

Slow Down!

Reducing Downtown Bloomington's Progression Speed

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INC.

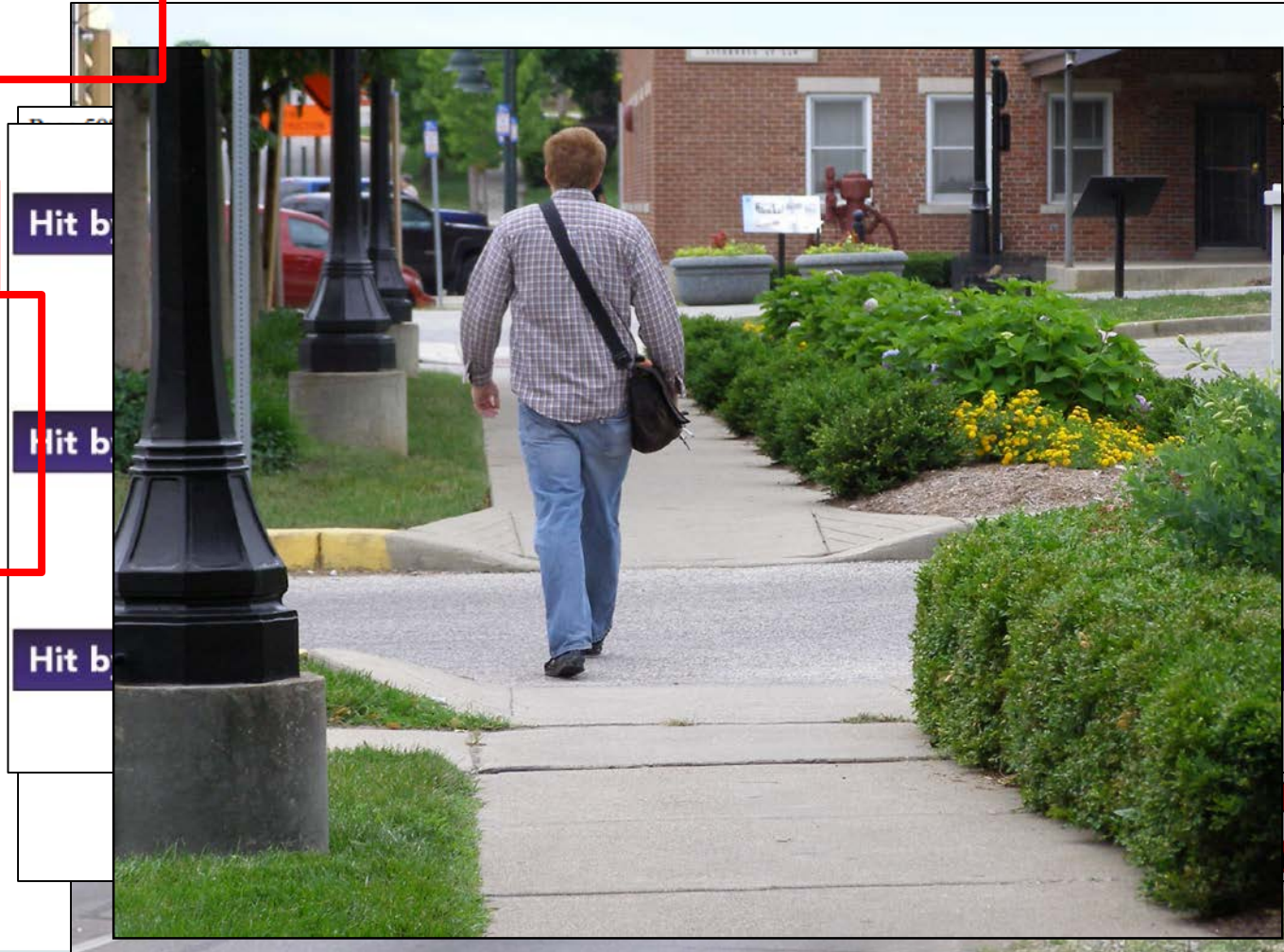
Background and Project Overview



- **Bloomington, IN**
 - Population 85,000
 - 81 Full Signals and 2 PHBs
- **Mode Split**
 - 5% Bicycle
 - 15% Walk
 - 5% Transit
 - 5% Work at Home
 - 70% Drive
- **Last Signal Retiming**
- **HSIP Funding**

Project Goals

- Compliance with standards
- Safety
- Walkability
- Minimize Stops and Delay

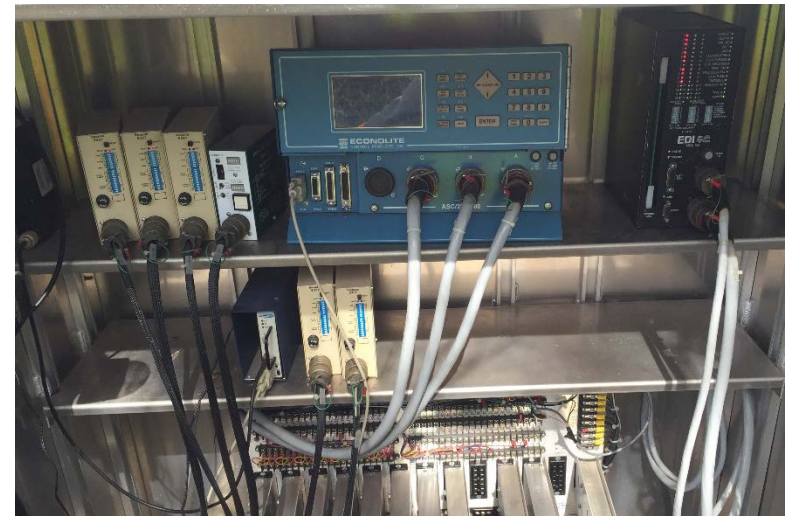


Project Goals – Consultant View



- Increased Clearance Times
- Maintain Similar Cycle Lengths
- Address Multi-Modal Needs
- Lack of Detection
- Communication Deficiencies

- Central Business District
 - On-Street Parking
 - Commercial Deliveries

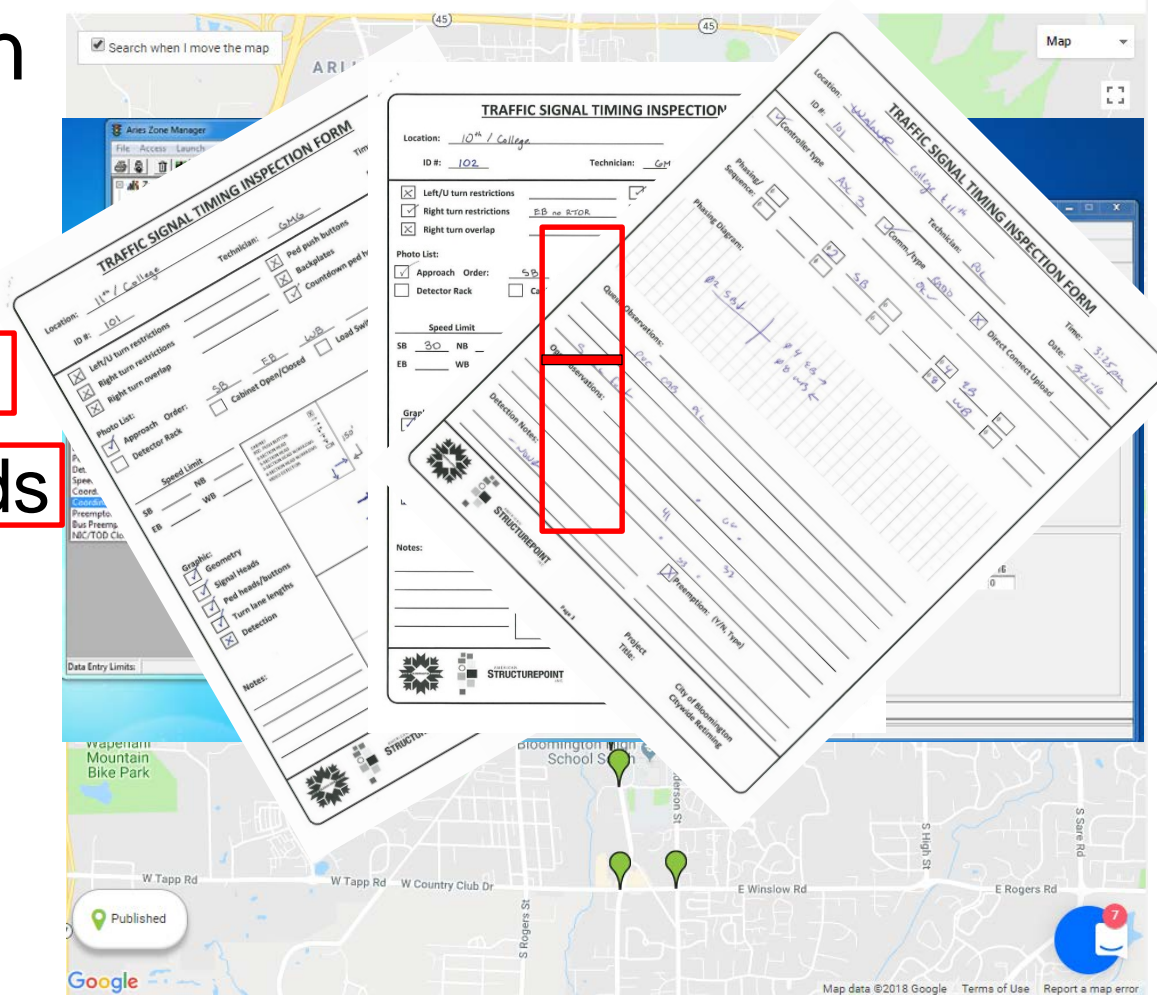


Why Speed Reduction?

- Existing Posted Speed Limit
 - College Avenue 30 mph (Southbound)
 - Walnut Street 25 mph (Northbound)
- Observed Speeds
 - Well in excess of posted
- Existing Coordination Issues
 - Timings
 - Clock Synch

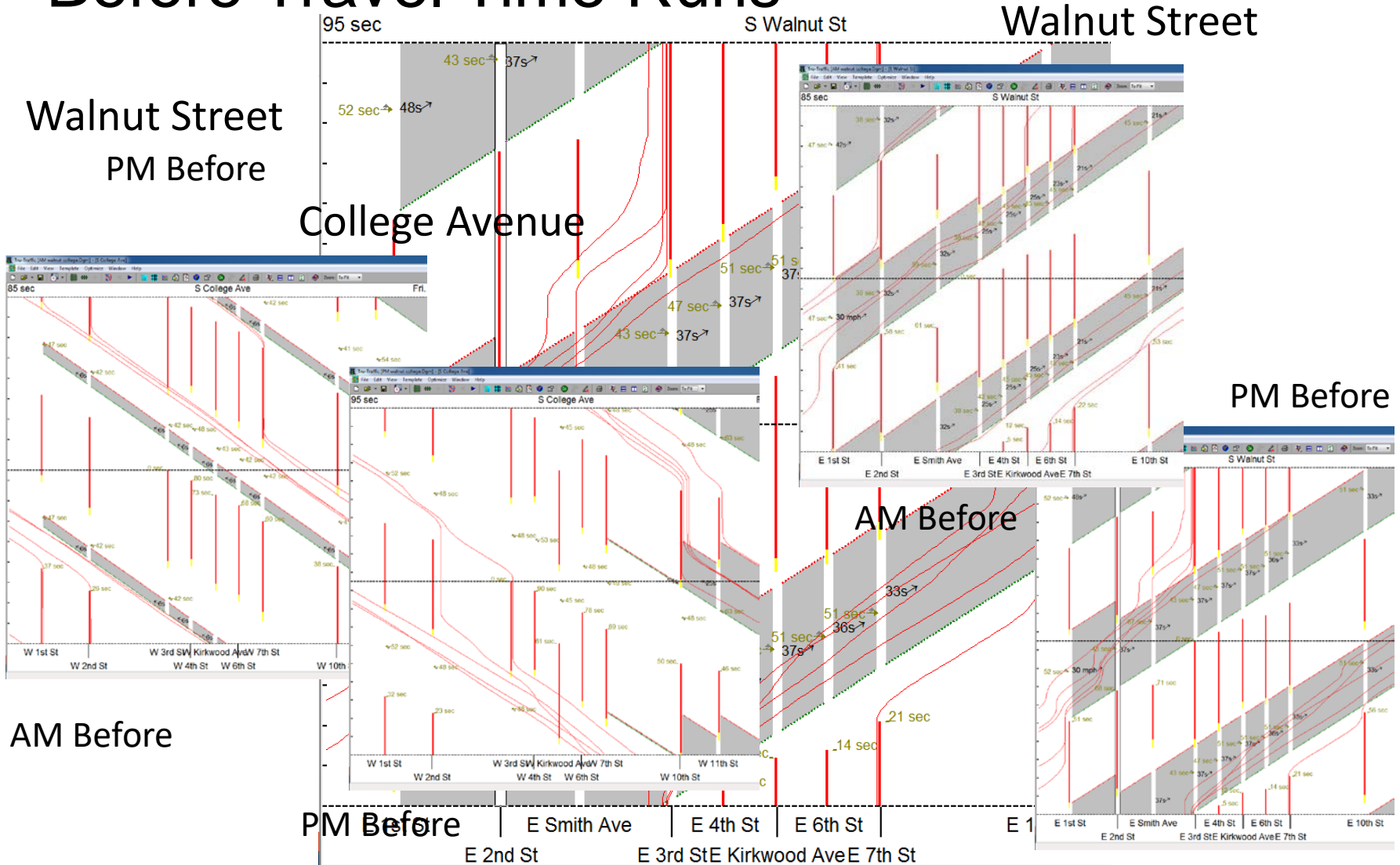
Project Specifics

- Data Collection
 - Tube Counts
 - TMCs
 - Field Reviews
 - Timing Uploads



Timing Development

- Before Travel Time Runs



Timing Development

- Clearance Compliance

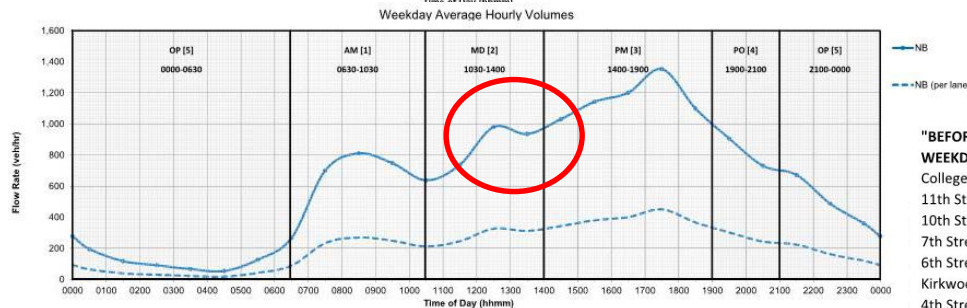
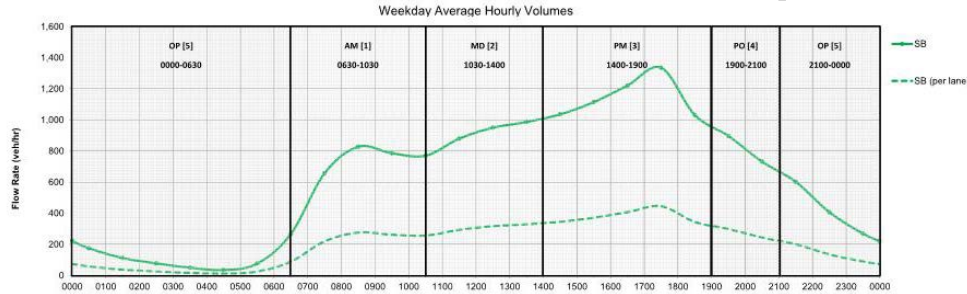
Node	Intersection	Minimum Initial	Yellow Change	All-Red Clearance	Recall Mode	Walk Time	Flashing Don't Walk	by Intersection		Average Clearance Change by Corridor (per Intersection)
								Flashing Don't Walk	Total Clearance Change	
101	N College Ave & W 11th St		X	X	Yell	X	All-F			
102	N College Ave & W 10th St		X	X	4.7	2.7	10.0	8.0		
103	N College Ave & W 10th St		X	X	3.7	3.2	-9.0	9.5		
104	N College Ave & W 7th St		X	X	4.1	5.0	3.0	3.9		
105	S College Ave & W Kirkwood Ave		X	X	1.6	3.8	11.0	13.2		
106	S College Ave & W Kirkwood Ave	X	X	X	1.6	3.6	8.0	10.0	8.2	
107	S College Ave & W 4th St		X	X	1.1	4.4	9.0	12.3		
108	S College Ave & W 3rd St		X	X	1.3	2.0	11.0	11.7		
109	S College Ave & W 2nd St		X	X	1.2	2.3	3.0	4.1		
201	N Walnut St & W 10th St		X	X	3.7	3.2	-2.0	-2.5		
202	N Walnut St & W 7th St		X	X	4.1	4.5	4.0	10.1		
203	N Walnut St & W 6th St		X	X	1.0	1.5	4.0	4.5		
204	S Walnut St & W Kirkwood Ave		X	X	1.6	2.5	4.0	4.9	5.8	
205	S Walnut St & W 4th St	X	X	X	4.1	3.7	6.0	5.6		
206	S Walnut St & W 3rd St	X	X	X	4.1	3.7	13.0	12.6		
207	S Walnut St & W 2nd St	X	X	X	3.7	1.9	-9.0	-10.8		
208	S Walnut St & W 1st St	X	X	X	0.8	1.9	3.0	5.7		

92% of Controller Timings Changed

Pedestrian Recall & Rest-In-Walk

Timing Development

• Schedule Development



“Before”

“BEFORE” SCHEDULES

WEEKDAYS*

College Avenue
11th Street
10th Street
7th Street
6th Street
Kirkwood Avenue
4th Street
3rd Street
2nd Street
1st Street

* Pattern 1 [75s] runs all weekend

12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am

“After”

“AFTER” SCHEDULES

WEEKDAYS*

College Avenue
11th Street
10th Street
7th Street
6th Street
Kirkwood Avenue
4th Street
3rd Street
2nd Street
1st Street

* Pattern 5 [80s] runs all weekend

* Westbound left-turn omitted

12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am

Timing Development

- Timing Optimization
 - Cycle/Split/Offset

The screenshot displays the 'Select Cycle Lengths' window in a traffic signal timing software. It features a table of cycle lengths and a detailed 'PHASING SETTINGS' table for a 2-SBTL phasing.

Cycle Length	Perform Index	Queue Delay
50	80	0
60	61	0
70	49	0
80	53	0
90	56	0
100	60	0
110	63	0
120	61	0
130	57	0
140	66	0
150	68	0

NODE SETTINGS	
Node #	102
Zone:	1
X East (ft):	3108243
Y North (ft):	1429457
Z Elevation (ft):	0
Description	
Control Type	Pretimed
Cycle Length (s):	100.0
Lock Timings:	<input type="checkbox"/>
Optimize Cycle Length:	Optimize
Optimize Splits:	Optimize
Actuated Cycle 90th (s):	100.0
Actuated Cycle 70th (s):	100.0
Actuated Cycle 50th (s):	100.0
Actuated Cycle 30th (s):	100.0
Actuated Cycle 10th (s):	100.0
Natural Cycle(s):	50.0
Max v/c Ratio:	0.57
Intersection Delay (s):	16.2
Intersection LOS:	B
ICU:	0.56
ICU LOS:	B
Offset (s):	25.0
Referenced to:	Begin of Green
Reference Phase:	2 - SBTL
Master Intersection:	<input type="checkbox"/>
Yield Point:	Single
Mandatory Stop On Yellow:	<input type="checkbox"/>

PHASING SETTINGS		2-SBTL	3-WBL	4-EBT	8-WBTL
Minimum Initial (s)		5.0	5.0	5.0	5.0
Minimum Split (s)		25.0	10.0	15.0	15.0
Maximum Split (s)		55.0	15.0	30.0	45.0
Yellow Time (s)		3.2	3.2	3.2	3.2
All-Red Time (s)		1.6	1.7	2.2	2.2
Lagging Phase?		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Allow Lead/Lag Optimize?		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Optimize Phs Weights - Del		1.0	1.0	1.0	1.0
Vehicle Extension (s)		7.0	3.0	5.0	5.0
Minimum Gap (s)		7.0	3.0	5.0	5.0
Time Before Reduce (s)		0.0	0.0	0.0	0.0
Time To Reduce (s)		0.0	0.0	0.0	0.0
Recall Mode		Max	Max	Max	Max
Pedestrian Phase		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Walk Time (s)		7.0	—	7.0	7.0
Flash Dont Walk (s)		11.0	—	8.0	8.0
Pedestrian Calls (#/hr)		0	—	0	0
Dual Entry?		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Fixed Force Off?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
90th %ile Green Time (s)		50 cd	10 mr	25 mr	40 mr
70th %ile Green Time (s)		50 cd	10 mr	25 mr	40 mr
50th %ile Green Time (s)		50 cd	10 mr	25 mr	40 mr
30th %ile Green Time (s)		50 cd	10 mr	25 mr	40 mr
10th %ile Green Time (s)		50 cd	10 mr	25 mr	40 mr

Dilemma Vehicles	% Dilemma Vehicles	Average Spd (mph)
331	2%	16
317	2%	17
280	2%	19
247	2%	18
218	2%	17
209	2%	17
247	2%	17
244	2%	17
281	2%	17
214	2%	16
194	1%	16

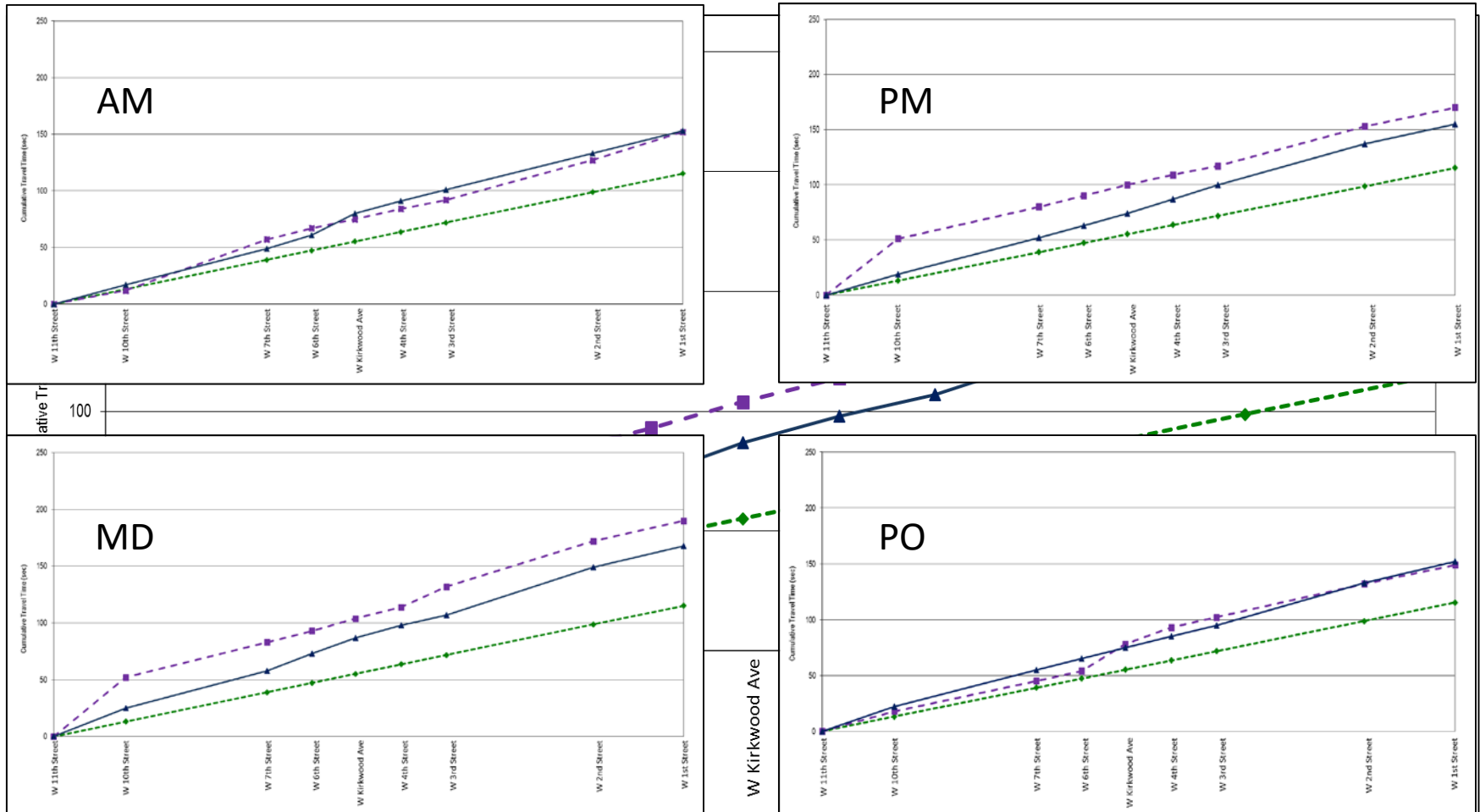
Timing Implementation

- Download New Timings
- In-Field Fine Tuning
- Travel Time Runs
- Observe All Patterns



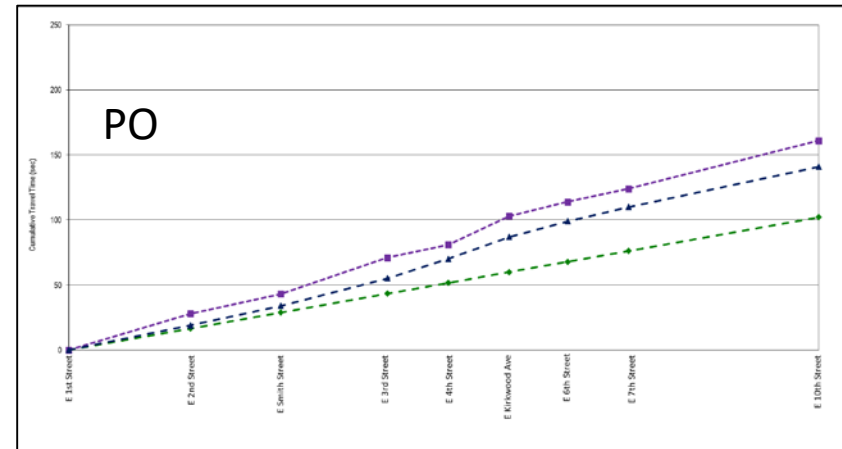
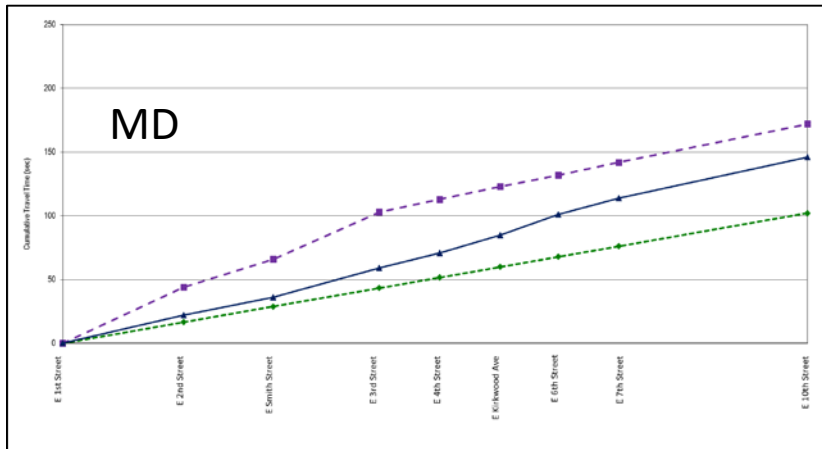
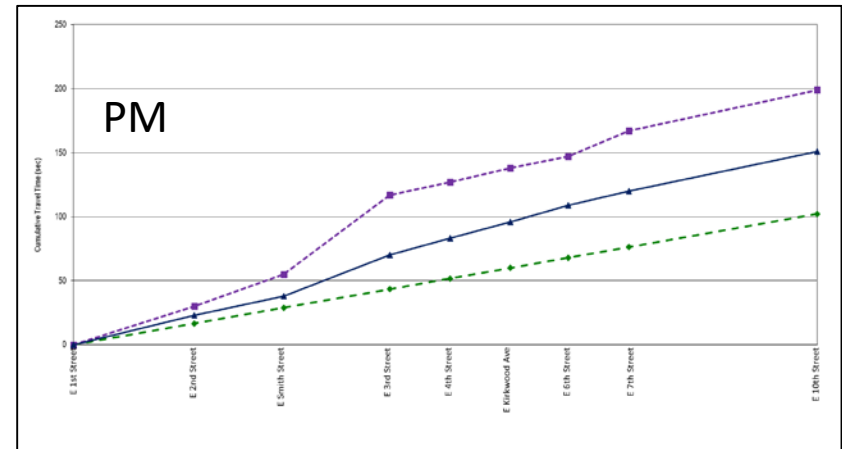
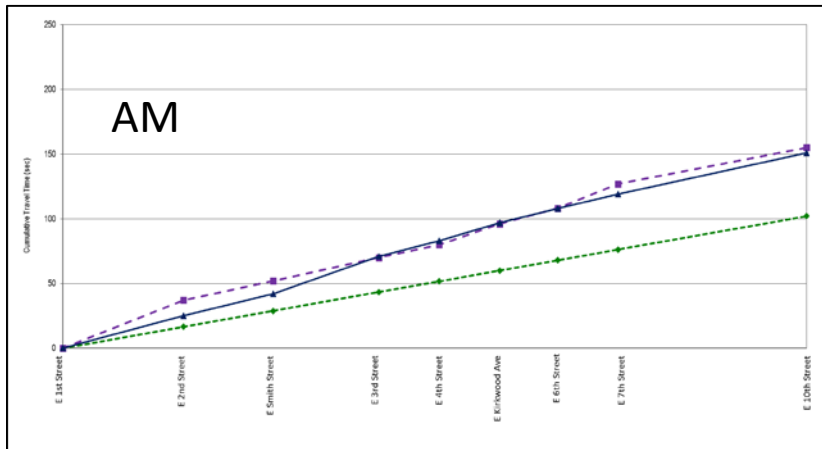
Average Travel Time & Delay

College Avenue Before & After Comparison MD





Average Travel Time & Delay

Walnut Street Before & After Comparison



Project Results

- **Standard Compliance** ✓
 - Yellow, All-Red, Walk, Don't Walk
 - Develop Citywide Standard Controller Timings
- **Progression Speed** ✓
 - Reduced (Noted by Citizens and Staff)
 - Multi-Modal (bicycle and pedestrians)
- **Minimize Stops and Delay** ✓
 - Delay  52,000 hours (9%)
 - Stops  8.6 million stops (14%)

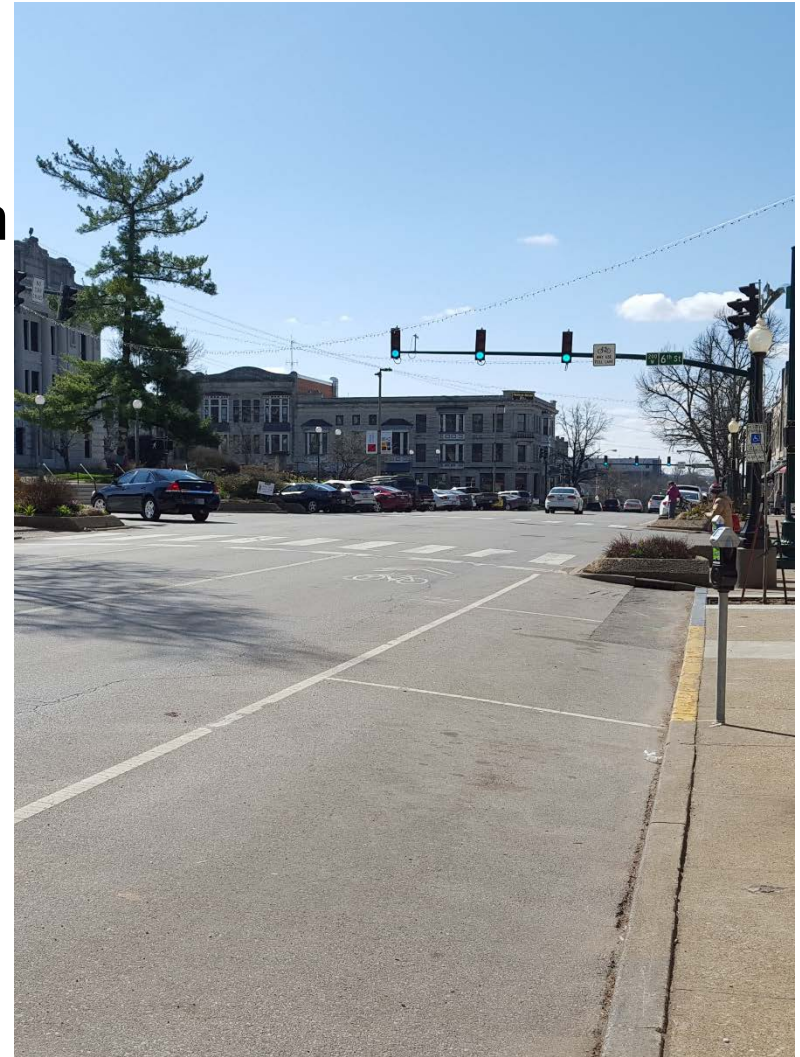
Benefit-Cost Analysis

(5-year Project Life)

- **Benefits – Network Performance Measures**
 - **~\$600,000**
- **Costs**
 - **~\$50,000*** (**portion from Citywide retiming*)
- **B:C Ratio**
 - **12:1** College Avenue/Walnut Street
 - **17:1** Citywide Retiming

Lessons Learned

- Continually Adaptable
 - Signal Timing \neq Construction
- Educate Traveling Public
 - “I stopped at every signal!”
 - “It’s not working right!”
- Maintenance
 - Keep staff involved/informed



Perceived vs. Actual Issues

- **Perceived Issues – No Complaints**
 - Debated/discussed strategy prior to implementation
 - Removed overnight “flash” Citywide
- **Actual Issues – Complaints**
 - Removing protected phasing (5-section heads)
 - Reducing progression speed

City Feedback

- Expect updates
- Expect to find unrelated issues
- Keep local staff involved
- Change is hard ...sometimes
- Goals met

