Gibson Traffic Consultants
2802 Wetmore Avenue
Suite 220
Everett, WA 98201
425.339.8266

116TH STREET NE INTERCHANGE
2040 Analysis Update

September 2009

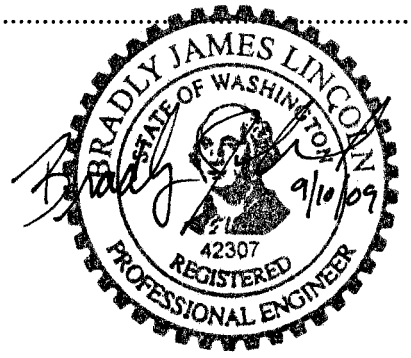
GTC #09-074

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ATTACHMENTS



1. PROJECT IDENTIFICATION

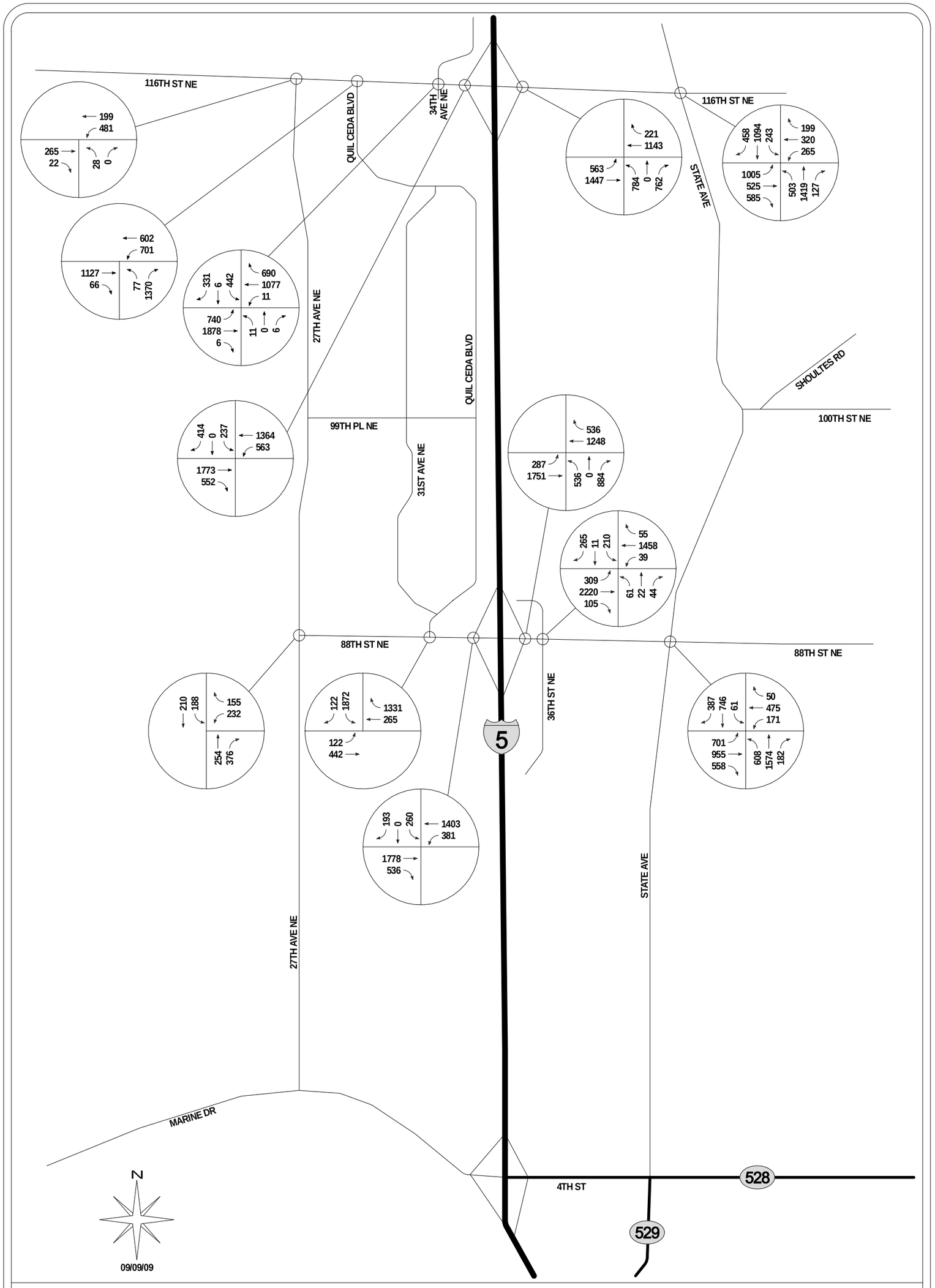
The initial analysis of the improvement for the 116th Street NE at Interstate-5 interchange was performed out to the year 2030. This report serves as a supplement to extend the analysis of the interchange to the year 2040 and update the accident analysis.

2. METHODOLOGY

The analysis in this report has been performed for the year 2040 using the same set of assumptions used in the original analysis of the interchange project. The analysis has been performed without the Single Point Urban Interchange (SPUI) and Quil Ceda Boulevard Extension and with these improvements.

The 2040 turning movements have been calculated by applying a 1% annually compounded growth rate to the 2030 volumes included in the original analysis. The use of this growth rate is consistent with the initial analysis of the interchange improvement. The 2040 volumes without the SPUI and Quil Ceda Boulevard Extension are shown in Figure 1 and the 2040 volumes with the SPUI and Quil Ceda Boulevard Extension are shown in Figure 2.

The analysis has been performed using the *Synchro 6.0, Build 614* software. Congestion at intersections is generally measured in terms of level of service (LOS). In accordance with the 2000 Highway Capacity Manual (HCM), road facilities and intersections are rated between LOS A and LOS F, with LOS A being free flow and LOS F being forced flow or over-capacity conditions. The level of service at signalized, roundabout and all-way stop-controlled intersections is based on the average delay of all approaches. The level of service for two-way stop-controlled intersections is based on average delays for the critical stopped approach. Geometric characteristics and conflicting traffic movements are taken into consideration when determining level of service values. A summary of the intersection level of service criteria is included in Table 1.



GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY
GTC #07-074

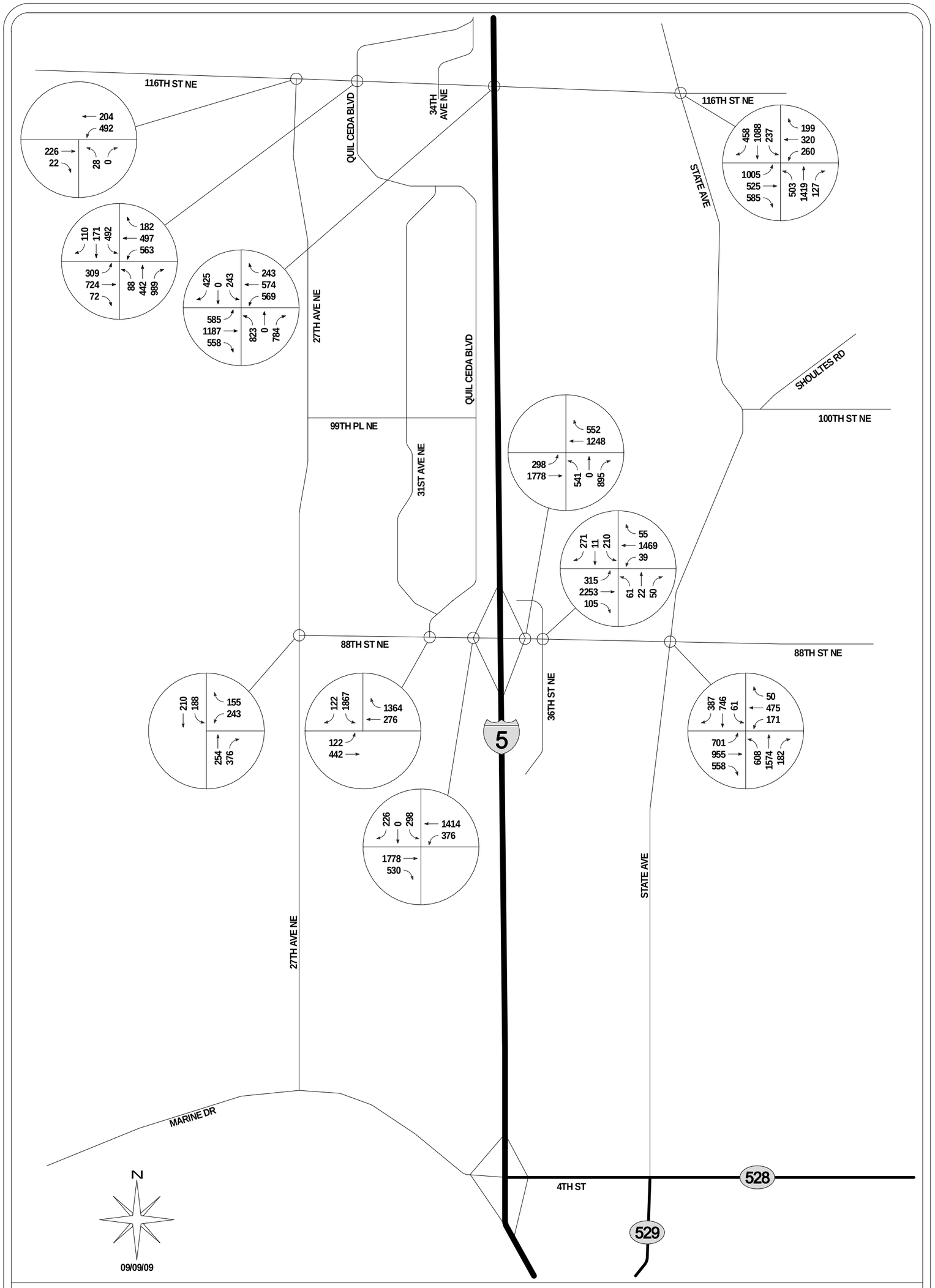
116TH STREET NE INTERCHANGE ANALYSIS UPDATE

LEGEND

XXX → PM PEAK-HOUR TURNING MOVEMENT VOLUMES

FIGURE 1

2040 NO BUILD TRAFFIC VOLUMES PM PEAK-HOUR



GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY
GTC #07-074

116TH STREET NE INTERCHANGE ANALYSIS UPDATE

LEGEND

XXX → PM PEAK-HOUR TURNING MOVEMENT VOLUMES

FIGURE 2

2040 BUILD TRAFFIC VOLUMES PM PEAK-HOUR

Table 1: Level of Service Criteria for Intersections

Level of [1] Service	Expected Delay	Intersection Control Delay (Seconds per Vehicle)	
		Unsignalized Intersections	**Signalized** Intersections
A	Little/No Delay	≤10	≤10
B	Short Delays	>10 and ≤15	>10 and ≤20
C	Average Delays	>15 and ≤25	>20 and ≤35
D	Long Delays	>25 and ≤35	>35 and ≤55
E	Very Long Delays	>35 and ≤50	>55 and ≤80
F	Extreme Delays[2]	>50	>80

The queue lengths at the intersections are based on the 95th Percentile queue lengths calculated by the *Synchro* software.

[1] **Source:** *Highway Capacity Manual* 2000.

LOS A: Free-flow traffic conditions, with minimal delay to stopped vehicles (no vehicle is delayed longer than one cycle at signalized intersection).
LOS B: Generally stable traffic flow conditions.
LOS C: Occasional back-ups may develop, but delay to vehicles is short term and still tolerable.
LOS D: During short periods of the peak hour, delays to approaching vehicles may be substantial but are tolerable during times of less demand (i.e. vehicles delayed one cycle or less at signal).
LOS E: Intersections operate at or near capacity, with long queues developing on all approaches and long delays.
LOS F: Jammed conditions on all approaches with excessively long delays and vehicles unable to move at times.

[2] When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection.

3. INTERCHANGE ANALYSIS

3.1 Level of Service Analysis

The 2040 No Build alternative is based on the same assumptions used for the previous 2009 No Build and 2030 No Build analysis. The 2040 Build analysis includes the Quil Ceda Boulevard Extension and the interchange improvements. The level of service results of the 2040 analysis is summarized in Table 2.

Table 2: Intersection Level of Service Summary

Intersection	Traffic Control	2040 No Build		2040 Build	
		LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
116th Street NE @ 27th Avenue NE	All-Way Stop	C	23.9	C	15.4
116th Street NE @ Quil Ceda Boulevard	Signal	F	179.3	D	47.6
116th Street NE @ 34th Avenue NE	Signal	F	437.8	---	---
116th Street NE @ I-5 Southbound Ramp	Signal	F	390.8	D	54.7
116th Street NE @ I-5 Northbound Ramp	Signal	F	255.7		
116th Street NE @ State Avenue	Signal	F	204.7	F	193.4
88th Street NE @ 27th Avenue NE	Two-Way Stop	F	114.8	F	131.5
	All-Way Stop	E	39.7	E	45.5
88th Street NE @ Quil Ceda Boulevard	Signal	C	24.4	C	31.1
88th Street NE @ I-5 Southbound Ramp	Signal	E	60.0	C	27.7
88th Street NE @ I-5 Northbound Ramp	Signal	F	145.1	F	85.0
88th Street NE @ 36th Street NE	Signal	E	57.4	E	60.9
88th Street NE @ State Avenue	Signal	F	214.9	F	221.7

The level of service analysis calculations are included in the attachments.

The construction of the SPUI and Quil Ceda Boulevard Extension will significantly reduce the delay at the 116th Street NE Interchange. A comparison of the delay experienced at the interchange under the 2030 and 2040 No Build and 2040 Build conditions is summarized in Table 3.

Table 3: Interchange Delay Comparison

Scenario	I-5 Southbound Ramps		I-5 Northbound Ramps		Total Interchange		Total Interchange Delay (hr)
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	
2030 No Build	F	137.0	F	115.3	F	252.3	260.1
2030 Build	---	---	---	---	C	30.2	29.9
2040 No Build	F	390.8	F	255.7	F	646.5	757.5
2040 Build	---	---	---	---	D	54.7	60.5

The construction of the SPUI and Quil Ceda Boulevard Extension will reduce the total delay at the intersection by nearly 230 under the 2030 conditions and nearly 700 hours under the 2040 conditions during the PM peak-hour. The delay calculations are included in the attachments.

3.2 Queuing Analysis

The queuing analysis concentrated on the 116th Street NE corridor between Quil Ceda Boulevard and through the I-5 Interchange. The queuing analysis shows that the eastbound and westbound queue lengths along 116th Street NE from Quil Ceda Boulevard through the I-5 Interchange will all exceed the available storage lengths if no improvements are made. The queue lengths are anticipated to spillover into the adjacent intersections.

The SPUI and Quil Ceda Boulevard extension will significantly reduce the queue lengths along 116th Street NE from Quil Ceda Boulevard through the SPUI will not spillover onto the adjacent intersections.

4. COLLISION ANALYSIS

4.1 Collision Rate

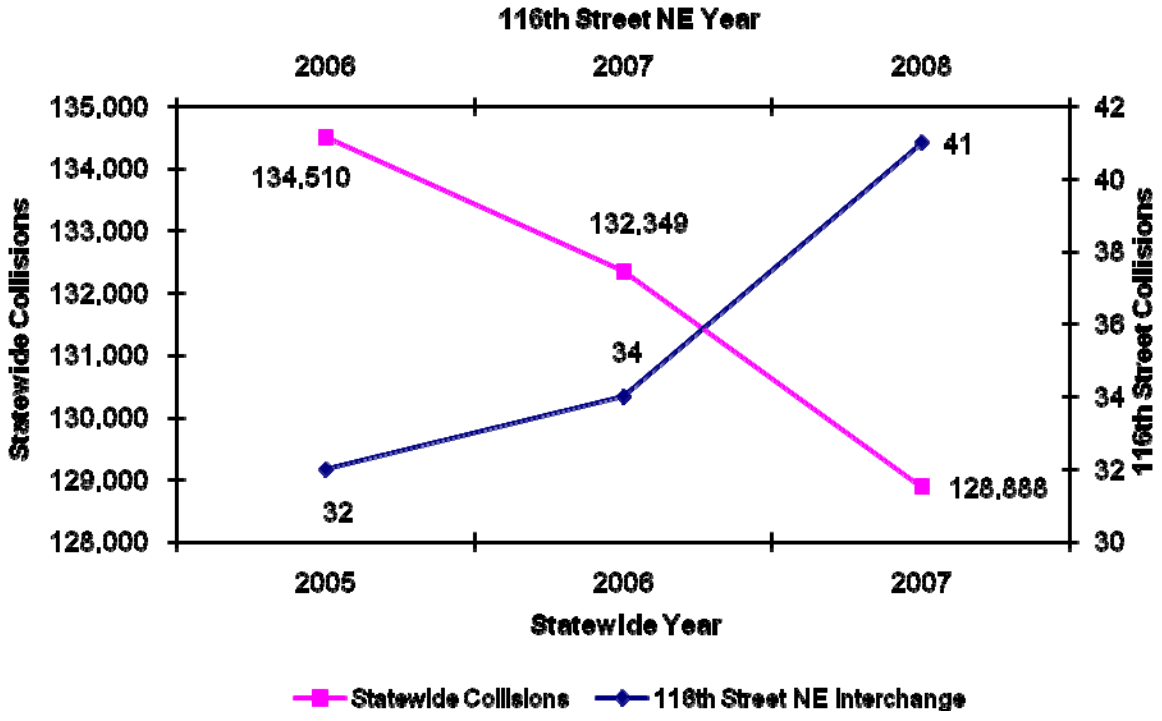
The Washington State Department of Transportation (WSDOT) has provided the latest three-year collision history (January 2006 through December 2008) for the ramps and mainline influence area of the 116th Street NE Interchange (Mile Post 201.81 to 203.12). The data shows the ramps, and influence area of the ramps, recorded 107 collisions, which resulted in 61 injuries involving 204 vehicles. The collision information is summarized in Table 4.

Table 4: 116th Street NE Interchange Collision Summary

Year	Other Collisions	Injury Collisions	Total Collisions
2006	18	14	32
2007	22	12	34
2008	29	12	41
Total	**69**	**38**	**107**

Approximately 50% of these collisions were rear-end accidents, systemic with the congestion associated with the existing interchange area. The rear-end collision rate for Washington State is only 27%. In addition, collisions at the 116th Street NE Interchange have *increased* an average of 13% annually in the last three year reporting period (2006 - 32 collisions, 2007 - 34 collisions, 2008 - 41 collisions). In the latest 3-year reporting period for the entire site, Washington State highways have experienced an annual average *decrease* of 3%. The comparison of the collision history at the 116th Street NE Interchange versus the Washington State collision history is shown in Figure 3.

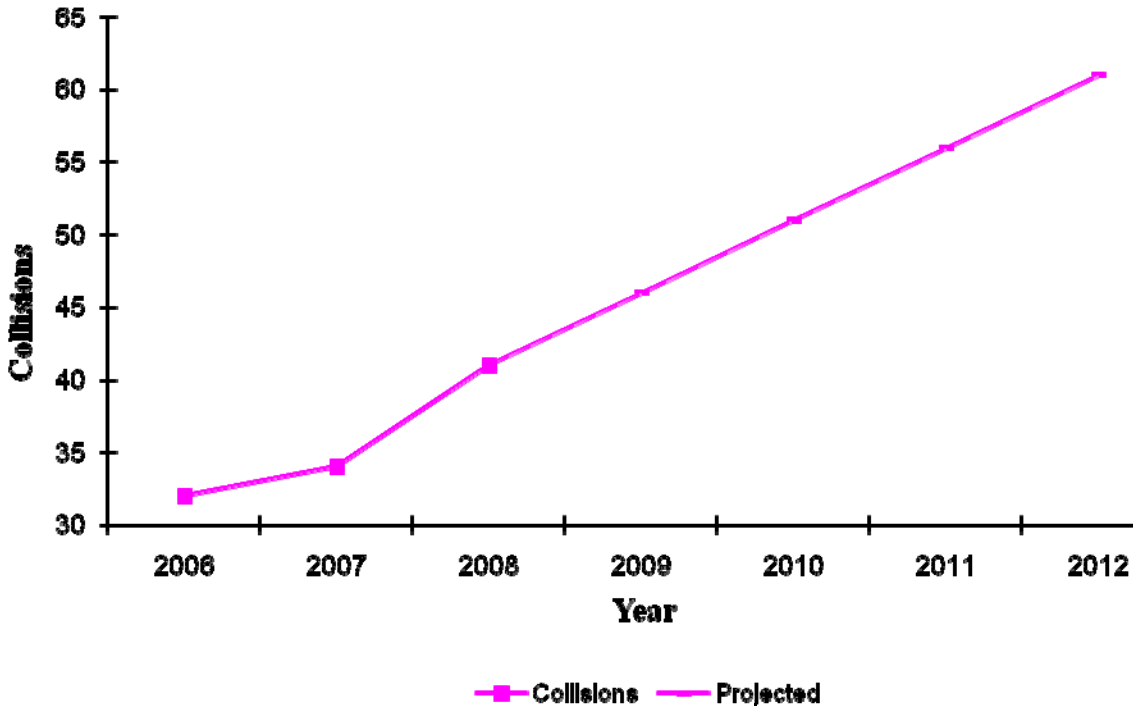
Figure 3: Collision History - 116th Street NE Interchange versus Washington State



WSDOT is constructing center median barriers on I-5 due to the severity of some of these collisions, but these barriers will not change the collision frequency on the 116th Street NE Interchange ramps and bridge. These barriers will only change the collisions along the I-5 mainline. A straight-line extrapolation of collision history to 2012 (the proposed opening year of

a new 116th Street NE Interchange) indicates 60 collisions a year (or 1 every 6 days). With the new 116th Street NE Interchange, congestion related rear-end collisions are anticipated to return to pre-2000 levels, and be consistent with Washington State averages. The collisions in the year 2012 are projected to drop 50% to 60% with the SPUI and Quil Ceda Boulevard Extension, half of which would be injury related accidents that are now avoided. The projection of collisions at the 116th Street NE Interchange is shown in Figure 4.

Figure 4: 116th Street NE Interchange Collision Projection



The new 116th Street NE Interchange would also significantly alter current and future scenarios for ramp traffic backing-up onto I-5 mainline. The existing 116th Street NE Interchange ramps provide over a 1,000 feet of storage, but vehicles frequently back-up during the PM peak-hour into I-5 northbound lanes. Back-ups carry through adjacent signals on either side of the interchange and create severe bottlenecks, causing increased driver frustration and collision potential on I-5 and on the local arterial system. These back-ups block driveways and increase red light violations. The forecasted peak queuing analysis without the interchange improvements exceeds the link distances of the ramps, and indicates queues would back-up into the adjacent arterial nearly 2,000 feet to the west and over 1,000 feet to the east.

This back-up onto the I-5 mainline is also concerning as it is the main truck route for commerce on the West Coast. Over 46 million tons of freight moves daily through this section of I-5. There is a large truck stop service business at the 116th Street NE Interchange attracting higher levels of truck exits than those simply dictated by local deliveries. The higher percentage of trucks (8-10%) moving through the interchange can cause collisions to be more frequent as off-

ramp spillover queues extend to the mainline and trucks have more difficulty avoiding collisions. This results in collisions that are more sever and cause longer delays for incident control.

4.2 Collision Costs

The collision cost savings with the SPUI and Quil Ceda Boulevard Extension were calculated using data from the United States Office of the Secretary of Transportation. The cost savings of reducing 1 fatality accident is $6,000,000 and the average cost savings of reducing 1 injury accident is $345,000.

The improved 116th Street NE Interchange is anticipated to reduce the number of collisions by 30, half of which are injury related accidents. This reduction of approximately 15 injury accidents per year is a cost savings of $5,175,000. Over the 28 year lifespan (2012 to 2040) of the improved 116th Street NE Interchange will result in a total collision cost savings of $144,900,000. This savings does not account for the additional cost savings of fatality accidents that would be avoided with the improved 116th Street NE Interchange.

2040 No Build Level of Service Calculations

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	265	22	481	199	28	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	270	22	491	203	29	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	293	694	29	0
Volume Left (vph)	0	491	29	0
Volume Right (vph)	22	0	0	0
Hadj (s)	0.02	0.19	0.53	0.00
Departure Headway (s)	4.8	4.5	7.3	6.7
Degree Utilization, x	0.39	0.87	0.06	0.00
Capacity (veh/h)	734	788	469	516
Control Delay (s)	10.8	30.0	9.5	8.5
Approach Delay (s)	10.8	30.0	9.5	
Approach LOS	B	D	A	

Intersection Summary			
Delay	23.9		
HCM Level of Service	C		
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50		50	50	50	50
Trailing Detector (ft)	0		0	0	0	0
Turning Speed (mph)		9	15		15	9
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	0.88
Frt	0.992					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3477	0	1770	3539	1770	2787
Flt Permitted			0.174		0.950	
Satd. Flow (perm)	3477	0	324	3539	1770	2787
Right Turn on Red		Yes				No
Satd. Flow (RTOR)	9					
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)	40			40	30	
Link Distance (ft)	502			443	1209	
Travel Time (s)	8.6			7.6	27.5	
Volume (vph)	1127	66	701	602	77	1370
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	3%	3%	2%	2%	2%	2%
Adj. Flow (vph)	1212	71	754	647	83	1473
Lane Group Flow (vph)	1283	0	754	647	83	1473
Turn Type			pm+pt			Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Detector Phases	2		1	6	8	8
Minimum Initial (s)	8.0		8.0	8.0	8.0	8.0
Minimum Split (s)	20.0		12.0	20.0	20.0	20.0
Total Split (s)	23.0	0.0	16.0	39.0	26.0	26.0
Total Split (%)	35.4%	0.0%	24.6%	60.0%	40.0%	40.0%
Maximum Green (s)	19.0		12.0	35.0	22.0	22.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	0.5		0.5	0.5	0.5	0.5
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes					
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	None	None
Act Effct Green (s)	20.0		36.0	36.0	23.0	23.0
Actuated g/C Ratio	0.31		0.55	0.55	0.35	0.35
v/c Ratio	1.19		1.61	0.33	0.13	1.49
Control Delay	120.2		305.7	8.5	15.0	250.3
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	120.2		305.7	8.5	15.0	250.3
LOS	F		F	A	B	F
Approach Delay	120.2			168.5	237.8	
Approach LOS	F			F	F	
Queue Length 50th (ft)	~334		~397	66	22	~472
Queue Length 95th (ft)	#456		#595	95	49	#605

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Internal Link Dist (ft)	422			363	1129	
Turn Bay Length (ft)						
Base Capacity (vph)	1076		469	1960	626	986
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	1.19		1.61	0.33	0.13	1.49

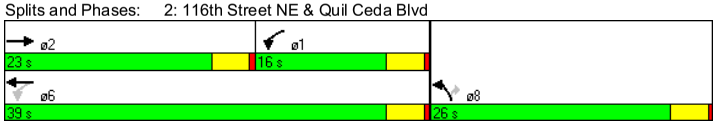
Intersection Summary

Area Type: Other
Cycle Length: 65
Actuated Cycle Length: 65
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.61
Intersection Signal Delay: 179.3 Intersection LOS: F
Intersection Capacity Utilization 88.8% ICU Level of Service E
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: 116th Street NE & Quil Ceda Blvd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		130	0		0	0		80
Storage Lanes	0		0	0		1	0		0	0		1
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50		50	50	50	50	50		50	50	50
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850		0.955				0.850
Flt Protected		0.986			0.999			0.968			0.953	
Satd. Flow (prot)	0	3178	0	0	1758	1495	0	1722	0	0	1775	1583
Flt Permitted		0.543			0.647			0.968			0.953	
Satd. Flow (perm)	0	1750	0	0	1138	1495	0	1722	0	0	1775	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						295		6				114
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		40			40			50			50	
Link Distance (ft)		189			282			163			113	
Travel Time (s)		3.2			4.8			2.2			1.5	
Volume (vph)	740	1878	6	11	1077	690	11	0	6	442	6	331
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	12%	12%	12%	8%	8%	8%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	787	1998	6	12	1146	734	12	0	6	470	6	352
Lane Group Flow (vph)	0	2791	0	0	1158	734	0	18	0	0	476	352
Turn Type	Perm			pm+pt		Perm	Split			Split		Perm
Protected Phases		2		1	6		8	8		4	4	
Permitted Phases	2			6		6						4
Detector Phases	2	2		1	6	6	8	8		4	4	4
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	20.0	20.0		12.0	20.0	20.0	20.0	20.0		20.0	20.0	20.0
Total Split (s)	63.0	63.0	0.0	12.0	75.0	75.0	20.0	20.0	0.0	25.0	25.0	25.0
Total Split (%)	52.5%	52.5%	0.0%	10.0%	62.5%	62.5%	16.7%	16.7%	0.0%	20.8%	20.8%	20.8%
Maximum Green (s)	59.0	59.0		8.0	71.0	71.0	16.0	16.0		21.0	21.0	21.0
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	0.5	0.5		0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None	None	None	None		Min	Min	Min
Act Effct Green (s)		72.2			72.2	72.2		9.0			22.1	22.1
Actuated g/C Ratio		0.69			0.69	0.69		0.08			0.21	0.21
v/c Ratio		10.09dl			1.48	0.65		0.12			1.27	0.83
Control Delay		612.1			242.2	9.0		39.2			178.0	45.4
Queue Delay		82.8			0.0	9.3		0.2			179.7	0.0
Total Delay		694.9			242.2	18.4		39.4			357.7	45.4
LOS		F			F	B		D			F	D
Approach Delay		694.9			155.4			39.4			224.9	
Approach LOS		F			F			D			F	

Lanes, Volumes, Timings
3: 116th Street NE & 34thAve NE 2040 No Build

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		~1517			~998	108		7			~375	147
Queue Length 95th (ft)		#1894			#1448	316		32			#657	#341
Internal Link Dist (ft)		109			202			83			33	
Turn Bay Length (ft)						130						80
Base Capacity (vph)		1206			784	1122		249			374	423
Starvation Cap Reductn		0			0	355		0			0	0
Spillback Cap Reductn		324			0	0		75			90	0
Storage Cap Reductn		0			0	0		0			0	0
Reduced v/c Ratio		3.16			1.48	0.96		0.10			1.68	0.83

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 104.8
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 2.31
Intersection Signal Delay: 437.8 Intersection LOS: F
Intersection Capacity Utilization 172.4% ICU Level of Service H
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 3: 116th Street NE & 34thAve NE

116th Street NE Interchange - 2040 Analysis Update PM Peak-Hour
Gibson Traffic Consultants, Inc. [BJL]

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		0	0		0	0		0
Storage Lanes	0		1	1		0	0		0	0		1
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1759	1495	1752	1845	0	0	0	0	0	1641	1468
Flt Permitted				0.106							0.950	
Satd. Flow (perm)	0	1759	1495	196	1845	0	0	0	0	0	1641	1468
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			228									58
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		282			831			563			641	
Travel Time (s)		4.8			14.2			12.8			14.6	
Volume (vph)	0	1773	552	563	1364	0	0	0	0	237	0	414
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	8%	8%	8%	3%	3%	3%	2%	2%	2%	10%	10%	10%
Adj. Flow (vph)	0	2086	649	662	1605	0	0	0	0	279	0	487
Lane Group Flow (vph)	0	2086	649	662	1605	0	0	0	0	0	279	487
Turn Type			Perm	pm+pt						custom		Perm
Protected Phases		2		1	6					4	4	
Permitted Phases			2	6						4		4
Detector Phases		2	2	1	6					4	4	4
Minimum Initial (s)		8.0	8.0	8.0	8.0					8.0	8.0	8.0
Minimum Split (s)		24.0	24.0	12.0	24.0					24.0	24.0	24.0
Total Split (s)	0.0	69.0	69.0	22.0	91.0	0.0	0.0	0.0	0.0	29.0	29.0	29.0
Total Split (%)	0.0%	57.5%	57.5%	18.3%	75.8%	0.0%	0.0%	0.0%	0.0%	24.2%	24.2%	24.2%
Maximum Green (s)		65.0	65.0	18.0	87.0					25.0	25.0	25.0
Yellow Time (s)		3.5	3.5	3.5	3.5					3.5	3.5	3.5
All-Red Time (s)		0.5	0.5	0.5	0.5					0.5	0.5	0.5
Lead/Lag		Lead	Lead	Lag								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		3.0	3.0	3.0	3.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	None	C-Max					None	None	None
Act Effct Green (s)		66.0	66.0	88.0	88.0						26.0	26.0
Actuated g/C Ratio		0.55	0.55	0.73	0.73						0.22	0.22
v/c Ratio		2.16	0.70	1.70	1.19						0.78	1.34
Control Delay		544.9	17.0	340.8	100.9						61.0	203.0
Queue Delay		0.0	32.0	0.0	267.6						0.0	313.6
Total Delay		544.9	49.0	340.8	368.5						61.0	516.7
LOS		F	D	F	F						E	F
Approach Delay		427.2			360.4						350.7	
Approach LOS		F			F						F	

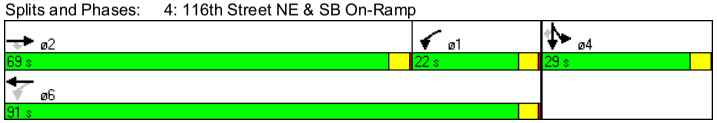
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		~2583	232	~660	~1487						206	~458
Queue Length 95th (ft)		#2642	327	m#357	m394						#302	#615
Internal Link Dist (ft)		202			751			483			561	
Turn Bay Length (ft)				150								
Base Capacity (vph)		967	925	390	1353						356	364
Starvation Cap Reductn		0	305	0	85						0	0
Spillback Cap Reductn		0	0	0	453						0	125
Storage Cap Reductn		0	0	0	0						0	0
Reduced v/c Ratio		2.16	1.05	1.70	1.78						0.78	2.04

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 96 (80%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 2.16
Intersection Signal Delay: 390.8 Intersection LOS: F
Intersection Capacity Utilization 216.0% ICU Level of Service H
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: 116th Street NE & SB On-Ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	0		150	0		0	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1687	1776	0	0	1863	1583	0	1719	1538	0	0	0
Flt Permitted	0.075							0.950				
Satd. Flow (perm)	133	1776	0	0	1863	1583	0	1719	1538	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						70			43			
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		831			1922			545			668	
Travel Time (s)		14.2			32.8			12.4			15.2	
Volume (vph)	563	1447	0	0	1143	221	784	0	762	0	0	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	7%	7%	7%	2%	2%	2%	5%	5%	5%	2%	2%	2%
Adj. Flow (vph)	586	1507	0	0	1191	230	817	0	794	0	0	0
Lane Group Flow (vph)	586	1507	0	0	1191	230	0	817	794	0	0	0
Turn Type	pm+pt					Perm	custom		Perm			
Protected Phases	5	2			6		8	8				
Permitted Phases	2					6	8		8			
Detector Phases	5	2			6	6	8	8	8			
Minimum Initial (s)	8.0	8.0			8.0	8.0	8.0	8.0	8.0			
Minimum Split (s)	12.0	24.0			24.0	24.0	24.0	24.0	24.0			
Total Split (s)	25.0	78.0	0.0	0.0	53.0	53.0	42.0	42.0	42.0	0.0	0.0	0.0
Total Split (%)	20.8%	65.0%	0.0%	0.0%	44.2%	44.2%	35.0%	35.0%	35.0%	0.0%	0.0%	0.0%
Maximum Green (s)	21.0	74.0			49.0	49.0	38.0	38.0	38.0			
Yellow Time (s)	3.5	3.5			3.5	3.5	3.5	3.5	3.5			
All-Red Time (s)	0.5	0.5			0.5	0.5	0.5	0.5	0.5			
Lead/Lag	Lead				Lag	Lag						
Lead-Lag Optimize?	Yes				Yes	Yes						
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	None	C-Max			C-Max	C-Max	None	None	None			
Act Effct Green (s)	75.0	75.0			50.0	50.0		39.0	39.0			
Actuated g/C Ratio	0.62	0.62			0.42	0.42		0.32	0.32			
v/c Ratio	1.59	1.36			1.53	0.33		1.46	1.50			
Control Delay	301.7	176.2			275.6	17.6		249.4	265.1			
Queue Delay	0.0	44.7			9.0	0.0		53.2	0.0			
Total Delay	301.7	220.9			284.6	17.6		302.6	265.1			
LOS	F	F			F	B		F	F			
Approach Delay		243.5			241.4			284.1				
Approach LOS		F			F			F				

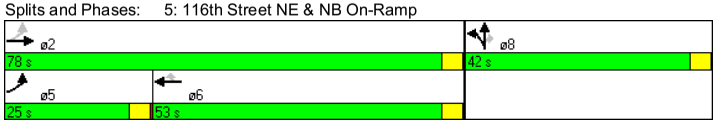
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	~595	~1520			~1294	80		~867	~837			
Queue Length 95th (ft)	m195	m106			#1554	142		#1110	#1081			
Internal Link Dist (ft)		751			1842			465			588	
Turn Bay Length (ft)	150					150						
Base Capacity (vph)	368	1110			776	700		559	529			
Starvation Cap Reductn	0	76			0	0		0	0			
Spillback Cap Reductn	0	0			10	0		42	0			
Storage Cap Reductn	0	0			0	0		0	0			
Reduced v/c Ratio	1.59	1.46			1.55	0.33		1.58	1.50			

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.59
Intersection Signal Delay: 255.7 Intersection LOS: F
Intersection Capacity Utilization 216.0% ICU Level of Service H
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: 116th Street NE & NB On-Ramp



Lanes, Volumes, Timings
6: 116th Street NE & State Ave — 2040 No Build

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	75		0	135		0	260		0	155		0
Storage Lanes	2		1	1		0	1		0	1		0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.943			0.988			0.956	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3400	1845	1568	1770	1757	0	1770	3497	0	1770	3383	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3400	1845	1568	1770	1757	0	1770	3497	0	1770	3383	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			295		24			9			55	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		1922			854			2214			9724	
Travel Time (s)		32.8			14.6			37.7			165.8	
Volume (vph)	1005	525	585	265	320	199	503	1419	127	243	1094	458
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	1036	541	603	273	330	205	519	1463	131	251	1128	472
Lane Group Flow (vph)	1036	541	603	273	535	0	519	1594	0	251	1600	0
Turn Type	Split		Perm	Split			Prot			Prot		
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4									
Detector Phases	4	4	4	8	8		5	2		1	6	
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0		8.0	8.0		8.0	8.0	
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0		12.0	20.0		12.0	20.0	
Total Split (s)	28.0	28.0	28.0	28.0	28.0	0.0	24.0	49.0	0.0	15.0	40.0	0.0
Total Split (%)	23.3%	23.3%	23.3%	23.3%	23.3%	0.0%	20.0%	40.8%	0.0%	12.5%	33.3%	0.0%
Maximum Green (s)	24.0	24.0	24.0	24.0	24.0		20.0	45.0		11.0	36.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min		None	Min	
Act Effct Green (s)	25.0	25.0	25.0	25.0	25.0		21.0	46.0		12.0	37.0	
Actuated g/C Ratio	0.21	0.21	0.21	0.21	0.21		0.18	0.38		0.10	0.31	
v/c Ratio	1.46	1.41	1.08	0.74	1.39		1.67	1.18		1.42	1.48	
Control Delay	251.4	235.2	84.0	57.8	225.8		349.3	124.8		257.3	252.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	251.4	235.2	84.0	57.8	225.8		349.3	124.8		257.3	252.2	
LOS	F	F	F	E	F		F	F		F	F	
Approach Delay		201.1			169.0			180.0			252.9	
Approach LOS		F			F			F			F	

Lanes, Volumes, Timings
6: 116th Street NE & State Ave — 2040 No Build

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	~566	~562	~327	200	~540		~587	~782		~262	~889	
Queue Length 95th (ft)	#696	#780	#555	#315	#760		#801	#924		#430	#1031	
Internal Link Dist (ft)		1842			774			2134			9644	
Turn Bay Length (ft)	75			135			260			155		
Base Capacity (vph)	708	384	560	369	385		310	1346		177	1081	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	1.46	1.41	1.08	0.74	1.39		1.67	1.18		1.42	1.48	

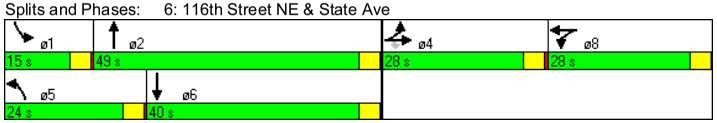
Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.67
Intersection Signal Delay: 204.7 — Intersection LOS: F
Intersection Capacity Utilization 143.7% — ICU Level of Service H
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: 116th Street NE & State Ave



116th Street NE Interchange - 2040 Analysis Update — PM Peak-Hour
Gibson Traffic Consultants, Inc. [BJL]

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	232	155	254	376	188	210
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	239	160	262	388	194	216
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1060	456			649	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1060	456			649	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	74			79	
cM capacity (veh/h)	197	605			937	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	239	160	649	410
Volume Left	239	0	0	194
Volume Right	0	160	388	0
cSH	197	605	1700	937
Volume to Capacity	1.21	0.26	0.38	0.21
Queue Length 95th (ft)	312	26	0	19
Control Delay (s)	182.7	13.1	0.0	5.9
Lane LOS	F	B		A
Approach Delay (s)	114.8		0.0	5.9
Approach LOS	F			

Intersection Summary			
Average Delay	33.0		
Intersection Capacity Utilization	80.7%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	232	155	254	376	188	210
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	239	160	262	388	194	216

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	239	160	649	410
Volume Left (vph)	239	0	0	194
Volume Right (vph)	0	160	388	0
Hadj (s)	0.53	-0.67	-0.32	0.13
Departure Headway (s)	7.8	6.6	5.7	6.3
Degree Utilization, x	0.52	0.29	1.02	0.72
Capacity (veh/h)	453	533	639	557
Control Delay (s)	17.6	11.1	64.8	24.0
Approach Delay (s)	15.0		64.8	24.0
Approach LOS	C		F	C

Intersection Summary			
Delay	39.7		
HCM Level of Service	E		
Intersection Capacity Utilization	80.7%	ICU Level of Service	D
Analysis Period (min)	15		

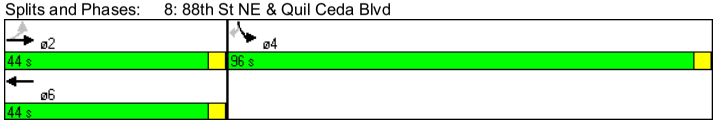
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			175	120	0
Storage Lanes	0			1	2	1
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Turning Speed (mph)	15			9	15	9
Lane Util. Factor	0.95	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected		0.989			0.950	
Satd. Flow (prot)	0	3500	3539	1583	3433	1583
Flt Permitted		0.741			0.950	
Satd. Flow (perm)	0	2623	3539	1583	3433	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				951		107
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		35	35		30	
Link Distance (ft)		1642	529		371	
Travel Time (s)		32.0	10.3		8.4	
Volume (vph)	122	442	265	1331	1872	122
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	126	456	273	1372	1930	126
Lane Group Flow (vph)	0	582	273	1372	1930	126
Turn Type	Perm			Free		Perm
Protected Phases		2	6		4	
Permitted Phases	2			Free		4
Detector Phases	2	2	6		4	4
Minimum Initial (s)	8.0	8.0	8.0		8.0	8.0
Minimum Split (s)	20.0	20.0	20.0		20.0	20.0
Total Split (s)	44.0	44.0	44.0	0.0	96.0	96.0
Total Split (%)	31.4%	31.4%	31.4%	0.0%	68.6%	68.6%
Maximum Green (s)	40.0	40.0	40.0		92.0	92.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	0.5	0.5	0.5		0.5	0.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	C-Max	C-Max	C-Max		Min	Min
Act Effct Green (s)		46.8	46.8	140.0	87.2	87.2
Actuated g/C Ratio		0.33	0.33	1.00	0.62	0.62
v/c Ratio		0.66	0.23	0.87	0.90	0.12
Control Delay		45.7	33.3	5.8	29.3	2.4
Queue Delay		0.0	0.0	0.0	2.1	0.0
Total Delay		45.7	33.3	5.8	31.3	2.4
LOS		D	C	A	C	A
Approach Delay		45.7	10.4		29.6	
Approach LOS		D	B		C	
Queue Length 50th (ft)		245	104	833	696	6

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (ft)		327	m99	m0	762	28
Internal Link Dist (ft)		1562	449		291	
Turn Bay Length (ft)				175	120	
Base Capacity (vph)		876	1182	1583	2280	1087
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	215	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.66	0.23	0.87	0.93	0.12

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 8 (6%), Referenced to phase 2:EBTL and 6:WBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 24.4 Intersection LOS: C
Intersection Capacity Utilization 86.5% ICU Level of Service E
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: 88th St NE & Quil Ceda Blvd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		255	110		0	0		0	0		0
Storage Lanes	0		1	1		0	0		0	0		0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)		50	50	50	50					50	50	
Trailing Detector (ft)		0	0	0	0					0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850								0.942	
Flt Protected				0.950							0.972	
Satd. Flow (prot)	0	3539	1583	3433	1863	0	0	0	0	0	1689	0
Flt Permitted				0.950							0.972	
Satd. Flow (perm)	0	3539	1583	3433	1863	0	0	0	0	0	1689	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			385								25	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		529			497			462			674	
Travel Time (s)		10.3			9.7			10.5			15.3	
Volume (vph)	0	1778	536	381	1403	0	0	0	0	260	0	193
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	3%
Adj. Flow (vph)	0	1833	553	393	1446	0	0	0	0	268	0	199
Lane Group Flow (vph)	0	1833	553	393	1446	0	0	0	0	0	467	0
Turn Type			Perm	Prot						custom		
Protected Phases		2		1	6					4	4	
Permitted Phases			2							4		
Detector Phases		2	2	1	6					4	4	
Minimum Initial (s)		8.0	8.0	8.0	8.0					8.0	8.0	
Minimum Split (s)		24.0	24.0	12.0	24.0					24.0	24.0	
Total Split (s)	0.0	83.0	83.0	20.0	103.0	0.0	0.0	0.0	0.0	37.0	37.0	0.0
Total Split (%)	0.0%	59.3%	59.3%	14.3%	73.6%	0.0%	0.0%	0.0%	0.0%	26.4%	26.4%	0.0%
Maximum Green (s)		79.0	79.0	16.0	99.0					33.0	33.0	
Yellow Time (s)		3.5	3.5	3.5	3.5					3.5	3.5	
All-Red Time (s)		0.5	0.5	0.5	0.5					0.5	0.5	
Lead/Lag		Lead	Lead	Lag								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		3.0	3.0	3.0	3.0					3.0	3.0	
Recall Mode		C-Max	C-Max	None	C-Max					None	None	
Act Effct Green (s)		80.0	80.0	17.0	100.0						34.0	
Actuated g/C Ratio		0.57	0.57	0.12	0.71						0.24	
v/c Ratio		0.91	0.52	0.94	1.09						1.09	
Control Delay		21.1	2.4	49.1	59.9						115.8	
Queue Delay		29.1	0.7	0.0	19.1						1.0	
Total Delay		50.2	3.1	49.1	79.0						116.8	
LOS		D	A	D	E						F	
Approach Delay		39.3			72.6						116.8	
Approach LOS		D			E						F	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		618	15	174	~738						~460	
Queue Length 95th (ft)		769	m33	m166	m331						#680	
Internal Link Dist (ft)		449			417			382			594	
Turn Bay Length (ft)			255	110								
Base Capacity (vph)		2022	1070	417	1331						429	
Starvation Cap Reductn		292	231	0	53						0	
Spillback Cap Reductn		181	0	0	0						1	
Storage Cap Reductn		0	0	0	0						0	
Reduced v/c Ratio		1.06	0.66	0.94	1.13						1.09	

Intersection Summary

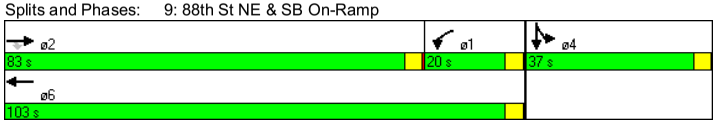
Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 58 (41%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.09
Intersection Signal Delay: 60.0 Intersection LOS: E
Intersection Capacity Utilization 178.9% ICU Level of Service H
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: 88th St NE & SB On-Ramp



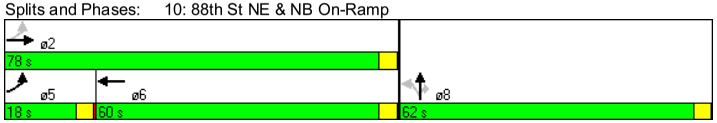
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	14	12	14	12	12	12
Storage Length (ft)	110		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	1		1	0		0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50			50		50	50	50			
Trailing Detector (ft)	0	0			0		0	0	0			
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Frt					0.955				0.850			
Flt Protected	0.950						0.950	0.950				
Satd. Flow (prot)	1752	3505	0	0	3380	0	1793	1681	1689	0	0	0
Flt Permitted	0.067						0.950	0.950				
Satd. Flow (perm)	124	3505	0	0	3380	0	1793	1681	1689	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					58				11			
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.92	1.00	0.92	1.00	1.00	1.00
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		497			387			1024			527	
Travel Time (s)		9.7			7.5			23.3			12.0	
Volume (vph)	287	1751	0	0	1248	536	536	0	884	0	0	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	296	1805	0	0	1287	553	553	0	911	0	0	0
Lane Group Flow (vph)	296	1805	0	0	1840	0	278	275	911	0	0	0
Turn Type	pm+pt						Perm		Perm			
Protected Phases	5	2			6			8				
Permitted Phases	2						8		8			
Detector Phases	5	2			6		8	8	8			
Minimum Initial (s)	8.0	8.0			8.0		8.0	8.0	8.0			
Minimum Split (s)	12.0	24.0			24.0		24.0	24.0	24.0			
Total Split (s)	18.0	78.0	0.0	0.0	60.0	0.0	62.0	62.0	62.0	0.0	0.0	0.0
Total Split (%)	12.9%	55.7%	0.0%	0.0%	42.9%	0.0%	44.3%	44.3%	44.3%	0.0%	0.0%	0.0%
Maximum Green (s)	14.0	74.0			56.0		58.0	58.0	58.0			
Yellow Time (s)	3.5	3.5			3.5		3.5	3.5	3.5			
All-Red Time (s)	0.5	0.5			0.5		0.5	0.5	0.5			
Lead/Lag	Lead				Lag							
Lead-Lag Optimize?	Yes				Yes							
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Recall Mode	None	None			None		C-Max	C-Max	C-Max			
Act Effct Green (s)	75.0	75.0			57.0		59.0	59.0	59.0			
Actuated g/C Ratio	0.54	0.54			0.41		0.42	0.42	0.42			
v/c Ratio	1.23	0.96			1.30		0.37	0.39	1.27			
Control Delay	161.3	18.4			163.1		29.5	30.1	166.6			
Queue Delay	0.0	28.0			0.4		0.0	0.0	201.5			
Total Delay	161.3	46.5			163.5		29.5	30.1	368.1			
LOS	F	D			F		C	C	F			
Approach Delay		62.6			163.5			240.3				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		E			F			F				
Queue Length 50th (ft)	~276	268			~1090		180	180	~1042			
Queue Length 95th (ft)	m#323	m#750			#1235		260	262	#1303			
Internal Link Dist (ft)		417			307			944			447	
Turn Bay Length (ft)	110											
Base Capacity (vph)	241	1878			1411		756	708	718			
Starvation Cap Reductn	0	135			0		0	0	0			
Spillback Cap Reductn	0	182			1		4	3	188			
Storage Cap Reductn	0	0			0		0	0	0			
Reduced v/c Ratio	1.23	1.06			1.30		0.37	0.39	1.72			

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 8:NBTL, Start of Green, Master Intersection
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.30
Intersection Signal Delay: 145.1 Intersection LOS: F
Intersection Capacity Utilization 178.9% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: 88th St NE & NB On-Ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	120		0	100		0	55		0	90		0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.993			0.995			0.901			0.856	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	3480	0	1770	3522	0	1770	1678	0	1770	1595	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1752	3480	0	1770	3522	0	1770	1678	0	1770	1595	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			4			45			273	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		387			1532			1529			345	
Travel Time (s)		7.5			29.8			34.8			7.8	
Volume (vph)	309	2220	105	39	1458	55	61	22	44	210	11	265
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	319	2289	108	40	1503	57	63	23	45	216	11	273
Lane Group Flow (vph)	319	2397	0	40	1560	0	63	68	0	216	284	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Detector Phases	5	2		1	6		3	8		7	4	
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0		8.0	8.0	
Minimum Split (s)	12.0	20.0		12.0	20.0		12.0	20.0		12.0	20.0	
Total Split (s)	30.0	90.0	0.0	12.0	72.0	0.0	12.0	20.0	0.0	18.0	26.0	0.0
Total Split (%)	21.4%	64.3%	0.0%	8.6%	51.4%	0.0%	8.6%	14.3%	0.0%	12.9%	18.6%	0.0%
Maximum Green (s)	26.0	86.0		8.0	68.0		8.0	16.0		14.0	22.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max		None	C-Max		None	Min		None	Min	
Act Effct Green (s)	31.9	95.1		10.3	71.1		9.0	10.0		15.0	18.4	
Actuated g/C Ratio	0.23	0.68		0.07	0.51		0.06	0.07		0.11	0.13	
v/c Ratio	0.80	1.01		0.31	0.87		0.55	0.42		1.14	0.64	
Control Delay	61.7	25.2		67.3	37.3		82.2	34.2		161.1	14.4	
Queue Delay	41.8	34.4		0.0	0.2		0.0	0.0		0.0	1.5	
Total Delay	103.5	59.6		67.3	37.5		82.2	34.2		161.1	15.9	
LOS	F	E		E	D		F	C		F	B	
Approach Delay		64.7			38.3			57.3			78.6	
Approach LOS		E			D			E			E	

Lanes, Volumes, Timings
11: 88th St NE & 36th Ave NE 2040 No Build

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	282	~1221		35	664		57	20		~229	9	
Queue Length 95th (ft)	m275	m#1191		74	778		#112	69		#397	101	
Internal Link Dist (ft)		307			1452			1449			265	
Turn Bay Length (ft)	120			100			55			90		
Base Capacity (vph)	400	2367		130	1792		114	243		190	498	
Starvation Cap Reductn	100	189		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	17		0	0		0	89	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	1.06	1.10		0.31	0.88		0.55	0.28		1.14	0.69	

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 75 (54%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.14
Intersection Signal Delay: 57.4 Intersection LOS: E
Intersection Capacity Utilization 108.3% ICU Level of Service G
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: 88th St NE & 36th Ave NE

116th Street NE Interchange - 2040 Analysis Update PM Peak-Hour
Gibson Traffic Consultants, Inc. [BJL]

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		185	100		0	325		0	125		0
Storage Lanes	1		1	1		0	1		0	1		0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.986			0.984			0.949	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1837	0	1770	3483	0	1770	3359	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	1863	1583	1770	1837	0	1770	3483	0	1770	3359	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			229		4			12			74	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		1532			887			3861			757	
Travel Time (s)		29.8			17.3			65.8			12.9	
Volume (vph)	701	955	558	171	475	50	608	1574	182	61	746	387
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	723	985	575	176	490	52	627	1623	188	63	769	399
Lane Group Flow (vph)	723	985	575	176	542	0	627	1811	0	63	1168	0
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Detector Phases	7	4	4	3	8		5	2		1	6	
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0		8.0	8.0		8.0	8.0	
Minimum Split (s)	12.0	20.0	20.0	12.0	20.0		12.0	20.0		12.0	20.0	
Total Split (s)	31.0	46.0	46.0	13.0	28.0	0.0	28.0	49.0	0.0	12.0	33.0	0.0
Total Split (%)	25.8%	38.3%	38.3%	10.8%	23.3%	0.0%	23.3%	40.8%	0.0%	10.0%	27.5%	0.0%
Maximum Green (s)	27.0	42.0	42.0	9.0	24.0		24.0	45.0		8.0	29.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min		None	Min	
Act Effct Green (s)	28.0	43.0	43.0	10.0	25.0		25.0	48.4		9.0	30.0	
Actuated g/C Ratio	0.23	0.36	0.36	0.08	0.21		0.21	0.40		0.07	0.25	
v/c Ratio	1.75	1.47	0.81	1.19	1.40		1.70	1.28		0.48	1.31	
Control Delay	377.4	252.4	30.4	180.9	233.0		357.1	164.4		66.3	180.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	377.4	252.4	30.4	180.9	233.0		357.1	164.4		66.3	180.3	
LOS	F	F	C	F	F		F	F		E	F	
Approach Delay		236.1			220.2			213.9			174.5	
Approach LOS		F			F			F			F	
Queue Length 50th (ft)	~832	~1050	253	~165	~564		~713	~970		48	~590	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	#1068	#1301	415	#310	#786		#941	#1112		96	#728	
Internal Link Dist (ft)		1452			807			3781			677	
Turn Bay Length (ft)			185	100			325			125		
Base Capacity (vph)	413	668	714	148	386		369	1412		131	895	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	1.75	1.47	0.81	1.19	1.40		1.70	1.28		0.48	1.31	

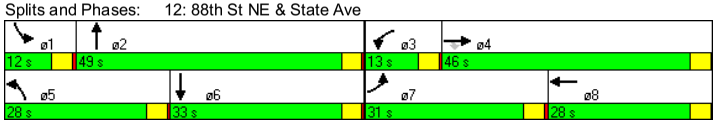
Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.75
Intersection Signal Delay: 214.9 Intersection LOS: F
Intersection Capacity Utilization 146.9% ICU Level of Service H
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 12: 88th St NE & State Ave



Interchange Delay Calcualtions - 2040 No Build

Existing - Southbound Ramps													
SB Left			EB Through			WB Left			WB Through			Total Vol	Total Delay
Vol	Delay	Total	Vol	Delay	Total	Vol	Delay	Total	Vol	Delay	Total		
237	61	14457	1773	544.9	966108	563	340.8	191870	1364	368.5	502634	3937	465.30

Existing - Northbound Ramps													
NB Left			EB Left			EB Through			WB Through			Total Vol	Total Delay
Vol	Delay	Total	Vol	Delay	Total	Vol	Delay	Total	Vol	Delay	Total		
784	302.6	237238	563	301.7	169857	1447	220.9	319642	1143	284.6	325298	3937	292.23

2040 Build Level of Service Calculations

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	226	22	492	204	28	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	233	23	507	210	29	0

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total (vph)	256	507	210	29
Volume Left (vph)	0	507	0	29
Volume Right (vph)	23	0	0	0
Hadj (s)	-0.02	0.53	0.03	0.23
Departure Headway (s)	4.7	5.3	4.8	6.1
Degree Utilization, x	0.34	0.75	0.28	0.05
Capacity (veh/h)	745	670	737	540
Control Delay (s)	10.1	21.3	8.5	9.5
Approach Delay (s)	10.1	17.5		9.5
Approach LOS	B	C		A

Intersection Summary			
Delay	15.4		
HCM Level of Service	C		
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		

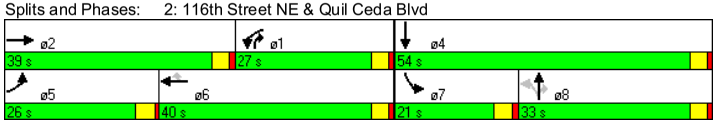
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250		0	330		330	0		250	295		0
Storage Lanes	1		0	1		1	1		2	2		0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50		50	50	50	50	50	50	50	50	
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	0.88	0.97	1.00	1.00
Frt		0.986				0.850			0.850		0.941	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	3358	0	3367	1827	1553	1770	1863	2787	3433	1753	0
Flt Permitted	0.950			0.950			0.583			0.950		
Satd. Flow (perm)	1703	3358	0	3367	1827	1553	1086	1863	2787	3433	1753	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9				188			50		33	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		1083			1145			1209			417	
Travel Time (s)		18.5			19.5			27.5			9.5	
Volume (vph)	309	724	72	563	497	182	88	442	989	492	171	110
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	6%	6%	6%	4%	4%	4%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	319	746	74	580	512	188	91	456	1020	507	176	113
Lane Group Flow (vph)	319	820	0	580	512	188	91	456	1020	507	289	0
Turn Type	Prot			Prot		Perm	Perm		pm+ov	Prot		
Protected Phases	5	2		1	6			8	1	7	4	
Permitted Phases						6	8		8			
Detector Phases	5	2		1	6	6	8	8	1	7	4	
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	
Minimum Split (s)	12.0	20.0		12.0	20.0	20.0	20.0	20.0	12.0	12.0	20.0	
Total Split (s)	26.0	39.0	0.0	27.0	40.0	40.0	33.0	33.0	27.0	21.0	54.0	0.0
Total Split (%)	21.7%	32.5%	0.0%	22.5%	33.3%	33.3%	27.5%	27.5%	22.5%	17.5%	45.0%	0.0%
Maximum Green (s)	22.0	35.0		23.0	36.0	36.0	29.0	29.0	23.0	17.0	50.0	
Yellow Time (s)	3.5	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	0.5	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag	Lag	Lag	Lag	Lead		
Lead-Lag Optimize?		Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Max		None	C-Max	C-Max	None	None	None	None	None	
Act Effct Green (s)	23.0	36.0		24.0	37.0	37.0	30.0	30.0	54.0	18.0	51.0	
Actuated g/C Ratio	0.19	0.30		0.20	0.31	0.31	0.25	0.25	0.45	0.15	0.42	
v/c Ratio	0.98	0.81		0.86	0.91	0.31	0.33	0.98	0.80	0.98	0.38	
Control Delay	93.5	45.8		42.0	42.6	5.0	41.0	81.9	21.0	87.1	22.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	93.5	45.8		42.0	42.6	5.0	41.0	81.9	21.0	87.1	22.5	
LOS	F	D		D	D	A	D	F	C	F	C	
Approach Delay		59.1			36.8			39.9			63.6	
Approach LOS		E			D			D			E	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	248	305		203	320	17	58	352	215	204	132	
Queue Length 95th (ft)	#433	385		m242	m#476	m28	109	#564	275	#317	205	
Internal Link Dist (ft)		1003			1065			1129			337	
Turn Bay Length (ft)	250			330		330			250	295		
Base Capacity (vph)	326	1014		673	563	609	272	466	1282	515	764	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.98	0.81		0.86	0.91	0.31	0.33	0.98	0.80	0.98	0.38	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 65 (54%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 47.6 Intersection LOS: D
Intersection Capacity Utilization 93.9% ICU Level of Service F
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: 116th Street NE & Quil Ceda Blvd



Lane Group	EBL	EBT	WBL	WBT	SEL	NWL
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Turning Speed (mph)	15		15		15	15
Lane Util. Factor	*0.90	0.95	*0.90	0.95	1.00	*0.90
Frt						
Flt Protected	0.950		0.950		0.950	0.950
Satd. Flow (prot)	3154	3505	3185	3539	1703	3094
Flt Permitted	0.950		0.950		0.950	0.950
Satd. Flow (perm)	3154	3505	3185	3539	1703	3094
Right Turn on Red						
Satd. Flow (RTOR)						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		35		35		
Link Distance (ft)		175		175		
Travel Time (s)		3.4		3.4		
Volume (vph)	585	1187	569	574	243	823
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	113%	113%	113%	113%	113%	113%
Heavy Vehicles (%)	3%	3%	2%	2%	6%	5%
Adj. Flow (vph)	681	1383	663	669	283	959
Lane Group Flow (vph)	681	1383	663	669	283	959
Turn Type	custom		Prot		custom	custom
Protected Phases	5	2	1	6	4	8
Permitted Phases	5				4	8
Detector Phases	5	2	1	6	4	8
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	13.0	25.0	13.0	25.0	13.0	25.0
Total Split (s)	38.0	52.0	28.0	42.0	40.0	40.0
Total Split (%)	31.7%	43.3%	23.3%	35.0%	33.3%	33.3%
Maximum Green (s)	29.0	43.0	19.0	33.0	31.0	31.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	None	C-Max	None	None
Walk Time (s)		5.0		5.0		5.0
Flash Dont Walk (s)		11.0		11.0		11.0
Pedestrian Calls (#/hr)		0		0		0
Act Effct Green (s)	33.8	49.0	25.0	40.2	37.0	37.0
Actuated g/C Ratio	0.28	0.41	0.21	0.34	0.31	0.31
v/c Ratio	0.77	0.97	1.00	0.56	0.54	1.01
Control Delay	46.5	46.1	82.3	35.3	39.0	72.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.5	46.1	82.3	35.3	39.0	72.1
LOS	D	D	F	D	D	E

Lanes, Volumes, Timings
3: 116th Street NE & NB Ramps 2040 Build

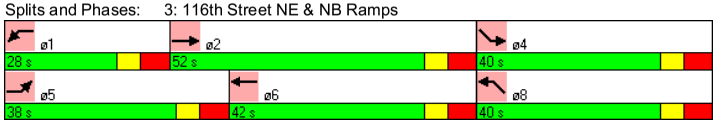
Lane Group	EBL	EBT	WBL	WBT	SEL	NWL
Approach Delay		46.2		58.7		
Approach LOS		D		E		
Queue Length 50th (ft)	277	536	287	226	182	~416
Queue Length 95th (ft)	m336	m#684	#424	288	272	#570
Internal Link Dist (ft)		95		95		
Turn Bay Length (ft)						
Base Capacity (vph)	920	1431	664	1186	525	954
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.97	1.00	0.56	0.54	1.01

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.01
Intersection Signal Delay: 54.7 Intersection LOS: D
Intersection Capacity Utilization 92.0% ICU Level of Service F
Analysis Period (min) 15

* User Entered Value
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: 116th Street NE & NB Ramps



116th Street NE Interchange - 2040 Analysis Update PM Peak Hour
Gibson Traffic Consultants, Inc. [BJL]

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	600		375	135		0	400		0	155		0
Storage Lanes	1		1	1		0	1		0	1		0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.943			0.988			0.956	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	1863	1583	1770	1757	0	1770	3497	0	1770	3383	0
Flt Permitted	0.950			0.462			0.950			0.950		
Satd. Flow (perm)	3433	1863	1583	861	1757	0	1770	3497	0	1770	3383	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			6		24			9			55	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			40			40			40	
Link Distance (ft)		2172			854			2214			12820	
Travel Time (s)		49.4			14.6			37.7			218.5	
Volume (vph)	1005	525	585	260	320	199	503	1419	127	237	1088	458
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	1036	541	603	268	330	205	519	1463	131	244	1122	472
Lane Group Flow (vph)	1036	541	603	268	535	0	519	1594	0	244	1594	0
Turn Type	Prot		pm+ov	Perm			Prot			Prot		
Protected Phases	7	4	5		8		5	2		1	6	
Permitted Phases			4	8								
Detector Phases	7	4	5	8	8		5	2		1	6	
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0		8.0	8.0		8.0	8.0	
Minimum Split (s)	20.0	20.0	12.0	20.0	20.0		12.0	20.0		12.0	20.0	
Total Split (s)	28.0	57.0	24.0	29.0	29.0	0.0	24.0	48.0	0.0	15.0	39.0	0.0
Total Split (%)	23.3%	47.5%	20.0%	24.2%	24.2%	0.0%	20.0%	40.0%	0.0%	12.5%	32.5%	0.0%
Maximum Green (s)	24.0	53.0	20.0	25.0	25.0		20.0	44.0		11.0	35.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lead		Lead	Lag	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?			Yes				Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min		None	Min	
Act Effct Green (s)	25.0	54.0	78.0	26.0	26.0		21.0	45.0		12.0	36.0	
Actuated g/C Ratio	0.21	0.45	0.65	0.22	0.22		0.18	0.38		0.10	0.30	
v/c Ratio	1.45	0.65	0.58	1.43	1.34		1.67	1.21		1.38	1.51	
Control Delay	245.3	30.0	14.6	258.4	205.4		349.3	136.0		242.0	266.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	245.3	30.0	14.6	258.4	205.4		349.3	136.0		242.0	266.9	
LOS	F	C	B	F	F		F	F		F	F	
Approach Delay		128.1			223.1			188.4			263.6	
Approach LOS		F			F			F			F	
Queue Length 50th (ft)	~563	318	241	~282	~528		~587	~795		~251	~896	

Lanes, Volumes, Timings
4: 116th Street NE & State Ave 2040 Build

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	#694	442	346	#453	#748		#801	#937		#417	#1038	
Internal Link Dist (ft)		2092			774			2134			12740	
Turn Bay Length (ft)	600		375	135			400			155		
Base Capacity (vph)	715	838	1031	187	399		310	1317		177	1053	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	1.45	0.65	0.58	1.43	1.34		1.67	1.21		1.38	1.51	

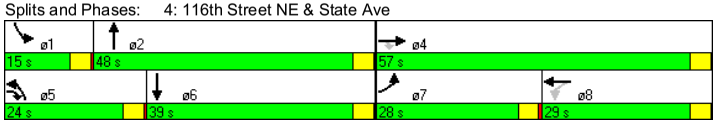
Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.67
Intersection Signal Delay: 193.4 Intersection LOS: F
Intersection Capacity Utilization 143.6% ICU Level of Service H
Analysis Period (min) 15

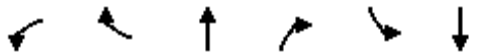
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: 116th Street NE & State Ave



116th Street NE Interchange - 2040 Analysis Update PM Peak Hour
Gibson Traffic Consultants, Inc. [BJL]



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	243	155	254	376	188	210
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	251	160	262	388	194	216
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1060	456			649	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1060	456			649	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	73			79	
cM capacity (veh/h)	196	603			932	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	251	160	649	194	216
Volume Left	251	0	0	194	0
Volume Right	0	160	388	0	0
cSH	196	603	1700	932	1700
Volume to Capacity	1.28	0.27	0.38	0.21	0.13
Queue Length 95th (ft)	343	27	0	20	0
Control Delay (s)	207.0	13.1	0.0	9.9	0.0
Lane LOS	F	B		A	
Approach Delay (s)	131.5		0.0	4.7	
Approach LOS	F				

Intersection Summary			
Average Delay	38.0		
Intersection Capacity Utilization	70.3%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	243	155	254	376	188	210
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	251	160	262	388	194	216

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	251	160	649	194	216
Volume Left (vph)	251	0	0	194	0
Volume Right (vph)	0	160	388	0	0
Hadj (s)	0.55	-0.65	-0.31	0.55	0.05
Departure Headway (s)	7.7	6.5	6.0	7.3	6.8
Degree Utilization, x	0.54	0.29	1.08	0.39	0.41
Capacity (veh/h)	458	540	602	483	518
Control Delay (s)	18.1	10.9	84.7	13.8	13.2
Approach Delay (s)	15.3		84.7	13.5	
Approach LOS	C		F	B	

Intersection Summary			
Delay	45.5		
HCM Level of Service	E		
Intersection Capacity Utilization	70.3%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			175	120	0
Storage Lanes	1			1	2	1
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Turning Speed (mph)	15			9	15	9
Lane Util. Factor	1.00	1.00	0.91	0.91	0.97	1.00
Frt			0.918	0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1752	1845	3082	1427	3400	1568
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1752	1845	3082	1427	3400	1568
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			197	1001		97
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		35	35		30	
Link Distance (ft)		1642	529		371	
Travel Time (s)		32.0	10.3		8.4	
Volume (vph)	122	442	276	1364	1867	122
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Adj. Flow (vph)	126	456	285	1406	1925	126
Lane Group Flow (vph)	126	456	632	1059	1925	126
Turn Type	Prot			Free		Perm
Protected Phases	5	2	6		4	
Permitted Phases				Free		4
Detector Phases	5	2	6		4	4
Minimum Initial (s)	8.0	8.0	8.0		8.0	8.0
Minimum Split (s)	12.0	20.0	20.0		20.0	20.0
Total Split (s)	17.0	49.0	32.0	0.0	91.0	91.0
Total Split (%)	12.1%	35.0%	22.9%	0.0%	65.0%	65.0%
Maximum Green (s)	13.0	45.0	28.0		87.0	87.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	0.5	0.5	0.5		0.5	0.5
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	C-Max	C-Max		Min	Min
Act Effct Green (s)	14.0	48.7	31.7	140.0	85.3	85.3
Actuated g/C Ratio	0.10	0.35	0.23	1.00	0.61	0.61
v/c Ratio	0.72	0.71	0.74	0.74	0.93	0.13
Control Delay	83.9	47.7	47.5	4.3	33.6	3.3
Queue Delay	0.0	0.0	0.0	0.0	1.3	0.0
Total Delay	83.9	47.7	47.5	4.3	34.9	3.3
LOS	F	D	D	A	C	A
Approach Delay		55.6	20.4		33.0	
Approach LOS		E	C		C	

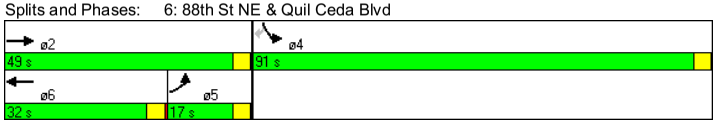
Lanes, Volumes, Timings
6: 88th St NE & Quil Ceda Blvd 2040 Build

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 50th (ft)	113	370	253	61	730	9
Queue Length 95th (ft)	#209	505	314	63	863	35
Internal Link Dist (ft)		1562	449		291	
Turn Bay Length (ft)				175	120	
Base Capacity (vph)	175	641	850	1427	2137	1022
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	84	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.72	0.71	0.74	0.74	0.94	0.12

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 136 (97%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 31.1 Intersection LOS: C
Intersection Capacity Utilization 92.3% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: 88th St NE & Quil Ceda Blvd



116th Street NE Interchange - 2040 Analysis Update PM Peak Hour
Gibson Traffic Consultants, Inc. [BJL]

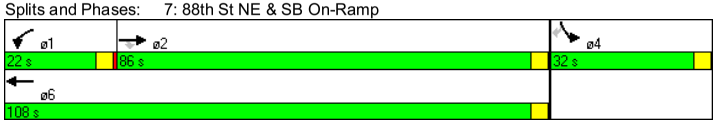
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		255	110		0	0		0	0		0
Storage Lanes	0		1	1		0	0		0	1		1
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)		50	50	50	50					50		50
Trailing Detector (ft)		0	0	0	0					0		0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.91	0.91	0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950						0.950		
Satd. Flow (prot)	0	3357	1427	3400	3505	0	0	0	0	1752	0	1568
Flt Permitted				0.950						0.950		
Satd. Flow (perm)	0	3357	1427	3400	3505	0	0	0	0	1752	0	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			384									82
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		529			497			462			674	
Travel Time (s)		10.3			9.7			10.5			15.3	
Volume (vph)	0	1778	530	376	1414	0	0	0	0	298	0	226
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Adj. Flow (vph)	0	1833	546	388	1458	0	0	0	0	307	0	233
Lane Group Flow (vph)	0	1833	546	388	1458	0	0	0	0	307	0	233
Turn Type			Perm	Prot						custom		custom
Protected Phases		2		1	6					4		
Permitted Phases			2							4		4
Detector Phases		2	2	1	6					4		4
Minimum Initial (s)		8.0	8.0	8.0	8.0					8.0		8.0
Minimum Split (s)		24.0	24.0	12.0	24.0					24.0		24.0
Total Split (s)	0.0	86.0	86.0	22.0	108.0	0.0	0.0	0.0	0.0	32.0	0.0	32.0
Total Split (%)	0.0%	61.4%	61.4%	15.7%	77.1%	0.0%	0.0%	0.0%	0.0%	22.9%	0.0%	22.9%
Maximum Green (s)		82.0	82.0	18.0	104.0					28.0		28.0
Yellow Time (s)		3.5	3.5	3.5	3.5					3.5		3.5
All-Red Time (s)		0.5	0.5	0.5	0.5					0.5		0.5
Lead/Lag		Lag	Lag	Lead								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		3.0	3.0	3.0	3.0					3.0		3.0
Recall Mode		C-Max	C-Max	None	C-Max					None		None
Act Effct Green (s)		84.7	84.7	18.9	106.5					27.5		27.5
Actuated g/C Ratio		0.60	0.60	0.14	0.76					0.20		0.20
v/c Ratio		0.90	0.54	0.85	0.55					0.89		0.62
Control Delay		19.2	3.0	65.5	1.4					82.3		40.5
Queue Delay		16.8	0.6	0.0	1.2					0.0		0.0
Total Delay		36.0	3.6	65.5	2.5					82.3		40.5
LOS		D	A	E	A					F		D
Approach Delay		28.6			15.8							
Approach LOS		C			B							

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		430	7	178	65					271		125
Queue Length 95th (ft)		786	m54	m173	m54					#428		218
Internal Link Dist (ft)		449			417			382			594	
Turn Bay Length (ft)			255	110								
Base Capacity (vph)		2030	1014	466	2667					363		390
Starvation Cap Reductn		244	184	0	897					0		0
Spillback Cap Reductn		70	0	0	0					0		0
Storage Cap Reductn		0	0	0	0					0		0
Reduced v/c Ratio		1.03	0.66	0.83	0.82					0.85		0.60

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 41 (29%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 27.7 Intersection LOS: C
Intersection Capacity Utilization 102.8% ICU Level of Service G
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: 88th St NE & SB On-Ramp



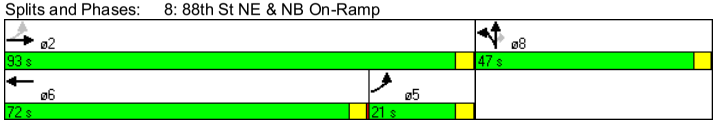
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	14	12	14	12	12	12
Storage Length (ft)	110		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	1		1	0		0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50			50		50	50	50			
Trailing Detector (ft)	0	0			0		0	0	0			
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	0.95	0.91	0.95	1.00	1.00	1.00
Frt					0.954			0.868	0.850			
Flt Protected	0.950						0.950	0.994				
Satd. Flow (prot)	1752	3505	0	0	3344	0	1776	1448	1589	0	0	0
Flt Permitted	0.056						0.950	0.994				
Satd. Flow (perm)	103	3505	0	0	3344	0	1776	1448	1589	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					71			23	23			
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.92	1.00	0.92	1.00	1.00	1.00
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		497			387			1024			527	
Travel Time (s)		9.7			7.5			23.3			12.0	
Volume (vph)	298	1778	0	0	1248	552	541	0	895	0	0	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Adj. Flow (vph)	307	1833	0	0	1287	569	558	0	923	0	0	0
Lane Group Flow (vph)	307	1833	0	0	1856	0	498	505	478	0	0	0
Turn Type	pm+pt						custom		Perm			
Protected Phases	5	2			6		8	8				
Permitted Phases	2						8		8			
Detector Phases	5	2			6		8	8	8			
Minimum Initial (s)	8.0	8.0			8.0		8.0	8.0	8.0			
Minimum Split (s)	12.0	24.0			24.0		24.0	24.0	24.0			
Total Split (s)	21.0	93.0	0.0	0.0	72.0	0.0	47.0	47.0	47.0	0.0	0.0	0.0
Total Split (%)	15.0%	66.4%	0.0%	0.0%	51.4%	0.0%	33.6%	33.6%	33.6%	0.0%	0.0%	0.0%
Maximum Green (s)	17.0	89.0			68.0		43.0	43.0	43.0			
Yellow Time (s)	3.5	3.5			3.5		3.5	3.5	3.5			
All-Red Time (s)	0.5	0.5			0.5		0.5	0.5	0.5			
Lead/Lag	Lag				Lead							
Lead-Lag Optimize?	Yes				Yes							
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Recall Mode	None	None			None		C-Max	C-Max	C-Max			
Act Effct Green (s)	90.0	90.0			69.0		44.0	44.0	44.0			
Actuated g/C Ratio	0.64	0.64			0.49		0.31	0.31	0.31			
v/c Ratio	1.10	0.81			1.10		0.89	1.07	0.93			
Control Delay	105.8	9.4			69.4		65.4	105.4	69.8			
Queue Delay	0.0	13.7			0.0		0.0	170.6	118.2			
Total Delay	105.8	23.1			69.4		65.4	276.0	188.0			
LOS	F	C			E		E	F	F			
Approach Delay		35.0			69.4			176.8				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		C			E			F				
Queue Length 50th (ft)	~274	176			~993		455	~543	427			
Queue Length 95th (ft)	m#336	227			#1113		#670	#792	#655			
Internal Link Dist (ft)		417			307			944			447	
Turn Bay Length (ft)	110											
Base Capacity (vph)	278	2253			1684		558	471	515			
Starvation Cap Reductn	0	322			0		0	0	0			
Spillback Cap Reductn	0	442			0		0	127	139			
Storage Cap Reductn	0	0			0		0	0	0			
Reduced v/c Ratio	1.10	1.01			1.10		0.89	1.47	1.27			

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 8:NBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.10
Intersection Signal Delay: 85.0 Intersection LOS: F
Intersection Capacity Utilization 102.8% ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: 88th St NE & NB On-Ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	120		0	100		0	55		0	90		0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.993			0.995			0.896			0.856	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	3480	0	1752	3487	0	1752	1653	0	1752	1579	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1752	3480	0	1752	3487	0	1752	1653	0	1752	1579	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			4			52			279	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		387			1532			1529			345	
Travel Time (s)		7.5			29.8			34.8			7.8	
Volume (vph)	315	2253	105	39	1469	55	61	22	50	210	11	271
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Adj. Flow (vph)	325	2323	108	40	1514	57	63	23	52	216	11	279
Lane Group Flow (vph)	325	2431	0	40	1571	0	63	75	0	216	290	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Detector Phases	5	2		1	6		3	8		7	4	
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0		8.0	8.0	
Minimum Split (s)	12.0	20.0		12.0	20.0		12.0	20.0		12.0	20.0	
Total Split (s)	30.0	90.0	0.0	12.0	72.0	0.0	12.0	20.0	0.0	18.0	26.0	0.0
Total Split (%)	21.4%	64.3%	0.0%	8.6%	51.4%	0.0%	8.6%	14.3%	0.0%	12.9%	18.6%	0.0%
Maximum Green (s)	26.0	86.0		8.0	68.0		8.0	16.0		14.0	22.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lag	Lead		Lag	Lead		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max		None	C-Max		None	Min		None	Min	
Act Effct Green (s)	27.0	96.3		9.0	75.9		9.0	10.1		15.0	18.5	
Actuated g/C Ratio	0.19	0.69		0.06	0.54		0.06	0.07		0.11	0.13	
v/c Ratio	0.96	1.01		0.35	0.83		0.56	0.45		1.15	0.64	
Control Delay	84.3	38.1		71.9	31.7		82.6	32.6		165.1	14.4	
Queue Delay	17.2	32.5		0.0	0.1		0.0	0.0		0.0	1.0	
Total Delay	101.5	70.6		71.9	31.8		82.6	32.6		165.1	15.4	
LOS	F	E		E	C		F	C		F	B	
Approach Delay		74.3			32.8			55.4			79.3	
Approach LOS		E			C			E			E	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	303	~1250		36	594		57	20		~231	9	
Queue Length 95th (ft)	m#392	m#1376		77	749		#113	71		#399	101	
Internal Link Dist (ft)		307			1452			1449			265	
Turn Bay Length (ft)	120			100			55			90		
Base Capacity (vph)	338	2396		113	1893		113	246		188	500	
Starvation Cap Reductn	23	181		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	16		0	0		0	67	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	1.03	1.10		0.35	0.84		0.56	0.30		1.15	0.67	

Intersection Summary

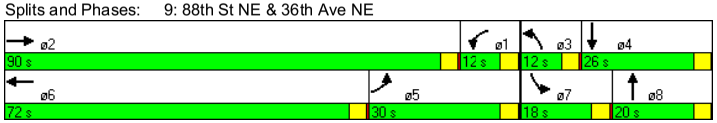
Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 54 (39%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.15
Intersection Signal Delay: 60.9 Intersection LOS: E
Intersection Capacity Utilization 109.6% ICU Level of Service H
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: 88th St NE & 36th Ave NE



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		185	100		0	325		0	125		0
Storage Lanes	1		1	1		0	1		0	1		0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.986			0.984			0.949	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1845	1568	1752	1819	0	1752	3449	0	1752	3326	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1752	1845	1568	1752	1819	0	1752	3449	0	1752	3326	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			232		4			12			73	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		1532			887			1969			757	
Travel Time (s)		29.8			17.3			33.6			12.9	
Volume (vph)	701	955	558	171	475	50	608	1574	182	61	746	387
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Adj. Flow (vph)	723	985	575	176	490	52	627	1623	188	63	769	399
Lane Group Flow (vph)	723	985	575	176	542	0	627	1811	0	63	1168	0
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Detector Phases	7	4	4	3	8		5	2		1	6	
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0		8.0	8.0		8.0	8.0	
Minimum Split (s)	12.0	20.0	20.0	12.0	20.0		12.0	20.0		12.0	20.0	
Total Split (s)	32.0	47.0	47.0	13.0	28.0	0.0	28.0	48.0	0.0	12.0	32.0	0.0
Total Split (%)	26.7%	39.2%	39.2%	10.8%	23.3%	0.0%	23.3%	40.0%	0.0%	10.0%	26.7%	0.0%
Maximum Green (s)	28.0	43.0	43.0	9.0	24.0		24.0	44.0		8.0	28.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min		None	Min	
Act Effct Green (s)	29.0	44.0	44.0	10.0	25.0		25.0	47.4		9.0	29.0	
Actuated g/C Ratio	0.24	0.37	0.37	0.08	0.21		0.21	0.40		0.07	0.24	
v/c Ratio	1.71	1.45	0.80	1.21	1.42		1.72	1.32		0.49	1.36	
Control Delay	359.2	243.8	29.2	186.6	239.1		365.1	181.7		66.9	203.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	359.2	243.8	29.2	186.6	239.1		365.1	181.7		66.9	203.6	
LOS	F	F	C	F	F		F	F		E	F	
Approach Delay		226.3			226.2			228.9			196.6	
Approach LOS		F			F			F			F	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	~824	~1042	248	~166	~567		~716	~988		48	~606	
Queue Length 95th (ft)	#1059	#1294	410	#311	#789		#944	#1130		96	#744	
Internal Link Dist (ft)		1452			807			1889			677	
Turn Bay Length (ft)			185	100			325			125		
Base Capacity (vph)	423	677	722	146	382		365	1370		129	859	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	1.71	1.45	0.80	1.21	1.42		1.72	1.32		0.49	1.36	

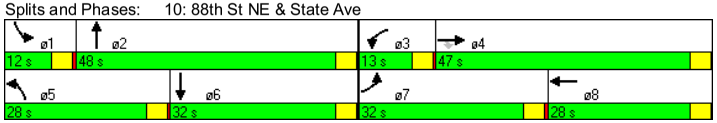
Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.72
Intersection Signal Delay: 221.7 Intersection LOS: F
Intersection Capacity Utilization 146.9% ICU Level of Service H
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: 88th St NE & State Ave



Interchange Delay Calcualtions - 2040 Build

SPUI - Both Ramps

NB Left			SB Left		
Vol	Delay	Total	Vol	Delay	Total
823	72.1	59338	243	39	9477

EB Left			EB Through		
Vol	Delay	Total	Vol	Delay	Total
585	46.5	27203	1187	46.1	54721

WB Left			WB Through		
Vol	Delay	Total	Vol	Delay	Total
569	82.3	46829	574	35.3	20262

Total Vol	Delay (hr)
3981	60.51

Collision Data

STATE ROUTE	SRMP	A/B	PRE 1	U/R	ACCDNT REPORT NUMBER	DATE	TIME	DIAGRAM ANALYSIS DATA	RAMP	MSVJ	# IN	# FAT	# VEH	VEH1 TYPE	VEH2 TYPE	JUNC	SURF	LITE	FIRST COLLISION TYPE / OBJECT STRUCK	UNIT 1 CONTR CIRCUMSTANCE 1	UNIT 2 CONTR CIRCUMSTANCE 1
005	201.82			U	2360991	06/28/06	14:10	5BA33000D9		1	0	0	1	1		4	1	1	Cable Barrier	Exceeding Reas. Safe Speed	
005	201.82			U	2808196	08/18/07	01:18	5BA065BAD2		7	1	0	2	1	1	4	1	6	From same direction - both going straight - both moving - rear-end	Under Influence of Alcohol	None
005	201.85			U	2726774	11/12/06	19:45	1AA051AAA3		1	0	0	2	2	2	4	2	5	From same direction - both going straight - both moving - sideswipe	Under Influence of Alcohol	None
005	201.90			U	3031802	07/24/08	04:56	5BA035BAD1		1	0	0	2	7	1	4	1	6	From same direction - all others	None	None
005	201.96			U	3031589	05/09/08	18:46	5BA33000D0		1	0	0	1	1		4	1	1	Wood Sign Post	Follow Too Closely	
005	201.98			U	2808474	02/01/07	05:17	5BA045BAD2		1	0	0	2	2	6	4	1	4	From same direction - both going straight - both moving - sideswipe	Under Influence of Drugs	None
005	202.00			U	2561033	09/04/06	12:50	1AA50000A0		1	0	0	1	2		4	1	1	Vehicle overturned	Exceeding Reas. Safe Speed	
005	202.00			U	3027342	07/10/07	08:14	5BA065BAD2		6	2	0	2	4	1	4	1	1	From same direction - both going straight - both moving - rear-end	Follow Too Closely	None
005	202.03			U	2560600	01/07/07	00:21	5BA065BAD1		7	2	0	2	1	1	4	2	6	From same direction - both going straight - both moving - rear-end	Exceeding Reas. Safe Speed	None
005	202.05			U	2691368	11/24/06	00:05	5BA065BAD1		6	2	0	2	9	2	4	1	9	From same direction - both going straight - both moving - rear-end	Exceeding Reas. Safe Speed	None
005	202.08			U	3128102	12/18/08	12:19	5BA33000D9		1	0	0	1	2		4	3	1	Cable Barrier	Exceeding Reas. Safe Speed	
005	202.17			U	2808201	02/12/07	08:10	5BS33000D9		1	0	0	1	1		1	1	1	Cable Barrier	Other	
005	202.17			U	3031943	02/28/07	17:21	5BA065BQD1		7	1	0	3	1	1	5	3	1	From same direction - both going straight - one stopped - rear-end	Exceeding Reas. Safe Speed	None
005	202.20			U	2808311	03/29/07	18:20	5BA50000D0		1	0	0	1	2		1	1	1	Vehicle overturned	None	
005	202.20			U	E008321	09/27/08	05:43	5BS065BAD2		7	1	0	2	2	2	4	1	6	From same direction - both going straight - both moving - rear-end	Follow Too Closely	None
005	202.28			U	2360938	03/11/06	13:00	1AA061AAA3		6	2	0	4	2	2	4	1	1	From same direction - both going straight - both moving - rear-end	Follow Too Closely	None
005	202.28		5	U	2808346	01/23/07	07:50	1AR041AAA2		1	0	0	2	1	2	4	1	1	From same direction - both going straight - both moving - sideswipe	Did Not Grant RW to Vehicle	None
005	202.28			U	2808278	03/04/07	06:01	5BA045BAD2		1	0	0	2	1	1	4	1	2	From same direction - both going straight - both moving - sideswipe	Apparently Asleep	None
005	202.28			U	3027785	03/24/08	20:32	1AS051AAA2		1	0	0	2	1	1	4	1	6	From same direction - both going straight - both moving - sideswipe	Did Not Grant RW to Vehicle	None
005	202.33			U	3127922	11/27/08	23:57	1AA061AQA1		1	0	0	2	1	1	4	1	4	From same direction - both going straight - one stopped - rear-end	Exceeding Reas. Safe Speed	None
005	202.35			U	3128020	12/14/08	14:31	5BA33000S7		1	0	0	1	1		5	1	1	Guardrail - Face	Under Influence of Alcohol	
005	202.36			U	3028139	03/25/08	16:20	5BA045BAD2		7	2	0	2	1	2	4	2	1	From same direction - both going straight - both moving - sideswipe	Driver Operating Handheld Telecommunicat	None
005	202.37			U	2808002	06/13/07	11:38	5BA32000D2		1	0	0	1	1		4	1	1	Non-domestic animal (deer, bear, elk,	None	
005	202.37			U	3028412	12/11/07	13:52	1AR041AAA1		1	0	0	2	4	1	4	1	1	From same direction - both going straight - both moving - sideswipe	Did Not Grant RW to Vehicle	None

RAMPS AND MAINLINE

TOTAL NUMBER OF COLLISIONS: 107

STATE ROUTE	SRMP	A/B	PRE1	U/R	ACCDNT REPORT NUMBER	DATE	TIME	DIAGRAM ANALYSIS DATA	RAMP	MSVJ	# IN	# FAT	# VEH	VEH1 TYPE	VEH2 TYPE	JUNC	SURF	LITE	FIRST COLLISION TYPE / OBJECT STRUCK	UNIT 1 CONTR CIRCUMSTANCE 1	UNIT 2 CONTR CIRCUMSTANCE 1
005	202.37			U	2853703	12/17/08	07:30	1AA33000A9		1	0	0	1	2		4	3	6	Cable Barrier	Exceeding Reas. Safe Speed	
005	202.38			U	2596055	01/28/08	06:35	1AS33000A9		1	0	0	1	2		4	3	6	Cable Barrier	Exceeding Reas. Safe Speed	
005	202.40			U	2337954	03/11/06	14:20	5BA065BQD1		7	2	0	2	1	2	4	1	1	From same direction - both going straight - one stopped - rear-end	Exceeding Reas. Safe Speed	None
005	202.40			U	E012964	12/25/08	11:03	1AA33000A9		1	0	0	1	2		4	3	1	Cable Barrier	Exceeding Reas. Safe Speed	
005	202.44			U	3028100	07/29/08	23:45	1AS061AAA1		7	1	0	2	7	1	4	1	4	From same direction - both going straight - both moving - rear-end	Did Not Grant RW to Vehicle	None
005	202.47			U	2560585	08/21/06	23:04	1AA60000A0		1	0	0	1	1		4	1	6	Roadway Ditch	Other	
005	202.47			U	2808801	05/25/07	04:45	1AA50000A0		6	1	0	1	2		4	1	2	Vehicle overturned	Other	
005	202.47			U	C689687	07/28/07	18:30	1AA99000A2		1	0	0	1	1		4	1	1	All other non-collision		
005	202.48			U	E012032	12/10/08	17:40	1AA061AAA1		1	0	0	2	1	2	4	1	6	From same direction - both going straight - both moving - rear-end	Follow Too Closely	None
005	202.49			U	E012034	12/10/08	18:27	1AR041AAA1		1	0	0	2	1	1	4	1	6	From same direction - both going straight - both moving - sideswipe	Inattention	None
005	202.50			U	C695242	09/25/07	07:45	5BA275BAD1		1	0	0	2	1	3	4	1	1	From same direction - all others		
005	202.53			U	2337969	04/27/06	13:48	1AS141AAA3		7	2	0	3	1	1	4	1	1	From same direction - both going straight - both moving - sideswipe	Did Not Grant RW to Vehicle	None
005	202.53			U	2596326	07/13/06	13:36	1AA061AAA3		1	0	0	2	2	1	4	1	1	From same direction - both going straight - both moving - rear-end	Exceeding Reas. Safe Speed	None
005	202.56			U	2337671	04/19/06	19:02	1AA32000A2		1	0	0	1	2		4	1	1	Domestic animal other (cat, dog, etc)	None	
005	202.57			U	2337638	04/01/06	20:37	1AA061AAA1		1	0	0	2	0	2	4	1	6	From same direction - both going straight - both moving - rear-end	Other	None
005	202.57			U	2560713	07/30/06	15:14	5BA065BAD3		6	1	0	2	1	1	4	1	1	From same direction - both going straight - both moving - rear-end	Follow Too Closely	None
005	202.57			U	2691618	09/01/06	15:38	1AA061AAA2		1	0	0	3	6	1	4	1	1	From same direction - both going straight - both moving - rear-end	Exceeding Reas. Safe Speed	None
005	202.58			U	E007729	09/06/08	19:26	5BA065BAD2		1	0	0	2	1	1	4	1	1	From same direction - both going straight - both moving - rear-end	Exceeding Reas. Safe Speed	None
005	202.62			U	2808223	04/21/07	18:22	5BA065BAD3		1	0	0	2	2	2	4	1	1	From same direction - both going straight - both moving - rear-end	Exceeding Reas. Safe Speed	None
005	202.72			U	2854088	07/12/08	02:00	1AA33000A9		6	3	0	1	2		4	1	6	Cable Barrier	Under Influence of Alcohol	
005	202.77			U	2808886	01/21/08	10:40	5BA155BSD2		1	0	0	2	6	1	4	1	1	From same direction - both going straight - both moving - sideswipe	None	Did Not Grant RW to Vehicle
005	202.85			U	E008649	09/28/08	17:43	5BF065BAD1		7	1	0	2	12	1	5	1	1	From same direction - both going straight - both moving - rear-end	Exceeding Reas. Safe Speed	None
005	202.90			U	2337631	02/14/06	05:30	5BA33000D9		1	0	0	1	2		4	3	6	Cable Barrier	Exceeding Reas. Safe Speed	
005	202.97			U	2690844	01/16/07	06:40	1AA33000A9		1	0	0	1	1		4	3	6	Cable Barrier	Exceeding Reas. Safe Speed	

STATE ROUTE	SRMP	A/B	PRE1	U/R	ACCDNT REPORT NUMBER	DATE	TIME	DIAGRAM ANALYSIS DATA	RAMP	MSVJ	# IN	# FAT	# VEH	VEH1 TYPE	VEH2 TYPE	JUNC	SURF	LITE	FIRST COLLISION TYPE / OBJECT STRUCK	UNIT 1 CONTR CIRCUMSTANCE 1	UNIT 2 CONTR CIRCUMSTANCE 1
005	202.97			U	2854094	07/28/08	18:57	5BR055BAD2		1	0	0	2	2	4	4	1	1	From same direction - both going straight - both moving - sideswipe	Did Not Grant RW to Vehicle	None
005	202.99			U	2441587	07/22/08	23:24	1AA33000A0		7	1	0	1	2		4	1	4	Guide Post	Under Influence of Drugs	
005	203.00			U	2808296	06/25/07	07:40	5BS055BAD3		1	0	0	2	1	2	4	1	1	From same direction - both going straight - both moving - sideswipe	Did Not Grant RW to Vehicle	None
005	203.09			U	2361603	06/13/06	14:30	1AA271AAA3		1	0	0	2	2	1	4	1	1	From same direction - all others	Other	None
005	203.10			U	2599809	11/20/06	08:20	1AA061AAA1		1	0	0	2	1	2	4	1	1	From same direction - both going straight - both moving - rear-end	Exceeding Reas. Safe Speed	None
005LX20247	0.00			U	C665626	03/15/06	12:45	7BQ167BAX1		1	0	0	2	2	0	1	1	1	From same direction - both going straight - one stopped - rear-end		
005LX20247	0.00			U	C669453	06/01/06	08:45	7BA167BAX1		7	1	0	2	1	0	1	1	1	From same direction - both going straight - both moving - rear-end		
005LX20247	0.00			U	2690877	09/20/06	12:30	3AA063AQL1		7	1	0	2	1	2	1	2	1	From same direction - both going straight - one stopped - rear-end	Exceeding Reas. Safe Speed	None
005LX20247	0.00			U	2716502	10/09/06	19:18	7BA067BQX6		7	3	0	4	1	1	1	1	4	From same direction - both going straight - one stopped - rear-end	Follow Too Closely	None
005LX20247	0.00			U	2526843	10/27/06	18:20	7BC073AAL1		6	2	0	2	1	2	1	1	4	From opposite direction - one left turn - one straight	Did Not Grant RW to Vehicle	None
005LX20247	0.00			U	2781103	11/24/06	11:14	3AA063AQL1		7	2	0	3	2	2	1	2	1	From same direction - both going straight - one stopped - rear-end	Follow Too Closely	None
005LX20247	0.00			U	2690847	01/24/07	05:45	7BC133AAL1		6	3	0	2	1	1	1	1	4	From opposite direction - one left turn - one straight	Did Not Grant RW to Vehicle	None
005LX20247	0.00			U	2813429	06/08/07	12:55	3AA037BCL1		1	0	0	2	1	1	1	1	1	From opposite direction - one left turn - one straight	None	Did Not Grant RW to Vehicle
005LX20247	0.00			U	C689168	07/02/07	16:30	3AA063AAL1		7	2	0	2	2	2	1	1	1	From same direction - both going straight - both moving - rear-end		
005LX20247	0.00			U	2690974	08/19/07	08:30	7BC33000S8		1	0	0	1	1		1	2	1	Guardrail - Face	Exceeding Reas. Safe Speed	
005LX20247	0.00			U	3027445	11/19/07	19:25	7BC133AAL2		1	0	0	2	1	1	1	2	4	From opposite direction - one left turn - one straight	Did Not Grant RW to Vehicle	None
005LX20247	0.00			U	2989551	12/13/07	19:40	7BC133AAL2		1	0	0	2	1	1	1	2	4	From opposite direction - one left turn - one straight	Did Not Grant RW to Vehicle	Inattention
005LX20247	0.00			U	3028107	10/11/08	19:45	7BC073AAL1		7	2	0	2	1	1	1	1	4	From opposite direction - one left turn - one straight	Did Not Grant RW to Vehicle	None
005LX20247	0.00			U	3128005	10/17/08	16:15	3AA063AAL1		7	2	0	3	1	2	5	1	1	From same direction - both going straight - both moving - rear-end	Follow Too Closely	None
005LX20247	0.00			U	2490894	11/11/08	13:51	3AA063AQL1		1	0	0	2	1	2	5	1	1	From same direction - both going straight - one stopped - rear-end	Other Driver Distractions Inside Vehicle	None
005LX20247	0.00			U	E010550	11/19/08	19:26	3AQ163AAL2		7	1	0	2	2	1	1	1	4	From same direction - both going straight - one stopped - rear-end	None	Inattention
005LX20247	0.00			U	3031255	11/21/08	18:50	3AA063AQL1		1	0	0	3	2	1	5	2	4	From same direction - both going straight - one stopped - rear-end	Follow Too Closely	None

STATE ROUTE	SRMP	A/B	PRE1	U/R	ACCDNT REPORT NUMBER	DATE	TIME	DIAGRAM ANALYSIS DATA	RAMP	MSVJ	#IN	#FAT	#VEH	VEH1 TYPE	VEH2 TYPE	JUNC	SURF	LITE	FIRST COLLISION TYPE / OBJECT STRUCK	UNIT 1 CONTR CIRCUMSTANCE 1	UNIT 2 CONTR CIRCUMSTANCE 1
005LX20247	0.05			U	2348550	02/03/06	15:31	7BA067BQX1		1	0	0	2	1	1	2	1	1	From same direction - both going straight - one stopped - rear-end	Follow Too Closely	None
005LX20247	0.05			U	2691115	09/20/07	17:57	3AA063AAL1		6	3	0	2	2	1	2	1	1	From same direction - both going straight - both moving - rear-end	Follow Too Closely	None
005LX20247	0.08			U	2716723	03/29/08	18:22	3AA063AQL1		1	0	0	2	2	2	4	2	1	From same direction - both going straight - one stopped - rear-end	Follow Too Closely	None
005LX20247	0.13			U	2268556	03/07/06	16:00	7BA067BAX1		7	2	0	3	2	2	5	2	1	From same direction - both going straight - both moving - rear-end	Exceeding Reas. Safe Speed	None
005LX20247	0.13			U	2337321	04/06/06	15:55	3AA063AQL1		6	1	0	2	2	2	1	1	1	From same direction - both going straight - one stopped - rear-end	Follow Too Closely	None
005LX20247	0.13			U	2560836	10/21/06	17:34	1CC137BAX1		1	0	0	2	1	2	1	1	1	Entering at angle	Disregard Stop and Go Light	None
005LX20247	0.13			U	2445789	12/27/06	15:05	7BA067BQL1		1	0	0	2	2	2	1	1	1	From same direction - both going straight - one stopped - rear-end	Follow Too Closely	None
005LX20247	0.13			U	2891777	08/19/07	15:47	3AR043AAL1		1	0	0	2	2	1	1	1	1	From same direction - both going straight - both moving - sideswipe	Did Not Grant RW to Vehicle	None
005LX20247	0.13			U	2891362	11/29/07	18:48	7BA033ACX1		1	0	0	2	1	1	1	2	4	From opposite direction - one left turn - one straight	Disregard Stop and Go Light	None
005LX20247	0.13			U	2854081	05/08/08	13:15	3AA063AQL6		1	0	0	2	2	2	1	1	1	From same direction - both going straight - one stopped - rear-end	Follow Too Closely	None
005LX20247	0.13			U	C704296	05/14/08	17:48	7BQ165DBX1		1	0	0	2	2	0	6	1	1	One car leaving driveway access		
005LX20247	0.13			U	3148506	10/30/08	13:50	3AA021CCL1		7	1	0	2	1	2	1	2	1	Entering at angle	Disregard Stop and Go Light	None
005LX20247	0.13			U	2541537	11/10/08	09:44	3AC077BAX2		1	0	0	2	2	2	1	2	1	From opposite direction - one left turn - one straight	Did Not Grant RW to Vehicle	None
005LX20247	0.13			U	2981121	12/06/08	18:30	3AR063AQL1		1	0	0	3	1	1	1	1	4	From same direction - both going straight - one stopped - rear-end	Did Not Grant RW to Vehicle	None
005LX20247	0.13			U	2853701	12/17/08	06:30	1CB027BQX2		1	0	0	3	1	2	1	3	4	Entering at angle	Exceeding Reas. Safe Speed	None
005P120218	0.10			U	3027337	07/04/07	13:40	2AA062AQP1	B	6	1	0	2	2	2	4	1	1	From same direction - both going straight - one stopped - rear-end	Exceeding Reas. Safe Speed	None
005P120218	0.19			U	E011210	11/28/08	00:22	2AA062AQP1		1	0	0	2	2	1	4	1	6	From same direction - both going straight - one stopped - rear-end	Under Influence of Alcohol	None
005P120218	0.20			U	C679223	10/13/06	10:48	1AA151AFP1		1	0	0	2	2	1	2	1	1	From same direction - both going straight - both moving - sideswipe		
005P120218	0.24			U	2689786	10/22/07	17:10	1AA061AQP2		1	0	0	2	2	2	4	1	1	From same direction - both going straight - one stopped - rear-end	Exceeding Reas. Safe Speed	None
005P120218	0.24			U	3027125	11/24/07	18:50	1AA061AQP2		7	1	0	2	1	1	2	1	4	From same direction - both going straight - one stopped - rear-end	Under Influence of Alcohol	None
005P120218	0.27			U	3031908	08/23/08	03:30	1AA7170WP1		6	1	0	1	1		4	1	6	Vehicle going straight hits pedestrian	None	Under Influence of Alcohol
005P120218	0.28			U	2808607	02/26/07	13:41	1AA061AQP2		7	2	0	2	2	1	2	1	1	From same direction - both going straight - one stopped - rear-end	Follow Too Closely	None

STATE ROUTE	SRMP	A/B	PRE1	U/R	ACCDNT REPORT NUMBER	DATE	TIME	DIAGRAM ANALYSIS DATA	RAMP	MSVJ	# IN	# FAT	# VEH	VEH1 TYPE	VEH2 TYPE	JUNC	SURF	LITE	FIRST COLLISION TYPE / OBJECT STRUCK	UNIT 1 CONTR CIRCUMSTANCE 1	UNIT 2 CONTR CIRCUMSTANCE 1
005P120218	0.29			U	2361118	06/08/06	14:45	1AA061AQP2	E	7	1	0	2	1	1	1	2	1	From same direction - both going straight - one stopped - rear-end	Exceeding Reas. Safe Speed	None
005P120218	0.29			U	2690850	02/23/07	15:57	1AA061AQP1	E	1	0	0	2	2	2	1	2	1	From same direction - one right turn - one straight	Follow Too Closely	None
005P120218	0.29			U	3034126	08/30/07	15:15	1AA061AQP1	E	1	0	0	2	2	1	1	1	1	From same direction - both going straight - one stopped - rear-end	Exceeding Reas. Safe Speed	None
005P120218	0.29			U	E007172	08/20/08	08:56	1AA061AQP1	E	1	0	0	2	2	1	1	1	1	From same direction - both going straight - one stopped - rear-end	Other	None
005P120218	0.29			U	C709951	09/11/08	17:20	1AQ161AAP1	E	1	0	0	2	1	2	1	1	1	From same direction - both going straight - one stopped - rear-end		
005R120273	0.23			U	2421848	06/25/06	17:09	20L34000R9		6	1	0	1	2		4	1	1	Tree or Stump (stationary)	Other	
005R120273	0.23			U	3032647	09/14/07	15:07	6AA066AQR2		7	2	0	3	1	1	2	1	1	From same direction - both going straight - one stopped - rear-end	Exceeding Reas. Safe Speed	None
005R120273	0.26			U	2808262	02/12/08	15:39	5AA065AQR2	E	1	0	0	2	1	2	1	2	1	From same direction - both going straight - one stopped - rear-end	Follow Too Closely	None
005R120273	0.26			U	3028136	03/05/08	16:04	5AA065AQR2	E	1	0	0	2	2	2	1	1	1	From same direction - both going straight - one stopped - rear-end	Exceeding Reas. Safe Speed	None
005R120273	0.26			U	C705037	05/30/08	13:15	5AQ155ABR2	E	7	1	0	2	1	4	1	1	1	From same direction - one right turn - one straight		
005R120273	0.26			U	E009828	10/28/08	15:15	5AA065AQR2	E	1	0	0	2	2	2	1	1	1	From same direction - both going straight - one stopped - rear-end	Inattention	None
005S120206	0.00			U	2691473	06/09/07	09:30	3CB137DCS1	B	1	0	0	2	1	1	1	2	1	From opposite direction - one left turn - one right turn	Improper Turn	None
005S120206	0.00			U	3031481	04/23/08	03:39	1DC33000S8	B	1	0	0	1	6		1	2	4	Guardrail - Face	Inattention	
005S120206	0.04			U	2726769	11/02/06	16:32	5AA33000S7		1	0	0	1	2		4	2	4	Guardrail - Face	Exceeding Reas. Safe Speed	
005S120206	0.09			U	C668283	04/18/06	05:00	4AA274AAS1		1	0	0	2	2	6	5	1	4	From same direction - all others		

DOT-BRIODETAIL
SR/RRT/RRQ: 005
SRMP: 201.81 to 203.12
Date Range: 01/01/06 to 12/31/08

RAMPS AND MAINLINE

STATE OF WASHINGTON - DEPARTMENT OF TRANSPORTATION
STANDARD ACCIDENT HISTORY DETAIL REPORT
CURRENT ACCIDENT LOCATION
SORTED BY SR/RRT/RRQ/SRMP/DATE

TOTAL NUMBER OF COLLISIONS: 107

DATE TIME
07/28/09 03:20 PM

*UNDER 23 UNITED STATES CODE - SECTION 409, THIS
*DATA CANNOT BE USED IN DISCOVERY OR AS EVIDENCE
*AT TRIAL IN ANY ACTION FOR DAMAGES AGAINST THE
*WSDOT OR THE STATE OF WASHINGTON

YEAR	TOTAL COLS	PROP DMAG COLS	POSS INJ COLS	EVID INJ COLS	SER INJ COLS	TOTAL INJ COLS	FATAL COLS	# OF INJS	# OF FTLS	# OF VEHS	ALC REL COLS	FIXD OBJ COLS	REAR END COLS	OPP DIR COLS	ENTER AT ANGLE	OVER TURN COLS	PEDL CYC COLS	PEDES COLS
2006	32	18	8	6	0	14	0	23	0	65	1	5	18	1	1	1	0	0
2007	34	22	7	5	0	12	0	21	0	63	2	3	13	6	0	2	0	0
2008	41	29	10	2	0	12	0	17	0	76	4	9	19	2	2	0	0	1
	107	**69**	**25**	**13**	**0**	**38**	**0**	**61**	**0**	**204**	**7**	**17**	**50**	**9**	**3**	**3**	**0**	**1**