	T	T	T	T	TR	LT	T	T	TR
Seed 1		139	124	121	119	98	90	1523	1406	922	682
2		119	114	110	138	102	96	1598	1511	1165	675
3		132	125	117	104	96	100	1599	1550	1342	1205
4		132	126	104	128	109	115	2019	1970	1604	1319
5		137	123	122	125	110	122	1229	1177	905	870
Average		**132**	**122**	**115**	**123**	**103**	**105**	**1487**	**1411**	**1084**	**858**
Model Storage Length		199	199	199	1472	1472	1472	1821	1821	1821	1821

Intersection: 120:	Direction	WB	WB	WB	WB	SB	SB	SB	SB
Broadway & Martin Luther King Blvd.	Lanes	LT	T	T	T	T	T	T	TR
Seed 1		195	147	174	172	145	164	196	227
2		204	167	180	207	155	157	193	241
3		219	179	172	197	135	151	166	217
4		200	175	183	191	151	157	175	235
5		189	171	178	177	151	157	209	225
Average		**201**	**168**	**177**	**189**	**147**	**157**	**188**	**229**
Model Storage Length		181	181	181	181	471	471	471	471

Scenario 2 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 130:	Direction	EB	EB	EB	EB	SB	SB	SB	SB
Weidler & Martin Luther King Blvd.	Lanes	T	T	T	R	LT	T	T	T
Seed 1		967	1043	1129	1233	124	176	163	147
2		1002	1027	1004	997	174	193	173	163
3		1028	1069	1027	998	158	172	146	133
4		1042	1045	1060	1027	134	173	156	149
5		998	1092	1091	1162	134	171	138	132
Average		**1007**	**1055**	**1062**	**1083**	**145**	**177**	**155**	**145**
Model Storage Length		938	938	938	938	199	199	199	199

Intersection: 140:	Direction	WB	SB	SB	SB
Halsey & Martin Luther King Blvd.	Lanes	L	LT	T	T
Seed 1		74	18	24	24
2		87	104	105	77
3		79	0	0	0
4		178	0	0	0
5		76	0	0	0
Average		**99**	**24**	**26**	**20**
Model Storage Length		182	177	177	177

Intersection: 150:	Direction	EB	WB	SB	SB	SB
Clackamas & Martin Luther King Blvd.	Lanes	TR	LT	LT	T	TR
Seed 1		66	62	147	127	136
2		58	62	190	165	183
3		75	69	143	128	134
4		63	71	138	113	120
5		73	62	114	87	117
Average		**67**	**65**	**146**	**124**	**138**
Model Storage Length		448	182	223	223	223

Scenario 2 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 160:	Direction	EB	EB	B165	B165	B245	B245	WB	WB	WB	SB	SB	SB
Multnomah & Martin Luther King Blvd.	Lanes	T	TR	T	T	T	T	L	L	T	LT	T	TR
Seed 1		478	485	323	348	0	0	107	92	147	440	402	380
2		726	736	486	527	74	65	128	121	187	460	439	416
3		747	816	517	537	74	132	131	104	177	501	478	420
4		459	484	307	342	0	0	108	83	164	455	442	426
5		671	602	436	445	72	70	116	105	165	448	416	372
Average		**616**	**625**					**118**	**101**	**168**	**461**	**435**	**403**
Model Storage Length		73	73	420	420	204	179	179	179	432	432	432	432
		697	672										

Intersection: 170:	Direction	EB	SB	SB	SB
Holladay & Martin Luther King Blvd.	Lanes	TR	LT	T	T
Seed 1		186	443	426	414
2		180	308	328	327
3		169	324	296	297
4		190	420	411	404
5		191	289	283	295
Average		**183**	**357**	**349**	**347**
Model Storage Length		152	442	442	442

Intersection: 175:	Direction	EB	WB	SB
Holladay & 3rd Avenue	Lanes	T	T	L
Seed 1		94	99	65
2		87	145	60
3		74	96	66
4		90	150	78
5		115	151	55
Average		**92**	**128**	**65**
Model Storage Length		258	152	214

Scenario 2 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 180:	Direction	WB	SB	SB	SB
Oregon & Martin Luther King Blvd.	Lanes	L	LT	T	T
Seed 1		171	506	504	498
2		135	287	236	187
3		112	252	211	254
4		153	486	455	450
5		106	292	270	294
Average		**135**	**365**	**335**	**337**
Model Storage Length		183	480	480	480

Intersection: 190:	Direction	EB	EB	B8	B8	WB	WB	WB	SB	SB	SB	SB	B185	B185	B185	B185
LLoyd & Martin Luther King Blvd.	Lanes	T	R	T	T	L	LT	T	LT	T	T	TR	T	T	T	T
Seed 1		1785	1816	244	270	266	275	204	836	815	809	782	546	514	494	463
2		1464	1486	210	228	251	256	156	772	686	630	568	451	370	322	261
3		1753	1789	273	288	252	261	213	669	568	399	334	354	273	132	72
4		1750	1729	246	268	243	264	199	805	780	745	752	495	476	441	443
5		1784	1792	269	283	225	227	139	709	654	496	459	395	355	215	163
Average		**1707**	**1722**			**247**	**257**	**182**	**758**	**701**	**616**	**579**				
Model Storage Length		404	404	202	202	213	213	213	195	195	195	195	427	427	427	427
		1297	1297						622	622	622	622				

Intersection: 191:	Direction	SB	SE	B232
LLoyd &	Lanes	LR	L	T
Seed 1		36	1077	485
2		52	789	364
3		48	967	431
4		51	945	417
5		46	1000	445
Average		**47**	**956**	
Model Storage Length		286	364	327
			691	

Scenario 2 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 200:	Direction	SB	SB	SB	SB
Everett & Martin Luther King Blvd.	Lanes	LT	T	T	T
Seed 1		623	621	619	607
2		557	529	556	525
3		551	526	500	464
4		598	614	604	585
5		623	586	595	574
Average		**590**	**575**	**575**	**551**
Model Storage Length		455	455	455	455

Intersection: 210:	Direction	EB	WB	SB	SB	SB	SB
Couch & Martin Luther King Blvd.	Lanes	TR	LT	LT	T	T	TR
Seed 1		463	99	548	555	558	551
2		312	121	528	536	546	534
3		456	99	527	530	534	517
4		200	96	535	540	529	530
5		203	89	527	539	532	524
Average		**327**	**101**	**1123**	**1115**	**1115**	**1082**
Model Storage Length		448	204	472	472	472	472

Intersection: 220:	Direction	EB	EB	EB	EB	B221	B221	B221	WB	WB	WB	SB	SB	SB	SB
Burnside & Martin Luther King Blvd.	Lanes	T	T	TR	R	T	T	T	T	T	T	LT	T	T	TR
Seed 1		713	693	715	390	261	247	286	98	96	92	193	205	189	212
2		390	375	321	250	8	0	0	95	81	81	205	209	186	203
3		399	425	400	298	29	54	44	97	91	90	203	208	194	206
4		341	304	280	244	16	0	0	105	104	89	206	204	203	198
5		453	440	423	282	60	58	59	103	94	88	210	219	197	198
Average		**459**	**447**	**428**	**293**				**100**	**93**	**88**	**203**	**209**	**194**	**203**
Model Storage Length		316	316	316	316	1743	1743	1743	199	199	199	163	163	163	163
		2059	2059	2059											

Scenario 2 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 230:	Direction	EB	EB	EB	B231	B231	NB	B232	SB
LLoyd & Steel Bridge	Lanes	LT	T	R	T	T	TR	T	LT
Seed 1		1484	1539	263	1174	1174	357	32	268
2		1573	1581	251	1227	1205	475	112	281
3		936	1045	275	616	667	325	0	272
4		1504	1536	264	1162	1186	357	18	271
5		1507	1561	264	1167	1196	317	0	271
Average		**1401**	**1452**	**263**			**366**		**273**
Model Storage Length		244	244	200	1084	1084	327	364	212
		1328	1328				691		

Intersection: 240:	Direction	EB	EB	WB	WB	NB	NB	NB	SB
Multnomah & 1st Avenue	Lanes	LT	T	T	TR	L	L	TR	LR
Seed 1		92	95	132	140	74	71	164	37
2		91	91	143	139	85	75	165	36
3		90	97	140	129	80	74	183	25
4		97	98	134	150	64	62	135	35
5		86	114	145	147	75	86	183	31
Average		**91**	**99**	**139**	**141**	**76**	**74**	**166**	**33**
Model Storage Length		365	365	204	204	177	177	177	264

Intersection: 250:	Direction	EB	WB	NB	NB	NE
Holladay & 1st Avenue	Lanes	LT	T	T	TR	<L
Seed 1		33	116	162	343	100
2		33	141	153	307	105
3		23	120	212	331	94
4		22	153	101	309	82
5		19	159	249	375	104
Average		**26**	**138**	**175**	**333**	**97**
Model Storage Length		310	191	376	376	386

Scenario 2 2008 PM - Build Conditions

95% Queue Calculations

Intersection: 255:	Direction	EB	WB	SB
Holladay & 2nd Avenue	Lanes	LT	T	L
Seed 1		80	100	95
2		61	121	94
3		83	102	76
4		85	127	74
5		130	129	69
Average		**88**	**116**	**82**
Model Storage Length		191	258	141

Intersection: 260:	Direction	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Multnomah & 7th Avenue	Lanes	L	T	TR	L	T	TR	L	TR	L	TR
Seed 1		73	168	177	39	118	143	100	226	96	152
2		48	170	171	51	108	153	95	150	107	148
3		72	166	169	47	136	146	125	164	111	195
4		60	140	130	46	119	152	109	207	107	169
5		66	145	150	42	102	159	96	165	98	157
Average		**64**	**158**	**159**	**45**	**117**	**151**	**105**	**182**	**104**	**164**
Model Storage Length		440	440	440	994	994	994	100	457	75	611

Intersection:	Direction	EB	WB	NB	SB
270: Holladay & 7th Avenue	Lanes	TR	T	TR	LT
Seed 1		110	129	161	109
2		101	179	130	125
3		129	138	153	105
4		99	171	149	140
5		103	197	164	108
Average		**108**	**163**	**151**	**117**
Model Storage Length		208	360	412	457

Intersection: 280:	Direction	EB	EB	EB	WB	WB	SB	SB
LLoyd & 9th Avenue	Lanes	L	T	T	T	TR	L	R
Seed 1		58	91	104	168	214	179	54
2		62	100	111	119	197	200	55
3		55	84	101	92	151	218	40
4		52	82	95	98	150	156	30
5		61	87	99	120	152	181	37
Average		**58**	**89**	**102**	**119**	**173**	**187**	**43**
Model Storage Length		150	653	653	611	611	486	486