

## **7<sup>th</sup> Street Bike Lane Traffic Impact Study**

Submitted by:

San Francisco Department of Parking and Traffic

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## **EXECUTIVE SUMMARY**

This report presents the Department of Parking and Traffic's (DPT) proposal for a Class II bikeway (bike lanes) on 7<sup>th</sup> Street between Townsend and 16<sup>th</sup> Streets. As part of the Mission Bay project, the design by Catellus shows four motor vehicle lanes along this stretch of 7<sup>th</sup> Street with no on-street provisions for bicycles (Class III bikeway – shared roadway). DPT proposes three motor vehicle lanes plus bike lanes. The bike lanes would be in both directions between Townsend and 16<sup>th</sup> Streets. North of Townsend Street, the existing northbound bike lane would be retained.

Computer modeling of the two proposals using traffic volumes projected to 2015 shows no degradation in performance with the DPT bike lane proposal. In fact, due to some additional striping changes, performance is improved with the DPT proposal, at no additional cost.

In order for the currently accepted design for 7<sup>th</sup> Street to be amended, the Redevelopment Agency, Catellus, and the Planning Department must approve the changes, prior to approval by the Parking and Traffic Commission and the Board of Supervisors.

## **BACKGROUND**

Seventh Street between Townsend and 16<sup>th</sup> Streets is part of the San Francisco Bicycle Route Network (Route 23). Currently, this section of 7<sup>th</sup> Street is a two-lane street with lanes wide enough to safely and easily accommodate bicyclists and motorists side by side. It connects bike lanes on 16<sup>th</sup> Street to a northbound bike lane on 7<sup>th</sup> Street, starting at Townsend Street.

Seventh Street also borders the Mission Bay Project to the west. In the Final Supplemental Environmental Impact Report (FSEIR) for Mission Bay, the design for 7<sup>th</sup> Street between 16<sup>th</sup> and Townsend Streets does not allow for bicycle lanes. While the San Francisco Bicycle Plan, approved by the Board of Supervisors in March of 1997, does not require bike lanes for this part of 7<sup>th</sup> Street, plans to re-stripe the street with four lanes instead of the current two wide lanes are not consistent with the Bicycle Plan. Therefore, these two documents appear to be in contradiction. Fortunately, this problem is solvable.

This report presents the DPT proposal to amend the currently approved design to allow for the installation of bike lanes on 7<sup>th</sup> Street.

## **PROPOSAL**

DPT's proposal for 7<sup>th</sup> Street between Townsend and 16<sup>th</sup> Streets calls for three motor vehicle lanes (one southbound and two northbound) and bike lanes in both directions. The design of the intersections at Townsend Street and The Commons also differ from the current Catellus proposal. The lane designations for each intersection can be seen in Figure 1. The respective Level of Service (LOS) results are also shown.

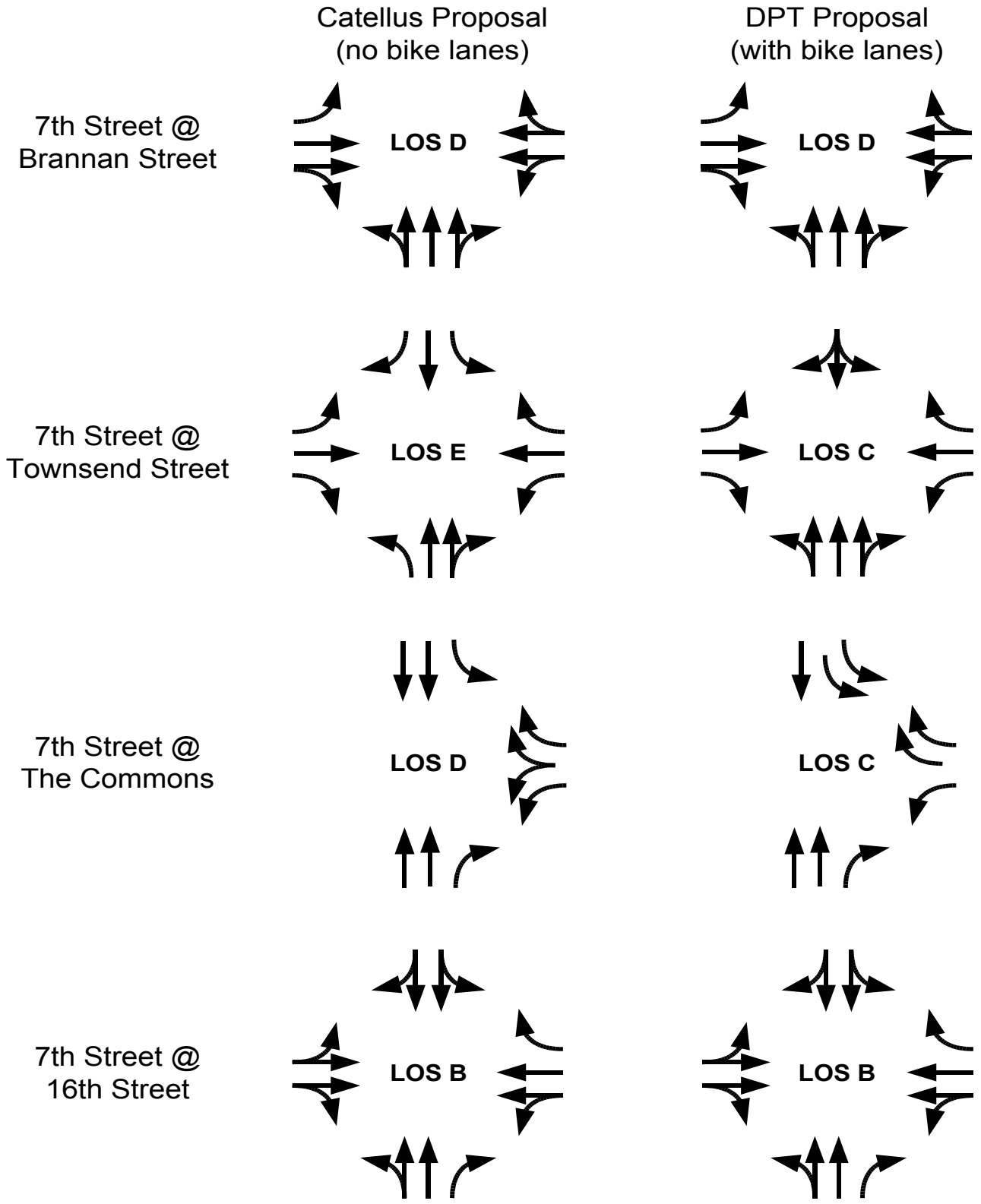


Figure 1. Comparison of Intersection Lane Designations and Resulting Level of Service

The intersections are: 7<sup>th</sup> Street at Brannan Street, at Townsend Street, at The Commons, and at 16<sup>th</sup> Street. The intersection designs at Brannan Street and at 16<sup>th</sup> Street are the same for both proposals. They are shown for information.

A sketch of the DPT proposal for 7<sup>th</sup> Street between Townsend and 16<sup>th</sup> Streets can be seen in Attachment A. The Catellus design can be seen in Attachment B.

**Possible Bike-Car Conflicts**

With both proposals, there is potential for conflicts between right-turning motorists and through cyclists at intersections. There are some advantages to a Class II bikeway, however. In particular, for northbound 7<sup>th</sup> Street at The Commons, DPT proposes a bike lane between the right turn lane and the through lanes. This design directs cyclists to the left of right-turning vehicles, a maneuver that should be done regardless but may not be performed by less experienced cyclists. A Class III bikeway would be less effective at directing cyclists to the left of the right turn lane.

**METHODOLOGY**

Both proposals were modeled using Synchro, a computer program based on the Highway Capacity Manual used to model the performance of signalized intersections or corridors.

Traffic volumes used to analyze each proposal were provided by Catellus’s transportation consultant, Wilbur Smith Associates. The volumes are projected for the year 2015 and shown in Figure 2 on the next page.

**RESULTS**

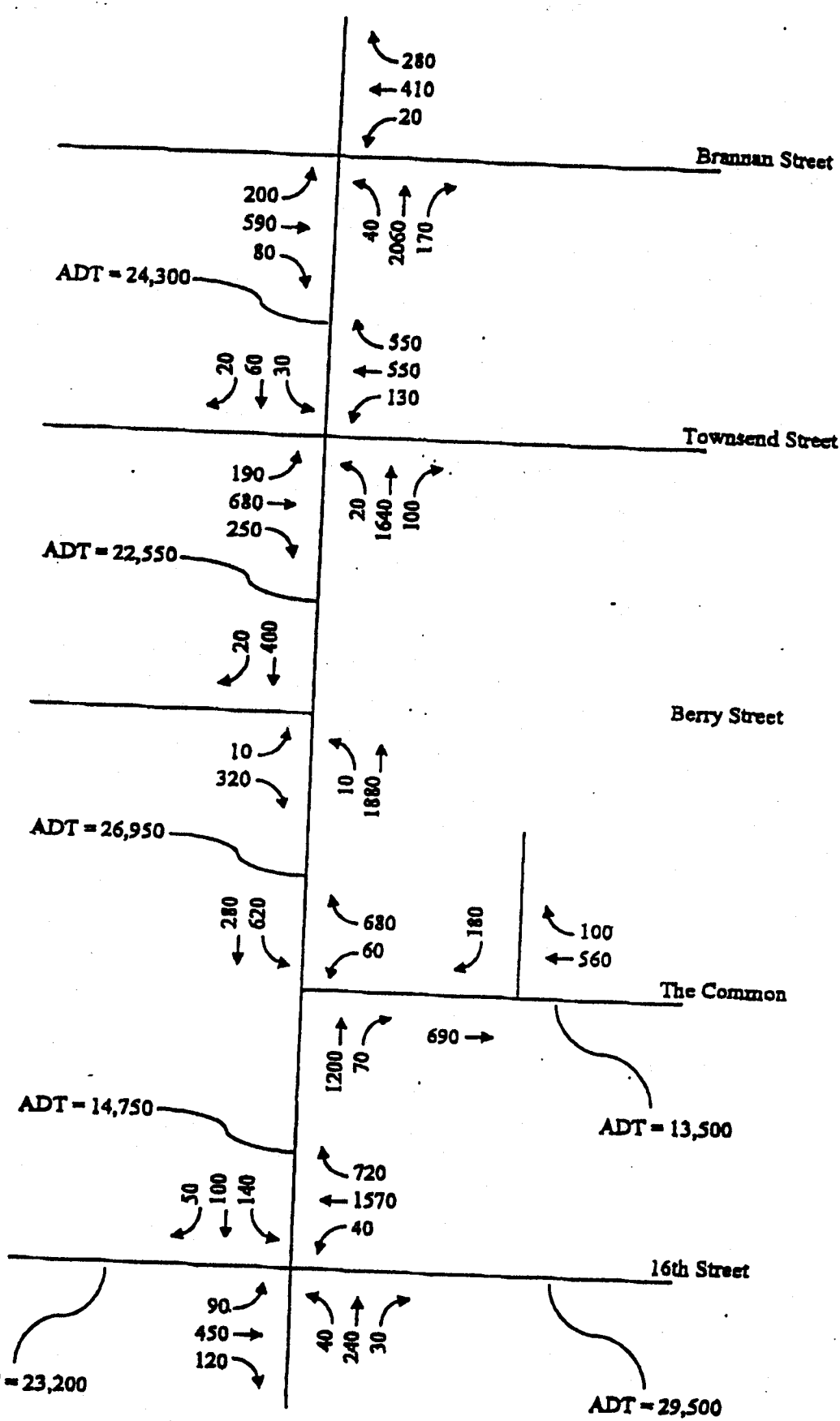
The inputted data and the results of the Synchro analysis are shown in full in Appendix A for the Catellus proposal and Appendix B for the DPT bike lane proposal. The table below summarizes the results:

Table 1. LOS/Delay at 7<sup>th</sup> Street Intersections

	LOS/Intersection Delay (seconds)*	
	Catellus Proposal	Bike Lane Proposal
Brannan St/7th St	D/49.1	D/49.1
Townsend St/7th St	E/80.0	C/32.1
Commons/7th St	D/42.1	C/26.5
16th St/7th St	B/13.3	B/13.5

\*LOS and Intersection Delays are based on Webster’s Method.

The intersection layouts of 7<sup>th</sup> and Brannan Streets and 7<sup>th</sup> and 16<sup>th</sup> Streets are the same in both proposals and thus generate the same Level of Service results.



Wilbur Smith Associates  
December 15, 1999

**Year 2015 Cumulative PM Peak Hour Turning Movement Volumes and Average Daily Traffic Volumes**

Figure 2. Projected Volumes Used in Synchro Modeling

### **Southbound 7<sup>th</sup> Street at Townsend Street**

The DPT proposal for southbound 7<sup>th</sup> Street at Townsend Street shows one lane instead of Catellus's three. Given the projected volumes, this design was sufficient, as shown in Table 1. However, if the need for two lanes along the southbound approach to Townsend Street arises, a tow-away restriction can be legislated and parking removed so the two lanes can be striped, a left-turn only lane and a through/right turn lane. Three lanes for this approach are excessive and do not allow for as many receiving lanes for northbound 7<sup>th</sup> Street. DPT does not anticipate that this second southbound lane at Townsend Street will be necessary, however.

The projected PM peak hour volumes for the 7th/Townsend Street intersection show the southbound 7<sup>th</sup> Street approach as the lightest of all approaches. This is expected as 7th Street is one-way northbound starting one block north at Brannan Street. Given this, DPT also expects that this approach will be the lightest during the AM, with most vehicles wishing to access southbound Seventh Street turning from Townsend Street.

The DPT proposal showing one lane for this approach is based on this light demand. Generally, one left turn movement per cycle still allows space for through and right turn movements to pass. Given the circulation patterns in the area and the low demand for southbound 7th Street at this intersection, it is doubtful that there will be enough left-turners to create delays of any significance. This is supported by the 20 left turn movements per PM peak hour projected for 2015.

With this in mind, the one lane southbound design balances the need of this approach with parking needs in the area and the need to accommodate the heavier northbound volume. Catellus's proposal requires parking removal on the west side of the street on that approach while DPT's proposal preserves it. Also, Catellus's proposal does not accommodate the heavier northbound traffic as effectively.

DPT did model a few scenarios for this approach. The first scenario is the same as the PM peak hour and uses those projected volumes. For the second scenario, DPT doubled the right, through, and left turn volumes for southbound 7<sup>th</sup> Street at Townsend Street. That resulted in LOS E for the approach. In the third scenario, DPT added a lane for the southbound approach and modeled a left turn only lane with a through/right turn lane. Keeping all else the same, this design was able to accommodate 110 left turns, 650 through, and 40 right turns at a LOS D. Thus, if the need for a second lane does arise, this design will be able to accommodate 10 times the amount of through traffic projected for the PM peak. The Synchro reports of these three scenarios are in Appendix C.

With 7<sup>th</sup> Street being a one-way street starting at Brannan Street, the northbound approach will always be more critical than the southbound approach. Assuming one- and two-way designations for the streets in the area remain the same as today, traffic wishing to access southbound 7<sup>th</sup> Street will be most likely to turn onto 7<sup>th</sup> Street from Townsend Street. Still, there will be the flexibility of making the southbound approach two lanes if warranted.

## **POTENTIAL TRAFFIC GROWTH**

There are concerns that unanticipated development not addressed in the Mission Bay FEIR may create more pressure on southbound 7<sup>th</sup> Street than the FEIR anticipated, thus necessitating the second southbound lane.

South of Townsend Street, there are two signals, one at The Commons and one at 16<sup>th</sup> Street. The only significant left turn is at The Commons, which will have two left turn lanes under DPT's proposal. At 16<sup>th</sup> Street, the intersection design is the same for both proposals.

One lane can handle up to 1900 vehicles per hour minus any red time at intersections and any friction from parking maneuvers, heavy vehicles, etc. Signalized intersections prove to be the primary source of bottlenecking, and since the intersection at 7<sup>th</sup>/16<sup>th</sup> Streets is the same configuration for both proposals, The Commons becomes the potential bottleneck in this stretch.

At the intersection of 7<sup>th</sup> Street and The Commons, the southbound through movement degrades to D only after the volume is increased from 280 to 1350 vehicles per hour. This is without any changes in the proposed signal timing. Adjusting the signal timing could accommodate an even greater increase. See the Synchro reports in Appendix D.

As a last resort, the installation of bike lanes can always be revoked if there is compelling need to do so and the Board of Supervisors agree.

While the DPT proposal will accommodate Mission Bay traffic in addition to some traffic from unanticipated developments, DPT will continue to monitor conditions and make adjustments as necessary.

## **DETOUR ROUTING**

With the current two-lane design of 7<sup>th</sup> Street (one lane northbound and one lane southbound), there have not been any problems with Pacific Bell game day detour traffic along 7<sup>th</sup> Street. DPT does not anticipate any significant increase in detour traffic to 7<sup>th</sup> Street on game/event days and believe that a three-lane design with one lane southbound will suffice.

As noted earlier, the addition of a tow-away for the southbound approach to Townsend Street could be considered on game days if warranted. South of Townsend Street, there are no left turns to impede traffic until The Commons which, as noted, will have two left turn lanes.

## **COST OF DPT PROPOSAL**

The difference in cost of DPT's proposal in lieu of the current Catellus proposal is negligible as the two proposals vary insignificantly in amount of paint and signage.

## **APPROVAL PROCESS**

Since the current proposal for 7<sup>th</sup> Street (without bike lanes) was studied in the Mission Bay Environmental Impact Report, and because DPT's proposal alters the Infrastructure Plans, the City Attorney has advised DPT to take a series of steps to amend the current proposal. A flowchart illustrating these steps is shown in Figure 3 on the next page.

DPT must present its proposal to the Planning Department's Major Environmental Analysis section to determine if further environmental review is warranted by the bike lane proposal. If not, the bike lane proposal will be presented to the developer, Catellus, and the Redevelopment Agency who must agree to the modification in the Infrastructure Plan. Once the agreement is obtained, the City may approve any non-material or material changes to the Interagency Cooperation Agreement. Non-material changes (i.e. changes that do not result in increased costs or liabilities to the City or decreased time for City reviews and approvals) may be approved by the Mayor and the Director of DPW. Material changes in the Infrastructure Plan require Board of Supervisors approval.

## **CONCLUSIONS**

As DPT's proposal actually improves traffic conditions for motor vehicles and for bicyclists, while not increasing costs or delaying project implementation for Catellus, DPT believes that the proposal should be accepted in lieu of the current four lane Catellus proposal without need for further environmental review.



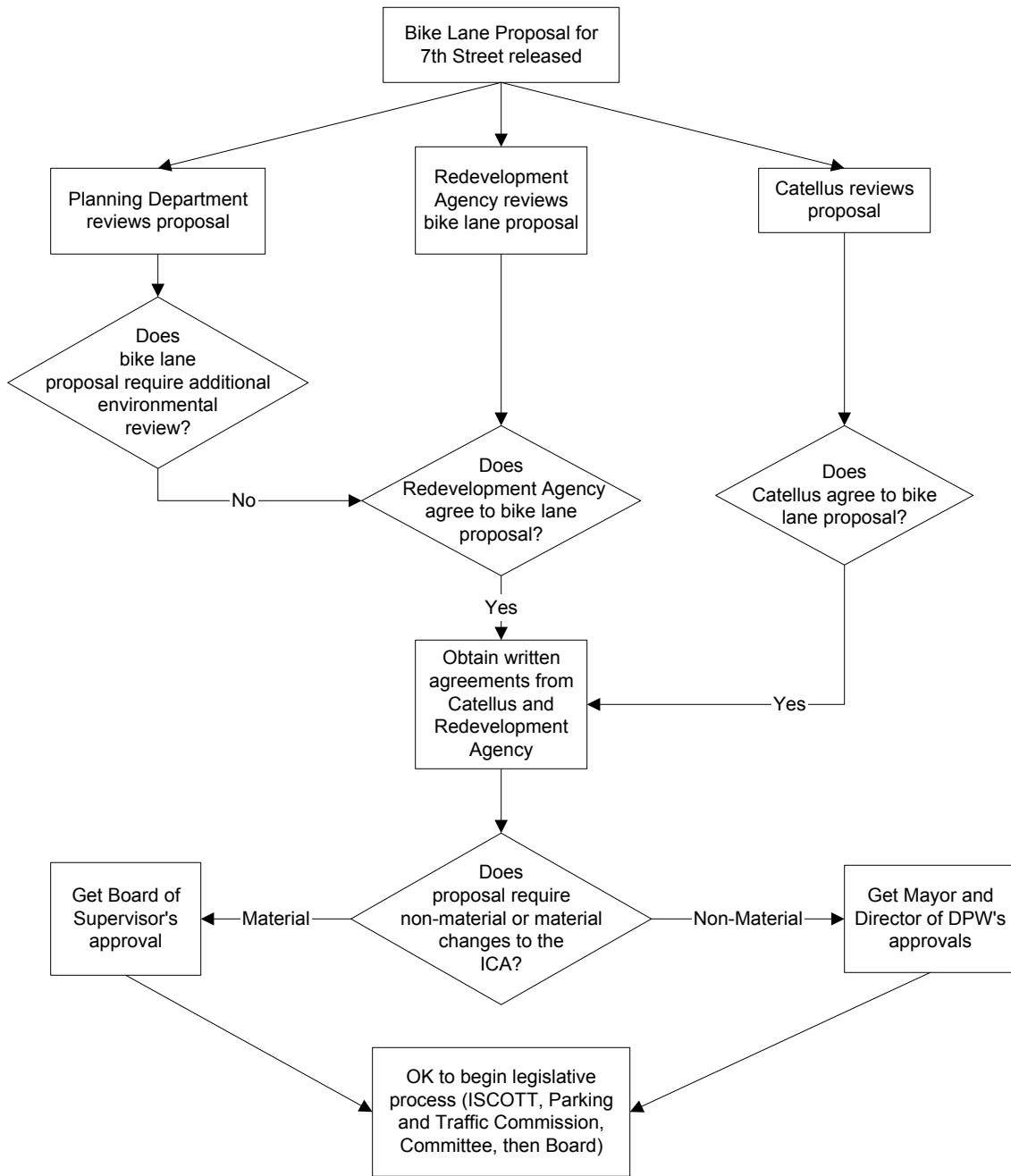
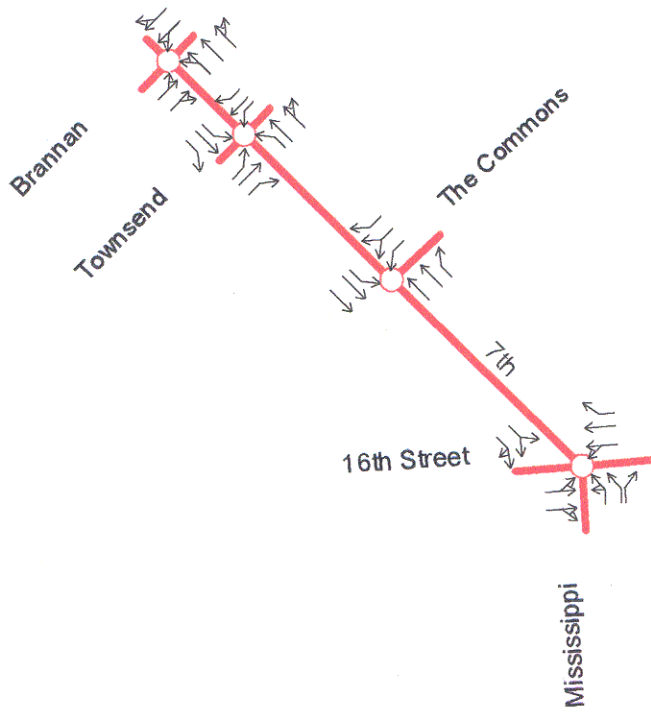





















Figure 3. Flowchart Illustrating Steps to be Taken to Modify Mission Bay Infrastructure Plans

**APPENDIX A**

**Synchro Analysis of 7<sup>th</sup> Street Intersections for  
Catellus Proposal**



**Lanes, Volumes, Timings**

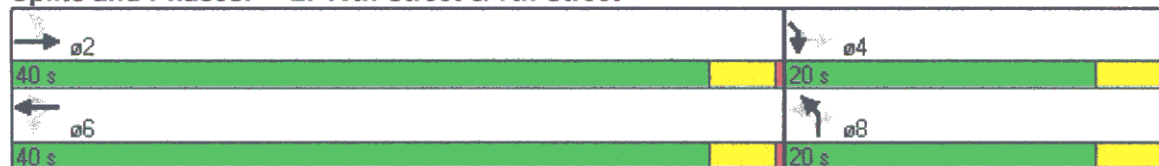
												
<b>Lane Group</b>	<b>EBL</b>	<b>EBT</b>	<b>EBR</b>	<b>WBL</b>	<b>WBT</b>	<b>WBR</b>	<b>NBL2</b>	<b>NBL</b>	<b>NBR</b>	<b>SEL</b>	<b>SER</b>	<b>SER2</b>
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	11	12
Grade (%)		0%			0%			0%		0%		
Storage Length (ft)	0		0	0		0		0	0	0	0	
Storage Lanes	0		0	0		1		0	1	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	50	
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15	15	9	15	9	9
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	1.00	0.95	0.97	1.00	1.00	0.95	1.00
Frnt Protected		0.973				0.850			0.850		0.850	
Flt Protected		0.993			0.999			0.950		0.950		
Satd. Flow (prot)	0	3420	0	0	3536	1583	0	3433	1583	1770	1454	0
Frnt Perm.		0.973				0.850			0.850		0.850	
Flt Perm.		0.591			0.922			0.899		0.526		
Satd. Flow (perm)	0	2035	0	0	3263	1583	0	3249	1583	980	1454	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		82				319			33		23	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.04	1.00
Volume (vph)	90	450	120	40	1570	720	40	240	30	140	100	50
Confl. Peds. (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%		0%		
Adj. Flow (vph)	100	500	133	44	1744	800	44	267	33	156	111	56
Lane Group Flow (vph)	0	733	0	0	1788	800	0	311	33	156	167	0
Turn Type	Perm			Perm		Perm	Perm		Perm	Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8		8	4		
Detector Phases	2	2		6	6	6	8	8	8	4	4	
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	
Total Split (s)	40.0	40.0	0.0	40.0	40.0	40.0	20.0	20.0	20.0	20.0	20.0	0.0
Total Split (%)	67%	67%	0%	67%	67%	67%	33%	33%	33%	33%	33%	0%
Maximum Green (s)	36.0	36.0		36.0	36.0	36.0	16.0	16.0	16.0	16.0	16.0	
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												
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	
Minimum Gap (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Recall Mode	Max	Max		Max	Max	Max	Max	Max	Max	Max	Max	

**Lanes, Volumes, Timings**
















<u>Lane Group</u>	<u>EBL</u>	<u>EBT</u>	<u>EBR</u>	<u>WBL</u>	<u>WBT</u>	<u>WBR</u>	<u>NBL2</u>	<u>NBL</u>	<u>NBR</u>	<u>SEL</u>	<u>SER</u>	<u>SER2</u>
Walk Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0	0	0	0	0
Lane Grp Cap (vph)		1286			2012	1098		921	472	278	428	
v/s Ratio Prot											0.11	
v/s Ratio Perm		0.35			0.55	0.45		0.10	0.02	0.16		
Critical LG?					Yes					Yes		
Act Effct Green (s)		37.0			37.0	37.0		17.0	17.0	17.0	17.0	17.0
Actuated g/C Ratio		0.62			0.62	0.62		0.28	0.28	0.28	0.28	0.28
v/c Ratio		0.57			0.89	0.73		0.34	0.07	0.56	0.39	
Uniform Delay, d1		5.9			9.7	4.3		17.0	0.0	18.3	14.8	
Percentile Delay		6.2			13.1	5.0		17.3	6.7	16.3	12.4	
Percentile LOS		A			B	A		B	A	B	B	
Uniform Delay, d1		5.9			9.7	4.3		17.0	0.0	18.3	14.8	
Platoon Factor		1.00			1.00	1.00		1.00	1.00	0.87	0.85	
Incr. Delay, d2		1.8			6.3	4.3		1.0	0.3	7.9	2.6	
Webster Delay		7.7			16.1	8.5		18.0	0.3	23.8	15.2	
Webster LOS		A			B	A		B	A	C	B	

Area Type: Other  
 Cycle Length: 60  
 Actuated Cycle Length: 60  
 Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
 Natural Cycle: 60  
 Control Type: Pretimed  
 Total Lost Time: 6  
 Sum of Critical v/s Ratios: 0.71  
 Intersection v/c Ratio: 0.79  
 Intersection Percentile Signal Delay: 10.6  
 Intersection Percentile LOS: B  
 Intersection Webster Signal Delay: 13.3  
 Intersection LOS: B













**Splits and Phases: 2: 16th Street & 7th Street**



**Lanes, Volumes, Timings**

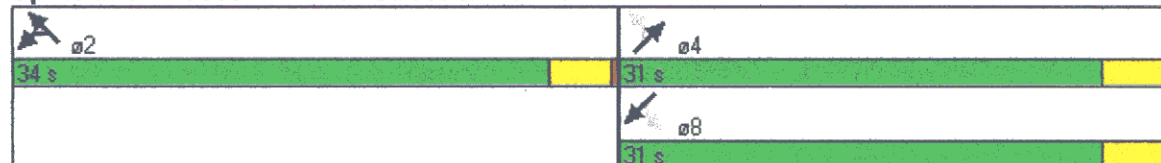
												
<b>Lane Group</b>	<b>SEL</b>	<b>SET</b>	<b>SER</b>	<b>NWL</b>	<b>NWT</b>	<b>NWR</b>	<b>NEL</b>	<b>NET</b>	<b>NER</b>	<b>SWL</b>	<b>SWT</b>	<b>SWR</b>
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		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	1.00	1.00	0.91	0.91	0.91	0.95	0.95	0.95	0.95	0.95	0.95
Frt Protected					0.989			0.986			0.941	
Flt Protected					0.999			0.989			0.999	
Satd. Flow (prot)	0	0	0	0	5024	0	0	3451	0	0	3327	0
Frt Perm.					0.989			0.986			0.941	
Flt Perm.					0.999			0.581			0.918	
Satd. Flow (perm)	0	0	0	0	5024	0	0	2027	0	0	3057	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					27			21			1	
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
Volume (vph)	0	0	0	40	2060	170	200	590	80	20	410	280
Confl. Peds. (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	0	0	44	2289	189	222	656	89	22	456	311
Lane Group Flow (vph)	0	0	0	0	2522	0	0	967	0	0	789	0
Turn Type				Split			Perm			Perm		
Protected Phases				2	2			4			8	
Permitted Phases							4			8		
Detector Phases				2	2		4	4		8	8	
Minimum Initial (s)				4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)				20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	0.0	0.0	0.0	34.0	34.0	0.0	31.0	31.0	0.0	31.0	31.0	0.0
Total Split (%)	0%	0%	0%	52%	52%	0%	48%	48%	0%	48%	48%	0%
Maximum Green (s)				30.0	30.0		27.0	27.0		27.0	27.0	
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 Optimize?												
Vehicle Extension (s)				3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)				3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)				0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)				0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode				Max	Max		Max	Max		Max	Max	

**Lanes, Volumes, Timings**

												
<u>Lane Group</u>	<u>SEL</u>	<u>SET</u>	<u>SER</u>	<u>NWL</u>	<u>NWT</u>	<u>NWR</u>	<u>NEL</u>	<u>NET</u>	<u>NER</u>	<u>SWL</u>	<u>SWT</u>	<u>SWR</u>
Walk Time (s)				5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)				11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)				0	0		0	0		0	0	
Lane Grp Cap (vph)					2410			885			1317	
v/s Ratio Prot												
v/s Ratio Perm					0.50			0.47			0.26	
Critical LG?					Yes			Yes				
Act Effct Green (s)					31.0			28.0			28.0	
Actuated g/C Ratio					0.48			0.43			0.43	
v/c Ratio					1.05			1.09			0.60	
Uniform Delay, d1					16.8			18.0			14.2	
Percentile Delay					44.1			66.3			14.5	
Percentile LOS					D			E			B	
Uniform Delay, d1					16.8			18.0			14.2	
Platoon Factor					1.00			1.00			1.00	
Incr. Delay, d2					31.9			58.7			2.0	
Webster Delay					48.7			76.8			16.2	
Webster LOS					D			E			B	

Area Type: Other  
 Cycle Length: 65  
 Actuated Cycle Length: 65  
 Offset: 0 (0%), Referenced to phase 6:, Start of Green  
 Natural Cycle: 65  
 Control Type: Pretimed  
 Total Lost Time: 6  
 Sum of Critical v/s Ratios: 0.97  
 Intersection v/c Ratio: 1.07  
 Intersection Percentile Signal Delay: 43.7  
 Intersection Percentile LOS: D  
 Intersection Webster Signal Delay: 49.1  
 Intersection LOS: D

**Splits and Phases: 3: 7th Street & Brannan**















**Lanes, Volumes, Timings**

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	1		1	1		0	1		1	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	50	50	50	50	50	50
Trailing Detector (ft)	0	0	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	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected			0.850		0.991				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	3507	0	1770	1863	1583	1770	1863	1583
Flt Perm.			0.850		0.991				0.850			0.850
Flt Perm.	0.148			0.713			0.209			0.148		
Satd. Flow (perm)	276	1863	1583	1328	3507	0	389	1863	1583	276	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			22		13				278			4
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
Volume (vph)	30	60	20	20	1640	100	190	680	250	130	550	550
Confl. Peds. (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	33	67	22	22	1822	111	211	756	278	144	611	611
Lane Group Flow (vph)	33	67	22	22	1933	0	211	756	278	144	611	611
Turn Type	Perm		Perm	Perm			Perm		Perm	Perm		Perm
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6			4		4	8		8
Detector Phases	2	2	2	6	6		4	4	4	8	8	8
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	30.0	30.0	30.0	30.0	30.0	0.0	30.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	50%	50%	50%	50%	50%	0%	50%	50%	50%	50%	50%	50%
Maximum Green (s)	26.0	26.0	26.0	26.0	26.0		26.0	26.0	26.0	26.0	26.0	26.0
Yellow Time (s)	3.5	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	0.5
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	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	Max	Max	Max	Max	Max		Max	Max	Max	Max	Max	Max

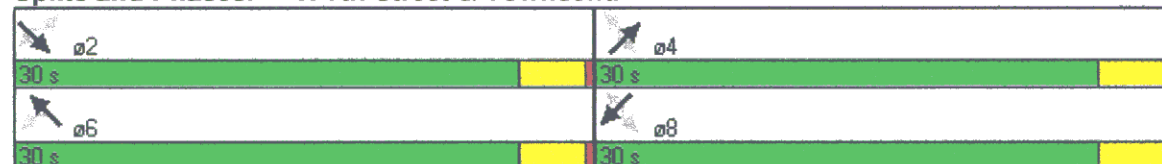


**Lanes, Volumes, Timings**

												
<b>Lane Group</b>	<b>SEL</b>	<b>SET</b>	<b>SER</b>	<b>NWL</b>	<b>NWT</b>	<b>NWR</b>	<b>NEL</b>	<b>NET</b>	<b>NER</b>	<b>SWL</b>	<b>SWT</b>	<b>SWR</b>
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0	0	0	0	0
Lane Grp Cap (vph)	124	838	724	598	1585		175	838	865	124	838	715
v/s Ratio Prot		0.04			0.55			0.41			0.33	
v/s Ratio Perm	0.12		0.01	0.02			0.54		0.14	0.52		0.38
Critical LG?					Yes		Yes					
Act Effct Green (s)	27.0	27.0	27.0	27.0	27.0		27.0	27.0	27.0	27.0	27.0	27.0
Actuated g/C Ratio	0.45	0.45	0.45	0.45	0.45		0.45	0.45	0.45	0.45	0.45	0.45
v/c Ratio	0.27	0.08	0.03	0.04	1.22		1.21	0.90	0.32	1.16	0.73	0.85
Uniform Delay, d1	10.3	9.4	0.0	9.2	16.3		16.5	15.3	0.0	16.5	13.5	14.6
Percentile Delay	12.1	9.6	4.5	11.2	119.1		118.2	25.4	1.7	118.1	14.8	22.3
Percentile LOS	B	A	A	B	F		F	C	A	F	B	C
Uniform Delay, d1	10.3	9.4	0.0	9.2	16.3		16.5	15.3	0.0	16.5	13.5	14.6
Platoon Factor	1.00	1.00	1.00	1.22	2.28		1.00	1.00	1.00	1.00	1.00	1.00
Incr. Delay, d2	5.2	0.2	0.1	0.1	102.1		134.2	14.8	1.0	130.6	5.5	12.4
Webster Delay	15.5	9.6	0.1	11.3	139.4		150.6	30.1	1.0	147.1	19.0	27.1
Webster LOS	B	A	A	B	F		F	C	A	F	B	C

Area Type: Other  
 Cycle Length: 60  
 Actuated Cycle Length: 60  
 Offset: 0 (0%), Referenced to phase 2:SETL and 6:NWTL, Start of Green  
 Natural Cycle: 50  
 Control Type: Pretimed  
 Total Lost Time: 6  
 Sum of Critical v/s Ratios: 1.09  
 Intersection v/c Ratio: 1.21  
 Intersection Percentile Signal Delay: 67.4  
 Intersection Percentile LOS: E  
 Intersection Webster Signal Delay: 80.0  
 Intersection LOS: E







**Splits and Phases: 6: 7th Street & Townsend**



**Lanes, Volumes, Timings**





<b>Lane Group</b>	<b>SEL</b>	<b>SET</b>	<b>NWT</b>	<b>NWR</b>	<b>SWL</b>	<b>SWR</b>
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	12	11	11	11
Grade (%)		0%	0%		0%	
Storage Length (ft)	180			0	0	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	0.95	0.95	1.00	0.97	0.91
Frt Protected				0.850	0.876	0.850
Flt Protected	0.950				0.991	
Satd. Flow (prot)	1711	3421	3539	1531	3033	1393
Frt Perm.				0.850	0.876	0.850
Flt Perm.	0.950				0.991	
Satd. Flow (perm)	1711	3421	3539	1531	3033	1393
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				78	318	9
Headway Factor	1.04	1.04	1.00	1.04	1.04	1.04
Volume (vph)	620	280	1200	70	60	680
Confl. Peds. (#/hr)						
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	689	311	1333	78	67	756
Lane Group Flow (vph)	689	311	1333	78	385	438
Turn Type	Prot			Pm+Ov		Pt+Ov
Protected Phases	5	2	6	4	4	4 5
Permitted Phases				6		
Detector Phases	5	2	6	4	4	4 5
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	8.0	20.0	20.0	20.0	20.0	
Total Split (s)	51.0	100.0	49.0	20.0	20.0	71.0
Total Split (%)	43%	83%	41%	17%	17%	59%
Maximum Green (s)	47.0	96.0	45.0	16.0	16.0	
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?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	
Recall Mode	Max	Max	Max	Max	Max	

**Lanes, Volumes, Timings**

						
<u>Lane Group</u>	<u>SEL</u>	<u>SET</u>	<u>NWT</u>	<u>NWR</u>	<u>SWL</u>	<u>SWR</u>
Walk Time (s)		5.0	5.0	5.0	5.0	
Flash Dont Walk (s)		11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)		0	0	0	0	
Lane Grp Cap (vph)	684	2765	1357	877	703	793
v/s Ratio Prot	0.40	0.09	0.38	0.01	0.08	0.31
v/s Ratio Perm				0.04		
Critical LG?	Yes		Yes			Yes
Act Effct Green (s)	48.0	97.0	46.0	66.0	17.0	68.0
Actuated g/C Ratio	0.40	0.81	0.38	0.55	0.14	0.57
v/c Ratio	1.01	0.11	0.98	0.09	0.55	0.55
Uniform Delay, d1	36.0	2.4	36.6	0.0	7.9	16.0
Percentile Delay	61.5	2.4	50.3	3.0	9.9	16.6
Percentile LOS	E	A	D	A	A	B
Uniform Delay, d1	36.0	2.4	36.6	0.0	7.9	16.0
Platoon Factor	1.06	0.90	0.96	99.00	1.00	1.00
Incr. Delay, d2	35.9	0.1	18.9	0.2	3.1	2.8
Webster Delay	74.1	2.3	54.1	0.2	10.9	18.7
Webster LOS	E	A	D	A	B	B

Area Type: Other  
 Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 0 (0%), Referenced to phase 2:SET and 6:NWT, Start of Green  
 Natural Cycle: 120  
 Control Type: Pretimed  
 Total Lost Time: 9  
 Sum of Critical v/s Ratios: 0.86  
 Intersection v/c Ratio: 0.93  
 Intersection Percentile Signal Delay: 37.5  
 Intersection Percentile LOS: D  
 Intersection Webster Signal Delay: 42.1  
 Intersection LOS: D

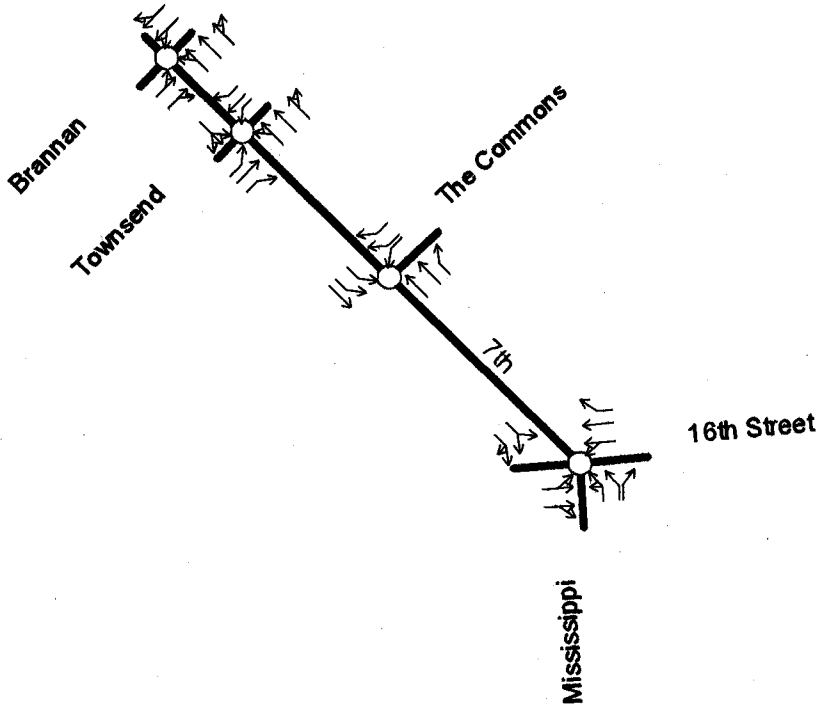
**Splits and Phases: 14: 7th Street & The Commons**

 ø2	 ø4
100 s	20 s
 ø5	 ø6
51 s	49 s

**APPENDIX B**

**Synchro Analysis of 7<sup>th</sup> Street Intersections for  
DPT (Bike Lane) Proposal**

Map - G:\7th Street\7th St with bike lanes.sy6  
Lane Diagram



Baseline  
Timing Plan: Default

G:\7th Street\7th St with bike lanes.sy6

**Lanes, Volumes, Timings**

<b>Lane Group</b>	<b>EBL</b>	<b>EBT</b>	<b>EBR</b>	<b>WBL</b>	<b>WBT</b>	<b>WBR</b>	<b>NBL2</b>	<b>NBL</b>	<b>NBR</b>	<b>SEL</b>	<b>SER</b>	<b>SER2</b>
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	12	12	12	12	11	12
Grade (%)		0%			0%			0%		0%		
Storage Length (ft)	0		0	0		0		0	0	0	0	
Storage Lanes	0		0	0		1		0	1	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	50	
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15	15	9	15	9	9
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	1.00	0.95	0.97	1.00	1.00	0.95	1.00
Frnt Protected		0.973				0.850			0.850		0.850	
Flt Protected		0.993			0.999			0.950		0.950		
Satd. Flow (prot)	0	3420	0	0	3536	1583	0	3433	1583	1770	1454	0
Frnt Perm.		0.973				0.850			0.850		0.850	
Flt Perm.		0.591			0.922			0.899		0.526		
Satd. Flow (perm)	0	2035	0	0	3263	1583	0	3249	1583	980	1454	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		82				319			33		23	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.04	1.00
Volume (vph)	90	450	120	40	1570	720	40	240	30	140	100	50
Confl. Peds. (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%		0%		
Adj. Flow (vph)	100	500	133	44	1744	800	44	267	33	156	111	56
Lane Group Flow (vph)	0	733	0	0	1788	800	0	311	33	156	167	0
Turn Type	Perm			Perm		Perm	Perm		Perm	Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8		8	4		
Detector Phases	2	2		6	6	6	8	8	8	4	4	
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	
Total Split (s)	40.0	40.0	0.0	40.0	40.0	40.0	20.0	20.0	20.0	20.0	20.0	0.0
Total Split (%)	67%	67%	0%	67%	67%	67%	33%	33%	33%	33%	33%	0%
Maximum Green (s)	36.0	36.0		36.0	36.0	36.0	16.0	16.0	16.0	16.0	16.0	
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												
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	
Minimum Gap (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Recall Mode	Max	Max		Max	Max	Max	Max	Max	Max	Max	Max	

**Lanes, Volumes, Timings**

<b>Lane Group</b>	<b>EBL</b>	<b>EBT</b>	<b>EBR</b>	<b>WBL</b>	<b>WBT</b>	<b>WBR</b>	<b>NBL2</b>	<b>NBL</b>	<b>NBR</b>	<b>SEL</b>	<b>SER</b>	<b>SER2</b>
Walk Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0	0	0	0	0
Lane Grp Cap (vph)		1286			2012	1098		921	472	278	428	
v/s Ratio Prot												0.11
v/s Ratio Perm		0.35			0.55	0.45		0.10	0.02	0.16		
Critical LG?					Yes					Yes		
Act Effct Green (s)		37.0			37.0	37.0		17.0	17.0	17.0	17.0	
Actuated g/C Ratio		0.62			0.62	0.62		0.28	0.28	0.28	0.28	
v/c Ratio		0.57			0.89	0.73		0.34	0.07	0.56	0.39	
Uniform Delay, d1		5.9			9.7	4.3		17.0	0.0	18.3	14.8	
Percentile Delay		6.2			13.1	5.0		17.3	6.7	19.8	15.4	
Percentile LOS		A			B	A		B	A	B	B	
Uniform Delay, d1		5.9			9.7	4.3		17.0	0.0	18.3	14.8	
Platoon Factor		1.00			1.00	1.00		1.00	1.00	1.00	1.00	
Incr. Delay, d2		1.8			6.3	4.3		1.0	0.3	8.0	2.7	
Webster Delay		7.7			16.1	8.5		18.0	0.3	26.3	17.4	
Webster LOS		A			B	A		B	A	C	B	

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 60

Control Type: Pretimed

Total Lost Time: 6

Sum of Critical v/s Ratios: 0.71

Intersection v/c Ratio: 0.79

Intersection Percentile Signal Delay: 10.9

Intersection Percentile LOS: B
















Intersection Webster Signal Delay: 13.5

Intersection LOS: B

**Splits and Phases: 2: 16th Street & 7th Street**













ø2	ø4
40 s	20 s
ø6	ø8
40 s	20 s

**Lanes, Volumes, Timings**

												
<b>Lane Group</b>	<b>SEL</b>	<b>SET</b>	<b>SER</b>	<b>NWL</b>	<b>NWT</b>	<b>NWR</b>	<b>NEL</b>	<b>NET</b>	<b>NER</b>	<b>SWL</b>	<b>SWT</b>	<b>SWR</b>
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	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		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	1.00	1.00	0.91	0.91	0.91	0.95	0.95	0.95	0.95	0.95	0.95
Frnt Protected					0.989			0.986			0.941	
Flt Protected					0.999			0.989			0.999	
Satd. Flow (prot)	0	0	0	0	5024	0	0	3451	0	0	3327	0
Frnt Perm.					0.989			0.986			0.941	
Flt Perm.					0.999			0.581			0.918	
Satd. Flow (perm)	0	0	0	0	5024	0	0	2027	0	0	3057	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					27			21			1	
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
Volume (vph)	0	0	0	40	2060	170	200	590	80	20	410	280
Confl. Peds. (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	0	0	44	2289	189	222	656	89	22	456	311
Lane Group Flow (vph)	0	0	0	0	2522	0	0	967	0	0	789	0
Turn Type				Split			Perm			Perm		
Protected Phases				2	2			4			8	
Permitted Phases							4			8		
Detector Phases				2	2		4	4		8	8	
Minimum Initial (s)				4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)				20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	0.0	0.0	0.0	34.0	34.0	0.0	31.0	31.0	0.0	31.0	31.0	0.0
Total Split (%)	0%	0%	0%	52%	52%	0%	48%	48%	0%	48%	48%	0%
Maximum Green (s)				30.0	30.0		27.0	27.0		27.0	27.0	
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 Optimize?												
Vehicle Extension (s)				3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)				3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)				0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)				0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode				Max	Max		Max	Max		Max	Max	






**Lanes, Volumes, Timings**







												
<u>Lane Group</u>	<u>SEL</u>	<u>SET</u>	<u>SER</u>	<u>NWL</u>	<u>NWT</u>	<u>NWR</u>	<u>NEL</u>	<u>NET</u>	<u>NER</u>	<u>SWL</u>	<u>SWT</u>	<u>SWR</u>
Walk Time (s)				5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)				11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)				0	0		0	0		0	0	
Lane Grp Cap (vph)				2410			885			1317		
v/s Ratio Prot												
v/s Ratio Perm					0.50			0.47			0.26	
Critical LG?					Yes			Yes				
Act Effct Green (s)					31.0			28.0			28.0	
Actuated g/C Ratio					0.48			0.43			0.43	
v/c Ratio					1.05			1.09			0.60	
Uniform Delay, d1					16.8			18.0			14.2	
Percentile Delay					44.1			66.3			14.5	
Percentile LOS					D			E			B	
Uniform Delay, d1					16.8			18.0			14.2	
Platoon Factor					1.00			1.00			1.00	
Incr. Delay, d2					31.9			58.7			2.0	
Webster Delay					48.7			76.8			16.2	
Webster LOS					D			E			B	

Area Type: Other  
 Cycle Length: 65  
 Actuated Cycle Length: 65  
 Offset: 0 (0%), Referenced to phase 6:, Start of Green  
 Natural Cycle: 65  
 Control Type: Pretimed  
 Total Lost Time: 6  
 Sum of Critical v/s Ratios: 0.97  
 Intersection v/c Ratio: 1.07  
 Intersection Percentile Signal Delay: 43.7  
 Intersection Percentile LOS: D  
 Intersection Webster Signal Delay: 49.1  
 Intersection LOS: D

**Splits and Phases: 3: 7th Street & Brannan**

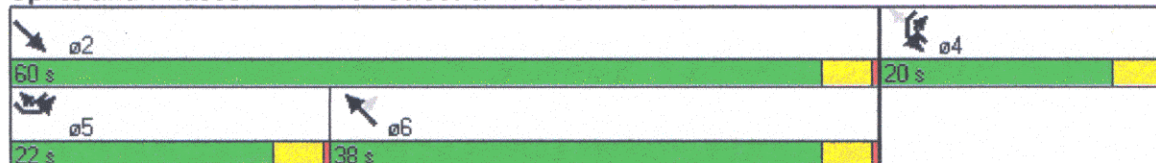
 ø2	 ø4
34 s	31 s
	 ø8
	31 s

**Lanes, Volumes, Timings**













						
<b>Lane Group</b>	<b>SEL</b>	<b>SET</b>	<b>NWT</b>	<b>NWR</b>	<b>SWL</b>	<b>SWR</b>
Walk Time (s)		5.0	5.0	5.0	5.0	
Flash Dont Walk (s)		11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)		0	0	0	0	
Lane Grp Cap (vph)	761	1416	1497	1023	364	1329
v/s Ratio Prot	0.22	0.16	0.39	0.02	0.04	0.14
v/s Ratio Perm				0.04		0.14
Critical LG?	Yes		Yes			Yes
Act Effct Green (s)	19.0	57.0	35.0	55.0	17.0	39.0
Actuated g/C Ratio	0.24	0.71	0.44	0.69	0.21	0.49
v/c Ratio	0.91	0.22	0.89	0.08	0.18	0.57
Uniform Delay, d1	29.6	3.9	20.7	3.0	25.8	13.9
Percentile Delay	39.6	4.0	24.6	3.3	26.3	14.2
Percentile LOS	D	A	C	A	C	B
Uniform Delay, d1	29.6	3.9	20.7	3.0	25.8	13.9
Platoon Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incr. Delay, d2	16.4	0.4	8.4	0.1	1.1	1.8
Webster Delay	46.0	4.3	29.1	3.1	26.9	15.6
Webster LOS	D	A	C	A	C	B

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 80  
 Offset: 0 (0%), Referenced to phase 2:SET and 6:NWT, Start of Green  
 Natural Cycle: 80  
 Control Type: Pretimed  
 Total Lost Time: 9  
 Sum of Critical v/s Ratios: 0.73  
 Intersection v/c Ratio: 0.82  
 Intersection Percentile Signal Delay: 22.9  
 Intersection Percentile LOS: C  
 Intersection Webster Signal Delay: 26.5  
 Intersection LOS: C













**Splits and Phases: 14: 7th Street & The Commons**



**Lanes, Volumes, Timings**

						
<b>Lane Group</b>	<b>SEL</b>	<b>SET</b>	<b>NWT</b>	<b>NWR</b>	<b>SWL</b>	<b>SWR</b>
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	14	11	10	11	11
Grade (%)		0%	0%		0%	
Storage Length (ft)	180			0	0	0
Storage Lanes	2			1	1	2
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	0.97	1.00	0.95	1.00	1.00	0.88
Frt Protected				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3204	1987	3421	1478	1711	2694
Frt Perm.				0.850		0.850
Flt Perm.	0.950				0.950	
Satd. Flow (perm)	3204	1987	3421	1478	1711	2694
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				21		30
Headway Factor	1.09	0.92	1.04	1.09	1.04	1.04
Volume (vph)	620	280	1200	70	60	680
Confl. Peds. (#/hr)						
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	689	311	1333	78	67	756
Lane Group Flow (vph)	689	311	1333	78	67	756
Turn Type	Prot			Pm+Ov		Pm+Ov
Protected Phases	5	2	6	4	4	5
Permitted Phases				6		4
Detector Phases	5	2	6	4	4	5
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	20.0	20.0	20.0	8.0
Total Split (s)	22.0	60.0	38.0	20.0	20.0	22.0
Total Split (%)	28%	75%	48%	25%	25%	28%
Maximum Green (s)	18.0	56.0	34.0	16.0	16.0	18.0
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
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	Max	Max	Max	Max	Max	Max

**Lanes, Volumes, Timings**

												
<b>Lane Group</b>	<b>SEL</b>	<b>SET</b>	<b>SER</b>	<b>NWL</b>	<b>NWT</b>	<b>NWR</b>	<b>NEL</b>	<b>NET</b>	<b>NER</b>	<b>SWL</b>	<b>SWT</b>	<b>SWR</b>
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	0
Lane Grp Cap (vph)		332			1931		196	857	878	149	857	730
v/s Ratio Prot								0.41			0.33	
v/s Ratio Perm		0.15			0.43		0.50		0.15	0.44		0.39
Critical LG?					Yes		Yes					
Act Effct Green (s)		21.0			21.0		23.0	23.0	23.0	23.0	23.0	23.0
Actuated g/C Ratio		0.42			0.42		0.46	0.46	0.46	0.46	0.46	0.46
v/c Ratio		0.37			1.01		1.08	0.88	0.32	0.97	0.71	0.84
Uniform Delay, d1		8.0			14.3		13.5	12.3	0.0	13.1	10.8	11.8
Percentile Delay		9.2			35.3		86.9	21.8	1.5	73.2	12.3	19.2
Percentile LOS		A			D		F	C	A	E	B	B
Uniform Delay, d1		8.0			14.3		13.5	12.3	0.0	13.1	10.8	11.8
Platoon Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incr. Delay, d2		3.1			23.6		86.1	12.7	0.9	65.3	5.0	11.0
Webster Delay		11.1			37.9		99.6	24.9	0.9	78.5	15.8	22.8
Webster LOS		B			D		F	C	A	E	B	C

Area Type: Other

Cycle Length: 50

Actuated Cycle Length: 50

Offset: 0 (0%), Referenced to phase 2:SETL and 6:NWTL, Start of Green

Natural Cycle: 50

Control Type: Pretimed

Total Lost Time: 6

Sum of Critical v/s Ratios: 0.92

Intersection v/c Ratio: 1.05





Intersection Percentile Signal Delay: 28.8

Intersection Percentile LOS: C





















Intersection Webster Signal Delay: 32.1

Intersection LOS: C

**Splits and Phases: 6: 7th Street & Townsend**

 ø2	 ø4
24 s	26 s
 ø6	 ø8
24 s	26 s

**Lanes, Volumes, Timings**

Lane Group	 SEL	 SET	 SER	 NWL	 NWT	 NWR	 NEL	 NET	 NER	 SWL	 SWT	 SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	12	12	11	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	1		1	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	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	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00	1.00	1.00	1.00
Frnt Protected		0.876			0.991				0.850			0.850
Flt Protected		0.987			0.999		0.950			0.950		
Satd. Flow (prot)	0	1557	0	0	4867	0	1770	1863	1583	1770	1863	1583
Frnt Perm.		0.876			0.991				0.850			0.850
Flt Perm.		0.482			0.937		0.228			0.174		
Satd. Flow (perm)	0	760	0	0	4565	0	425	1863	1583	324	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		22			23				278			3
Headway Factor	1.00	1.04	1.00	1.00	1.04	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Volume (vph)	30	60	20	20	1640	100	190	680	250	130	550	550
Confl. Peds. (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	33	67	22	22	1822	111	211	756	278	144	611	611
Lane Group Flow (vph)	0	122	0	0	1955	0	211	756	278	144	611	611
Turn Type	Perm			Perm			Perm		Perm	Perm		Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		8
Detector Phases	2	2		6	6		4	4	4	8	8	8
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	24.0	24.0	0.0	24.0	24.0	0.0	26.0	26.0	26.0	26.0	26.0	26.0
Total Split (%)	48%	48%	0%	48%	48%	0%	52%	52%	52%	52%	52%	52%
Maximum Green (s)	20.0	20.0		20.0	20.0		22.0	22.0	22.0	22.0	22.0	22.0
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												
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
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	Max	Max		Max	Max		Max	Max	Max	Max	Max	Max

## **APPENDIX C**

### **Synchro Analysis of Three Scenarios for Southbound 7<sup>th</sup> Street at Townsend**

Lanes, Volumes, Timings

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	12	12	11	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	1		1	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	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	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00	1.00	1.00	1.00
Frt Protected		0.876			0.991				0.850			0.850
Flt Protected		0.987			0.999		0.950			0.950		
Satd. Flow (prot)	0	1557	0	0	4867	0	1770	1863	1583	1770	1863	1583
Frt Perm.		0.876			0.991				0.850			0.850
Flt Perm.		0.482			0.937		0.228			0.174		
Satd. Flow (perm)	0	760	0	0	4565	0	425	1863	1583	324	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		22			23				278			3
Headway Factor	1.00	1.04	1.00	1.00	1.04	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Volume (vph)	330	60	20	20	1640	100	190	680	250	130	550	550
Confl. Peds. (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	33	67	22	22	1822	111	211	756	278	144	611	611
Lane Group Flow (vph)	0	122	0	0	1955	0	211	756	278	144	611	611
Turn Type	Perm			Perm			Perm		Perm	Perm		Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		8
Detector Phases	2	2		6	6		4	4	4	8	8	8
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	24.0	24.0	0.0	24.0	24.0	0.0	26.0	26.0	26.0	26.0	26.0	26.0
Total Split (%)	48%	48%	0%	48%	48%	0%	52%	52%	52%	52%	52%	52%
Maximum Green (s)	20.0	20.0		20.0	20.0		22.0	22.0	22.0	22.0	22.0	22.0
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												
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
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	Max	Max		Max	Max		Max	Max	Max	Max	Max	Max



6: 7th Street & Townsend

Baseline

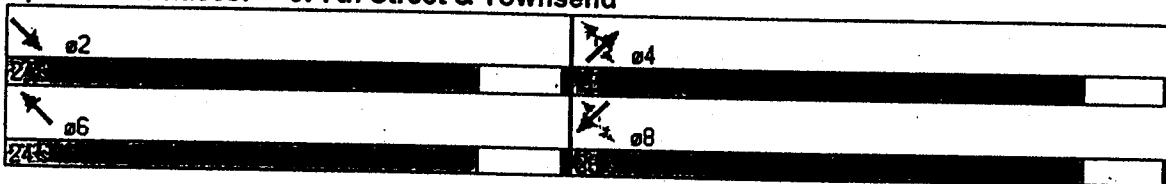
5/24/2001

Lanes, Volumes, Timings

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	0
Lane Grp Cap (vph)		332			1931		196	857	878	149	857	730
v/s Ratio Prot								0.41			0.33	
v/s Ratio Perm		0.15			0.43		0.50		0.15	0.44		0.39
Critical LG?					Yes		Yes					
Act Effct Green (s)		21.0			21.0		23.0	23.0	23.0	23.0	23.0	23.0
Actuated g/C Ratio		0.42			0.42		0.46	0.46	0.46	0.46	0.46	0.46
v/c Ratio		0.37			1.01		1.08	0.88	0.32	0.97	0.71	0.84
Uniform Delay, d1		8.0			14.3		13.5	12.3	0.0	13.1	10.8	11.8
Percentile Delay		9.2			35.3		86.9	21.8	1.5	73.2	12.3	19.2
Percentile LOS		A			D		F	C	A	E	B	B
Uniform Delay, d1		8.0			14.3		13.5	12.3	0.0	13.1	10.8	11.8
Platoon Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incr. Delay, d2		3.1			23.6		86.1	12.7	0.9	65.3	5.0	11.0
Webster Delay		11.1			37.9		99.6	24.9	0.9	78.5	15.8	22.8
Webster LOS		B			D		F	C	A	E	B	C

Area Type: Other  
 Cycle Length: 50  
 Actuated Cycle Length: 50  
 Offset: 0 (0%), Referenced to phase 2:SETL and 6:NWTL, Start of Green  
 Natural Cycle: 50  
 Control Type: Pretimed  
 Total Lost Time: 6  
 Sum of Critical v/s Ratios: 0.92  
 Intersection v/c Ratio: 1.05  
 Intersection Percentile Signal Delay: 28.8  
 Intersection Percentile LOS: C  
 Intersection Webster Signal Delay: 32.1  
 Intersection LOS: C

Splits and Phases: 6: 7th Street & Townsend





One lane southbound,  
PM projected volumes doubled for SB approach.

Baseline

5/24/2001

Lanes, Volumes, Timings

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	12	12	11	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	1		1	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	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	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00	1.00	1.00	1.00
Frt Protected		0.876			0.991				0.850			0.850
Flt Protected		0.986			0.999		0.950			0.950		
Satd. Flow (prot)	0	1555	0	0	4867	0	1770	1863	1583	1770	1863	1583
Frt Perm.		0.876			0.991				0.850			0.850
Flt Perm.		0.337			0.936		0.228			0.174		
Satd. Flow (perm)	0	532	0	0	4560	0	425	1863	1583	324	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		27			23				278			3
Headway Factor	1.00	1.04	1.00	1.00	1.04	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Volume (vph)	60	120	40	20	1640	100	190	680	250	130	550	550
Confl. Peds. (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	67	133	44	22	1822	111	211	756	278	144	611	611
Lane Group Flow (vph)	0	244	0	0	1955	0	211	756	278	144	611	611
Turn Type	Perm			Perm			Perm		Perm	Perm		Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		8
Detector Phases	2	2		6	6		4	4	4	8	8	8
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	24.0	24.0	0.0	24.0	24.0	0.0	26.0	26.0	26.0	26.0	26.0	26.0
Total Split (%)	48%	48%	0%	48%	48%	0%	52%	52%	52%	52%	52%	52%
Maximum Green (s)	20.0	20.0		20.0	20.0		22.0	22.0	22.0	22.0	22.0	22.0
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												
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
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	Max	Max		Max	Max		Max	Max	Max	Max	Max	Max



# 6: 7th Street & Townsend

Baseline

5/24/2001

## Lanes, Volumes, Timings

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	0
Lane Grp Cap (vph)		239			1929		196	857	878	149	857	730
v/s Ratio Prot								0.41				
v/s Ratio Perm		0.43			0.43		0.50			0.15	0.44	
Critical LG?		Yes					Yes					0.39
Act Effct Green (s)		21.0			21.0		23.0	23.0	23.0	23.0	23.0	23.0
Actuated g/C Ratio		0.42			0.42		0.46	0.46	0.46	0.46	0.46	0.46
v/c Ratio		1.02			1.01		1.08	0.88	0.32	0.97	0.71	0.84
Uniform Delay, d1		12.8			14.3		13.5	12.3	0.0	13.1	10.8	11.8
Percentile Delay		69.3			35.5		86.9	21.8	1.5	73.2	12.3	19.2
Percentile LOS		E			D		F	C	A	E	B	B
Uniform Delay, d1		12.8			14.3		13.5	12.3	0.0	13.1	10.8	11.8
Platoon Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incr. Delay, d2		63.7			23.9		86.1	12.7	0.9	65.3	5.0	11.0
Webster Delay		76.6			38.2		99.6	24.9	0.9	78.5	15.8	22.8
Webster LOS		E			D		F	C	A	E	B	C

Area Type: Other

Cycle Length: 50

Actuated Cycle Length: 50

Offset: 0 (0%), Referenced to phase 2:SETL and 6:NWTL, Start of Green

Natural Cycle: 40

Control Type: Pretimed

Total Lost Time: 6

Sum of Critical v/s Ratios: 0.93

Intersection v/c Ratio: 1.05

Intersection Percentile Signal Delay: 31.5

Intersection Percentile LOS: C

Intersection Webster Signal Delay: 35.0

Intersection LOS: D

### Splits and Phases: 6: 7th Street & Townsend

 02	 04
 06	 08

Two lanes southbound (parking removed and second lane added)  
 volumes for SB approach increased to LOS D.

Baseline

5/24/2001

Lanes, Volumes, Timings

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↖	↘	↙	↔	↗	↖	↗	↖	↗	↖	↗	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	12	12	11	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	1		1	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	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	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00	1.00	1.00	1.00
Frt Protected		0.991			0.991				0.850			0.850
Flt Protected	0.950				0.999		0.950			0.950		
Satd. Flow (prot)	1770	1784	0	0	4867	0	1770	1863	1583	1770	1863	1583
Frt Perm.		0.991			0.991				0.850			0.850
Flt Perm.	0.190				0.814		0.228			0.174		
Satd. Flow (perm)	354	1784	0	0	3965	0	425	1863	1583	324	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			23				113			3
Headway Factor	1.00	1.04	1.00	1.00	1.04	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Volume (vph)	110	650	40	20	1640	100	190	680	250	130	550	550
Confl. Peds. (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	122	722	44	22	1822	111	211	756	278	144	611	611
Lane Group Flow (vph)	122	766	0	0	1955	0	211	756	278	144	611	611
Turn Type	Perm			Perm			Perm		Perm	Perm		Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		8
Detector Phases	2	2		6	6		4	4	4	8	8	8
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	24.0	24.0	0.0	24.0	24.0	0.0	26.0	26.0	26.0	26.0	26.0	26.0
Total Split (%)	48%	48%	0%	48%	48%	0%	52%	52%	52%	52%	52%	52%
Maximum Green (s)	20.0	20.0		20.0	20.0		22.0	22.0	22.0	22.0	22.0	22.0
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												
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
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	Max	Max		Max	Max		Max	Max	Max	Max	Max	Max



Lanes, Volumes, Timings

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	0
Lane Grp Cap (vph)	149	754			1679		196	857	789	149	857	730
v/s Ratio Prot		0.43						0.41			0.33	
v/s Ratio Perm	0.34				0.49		0.50		0.16	0.44		0.39
Critical LG?					Yes		Yes					
Act Effct Green (s)	21.0	21.0			21.0		23.0	23.0	23.0	23.0	23.0	23.0
Actuated g/C Ratio	0.42	0.42			0.42		0.46	0.46	0.46	0.46	0.46	0.46
v/c Ratio	0.82	1.02			1.16		1.08	0.88	0.35	0.97	0.71	0.84
Uniform Delay, d1	12.8	14.3			14.3		13.5	12.3	4.9	13.1	10.8	11.8
Percentile Delay	48.6	46.9			83.0		86.9	21.8	5.3	73.2	12.3	19.2
Percentile LOS	D	D			F		F	C	A	E	B	B
Uniform Delay, d1	12.8	14.3			14.3		13.5	12.3	4.9	13.1	10.8	11.8
Platoon Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incr. Delay, d2	37.4	36.8			80.9		86.1	12.7	1.2	65.3	5.0	11.0
Webster Delay	50.2	51.2			95.2		99.6	24.9	6.1	78.5	15.8	22.8
Webster LOS	D	D			F		F	C	A	E	B	C

Area Type: Other  
 Cycle Length: 50  
 Actuated Cycle Length: 50  
 Offset: 0 (0%), Referenced to phase 2:SETL and 6:NWTL, Start of Green  
 Natural Cycle: 100  
 Control Type: Pretimed  
 Total Lost Time: 6  
 Sum of Critical v/s Ratios: 0.99  
 Intersection v/c Ratio: 1.12  
 Intersection Percentile Signal Delay: 49.5  
 Intersection Percentile LOS: D  
 Intersection Webster Signal Delay: 56.5  
 Intersection LOS: E

Splits and Phases: 6: 7th Street & Townsend

02	04
06	08



## **APPENDIX D**

### **Synchro Analysis of Southbound Through Capacity of 7<sup>th</sup> Street at The Commons**

Baseline







Lanes, Volumes, Timings

Lane Group	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations	↖↗	↖↗	↖↗	↖↗	↖↗	↖↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	14	11	10	11	11
Grade (%)		0%	0%		0%	
Storage Length (ft)	180			0	0	0
Storage Lanes	2			1	1	2
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	0.97	1.00	0.95	1.00	1.00	0.88
Frt Protected				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3204	1987	3421	1478	1711	2694
Frt Perm.				0.850		0.850
Flt Perm.	0.950				0.950	
Satd. Flow (perm)	3204	1987	3421	1478	1711	2694
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				21		30
Headway Factor	1.09	0.92	1.04	1.09	1.04	1.04
Volume (vph)	620	280	1200	70	60	680
Confl. Peds. (#/hr)						
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	689	311	1333	78	67	756
Lane Group Flow (vph)	689	311	1333	78	67	756
Turn Type	Prot			Pm+Ov		Pm+Ov
Protected Phases	5	2	6	4	4	5
Permitted Phases				6		4
Detector Phases	5	2	6	4	4	5
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	20.0	20.0	20.0	8.0
Total Split (s)	22.0	60.0	38.0	20.0	20.0	22.0
Total Split (%)	28%	75%	48%	25%	25%	28%
Maximum Green (s)	18.0	56.0	34.0	16.0	16.0	18.0
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
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	Max	Max	Max	Max	Max	Max

280 is volume provided by Catellos For 2015.

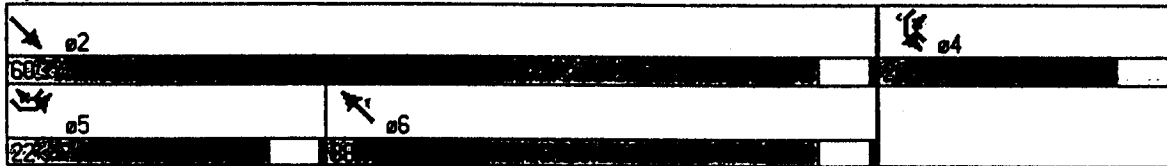


Lanes, Volumes, Timings

						
Lane Group	SEL	SET	NWT	NWR	SWL	SWR
Walk Time (s)		5.0	5.0	5.0	5.0	
Flash Dont Walk (s)		11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)		0	0	0	0	
Lane Grp Cap (vph)	761	1416	1497	1023	364	1329
v/s Ratio Prot	0.22	0.16	0.39	0.02	0.04	0.14
v/s Ratio Perm				0.04		0.14
Critical LG?	Yes		Yes			Yes
Act Effct Green (s)	19.0	57.0	35.0	55.0	17.0	39.0
Actuated g/C Ratio	0.24	0.71	0.44	0.69	0.21	0.49
v/c Ratio	0.91	0.22	0.89	0.08	0.18	0.57
Uniform Delay, d1	29.6	3.9	20.7	3.0	25.8	13.9
Percentile Delay	39.6	4.0	24.6	3.3	26.3	14.2
Percentile LOS	D	A	C	A	C	B
Uniform Delay, d1	29.6	3.9	20.7	3.0	25.8	13.9
Platoon Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incr. Delay, d2	16.4	0.4	8.4	0.1	1.1	1.8
Webster Delay	46.0	4.3	29.1	3.1	26.9	15.6
Webster LOS	D	A	C	A	C	B

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 80  
 Offset: 0 (0%), Referenced to phase 2:SET and 6:NWT, Start of Green  
 Natural Cycle: 80  
 Control Type: Pretimed  
 Total Lost Time: 9  
 Sum of Critical v/s Ratios: 0.73  
 Intersection v/c Ratio: 0.82  
 Intersection Percentile Signal Delay: 22.9  
 Intersection Percentile LOS: C  
 Intersection Webster Signal Delay: 26.5  
 Intersection LOS: C

Splits and Phases: 14: 7th Street & The Commons



Lanes, Volumes, Timings

Lane Group	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations	↖ ↗	↖ ↗	↖ ↗	↖ ↗	↖ ↗	↖ ↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	14	11	10	11	11
Grade (%)		0%	0%		0%	
Storage Length (ft)	180			0	0	0
Storage Lanes	2			1	1	2
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	0.97	1.00	0.95	1.00	1.00	0.88
Frt Protected				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3204	1987	3421	1478	1711	2694
Frt Perm.				0.850		0.850
Flt Perm.	0.950				0.950	
Satd. Flow (perm)	3204	1987	3421	1478	1711	2694
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				21		30
Headway Factor	1.09	0.92	1.04	1.09	1.04	1.04
Volume (vph)	620	1350	1200	70	60	680
Confl. Peds. (#/hr)						
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	689	1500	1333	78	67	756
Lane Group Flow (vph)	689	1500	1333	78	67	756
Turn Type	Prot			Pm+Ov		Pm+Ov
Protected Phases	5	2	6	4	4	5
Permitted Phases				6		4
Detector Phases	5	2	6	4	4	5
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	20.0	20.0	20.0	8.0
Total Split (s)	22.0	60.0	38.0	20.0	20.0	22.0
Total Split (%)	28%	75%	48%	25%	25%	28%
Maximum Green (s)	18.0	56.0	34.0	16.0	16.0	18.0
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
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	Max	Max	Max	Max	Max	Max







1350 is volume that brings the southbound through to LOS D, an increase of 1070 veh/hour over S. volume projected by Catellos.









Baseline

Lanes, Volumes, Timings

						
Lane Group	SEL	SET	NWT	NWR	SWL	SWR
Walk Time (s)		5.0	5.0	5.0	5.0	
Flash Dont Walk (s)		11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)		0	0	0	0	
Lane Grp Cap (vph)	761	1416	1497	1023	364	1329
v/s Ratio Prot	0.22	0.75	0.39	0.02	0.04	0.14
v/s Ratio Perm				0.04		0.14
Critical LG?		Yes				Yes
Act Effct Green (s)	19.0	57.0	35.0	55.0	17.0	39.0
Actuated g/C Ratio	0.24	0.71	0.44	0.69	0.21	0.49
v/c Ratio	0.91	1.06	0.89	0.08	0.18	0.57
Uniform Delay, d1	29.6	11.5	20.7	3.0	25.8	13.9
Percentile Delay	39.6	51.1	24.6	3.3	26.3	14.2
Percentile LOS	D	D	C	A	C	B
Uniform Delay, d1	29.6	11.5	20.7	3.0	25.8	13.9
Platoon Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incr. Delay, d2	16.4	41.3	8.4	0.1	1.1	1.8
Webster Delay	46.0	52.9	29.1	3.1	26.9	15.6
Webster LOS	D	D	C	A	C	B

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 80  
 Offset: 0 (0%), Referenced to phase 2:SET and 6:NWT, Start of Green  
 Natural Cycle: 90  
 Control Type: Pretimed  
 Total Lost Time: 6  
 Sum of Critical v/s Ratios: 0.88  
 Intersection v/c Ratio: 0.95  
 Intersection Percentile Signal Delay: 33.8  
 Intersection Percentile LOS: C  
 Intersection Webster Signal Delay: 37.0  
 Intersection LOS: D

Splits and Phases: 14: 7th Street & The Commons

 02	 04
60	20
 05	 06
22	78

