CEE 416 FINAL PROJECT REPORT

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Executive Summary

Due to the construction of the new Transportation Safety Research and Development building at its new location from Wright St and 4th St to Goodwin Ave and University Ave we at E&M Traffic Consulting Inc. have been hired by the Safe Campus Development company to prepare a TIS report for the resulting traffic changes. The traffic changes will be composed of a relocated Route 150 to Wright St and 4th St, the limitation of vehicular traffic on Springfield Ave beginning at 4th street to 50 vph, and the new building construction. Anticipating a design year of 2023, the building garage will have only one entrance/exit as the peak hour will most likely result in 85% departure and 15% arrival at peak hour. The project began by collecting field data on existing traffic at signalized intersections (total of 6) and conducting balanced volumes procedures on this data in order to understand the changes necessary to accommodate for the building construction. The project is designed for the year 2023, thereby using a growth factor of 2% the volumes were updated. Trip generation was obtained by the size of the TSRD and Trip Generation Handbook. The purpose of the trip generation values were to be added data points for traffic generation in combination with the field data to accommodate those that work in the new TSRD center to be accounted for in traffic optimization. The optimization process was handled using HCS simulations to understand present conditions and our purpose is to work the parameters to focus on establishing a LOS C for all approach and intersection delays juxtaposed to this project. The results of changing the signal timing and the phase plans for the corresponding intersections led to our conclusion that no significant geometric change or construction is necessary, rather just a reallocation of movement and time on lanes. The costs for our proposed project come out to be approximately $24,500 considering the technician rate and standard for signal timing change fees.

Introduction

A traffic study is necessary to determine what improvements and changes need to be made to optimize traffic flow after the construction of a new building on the corner of Goodwin and University Ave, the change of Route 150 going from University south to Springfield via Fourth St. rather than its current route on Wright St, and the limitation of Springfield Ave to buses and service vehicles. The traffic study is done by Safe Campus Development Inc. (SCDI) and the new building will be a 400,000 square feet Transportation Safety Research and Development center (TSRD). The building will generate trips arriving from Urbana and Champaign and departing to Champaign and Urbana. The building's exit is onto Goodwin Ave and will use University Ave to depart and arrive. The design year is December of 2023, three years from now. SCDI assumes that external traffic increases by 2% each year for three years, that in the pm peak hour 85% of the trips generated from the building will be exiting and 15% will be entering, and that improvements cannot include adding through lanes or change traffic flow patterns. SCDI also assumes that 60% of the trips generated by the building will come from Champaign and 40% from Urbana. The study focuses on the afternoon peak hours (4-6 pm) and data will be collected for vehicles, buses, bicycles, trucks, but not pedestrians. The six intersections studied will be: 4th St. and Springfield Ave, Wright St. and Springfield Ave, University Ave and 4th St., University Ave and Wright St., University Ave and Goodwin Ave, and Springfield Ave and 6th St.

Goals and Objectives

The objective of the study is to begin with field data of trips at the six intersections surrounding the proposed location of the TSRD building, balance that field data, and extrapolate it to the year 2023. Next, SCDI will determine the trips generated from the new building, combine the trips with the external balanced data, and finally include the changes of the Springfield Ave traffic limitations

and the relocation of Route 150 to have combined data to be used in the Highway Capacity Software (HCS). HCS will then use signal timings and phase plans from the field and the combined volumes to determine the delay and level of service of each intersection and then find what improvements are necessary to decrease the delay and optimize the level of service at each intersection.

Procedure

The field data was collected by six different groups, one for each intersection. Each group went to their respective intersection to collect data at 4-6 pm on Tuesday through Thursday as those days have the best data for workdays. The number of cars, buses, large trucks, and bicycles were counted for each movement in 15 minutes intervals for two hours. The movements were from north, south, east, or west and could be a movement through the intersection or turning right or left. Pedestrian data was not counted. Each intersection's geometry was drawn with indications of what movements were allowed. The groups found the cycle length, the green, yellow, red, and all red times for all four approaches by timing the signals 20-30 times for accurate data. The groups determined the phase plan at each intersection and noted whether there was a protected left or permitted left movement. The signals were determined to be either pretimed or actuated or semi-actuated.

Due to the fact that the six groups collected their data on different days, the volumes needed to be balanced so that all trips match each other at the six intersections. The intersection at 4th and University Ave was selected as the control intersection that the other five intersections would be modified to match those volumes. The volumes were balanced by starting at 4th and University and working east and through University and Wright to Goodwin and University. Then starting at 4th and University, they were balanced by working south and then east through 4th and Springfield

over to 6th and Springfield and finally Wright and Springfield. As an example for what was done to balance the intersections, if the eastbound through movement at 4th and University was 320 cars, the southbound left was 12 and the northbound right was 14, the total number of cars moving east to University and Wright would be 320 + 12 + 14 = 346 cars then the eastbound through for University and Wright would be the 346 total cars minus the eastbound left and right turns. This procedure continued through all the intersections until they matched up.

Once all the intersections were balanced, they needed to be updated to the 2023 volumes as the traffic is assumed to grow by 2% each year. Using equation 1 as the growth equation, the 2020 volumes were updated to the 2023 volumes by using the 2% growth rate percentage and the three years of growth.

$$2023\ Volume = 2020\ Volume + 2020\ Volume * ((1 + 0.02)^3 - 1) \quad 1)$$

For the peak hour factor, the volumes at the intersection of University and 4th were looked at. All the movements of the cars in the two hours were summed up to a total of 3322 cars between 4-6pm. Next, each 15-minute period was summed up to see which was the largest which was 5-5:15 pm at 445 cars. To find the peak hour factor, the 3322 cars was divided by eight times the 445 cars to get a peak hour factor of 0.933 as seen in equation 2. The 445 cars in the peak 15-minute period were multiplied by eight instead of four because the data collection was over two hours, not one.

$$\frac{3333\ cars\ in\ two\ hours}{8\frac{15\ minute\ periods}{two\ hours} * 445\ cars\ in\ peak\ 15\ minute\ period} = Peak\ Hour\ Factor = 0.933 \quad 2)$$

To find the trips generated by the TSRD, the Trip Generation Handbook was used. We used the 1,000 square foot research and development center on a weekday at the pm hour with 15% entering and 85% exiting, page 1384 in the handbook. The equation from the handbook can be seen in equation 3 where T is the number of trips generated and X is the number of 1,000 Square feet there are in the research and development center, in this case the TSRD is 400,000 square feet so X is

equal to 400 as seen in equation 4. Equation 5 shows that 417 trips will be generated by the new building and must be considered for the combined volumes.

$$Ln(T) = 0.83 * Ln(X) + 1.06 \quad 3)$$

$$Ln(T) = 0.83 * \ln(400) + 1.06 \quad 4)$$

$$e^{6.033} = 417\ trips\ generated \quad 5)$$

With a total of 417 trips generated, we know that 85% of the trips, or 354 trips, will be exiting the building and 15% of the trips, or 63 trips, will arrive at the building during the pm peak hour. These trips will come from and leave onto University Ave with 60% to or from Champaign and 40% to or from Urbana. This means that 212 trips will depart from the building west on University, 142 trips depart from the building east on University, 38 trips arrive from Champaign on University, and finally 25 trips arrive from Urbana on University. These trips are simplified in Table 1 below.

	Arrive from to TSRD (trips)	Depart to from TSRD (trips)
Champaign	38	212
Urbana	25	142

Table 1. Trips generated arriving to and departing from TSRD

These generated trips to and from the new building were added into the 2023 volumes assuming the trips all come from University Ave, the generated trips leaving the building were added to the through movements going east and west depending on which city they were coming from. Similarly, the generated trips arriving to the building were assumed to come from the through movements on University Ave.

With the combined volumes, the relocation of Route 150 and limitations of vehicular traffic on Springfield Ave needed to be considered for the final combined volumes. To do this, we assumed

that there would be 50 vehicles per hour in both the eastbound and westbound directions for Springfield Ave. We also assumed truck percentage was 2% and bus percentage was 1 % on all movements.

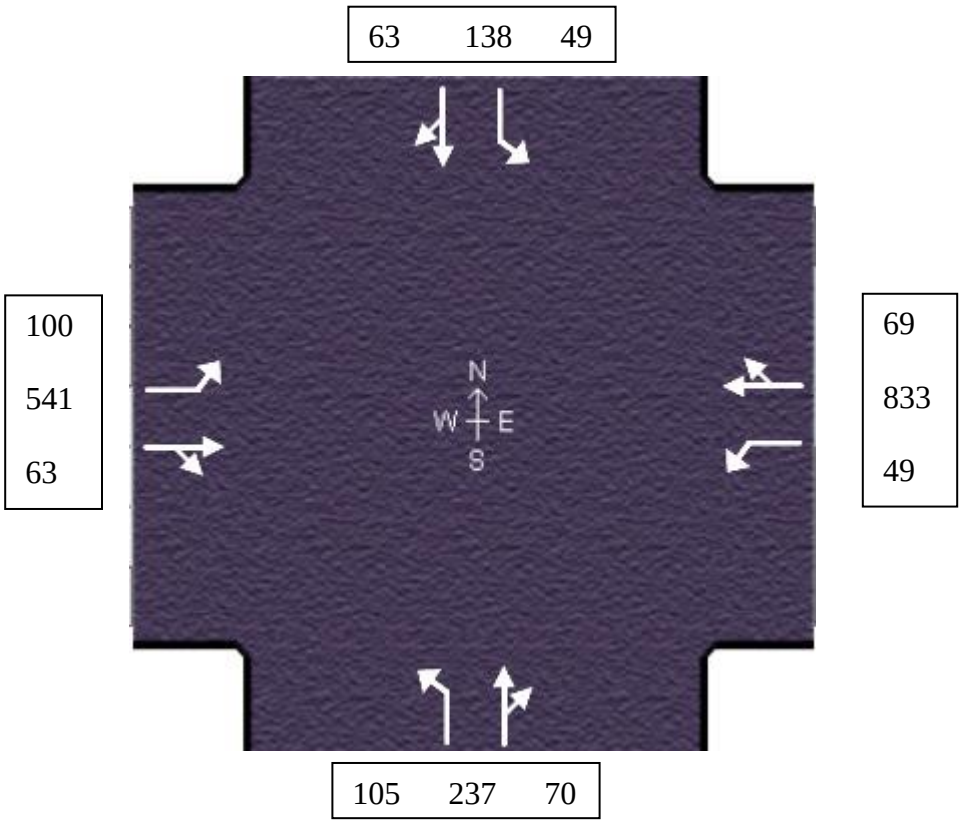
With the combined volumes and the field signal timing and phase plans, we used the Highway Capacity Software to optimize each intersection and reduce the delay. In the HCS software, we assumed that the speed limit for all intersections was 35 mph, a detector length of 40 ft, a peak hour factor of 0.92 for all intersections, and a lane width of 12 feet. We entered the combined volumes for each intersection as well as the geometry, phase plan, and signal timing. Next, we took note of the delay and level of service. Finally, we tried different timing and phase improvements to decrease the delay and took note of the improvements and the improved delay and improved level of service.

Traffic Information

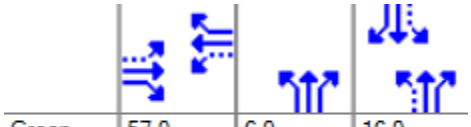
The following section will provide a pictorial representation of all the intersections studied under both external and combined conditions. The Arrival and Departure graphics show the traffic information on the volumes for each direction. Below each graphic is a phase diagram with timing details, in the combined section are the improved phase plans for certain intersections that sometimes required appending more phases.

EXTERNAL: (Volume in vph)

4th and Springfield Arrival and Departure Volumes

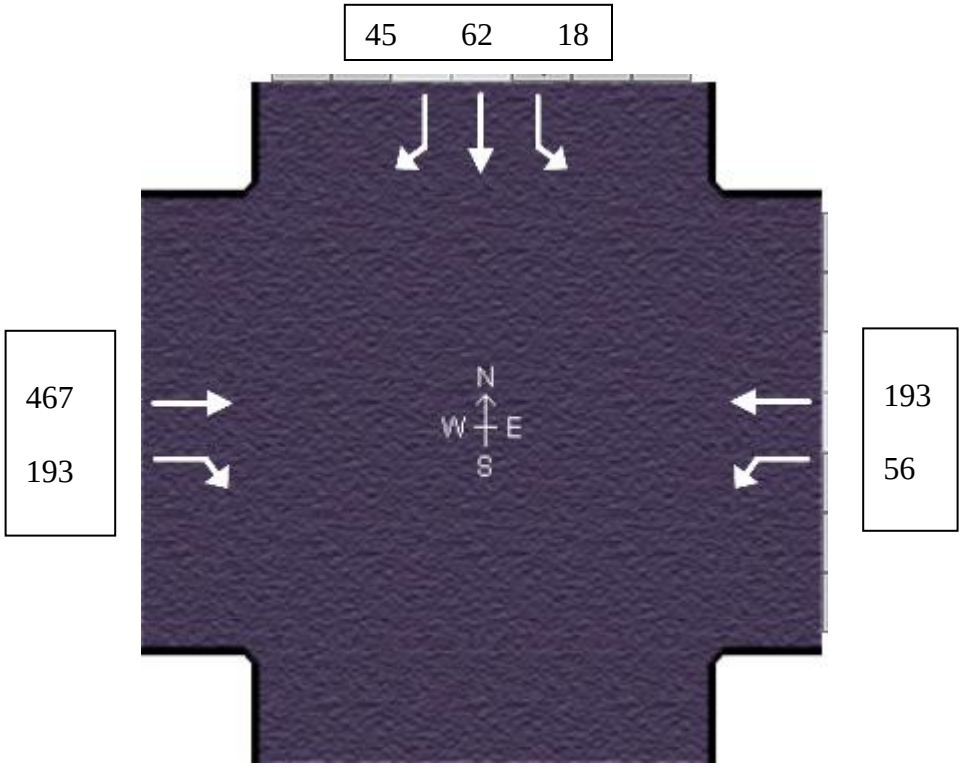


4th and Springfield Phase Diagram



Green	57.0	6.0	16.0
Yellow	3.0	0.0	3.0
Red	2.0	0.0	2.0

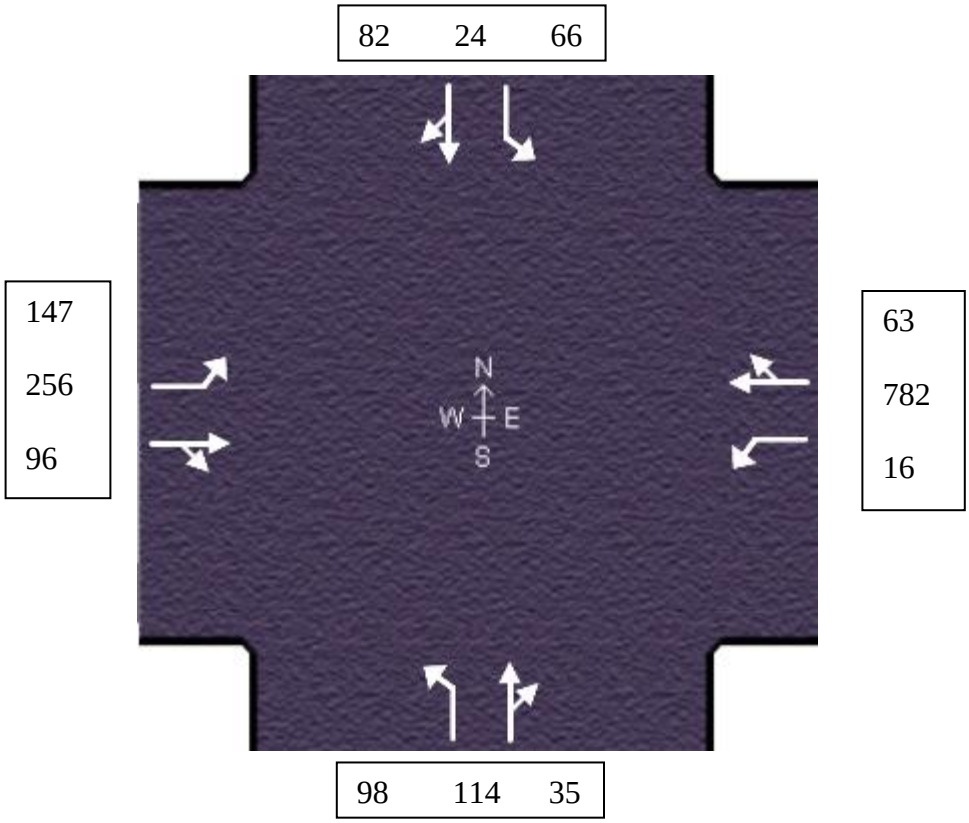
6th and Springfield Arrival and Departure Volumes



6th and Springfield Phase Diagram

Green	6.0	84.0	8.0
Yellow	0.0	3.2	3.0
Red	0.0	2.2	2.2

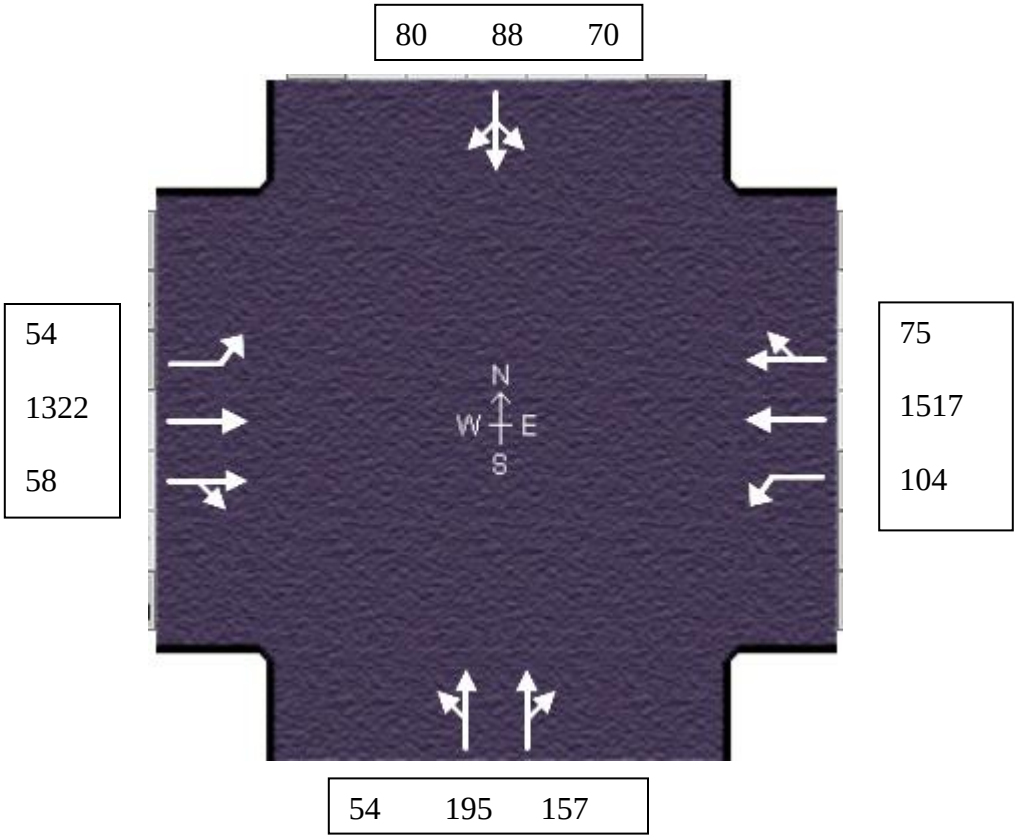
Wright and Springfield Arrival and Departure Volumes



Wright and Springfield Phase Diagram

Green	6.0	74.0	6.0	13.0
Yellow	3.0	3.0	3.0	3.0
Red	0.0	2.5	0.0	2.5

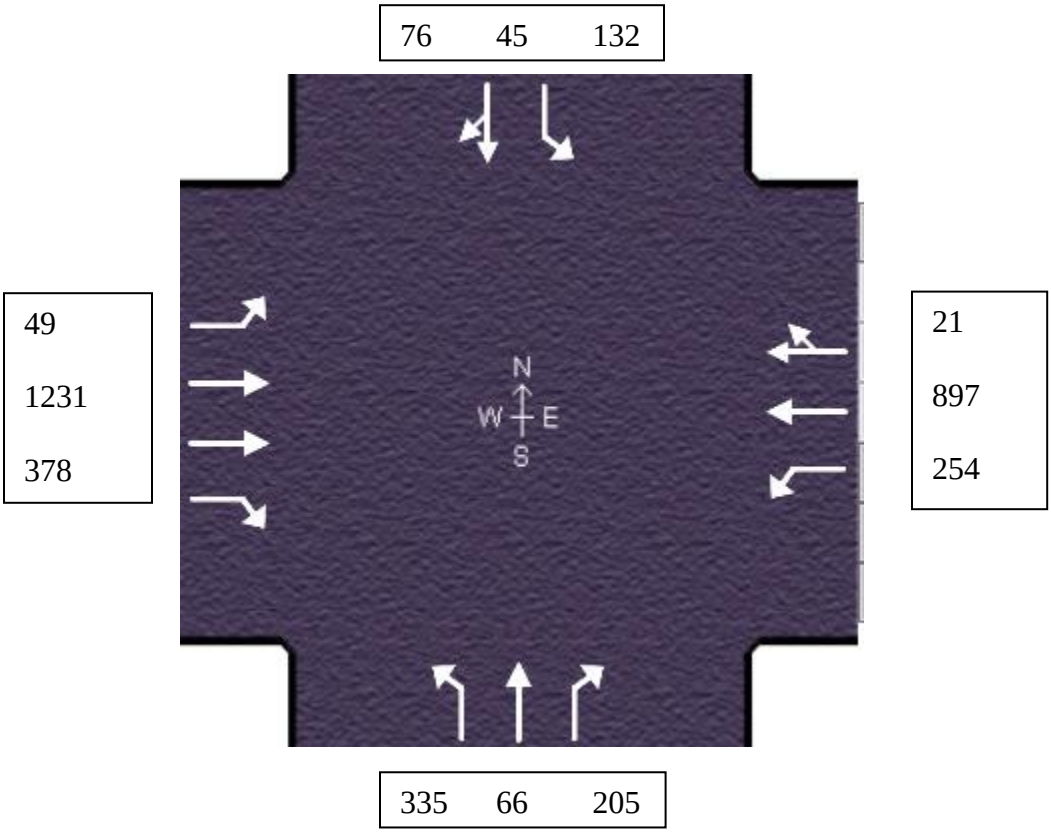
University and 4th Arrival and Departure Volumes



University and 4th Phase Diagram

Green	50.0	30.0	0.0	0.0	0.0	0.0
Yellow	2.0	2.5	0.0	0.0	0.0	0.0
Red	1.5	1.0	0.0	0.0	0.0	0.0

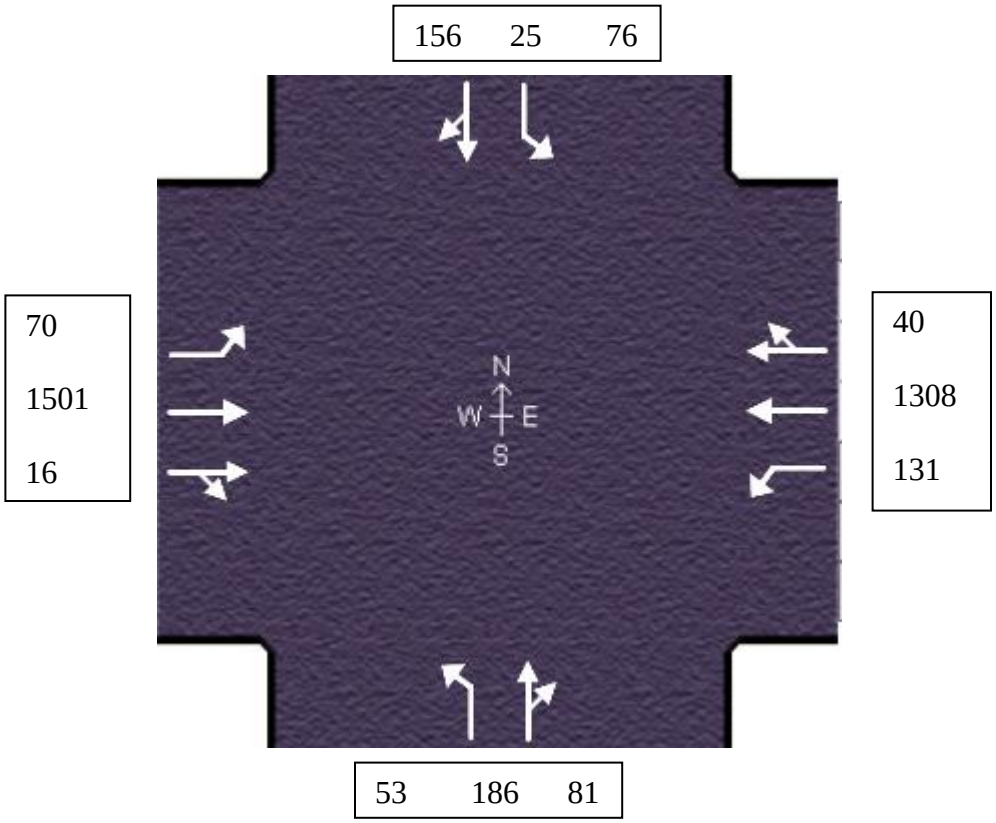
University and Goodwin Arrival and Departure Volumes



University and Goodwin Phase Diagram

Green	7.0	55.0	10.0	25.0
Yellow	3.2	3.2	3.2	3.2
Red	0.0	0.0	0.0	0.0

University and Wright Arrival and Departure Volumes

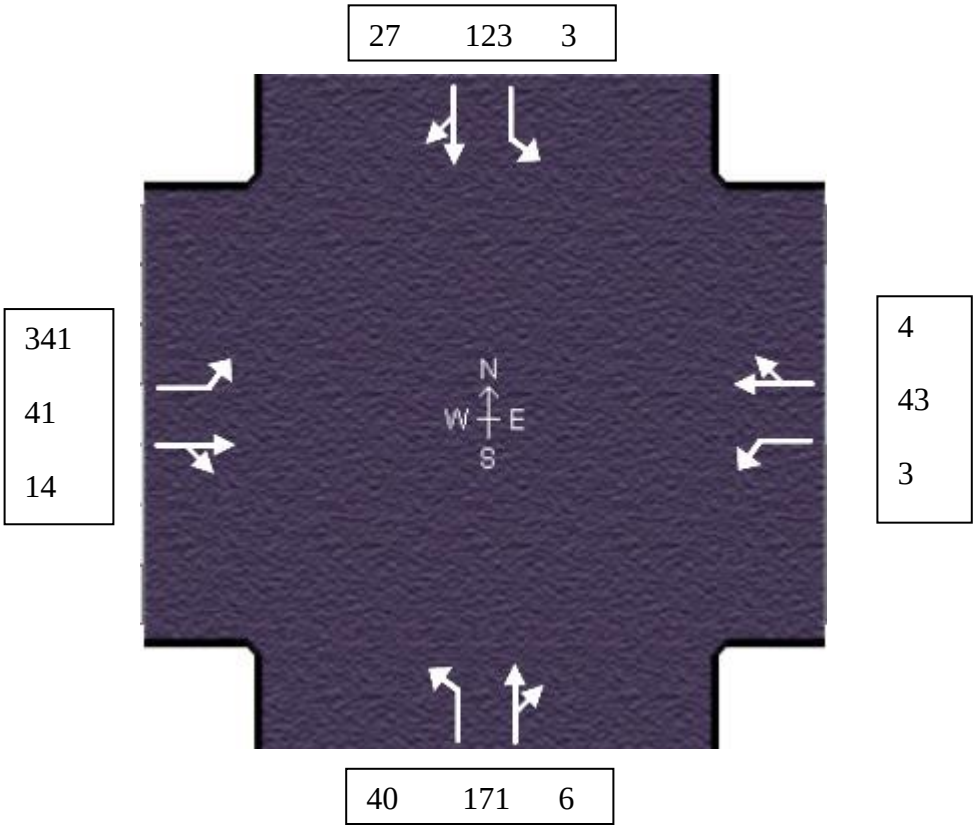


University and Wright Phase Diagram

Green	52.0	18.0
Yellow	1.0	2.0
Red	1.0	1.5

COMBINED: (Volume in vph)

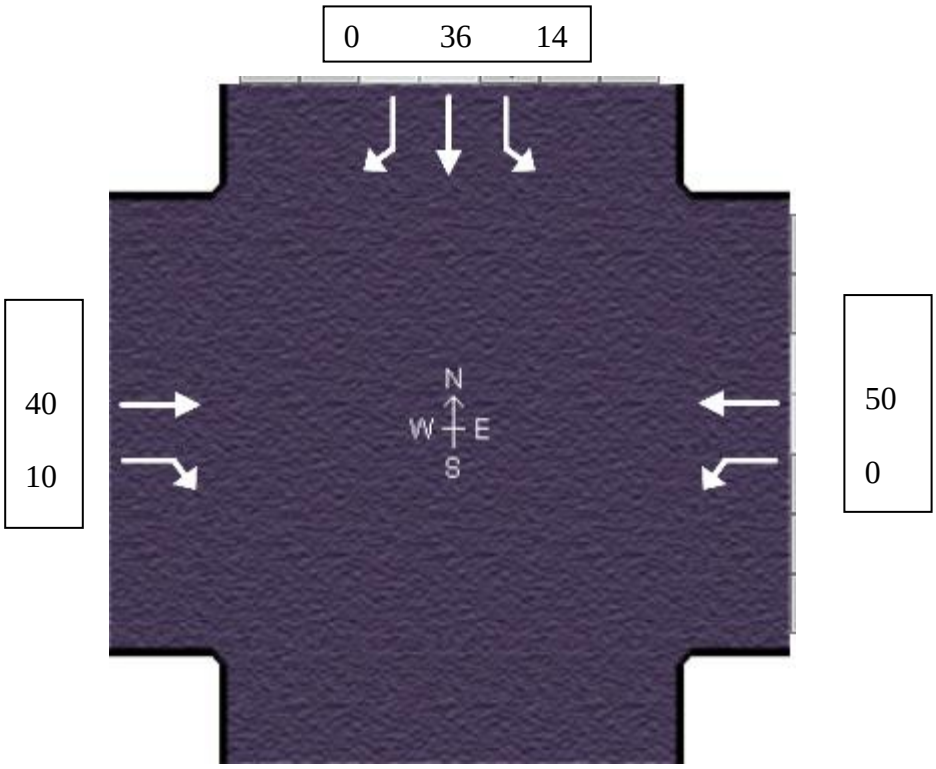
4th and Springfield Arrival and Departure Volumes



4th and Springfield Phase Diagram

Green	60.0	6.0	17.0
Yellow	3.0	0.0	3.0
Red	2.0	0.0	2.0

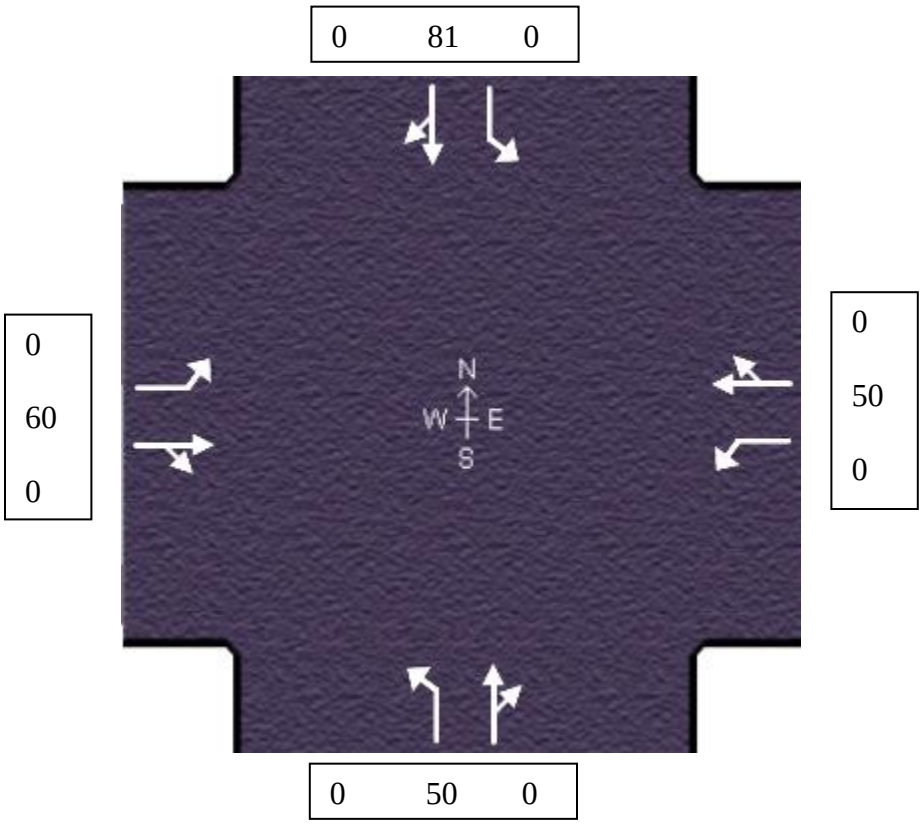
6th and Springfield Arrival and Departure Volumes



6th and Springfield Phase Diagram

Green	0.0	84.0	19.0
Yellow	0.0	3.2	3.0
Red	0.0	2.2	2.2

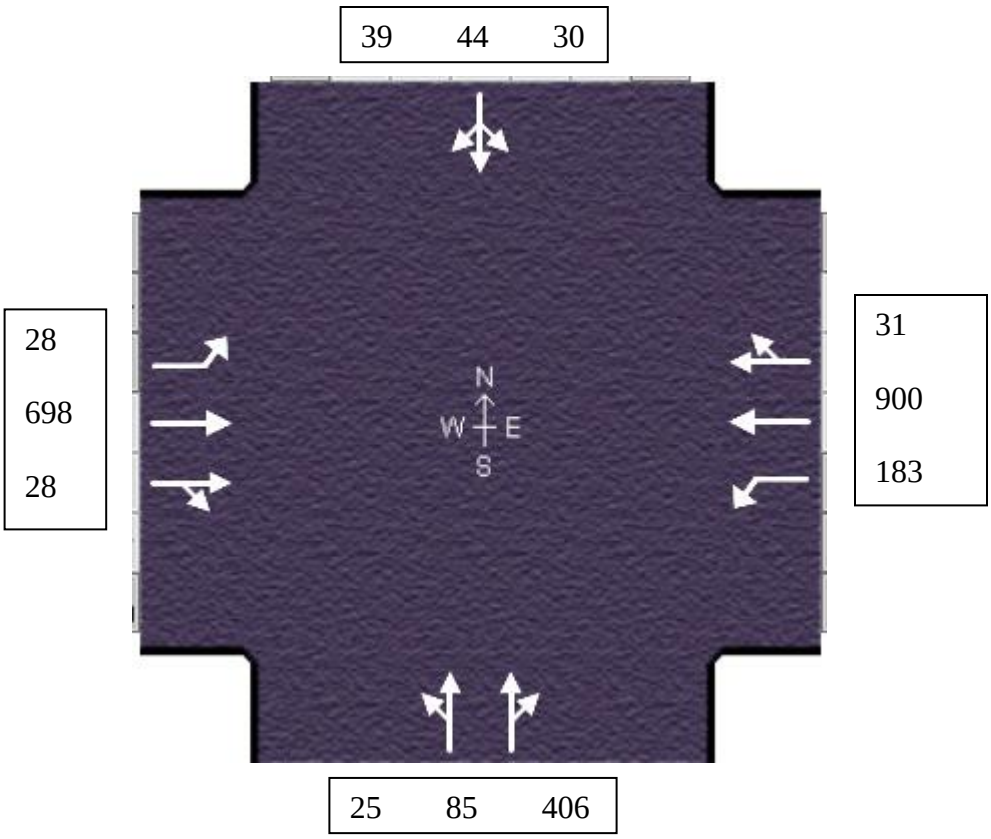
Wright and Springfield Arrival and Departure Volumes



Wright and Springfield Phase Diagram

Green	0.0	40.0	0.0	39.0
Yellow	3.0	3.0	3.0	3.0
Red	0.0	2.5	0.0	2.5

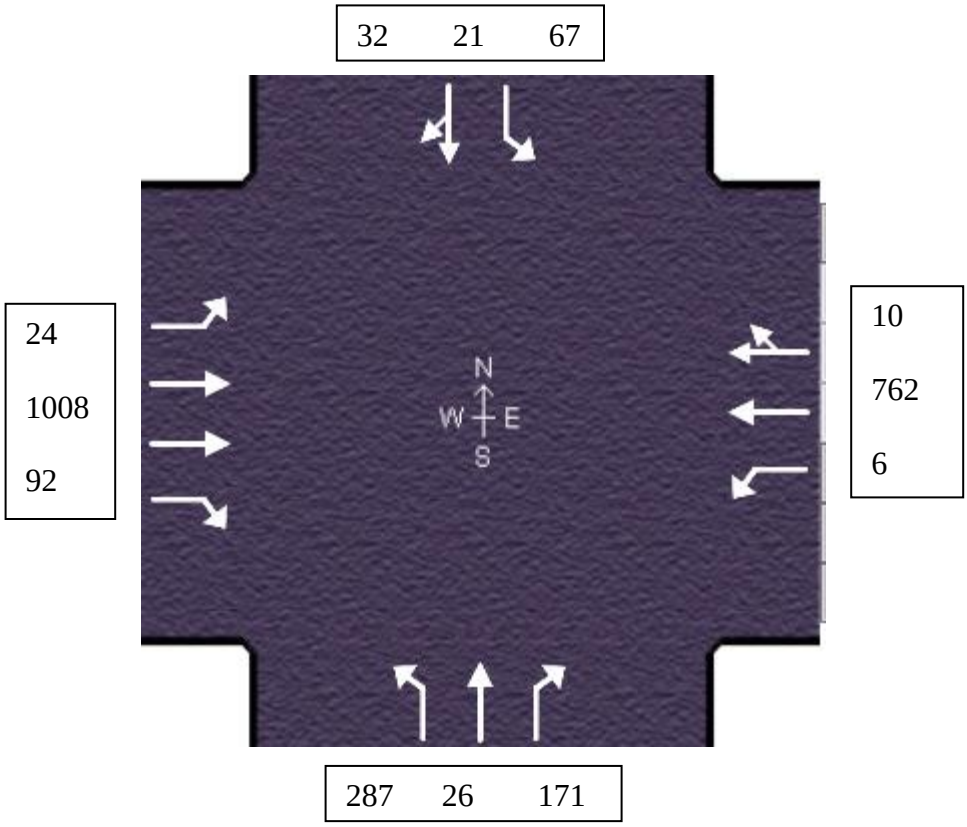
University and 4th Arrival and Departure Volumes



University and 4th Phase Diagram

Green	45.0	35.0
Yellow	2.0	2.5
Red	1.5	1.0

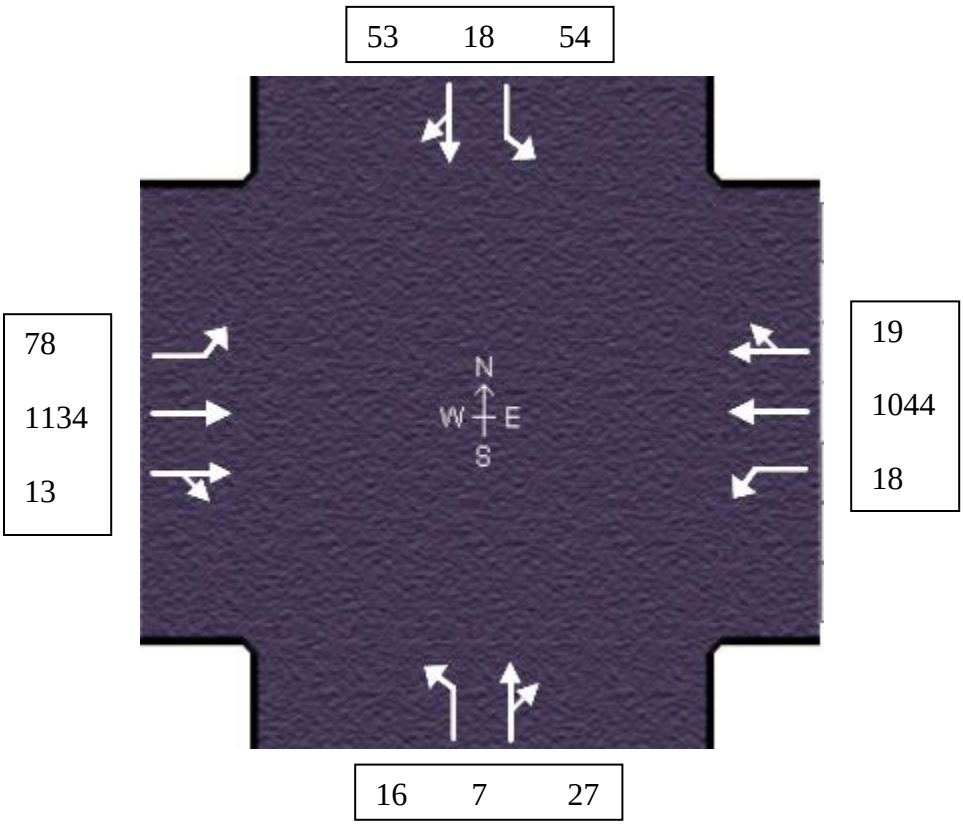
University and Goodwin Arrival and Departure Volumes



University and Goodwin Phase Diagram

Green	8.0	52.0	8.0	2.0	29.0
Yellow	3.2	3.2	3.2	0.0	3.2
Red	0.0	0.0	0.0	0.0	0.0

University and Wright Arrival and Departure Volumes



University and Wright Phase Diagram

Green	48.0	15.0
Yellow	1.0	2.0
Red	1.0	1.5

Results

External Condition

As seen in Table 2, the intersection delay for 4th St. and Springfield Ave external condition before improvements is 25 seconds per vehicle and the level of service is C. For the improved condition (Table 3), the delay dropped to 24.3 seconds per vehicle for a level of service of C. For this small improvement, the north and southbound through movements were increased from 15 seconds to 16 seconds, the northbound left movement decreased from seven seconds to 6 seconds, and the east and westbound movements decreased from 60 seconds to 57 seconds. The cycle length went from a total of 92 seconds down to 89 seconds.

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Level of Service (LOS)	D	B		B	B		C	D		D	D	
Approach Delay, s/veh / LOS	14.7	B		17.9	B		42.4	D		53.0	D	
Intersection Delay, s/veh / LOS	25.0						C					

Table 2. Delay and Level of Service for External Condition of 4th St. and Springfield Ave without Improvements

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Level of Service (LOS)	D	B		B	B		C	D		D	D	
Approach Delay, s/veh / LOS	15.3	B		18.9	B		39.2	D		45.8	D	
Intersection Delay, s/veh / LOS	24.3						C					

Table 3. Delay and Level of Service for External Condition of 4th St. and Springfield Ave with Signal Timing Improvements

As seen in Table 4, the intersection delay for 6th St. and Springfield Ave external condition before improvements is 11.8 seconds per vehicle and the level of service is B. For the improved condition (Table 5), the delay dropped to 8.6 seconds per vehicle for a level of service of A. For the signal timing improvement, the southbound through movement was decreased from 19 seconds to 8 seconds, changing the total cycle length of 120 down to 109 seconds.

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Level of Service (LOS)		A	A	A	B					D	D	D
Approach Delay, s/veh / LOS	7.7	A		10.3	B		0.0			45.2	D	
Intersection Delay, s/veh / LOS	11.8						B					

Table 4. Delay and Level of Service for External Condition of 6th St. and Springfield Ave without Improvements

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Level of Service (LOS)		A	A	A	A					D	E	E
Approach Delay, s/veh / LOS	4.2	A		5.2	A		0.0			58.2	E	
Intersection Delay, s/veh / LOS	8.6						A					

Table 5. Delay and Level of Service for External Condition of 6th St. and Springfield Ave with Signal Timing Improvements

As seen in Table 6, the intersection delay for Wright St. and Springfield Ave external condition before improvements is 103.2 seconds per vehicle and the level of service is F. For the improved condition (Table 7), the delay dropped to 25.8 seconds per vehicle for a level of service of C. For the signal timing improvements, the eastbound left movement was decreased from eight seconds to 6 seconds, the east and westbound through movements were increased from 45 seconds to 74 seconds while the north and southbound through movements were decreased from 39 seconds to 13 seconds, and the northbound left movement was decreased from seven seconds to six seconds. The cycle length stayed at 116 seconds.

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Level of Service (LOS)	E	C		C	F		C	C		C	C	
Approach Delay, s/veh / LOS	33.2	C		181.7	F		22.1	C		28.1	C	
Intersection Delay, s/veh / LOS	103.2						F					

Table 6. Delay and Level of Service for External Condition of Wright St. and Springfield Ave without Improvements

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Level of Service (LOS)	C	A		A	C		D	D		D	E	
Approach Delay, s/veh / LOS	11.3	B		20.9	C		48.1	D		60.4	E	
Intersection Delay, s/veh / LOS	25.8						C					

Table 7. Delay and Level of Service for External Condition of Wright St. and Springfield Ave with Signal Timing Improvements

As seen in Table 8, the intersection delay for University Ave and 4th St. external condition before improvements is 20.4 seconds per vehicle and the level of service is C. For the improved condition (Table 9), the delay increased to 21.7 seconds per vehicle for a level of service of C. Although, this may seem counterintuitive this method actually decreased the approach delay for SB traffic by nearly 13 seconds, improving it from LOS D to LOS C. This small improvement was accomplished by increasing the the north and southbound through movements from 22 to 30 seconds and reducing yellow and All red times and the green time by 2 seconds in EW direction. The cycle length changed from 85.1 to 87 seconds overall.

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Delay, s/veh / LOS	15.0		B	18.4		B	32.2		C	47.5		D
Intersection Delay, s/veh / LOS	20.4						C					

Table 8. Delay and Level of Service for External Condition of University Ave and 4th St. without Signal Timing Improvements

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Delay, s/veh / LOS	18.4		B	23.1		C	23.7		C	28.2		C
Intersection Delay, s/veh / LOS	21.7						C					

Table 9. Delay and Level of Service for External Condition of University Ave and 4th St. with Signal Timing Improvements

As seen in Table 10, the intersection delay for University Ave and 4th St. external condition before improvements is 57.4 seconds per vehicle and the level of service is E. For the improved condition (Table 11), the delay decreased to 34.3 seconds per vehicle for a level of service of C. This major improvement was accomplished by allowing protected NS direction left turns as a phase for 10 seconds before transitioning to a 25 second permitted signal. The cycle length changed from 129.8.1 to 109.8 seconds overall.

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Delay, s/veh / LOS	35.2	D		77.0	E		83.9	F		48.3	D	
Intersection Delay, s/veh / LOS	57.4						E					

Table 10. Delay and Level of Service for External Condition of University Ave and Goodwin Ave without Signal Timing Improvements

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Delay, s/veh / LOS	23.6	C		39.7	D		53.4	D		33.6	C	
Intersection Delay, s/veh / LOS	34.3						C					

Table 11. Delay and Level of Service for External Condition of University Ave and Goodwin Ave with Signal Timing Improvements

As seen in Table 12, the intersection delay for University Ave and Wright St. external condition before improvements is 46.1 seconds per vehicle and the level of service is D. For the improved condition (Table 13), the delay decreased to 13.6 seconds per vehicle for a level of service of B. This major improvement was accomplished by severely cutting down the green time in the EW direction from 79 seconds to 52 seconds and dynamically shifting the profile of the signal. Although the EW directions were LOS A in the unimproved state, the NS directions were LOS F, so a significant change was necessary which resulted doubling the green time for NS directions and subtracting nearly 27 seconds from EW directions. The cycle length changed from 98.8 to 75.5 seconds overall.

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Delay, s/veh / LOS	5.3	A		5.8	A		318.8	F		190.7	F	
Intersection Delay, s/veh / LOS	46.1						D					

Table 12. Delay and Level of Service for External Condition of University Ave and Wright St. without Signal Timing Improvements

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Delay, s/veh / LOS	9.5	A		10.3	B		34.4	C		32.9	C	
Intersection Delay, s/veh / LOS	13.6						B					

Table 13. Delay and Level of Service for External Condition of University Ave and Wright St. without Signal Timing Improvements

Combined Condition

As seen in Table 14, the intersection delay for 4th St. and Springfield Ave combined condition before improvements is 21.1 seconds per vehicle and the level of service is C. For the improved condition (Table 15), the delay dropped to 20.5 seconds per vehicle for a level of service of C. For the improvements, the north and southbound through movements were increased from 15 seconds to 17 seconds and the northbound left movement decreased from 7 seconds down to 6 seconds. The cycle length went up from 92 seconds to 93 seconds.

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Level of Service (LOS)	A	A		A	A		C	C		C	D	
Approach Delay, s/veh / LOS	8.8	A		5.8	A		31.7	C		42.6	D	
Intersection Delay, s/veh / LOS	21.1						C					

Table 14. Delay and Level of Service for Combined Condition of 4th St. and Springfield Ave without Improvements

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Level of Service (LOS)	A	A		A	A		C	C		C	D	
Approach Delay, s/veh / LOS	9.3	A		6.1	A		31.2	C		39.2	D	
Intersection Delay, s/veh / LOS	20.5						C					

Table 15. Delay and Level of Service for Combined Condition of 4th St. and Springfield Ave with Improvements

As seen in Table 16, the intersection delay for 6th St. and Springfield Ave combined condition before improvements is 17.1 seconds per vehicle and the level of service is B. For the improved condition (Table 17), the delay dropped to 16.3 seconds per vehicle for a level of service of B. For the improved condition, the westbound through movement was decreased from 94 seconds to 84 seconds leading to the cycle length to decrease from 120 seconds to 114 seconds.

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Level of Service (LOS)		A	A		A					D	D	
Approach Delay, s/veh / LOS	3.8	A		3.8	A		0.0			43.8	D	
Intersection Delay, s/veh / LOS	17.1						B					

Table 16. Delay and Level of Service for Combined Condition of 6th St. and Springfield Ave without Improvements

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Level of Service (LOS)		A	A		A					D	D	
Approach Delay, s/veh / LOS	4.0	A		4.0	A		0.0			40.8	D	
Intersection Delay, s/veh / LOS	16.3						B					

Table 17. Delay and Level of Service for Combined Condition of 6th St. and Springfield Ave with Improvements

As seen in Table 18, the intersection delay for Wright St. and Springfield Ave combined condition before improvements is 15.8 seconds per vehicle and the level of service is B. For the improved condition (Table 19), the delay dropped to 14.9 seconds per vehicle for a level of service of B. For the improved condition, the east and westbound through movements were decreased from 45 seconds to 40 seconds leading to the cycle length to decrease from 95 seconds to 90 seconds.

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Level of Service (LOS)												
Approach Delay, s/veh / LOS	13.8		B	13.7		B	17.2		B	17.6		B
Intersection Delay, s/veh / LOS	15.8						B					

Table 18. Delay and Level of Service for Combined Condition of Wright St. and Springfield Ave without Improvements

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Level of Service (LOS)												
Approach Delay, s/veh / LOS	14.6		B	14.5		B	15.0		B	15.4		B
Intersection Delay, s/veh / LOS	14.9						B					

Table 19. Delay and Level of Service for Combined Condition of Wright St. and Springfield Ave with Improvements

As seen in Table 20, the intersection delay for University Ave and 4th St combined condition before improvements is 34.8 seconds per vehicle and the level of service is C. For the improved condition (Table 21), the delay dropped to 19.5 seconds per vehicle for a level of service of B. For the improvements, the north and southbound through movements were increased from 22 seconds to 35 seconds and the northbound left movement decreased from 51.9 seconds down to 45 seconds. The cycle length went up from 85.6 seconds to 87 seconds.

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Delay, s/veh / LOS	9.5	A		11.9	B		116.8	F		54.0	D	
Intersection Delay, s/veh / LOS	34.8						C					

Table 20. Delay and Level of Service for Combined Condition of University Ave and 4th St. without Improvements

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Delay, s/veh / LOS	14.5	B		18.5	B		28.4	C		21.3	C	
Intersection Delay, s/veh / LOS	19.5						B					

Table 21. Delay and Level of Service for Combined Condition of University Ave and 4th St. with Improvements

As seen in Table 22, the intersection delay for University Ave and Goodwin Ave combined condition before improvements is 37 seconds per vehicle and the level of service is D. For the improved condition (Table 23), the delay dropped to 26.1 seconds per vehicle for a level of service of C. For the improvements, more phases were added to accommodate for the heavy traffic going EW from all directions. By adding a protected NS left turning phase and an all thru movement N phase of 8 and 2 seconds each respectively (refer to combined phase diagram) the LOS approach delay for the NS direction decreased by nearly 20 seconds both directions. The cycle length decreased from 128.9 seconds to 111.8 seconds.

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Delay, s/veh / LOS	30.0	C		28.0	C		66.2	E		44.2	D	
Intersection Delay, s/veh / LOS	37.0						D					

Table 22. Delay and Level of Service for Combined Condition of University Ave and Goodwin Ave without Improvements

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Delay, s/veh / LOS	24.3	C		22.8	C		34.5	C		29.2	C	
Intersection Delay, s/veh / LOS	26.1						C					

Table 23. Delay and Level of Service for Combined Condition of University Ave and Goodwin Ave with Improvements

As seen in Table 24, the intersection delay for University Ave and Wright St. combined condition before improvements is 7.1 seconds per vehicle and the level of service is A. For the improved condition (Table 25), marginally increased to 7.2 seconds per vehicle for a level of service of A. For the improvements, the north and southbound through movements were increased from 9.8 seconds to 15 seconds and the EW green time movement decreased from 79 seconds down to 48 seconds. The cycle length went down from 98.8 seconds to 68.5 seconds.

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Delay, s/veh / LOS	4.1	A		3.7	A		45.0	D		50.3	D	
Intersection Delay, s/veh / LOS	7.1						A					

Table 24. Delay and Level of Service for Combined Condition of University Ave and Wright St. without Improvements

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Delay, s/veh / LOS	6.2	A		5.7	A		22.5	C		23.5	C	
Intersection Delay, s/veh / LOS	7.2						A					

Table 25. Delay and Level of Service for Combined Condition of University Ave and Wright St. without Improvements

Results Summary

In summary, in order to improve the delay and level of service at the six intersections signal timing and phase improvements were made. The majority of the intersections were improved with signal timing changes, but there were also some phase changes. To estimate the cost, an hourly cost of $75 for a technician is assumed for them to go to an intersection to adjust the signal timing and phases to the improved versions. Each intersection is assumed to take an hour to update the timing and phases for a total of six hours for the six intersections. Travel must also be added and is assumed to be a total of one hour. The total cost is then calculated to be $525 for seven total hours of a technician at $75 an hour.

Conclusions and Recommendations

In order to mitigate the impact of the proposed projects by SCDI we recommend that a majority of the roadway renovations be signal timing improvements in order to efficiently control traffic movement. After conducting the HCS simulations based on both the external and combined conditions we concluded that the most cost effective and efficient solutions would involve both reallocating the green times for certain phases and appending more phases with stricter movements. These decisions were established by adhering to IDOT standards of pursuing a LOS C level; because LOS F is a breakdown condition, LOS E is the bare minimum standard for operational capacity and LOS B is the upper tier of design. Therefore, all the “Improved” sections were optimized for LOS C and any A or B level were a byproduct of already stellar design. After considering all these improvements we also assumed according to the Institute of Transportation Engineers stating that updates to signal timing costed $3000/intersection in 2005 [1]. Adjusting to inflation (33%) the cost per intersection would be about 4000$/intersection in

2023 and the total costs of the transportation aspect of this project can be assumed to be $24,000 plus $525 of technician cost to a total of $24,525 for all intersection changes.

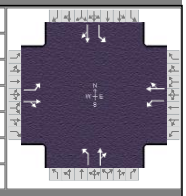
Citations

I. (2007, January 19). National Traffic Signal Report Card: Technical Report 2005. Retrieved December 09, 2020, from https://www.itskrs.its.dot.gov/its/benecost.nsf/ID/215f723db93d293c8525725f00786fd8

Appendix

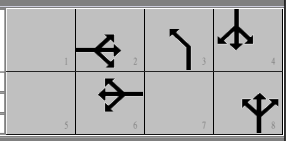
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst	Elliott Wittmeyer	Analysis Date	11/20/2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	4th and Springfield	File Name	4thandSpringfieldunimproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	100	541	63	49	833	69	105	237	70	49	138	63

Signal Information					EB			WB			NB		
Cycle, s	92.0	Reference Phase	2										
Offset, s	0	Reference Point	End	Green	60.0	7.0		15.0	0.0	0.0	0.0		
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.0	0.0		3.0	0.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	0.0		2.0	0.0	0.0	0.0		



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8		4
Case Number		6.0		6.0	1.0	4.0		6.3
Phase Duration, s		65.0		65.0	7.0	27.0		20.0
Change Period, ($Y+R_c$), s		5.0		5.0	0.0	5.0		5.0
Max Allow Headway (MAH), s		3.3		3.3	3.1	3.2		3.2
Queue Clearance Time (g_s), s		54.2		38.3	6.7	18.0		15.6
Green Extension Time (g_e), s		2.9		5.5	0.0	0.0		0.0
Phase Call Probability		1.00		1.00	1.00	1.00		1.00
Max Out Probability		0.74		0.10	1.00	1.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	109	657		53	980		114	334		53	218	
Adjusted Saturation Flow Rate (s), veh/h/ln	574	1792		777	1845		1781	1797		1046	1763	
Queue Service Time (g_s), s	16.0	18.5		3.7	36.3		4.7	16.0		4.6	10.9	
Cycle Queue Clearance Time (g_c), s	52.2	18.5		22.2	36.3		4.7	16.0		13.6	10.9	
Green Ratio (g/C)	0.65	0.65		0.65	0.65		0.26	0.24		0.16	0.16	
Capacity (c), veh/h	226	1169		429	1203		266	430		147	288	
Volume-to-Capacity Ratio (X)	0.481	0.562		0.124	0.815		0.430	0.777		0.363	0.760	
Back of Queue (Q), ft/ln (50 th percentile)	65.4	168.1		17.7	358.5		58.1	209.4		36.7	150.5	
Back of Queue (Q), veh/ln (50 th percentile)	2.6	6.6		0.7	14.1		2.3	8.2		1.4	5.9	
Queue Storage Ratio (RQ) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Uniform Delay (d_1), s/veh	31.3	8.8		14.9	11.9		27.9	32.7		42.3	36.8	
Incremental Delay (d_2), s/veh	7.1	2.0		0.6	6.1		5.0	12.9		6.8	17.1	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (d), s/veh	38.4	10.7		15.5	18.0		32.9	45.6		49.1	53.9	
Level of Service (LOS)	D	B		B	B		C	D		D	D	
Approach Delay, s/veh / LOS	14.7	B		17.9	B		42.4	D		53.0	D	
Intersection Delay, s/veh / LOS	25.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.87	B	1.87	B	1.93	B	1.94	B
Bicycle LOS Score / LOS	1.75	B	2.19	B	1.23	A	0.94	A

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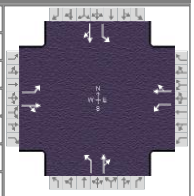
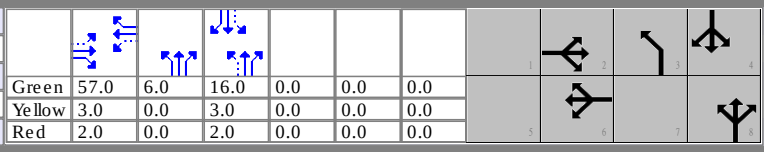
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst	Elliott Wittmeyer	Analysis Date	11/20/2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	4th and Springfield	File Name	4thandSpringfieldimproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	100	541	63	49	833	69	105	237	70	49	138	63

Signal Information			
Cycle, s	89.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	57.0	6.0	16.0	0.0	0.0	0.0						
Yellow	3.0	0.0	3.0	0.0	0.0	0.0						
Red	2.0	0.0	2.0	0.0	0.0	0.0						

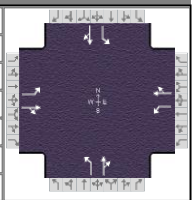
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8		4
Case Number		6.0		6.0	1.0	4.0		6.3
Phase Duration, s		62.0		62.0	6.0	27.0		21.0
Change Period, ($Y+R_c$), s		5.0		5.0	0.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.3		3.3	3.1	3.2		3.2
Queue Clearance Time (g_s), s		54.2		38.3	6.4	17.3		15.7
Green Extension Time (g_e), s		1.6		5.3	0.0	0.0		0.1
Phase Call Probability		1.00		1.00	1.00	1.00		1.00
Max Out Probability		1.00		0.15	1.00	1.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	109	657		53	980		114	334		53	218	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	574	1792		777	1845		1781	1797		1046	1763	
Queue Service Time (g_s), s	16.0	18.5		3.7	36.3		4.4	15.3		4.4	10.3	
Cycle Queue Clearance Time (g_c), s	52.2	18.5		22.2	36.3		4.4	15.3		13.7	10.3	
Green Ratio (*g/C*)	0.64	0.64		0.64	0.64		0.27	0.25		0.18	0.18	
Capacity (*c*), veh/h	214	1148		417	1182		275	444		160	317	
Volume-to-Capacity Ratio (*X*)	0.507	0.572		0.128	0.830		0.415	0.751		0.333	0.689	
Back of Queue (*Q*), ft/ln (50 th percentile)	66.6	168.7		17.8	363.3		55	196.4		34.4	134.7	
Back of Queue (*Q*), veh/ln (50 th percentile)	2.6	6.6		0.7	14.3		2.2	7.7		1.4	5.3	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Uniform Delay (d_1), s/veh	32.3	9.1		15.4	12.3		26.3	31.0		40.1	34.2	
Incremental Delay (d_2), s/veh	8.3	2.1		0.6	6.8		4.6	11.1		5.5	11.6	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	40.6	11.2		16.0	19.1		30.9	42.1		45.6	45.8	
Level of Service (LOS)	D	B		B	B		C	D		D	D	
Approach Delay, s/veh / LOS	15.3	B		18.9	B		39.2	D		45.8	D	
Intersection Delay, s/veh / LOS	24.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.87	B	1.87	B	1.93	B	1.93	B
Bicycle LOS Score / LOS	1.75	B	2.19	B	1.23	A	0.94	A

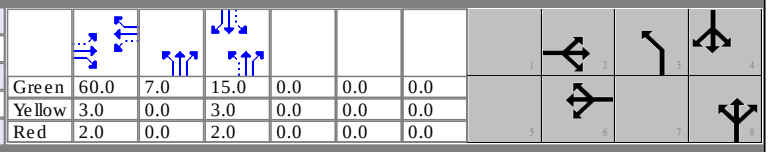
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst	Elliott Wittmeyer	Analysis Date	11/20/2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	4th and Springfield	File Name	4thandSpringfieldunimprovedCombined.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	341	41	14	3	43	4	40	171	6	3	123	27

Signal Information			
Cycle, s	92.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	60.0	7.0	15.0	0.0	0.0	0.0						
Yellow	3.0	0.0	3.0	0.0	0.0	0.0						
Red	2.0	0.0	2.0	0.0	0.0	0.0						

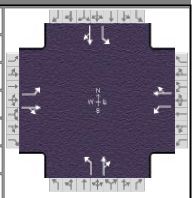
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8		4
Case Number		6.0		6.0	1.0	4.0		6.3
Phase Duration, s		65.0		65.0	7.0	27.0		20.0
Change Period, ($Y+R_c$), s		5.0		5.0	0.0	5.0		5.0
Max Allow Headway (MAH), s		3.2		3.2	3.1	3.1		3.1
Queue Clearance Time (g_s), s		15.3		3.2	3.7	10.1		9.6
Green Extension Time (g_e), s		1.0		1.0	0.0	0.3		0.4
Phase Call Probability		1.00		1.00	1.00	1.00		1.00
Max Out Probability		0.00		0.00	0.74	0.24		0.17

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	371	60		3	51		43	192		3	163	
Adjusted Saturation Flow Rate (s), veh/h/ln	1354	1745		1343	1842		1781	1859		1191	1804	
Queue Service Time (g_s), s	12.4	1.1		0.1	0.9		1.7	8.1		0.2	7.6	
Cycle Queue Clearance Time (g_c), s	13.3	1.1		1.2	0.9		1.7	8.1		1.3	7.6	
Green Ratio (g/C)	0.65	0.65		0.65	0.65		0.26	0.24		0.16	0.16	
Capacity (c), veh/h	948	1138		938	1201		311	445		258	294	
Volume-to-Capacity Ratio (X)	0.391	0.053		0.003	0.043		0.140	0.433		0.013	0.554	
Back of Queue (Q), ft/ln (50 th percentile)	86.6	9.8		0.6	8.2		19.9	98.6		1.7	98.4	
Back of Queue (Q), veh/ln (50 th percentile)	3.4	0.4		0.0	0.3		0.8	3.9		0.1	3.9	
Queue Storage Ratio (RQ) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Uniform Delay (d_1), s/veh	8.1	5.8		6.0	5.7		26.3	29.7		33.2	35.4	
Incremental Delay (d_2), s/veh	1.2	0.1		0.0	0.1		0.9	3.1		0.1	7.3	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (d), s/veh	9.3	5.9		6.0	5.8		27.2	32.8		33.3	42.8	
Level of Service (LOS)	A	A		A	A		C	C		C	D	
Approach Delay, s/veh / LOS	8.8	A		5.8	A		31.7	C		42.6	D	
Intersection Delay, s/veh / LOS	21.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.87	B	1.87	B	1.93	B	1.94	B
Bicycle LOS Score / LOS	1.20	A	0.58	A	0.88	A	0.76	A

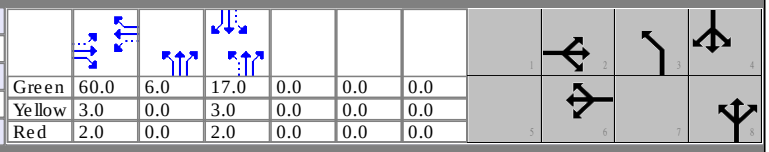
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst	Elliott Wittmeyer	Analysis Date	11/20/2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	4th and Springfield	File Name	4thandSpringfieldImprovedCombined.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	341	41	14	3	43	4	40	171	6	3	123	27

Signal Information			
Cycle, s	93.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	60.0	6.0	17.0	0.0	0.0	0.0						
Yellow	3.0	0.0	3.0	0.0	0.0	0.0						
Red	2.0	0.0	2.0	0.0	0.0	0.0						

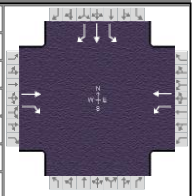
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8		4
Case Number		6.0		6.0	1.0	4.0		6.3
Phase Duration, s		65.0		65.0	6.0	28.0		22.0
Change Period, ($Y+R_c$), s		5.0		5.0	0.0	5.0		5.0
Max Allow Headway (MAH), s		3.2		3.2	3.1	3.1		3.1
Queue Clearance Time (g_s), s		15.7		3.3	3.7	10.1		9.5
Green Extension Time (g_e), s		1.0		1.0	0.0	0.4		0.4
Phase Call Probability		1.00		1.00	1.00	1.00		1.00
Max Out Probability		0.00		0.00	1.00	0.05		0.03

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	371	60		3	51		43	192		3	163	
Adjusted Saturation Flow Rate (s), veh/h/ln	1354	1745		1343	1842		1781	1859		1191	1804	
Queue Service Time (g_s), s	12.8	1.2		0.1	0.9		1.7	8.1		0.2	7.5	
Cycle Queue Clearance Time (g_c), s	13.7	1.2		1.3	0.9		1.7	8.1		2.3	7.5	
Green Ratio (g/C)	0.65	0.65		0.65	0.65		0.27	0.25		0.18	0.18	
Capacity (c), veh/h	937	1126		927	1188		317	460		268	330	
Volume-to-Capacity Ratio (X)	0.396	0.053		0.004	0.043		0.137	0.418		0.012	0.494	
Back of Queue (Q), ft/ln (50 th percentile)	90.1	10.2		0.6	8.6		19.8	98.1		1.7	94	
Back of Queue (Q), veh/ln (50 th percentile)	3.5	0.4		0.0	0.3		0.8	3.9		0.1	3.7	
Queue Storage Ratio (RQ) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Uniform Delay (d_1), s/veh	8.5	6.1		6.3	6.0		26.0	29.4		32.9	34.1	
Incremental Delay (d_2), s/veh	1.3	0.1		0.0	0.1		0.9	2.8		0.1	5.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (d), s/veh	9.8	6.2		6.3	6.1		26.9	32.2		33.0	39.4	
Level of Service (LOS)	A	A		A	A		C	C		C	D	
Approach Delay, s/veh / LOS	9.3	A		6.1	A		31.2	C		39.2	D	
Intersection Delay, s/veh / LOS	20.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.87	B	1.87	B	1.93	B	1.94	B
Bicycle LOS Score / LOS	1.20	A	0.58	A	0.88	A	0.76	A

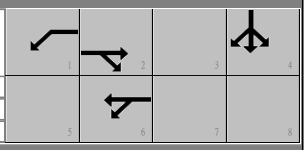
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst	Elliott Wittmeyer	Analysis Date	11/20/2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	6th and Springfield	File Name	6thandSpringfieldUnimproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h		467	193	56	906					18	62	45

Signal Information					EB			WB			NB			SB		
Cycle, s	119.6	Reference Phase	2		L	T	R	L	T	R	L	T	R	L	T	R
Offset, s	0	Reference Point	End	Green	6.0	84.0		19.0	0.0	0.0	0.0					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	0.0	3.2		3.0	0.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.0	2.2		2.2	0.0	0.0	0.0					



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6				4
Case Number		7.3	1.0	4.0				9.0
Phase Duration, s		89.4	6.0	95.4				24.2
Change Period, ($Y+R_c$), s		5.4	0.0	5.4				5.2
Max Allow Headway (MAH), s		3.1	3.1	3.1				3.2
Queue Clearance Time (g_s), s		15.3	3.0	34.9				5.8
Green Extension Time (g_e), s		4.3	0.0	4.3				0.2
Phase Call Probability		1.00	1.00	1.00				1.00
Max Out Probability		0.00	1.00	0.00				0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12	1	6					7	4	14
Adjusted Flow Rate (v), veh/h		508	210	61	985					20	67	49
Adjusted Saturation Flow Rate (s), veh/h/ln		1870	1579	1781	1870					1781	1870	1579
Queue Service Time (g_s), s		13.3	5.5	1.0	32.9					1.1	3.8	3.2
Cycle Queue Clearance Time (g_c), s		13.3	5.5	1.0	32.9					1.1	3.8	3.2
Green Ratio (g/C)		0.70	0.70	0.77	0.75					0.16	0.16	0.16
Capacity (c), veh/h		1314	1109	677	1407					283	297	251
Volume-to-Capacity Ratio (X)		0.386	0.189	0.090	0.700					0.069	0.227	0.195
Back of Queue (Q), ft/ln (50 th percentile)		128.3	44.7	8.5	298.6					13.4	47.8	34.9
Back of Queue (Q), veh/ln (50 th percentile)		5.1	1.8	0.3	11.8					0.5	1.9	1.4
Queue Storage Ratio (RQ) (50 th percentile)		0.00	0.00	0.00	0.00					0.00	0.00	0.00
Uniform Delay (d_1), s/veh		7.3	6.1	4.3	7.7					42.8	43.9	43.7
Incremental Delay (d_2), s/veh		0.9	0.4	0.3	2.9					0.5	1.8	1.7
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Control Delay (d), s/veh		8.1	6.5	4.6	10.7					43.3	45.7	45.4
Level of Service (LOS)		A	A	A	B					D	D	D
Approach Delay, s/veh / LOS	7.7	A		10.3	B		0.0			45.2	D	
Intersection Delay, s/veh / LOS	11.8						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.35	A	1.85	B	1.96	B	1.97	B
Bicycle LOS Score / LOS	1.67	B	2.21	B			0.71	A

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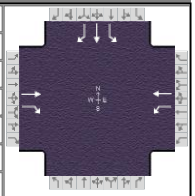
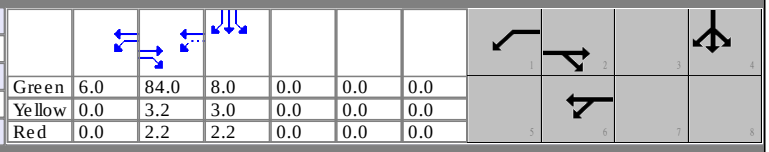
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst	Elliott Wittmeyer	Analysis Date	11/20/2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	6th and Springfield	File Name	6thandSpringfieldImproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h		467	193	56	906					18	62	45

Signal Information			
Cycle, s	108.6	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	6.0	84.0	8.0	0.0	0.0	0.0						
Yellow	0.0	3.2	3.0	0.0	0.0	0.0						
Red	0.0	2.2	2.2	0.0	0.0	0.0						

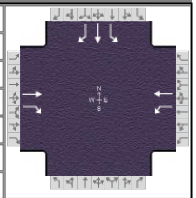
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6				4
Case Number		7.3	1.0	4.0				9.0
Phase Duration, s		89.4	6.0	95.4				13.2
Change Period, ($Y+R_c$), s		5.4	0.0	5.4				5.2
Max Allow Headway (MAH), s		3.1	3.1	3.1				3.2
Queue Clearance Time (g_s), s		11.2	2.6	22.7				5.8
Green Extension Time (g_e), s		4.3	0.0	4.3				0.0
Phase Call Probability		1.00	1.00	1.00				1.00
Max Out Probability		0.00	0.63	0.00				1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12	1	6					7	4	14
Adjusted Flow Rate (v), veh/h		508	210	61	985					20	67	49
Adjusted Saturation Flow Rate (s), veh/h/ln		1870	1579	1781	1870					1781	1870	1579
Queue Service Time (g_s), s		9.2	3.8	0.6	20.7					1.1	3.8	3.2
Cycle Queue Clearance Time (g_c), s		9.2	3.8	0.6	20.7					1.1	3.8	3.2
Green Ratio (g/C)		0.77	0.77	0.85	0.83					0.07	0.07	0.07
Capacity (c), veh/h		1447	1221	779	1550					131	138	116
Volume-to-Capacity Ratio (X)		0.351	0.172	0.078	0.635					0.149	0.489	0.421
Back of Queue (Q), ft/ln (50 th percentile)		72.4	25.4	3.4	130.3					14.7	55.7	40.7
Back of Queue (Q), veh/ln (50 th percentile)		2.8	1.0	0.1	5.1					0.6	2.2	1.6
Queue Storage Ratio (RQ) (50 th percentile)		0.00	0.00	0.00	0.00					0.00	0.00	0.00
Uniform Delay (d_1), s/veh		3.8	3.2	1.9	3.4					47.1	48.3	48.1
Incremental Delay (d_2), s/veh		0.7	0.3	0.2	2.0					2.4	11.9	10.8
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Control Delay (d), s/veh		4.5	3.5	2.1	5.4					49.5	60.2	58.9
Level of Service (LOS)		A	A	A	A					D	E	E
Approach Delay, s/veh / LOS	4.2	A		5.2	A		0.0			58.2	E	
Intersection Delay, s/veh / LOS	8.6						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.32	A	1.82	B	1.96	B	1.96	B
Bicycle LOS Score / LOS	1.67	B	2.21	B			0.71	A

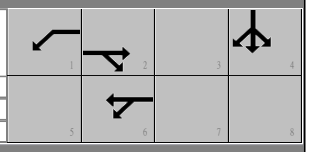
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst	Elliott Wittmeyer	Analysis Date	11/20/2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	6th and Springfield	File Name	6thandSpringfieldUnimprovedCombined.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h		40	10	0	50					14	36	0

Signal Information					Green	Yellow	Red
Cycle, s	119.6	Reference Phase	2		0.0	0.0	0.0
Offset, s	0	Reference Point	End		90.0	3.2	2.2
Uncoordinated	Yes	Simult. Gap E/W	On		19.0	3.0	2.2
Force Mode	Fixed	Simult. Gap N/S	On		0.0	0.0	0.0
					0.0	0.0	0.0
					0.0	0.0	0.0



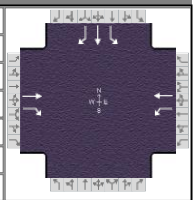
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6				4
Case Number		7.3	1.0	4.0				9.0
Phase Duration, s		95.4	0.0	95.4				24.2
Change Period, ($Y+R_c$), s		5.4	0.0	5.4				5.2
Max Allow Headway (MAH), s		3.1	0.0	3.1				3.1
Queue Clearance Time (g_s), s		2.7		2.9				4.1
Green Extension Time (g_e), s		0.2	0.0	0.2				0.0
Phase Call Probability		1.00		1.00				1.00
Max Out Probability		0.00		0.00				0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12	1	6					7	4	14
Adjusted Flow Rate (v), veh/h		43	11	0	54					15	39	0
Adjusted Saturation Flow Rate (s), veh/h/ln		1870	1579	1781	1870					1781	1870	1579
Queue Service Time (g_s), s		0.7	0.2	0.0	0.9					0.9	2.1	0.0
Cycle Queue Clearance Time (g_c), s		0.7	0.2	0.0	0.9					0.9	2.1	0.0
Green Ratio (g/C)		0.75	0.75	0.77	0.75					0.16	0.16	0.16
Capacity (c), veh/h		1407	1188	1079	1407					283	297	251
Volume-to-Capacity Ratio (X)		0.031	0.009	0.000	0.039					0.054	0.132	0.000
Back of Queue (Q), ft/ln (50 th percentile)		6.2	1.5	0	7.8					10.4	27.2	0
Back of Queue (Q), veh/ln (50 th percentile)		0.2	0.1	0.0	0.3					0.4	1.1	0.0
Queue Storage Ratio (RQ) (50 th percentile)		0.00	0.00	0.00	0.00					0.00	0.00	0.00
Uniform Delay (d_1), s/veh		3.8	3.7	0.0	3.8					42.7	43.2	0.0
Incremental Delay (d_2), s/veh		0.0	0.0	0.0	0.1					0.4	0.9	0.0
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Control Delay (d), s/veh		3.8	3.7	0.0	3.8					43.0	44.1	0.0
Level of Service (LOS)		A	A		A					D	D	
Approach Delay, s/veh / LOS	3.8	A		3.8	A		0.0			43.8	D	
Intersection Delay, s/veh / LOS	17.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.33	A	1.85	B	1.96	B	1.97	B
Bicycle LOS Score / LOS	0.58	A	0.58	A			0.58	A

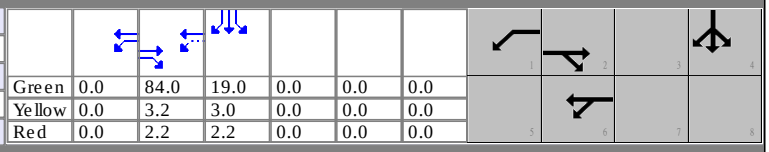
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst	Elliott Wittmeyer	Analysis Date	11/20/2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	6th and Springfield	File Name	6thandSpringfieldImprovedCombined.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h		40	10	0	50					14	36	0

Signal Information			
Cycle, s	113.6	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	0.0	84.0	19.0	0.0	0.0	0.0
Yellow	0.0	3.2	3.0	0.0	0.0	0.0
Red	0.0	2.2	2.2	0.0	0.0	0.0

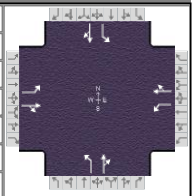
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6				4
Case Number		7.3	1.0	4.0				9.0
Phase Duration, s		89.4	0.0	89.4				24.2
Change Period, ($Y+R_c$), s		5.4	0.0	5.4				5.2
Max Allow Headway (MAH), s		3.1	0.0	3.1				3.1
Queue Clearance Time (g_s), s		2.7		2.9				4.0
Green Extension Time (g_e), s		0.2	0.0	0.2				0.0
Phase Call Probability		1.00		1.00				1.00
Max Out Probability		0.00		0.00				0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12	1	6					7	4	14
Adjusted Flow Rate (v), veh/h		43	11	0	54					15	39	0
Adjusted Saturation Flow Rate (s), veh/h/ln		1870	1579	1781	1870					1781	1870	1579
Queue Service Time (g_s), s		0.7	0.2	0.0	0.9					0.8	2.0	0.0
Cycle Queue Clearance Time (g_c), s		0.7	0.2	0.0	0.9					0.8	2.0	0.0
Green Ratio (g/C)		0.74	0.74	0.76	0.74					0.17	0.17	0.17
Capacity (c), veh/h		1383	1167	1064	1383					298	313	264
Volume-to-Capacity Ratio (X)		0.031	0.009	0.000	0.039					0.051	0.125	0.000
Back of Queue (Q), ft/ln (50 th percentile)		6.2	1.5	0	7.8					9.7	25.3	0
Back of Queue (Q), veh/ln (50 th percentile)		0.2	0.1	0.0	0.3					0.4	1.0	0.0
Queue Storage Ratio (RQ) (50 th percentile)		0.00	0.00	0.00	0.00					0.00	0.00	0.00
Uniform Delay (d_1), s/veh		3.9	3.9	0.0	4.0					39.7	40.2	0.0
Incremental Delay (d_2), s/veh		0.0	0.0	0.0	0.1					0.3	0.8	0.0
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Control Delay (d), s/veh		4.0	3.9	0.0	4.0					40.1	41.1	0.0
Level of Service (LOS)		A	A		A					D	D	
Approach Delay, s/veh / LOS	4.0	A		4.0	A		0.0			40.8	D	
Intersection Delay, s/veh / LOS	16.3						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.33	A	1.85	B	1.96	B	1.96	B
Bicycle LOS Score / LOS	0.58	A	0.58	A			0.58	A

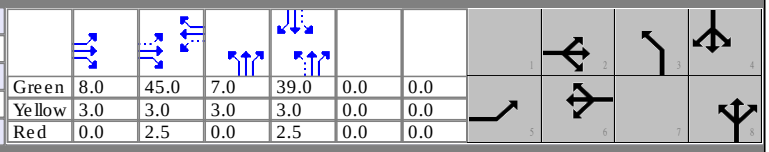
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst	Elliott Wittmeyer	Analysis Date	11/20/2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	Wright and Springfield	File Name	WrightandSpringfieldUnimproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	143	256	96	16	782	63	98	114	35	66	24	82

Signal Information			
Cycle, s	116.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	8.0	45.0	7.0	39.0	0.0	0.0
Yellow	3.0	3.0	3.0	3.0	0.0	0.0
Red	0.0	2.5	0.0	2.5	0.0	0.0

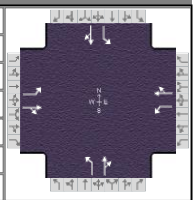
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6	3	8		4
Case Number	1.0	4.0		6.3	1.0	4.0		6.3
Phase Duration, s	11.0	61.5		50.5	10.0	54.5		44.5
Change Period, ($Y+R_c$), s	3.0	5.5		5.5	3.0	5.5		5.5
Max Allow Headway (MAH), s	3.1	3.1		3.1	3.1	3.2		3.2
Queue Clearance Time (g_s), s	7.9	18.4		47.0	6.3	8.7		7.8
Green Extension Time (g_e), s	0.0	3.2		0.0	0.0	0.7		0.7
Phase Call Probability	1.00	1.00		1.00	1.00	1.00		1.00
Max Out Probability	1.00	0.00		1.00	1.00	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	155	383		17	918		107	162		72	115	
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1783		1001	1809		1781	1787		1224	1642	
Queue Service Time (g_s), s	5.9	16.4		1.4	45.0		4.3	6.7		4.8	5.8	
Cycle Queue Clearance Time (g_c), s	5.9	16.4		6.8	45.0		4.3	6.7		4.8	5.8	
Green Ratio (g/C)	0.47	0.48		0.39	0.39		0.41	0.42		0.34	0.34	
Capacity (c), veh/h	185	861		404	702		535	755		474	552	
Volume-to-Capacity Ratio (X)	0.841	0.445		0.043	1.309		0.199	0.215		0.151	0.209	
Back of Queue (Q), ft/ln (50 th percentile)	105.7	178		8.7	1222.2		48.5	73.6		37.7	60.8	
Back of Queue (Q), veh/ln (50 th percentile)	4.2	7.0		0.3	48.1		1.9	2.9		1.5	2.4	
Queue Storage Ratio (RQ) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Uniform Delay (d_1), s/veh	27.5	19.8		25.6	35.5		21.5	21.3		27.1	27.5	
Incremental Delay (d_2), s/veh	34.6	1.7		0.2	149.2		0.8	0.6		0.7	0.9	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (d), s/veh	62.1	21.4		25.8	184.7		22.3	21.9		27.8	28.3	
Level of Service (LOS)	E	C		C	F		C	C		C	C	
Approach Delay, s/veh / LOS	33.2	C		181.7	F		22.1	C		28.1	C	
Intersection Delay, s/veh / LOS	103.2						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.91	B	1.92	B	1.92	B	1.93	B
Bicycle LOS Score / LOS	1.38	A	2.03	B	0.93	A	0.80	A

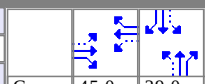
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst	Elliott Wittmeyer	Analysis Date	11/20/2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	Wright and Springfield	File Name	WrightandSpringfieldUnimprovedCombined.xus		
Project Description					

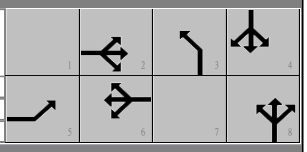


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	0	60	0	0	50	0	0	50	0	0	81	0

Signal Information			
Cycle, s	95.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	45.0	39.0	0.0	0.0	0.0	0.0						
Yellow	3.0	3.0	0.0	0.0	0.0	0.0						
Red	2.5	2.5	0.0	0.0	0.0	0.0						



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6	3	8		4
Case Number	1.0	4.0		6.3	1.0	4.0		6.3
Phase Duration, s	0.0	50.5		50.5	0.0	44.5		44.5
Change Period, ($Y+R_c$), s	3.0	5.5		5.5	3.0	5.5		5.5
Max Allow Headway (MAH), s	0.0	3.0		3.0	0.0	3.0		3.0
Queue Clearance Time (g_s), s		3.8		3.5		3.7		4.8
Green Extension Time (g_e), s	0.0	0.2		0.2	0.0	0.2		0.2
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.00		0.00		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	0	0		0	0		0	0		0	0	
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	0		1336	0		1781	0		1350	0	
Queue Service Time (g_s), s	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Cycle Queue Clearance Time (g_c), s	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Green Ratio (g/C)	0.46			0.47			0.40			0.41		
Capacity (c), veh/h	695			76			577			76		
Volume-to-Capacity Ratio (X)	0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000	
Back of Queue (Q), ft/ln (50 th percentile)	0	0		0	0		0	0		0	0	
Back of Queue (Q), veh/ln (50 th percentile)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Queue Storage Ratio (RQ) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Uniform Delay (d_1), s/veh	0.0			0.0			0.0			0.0		
Incremental Delay (d_2), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (d), s/veh	0.0			0.0			0.0			0.0		
Level of Service (LOS)												
Approach Delay, s/veh / LOS	13.8	B		13.7	B		17.2	B		17.6	B	
Intersection Delay, s/veh / LOS	15.8						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.90	B	1.90	B	1.91	B	1.91	B
Bicycle LOS Score / LOS	0.60	A	0.58	A	0.58	A	0.63	A

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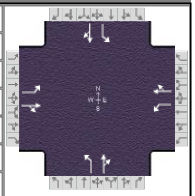
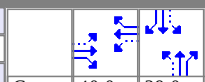
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst	Elliott Wittmeyer	Analysis Date	11/20/2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	Wright and Springfield	File Name	WrightandSpringfieldImprovedCombined.xus		
Project Description					

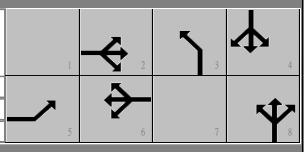


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	0	60	0	0	50	0	0	50	0	0	81	0

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	40.0	39.0	0.0	0.0	0.0	0.0						
Yellow	3.0	3.0	0.0	0.0	0.0	0.0						
Red	2.5	2.5	0.0	0.0	0.0	0.0						



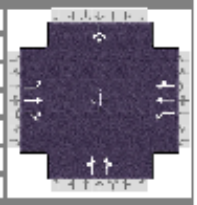
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6	3	8		4
Case Number	1.0	4.0		6.3	1.0	4.0		6.3
Phase Duration, s	0.0	45.5		45.5	0.0	44.5		44.5
Change Period, ($Y+R_c$), s	3.0	5.5		5.5	3.0	5.5		5.5
Max Allow Headway (MAH), s	0.0	3.0		3.0	0.0	3.0		3.0
Queue Clearance Time (g_s), s		3.8		3.5		3.5		4.5
Green Extension Time (g_e), s	0.0	0.2		0.2	0.0	0.2		0.2
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.00		0.00		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	0	0		0	0		0	0		0	0	
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	0		1336	0		1781	0		1350	0	
Queue Service Time (g_s), s	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Cycle Queue Clearance Time (g_c), s	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Green Ratio (g/C)	0.43			0.44			0.42			0.43		
Capacity (c), veh/h	659			80			612			80		
Volume-to-Capacity Ratio (X)	0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000	
Back of Queue (Q), ft/ln (50 th percentile)	0	0		0	0		0	0		0	0	
Back of Queue (Q), veh/ln (50 th percentile)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Queue Storage Ratio (RQ) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Uniform Delay (d_1), s/veh	0.0			0.0			0.0			0.0		
Incremental Delay (d_2), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (d), s/veh	0.0			0.0			0.0			0.0		
Level of Service (LOS)												
Approach Delay, s/veh / LOS	14.6	B		14.5	B		15.0	B		15.4	B	
Intersection Delay, s/veh / LOS	14.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.90	B	1.90	B	1.90	B	1.90	B
Bicycle LOS Score / LOS	0.60	A	0.58	A	0.58	A	0.63	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst	Mihir Thakar	Analysis Date	Dec 1, 2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	University & 4th	File Name	Univresity&4thCombinedImproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	28	698	28	183	900	31	25	85	406	30	44	39

Signal Information			
Cycle, s	87.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	45.0	35.0	0.0	0.0	0.0	0.0						
Yellow	2.0	2.5	0.0	0.0	0.0	0.0						
Red	1.5	1.0	0.0	0.0	0.0	0.0						

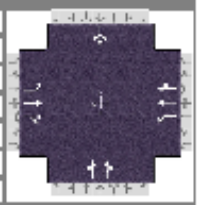
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		8.0		8.0
Phase Duration, s		48.5		48.5		38.5		38.5
Change Period, ($Y+R_c$), s		3.5		3.5		3.5		3.5
Max Allow Headway (*MAH*), s		3.3		3.3		3.4		3.4
Queue Clearance Time (g_s), s		21.5		35.4		24.9		26.6
Green Extension Time (g_e), s		5.7		4.1		1.3		1.2
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.10		0.49		0.06		0.12

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	30	403	386	199	518	494	120		441		123	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	557	1870	1793	687	1870	1781	1668		1442		749	
Queue Service Time (g_s), s	3.4	11.5	11.5	21.8	16.1	16.1	0.0		22.9		1.7	
Cycle Queue Clearance Time (g_c), s	19.5	11.5	11.5	33.4	16.1	16.1	3.6		22.9		24.6	
Green Ratio (*g/C*)	0.52	0.52	0.52	0.52	0.52	0.52	0.40		0.40		0.40	
Capacity (*c*), veh/h	268	967	927	347	967	921	722		580		354	
Volume-to-Capacity Ratio (*X*)	0.114	0.416	0.417	0.573	0.536	0.536	0.166		0.761		0.347	
Back of Queue (*Q*), ft/ln (50 th percentile)	12.3	120.4	114	100.1	170.3	160.3	38.6		216.5		44.7	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.5	4.7	4.6	3.9	6.7	6.4	1.5		8.7		1.8	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00	
Uniform Delay (d_1), s/veh	20.5	12.9	12.9	23.2	14.0	14.0	16.6		22.4		18.6	
Incremental Delay (d_2), s/veh	0.9	1.3	1.4	6.7	2.1	2.2	0.5		9.1		2.7	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	
Control Delay (*d*), s/veh	21.4	14.2	14.3	29.9	16.2	16.3	17.1		31.5		21.3	
Level of Service (LOS)	C	B	B	C	B	B	B		C		C	
Approach Delay, s/veh / LOS	14.5	B		18.5	B		28.4	C		21.3	C	
Intersection Delay, s/veh / LOS	19.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.89	B	1.89	B	2.27	B	2.27	B
Bicycle LOS Score / LOS	1.16	A	1.49	A	0.95	A	0.69	A

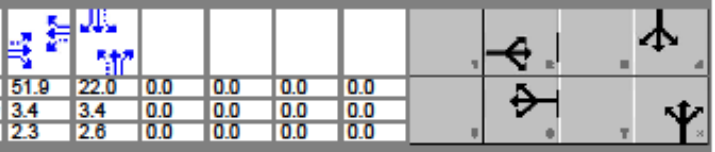
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst	Mihir Thakar	Analysis Date	Dec 1, 2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	University & 4th	File Name	Univresity&4thCombinedUnimproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	28	698	28	183	900	31	25	85	406	30	44	39

Signal Information			
Cycle, s	85.6	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	51.9	22.0	0.0	0.0	0.0	0.0	
Yellow	3.4	3.4	0.0	0.0	0.0	0.0	
Red	2.3	2.6	0.0	0.0	0.0	0.0	

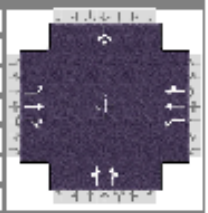
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		8.0		8.0
Phase Duration, s		57.6		57.6		28.0		28.0
Change Period, (*Y+R_c*), s		5.7		5.7		6.0		6.0
Max Allow Headway (*MAH*), s		3.3		3.3		3.4		3.4
Queue Clearance Time (*g_s*), s		17.6		28.8		24.0		24.0
Green Extension Time (*g_e*), s		5.9		5.6		0.0		0.0
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.03		0.11		1.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	30	403	386	199	518	494	120		441		123	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	557	1870	1793	687	1870	1781	1675		1442		428	
Queue Service Time (*g_s*), s	2.7	9.3	9.3	17.5	12.9	12.9	0.0		22.0		0.0	
Cycle Queue Clearance Time (*g_c*), s	15.6	9.3	9.3	26.8	12.9	12.9	4.3		22.0		22.0	
Green Ratio (*g/C*)	0.61	0.61	0.61	0.61	0.61	0.61	0.26		0.26		0.26	
Capacity (*c*), veh/h	338	1134	1087	426	1134	1080	482		371		163	
Volume-to-Capacity Ratio (*X*)	0.090	0.355	0.355	0.467	0.457	0.457	0.248		1.190		0.752	
Back of Queue (*Q*), ft/ln (50 th percentile)	9.3	88.3	83.6	73.7	124.4	117.1	50.6		463.5		80	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.4	3.5	3.3	2.9	4.9	4.7	2.0		18.5		3.1	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00	
Uniform Delay (*d₁*), s/veh	13.4	8.5	8.5	15.2	9.2	9.2	25.2		31.8		27.0	
Incremental Delay (*d₂*), s/veh	0.5	0.9	0.9	3.6	1.3	1.4	1.2		109.5		27.0	
Initial Queue Delay (*d₃*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	
Control Delay (*d*), s/veh	14.0	9.3	9.4	18.8	10.5	10.6	26.5		141.3		54.0	
Level of Service (LOS)	B	A	A	B	B	B	C		F		D	
Approach Delay, s/veh / LOS	9.5	A		11.9	B		116.8	F		54.0	D	
Intersection Delay, s/veh / LOS	34.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.87	B	1.87	B	2.28	B	2.28	B
Bicycle LOS Score / LOS	1.16	A	1.49	A	0.95	A	0.69	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst	Mihir Thakar	Analysis Date	Nov 20, 2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	University & 4th	File Name	University&4thImproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	54	1322	58	104	1517	75	54	195	157	70	88	80

Signal Information			
Cycle, s	87.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	50.0	30.0	0.0	0.0	0.0	0.0		
Yellow	2.0	2.5	0.0	0.0	0.0	0.0		
Red	1.5	1.0	0.0	0.0	0.0	0.0		

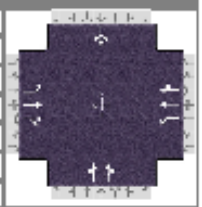
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		4		8
Case Number		6.0		6.0		8.0		8.0
Phase Duration, s		53.5		53.5		33.5		33.5
Change Period, ($Y+R_c$), s		3.5		3.5		3.5		3.5
Max Allow Headway (*MAH*), s		3.4		3.4		3.3		3.3
Queue Clearance Time (g_s), s		52.0		52.0		11.3		18.9
Green Extension Time (g_e), s		0.0		0.0		1.5		1.3
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		1.00		1.00		0.00		0.03

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	7	4	14	3	8	18
Adjusted Flow Rate (*v*), veh/h	59	754	746	113	868	862	232		209		259	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	280	1847	1819	350	1870	1839	1596		1484		1259	
Queue Service Time (g_s), s	17.3	25.5	25.7	24.3	32.0	32.7	0.0		9.3		7.5	
Cycle Queue Clearance Time (g_c), s	50.0	25.5	25.7	50.0	32.0	32.7	9.0		9.3		16.9	
Green Ratio (*g/C*)	0.57	0.57	0.57	0.57	0.57	0.57	0.34		0.34		0.34	
Capacity (*c*), veh/h	139	1061	1045	180	1075	1057	603		512		488	
Volume-to-Capacity Ratio (*X*)	0.424	0.710	0.714	0.627	0.808	0.816	0.385		0.409		0.530	
Back of Queue (*Q*), ft/ln (50 th percentile)	39.7	262.2	256.6	79.9	344.2	341.5	92.6		86.1		123.8	
Back of Queue (*Q*), veh/ln (50 th percentile)	1.6	10.3	10.3	3.1	13.6	13.7	3.7		3.4		4.9	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00	
Uniform Delay (d_1), s/veh	35.3	13.3	13.3	33.0	14.7	14.8	21.4		21.7		24.2	
Incremental Delay (d_2), s/veh	9.2	4.0	4.2	15.3	6.5	7.0	1.9		2.4		4.1	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	
Control Delay (*d*), s/veh	44.5	17.3	17.5	48.4	21.2	21.8	23.3		24.1		28.2	
Level of Service (LOS)	D	B	B	D	C	C	C		C		C	
Approach Delay, s/veh / LOS	18.4	B		23.1	C		23.7	C		28.2	C	
Intersection Delay, s/veh / LOS	21.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.88	B	1.88	B	2.27	B	2.27	B
Bicycle LOS Score / LOS	1.77	B	2.01	B	0.85	A	0.91	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst	Mihir Thakar	Analysis Date	Nov 20, 2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	University & 4th	File Name	University&4thUnimproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	54	1322	58	104	1517	75	54	195	157	70	88	80

Signal Information			
Cycle, s	85.1	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	51.9	22.0	0.0	0.0	0.0	0.0	
Yellow	3.4	2.9	0.0	0.0	0.0	0.0	
Red	2.3	2.6	0.0	0.0	0.0	0.0	

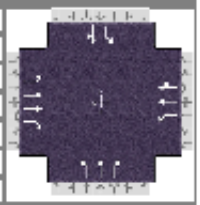
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		4		8
Case Number		6.0		6.0		8.0		8.0
Phase Duration, s		57.6		57.6		27.5		27.5
Change Period, ($Y+R_c$), s		5.7		5.7		5.5		5.5
Max Allow Headway (*MAH*), s		3.4		3.4		3.3		3.3
Queue Clearance Time (g_s), s		47.9		51.9		12.7		22.5
Green Extension Time (g_e), s		3.4		0.0		1.2		0.0
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.98		1.00		0.07		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	7	4	14	3	8	18
Adjusted Flow Rate (*v*), veh/h	59	754	746	113	868	862	225		216		259	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	280	1847	1819	350	1870	1839	1463		1490		1081	
Queue Service Time (g_s), s	16.6	22.9	23.1	26.9	28.8	29.3	0.0		10.7		9.8	
Cycle Queue Clearance Time (g_c), s	45.9	22.9	23.1	49.9	28.8	29.3	10.4		10.7		20.5	
Green Ratio (*g/C*)	0.61	0.61	0.61	0.61	0.61	0.61	0.26		0.26		0.26	
Capacity (*c*), veh/h	159	1126	1109	203	1141	1122	432		385		334	
Volume-to-Capacity Ratio (*X*)	0.369	0.669	0.672	0.557	0.761	0.769	0.522		0.561		0.774	
Back of Queue (*Q*), ft/ln (50 th percentile)	34.2	222.6	217.8	68.3	289.8	287.6	107.4		106.5		165.2	
Back of Queue (*Q*), veh/ln (50 th percentile)	1.3	8.8	8.7	2.7	11.4	11.5	4.3		4.3		6.5	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00	
Uniform Delay (d_1), s/veh	29.0	10.9	11.0	27.5	12.1	12.2	26.9		27.3		31.6	
Incremental Delay (d_2), s/veh	6.5	3.2	3.3	10.6	4.8	5.1	4.5		5.8		15.9	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	
Control Delay (*d*), s/veh	35.5	14.1	14.2	38.1	16.9	17.3	31.3		33.1		47.5	
Level of Service (LOS)	D	B	B	D	B	B	C		C		D	
Approach Delay, s/veh / LOS	15.0	B		18.4	B		32.2	C		47.5	D	
Intersection Delay, s/veh / LOS	20.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.87	B	1.87	B	2.28	B	2.28	B
Bicycle LOS Score / LOS	1.77	B	2.01	B	0.85	A	0.91	A

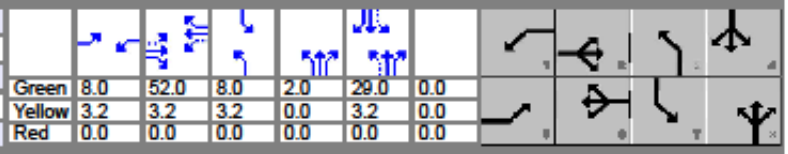
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst	Mihir Thakar	Analysis Date	Dec 1, 2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	University & Goodwin	File Name	University&GoodwinCombinedImproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	24	1008	92	6	762	19	287	26	171	67	21	32

Signal Information			
Cycle, s	111.8	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	8.0	52.0	8.0	2.0	29.0	0.0	
Yellow	3.2	3.2	3.2	0.0	3.2	0.0	
Red	0.0	0.0	0.0	0.0	0.0	0.0	

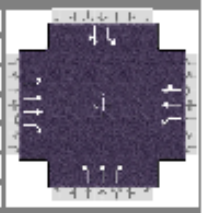
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	3.0	1.1	4.0	1.1	3.0	1.1	4.0
Phase Duration, s	11.2	55.2	11.2	55.2	13.2	34.2	11.2	32.2
Change Period, ($Y+R_c$), s	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Max Allow Headway (*MAH*), s	3.1	3.0	3.1	3.0	3.1	3.3	3.1	3.3
Queue Clearance Time (g_s), s	2.8	28.6	2.2	20.0	12.0	12.8	5.2	4.9
Green Extension Time (g_e), s	0.0	5.3	0.0	5.5	0.0	0.5	0.0	0.5
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	0.02	0.05	0.00	0.01	1.00	0.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	26	1096	100	7	432	417	312	28	186	73	58	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1781	1522	1781	1870	1802	1781	1870	1579	1781	1687	
Queue Service Time (g_s), s	0.8	26.6	4.2	0.2	18.0	18.0	10.0	1.2	10.8	3.2	2.9	
Cycle Queue Clearance Time (g_c), s	0.8	26.6	4.2	0.2	18.0	18.0	10.0	1.2	10.8	3.2	2.9	
Green Ratio (*g*/C)	0.54	0.47	0.47	0.54	0.47	0.47	0.36	0.28	0.28	0.33	0.26	
Capacity (*c*), veh/h	378	1656	708	300	870	838	538	519	438	535	438	
Volume-to-Capacity Ratio (*X*)	0.069	0.661	0.141	0.022	0.497	0.497	0.580	0.054	0.425	0.136	0.132	
Back of Queue (*Q*), ft/ln (50 th percentile)	8.5	284	38.8	2.1	205.5	195.4	67.1	14.8	112.6	36	32	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.3	11.2	1.5	0.1	8.1	7.8	2.6	0.6	4.4	1.4	1.3	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh	14.0	23.1	17.1	15.7	20.8	20.8	29.5	29.6	33.1	26.1	31.7	
Incremental Delay (d_2), s/veh	0.4	2.1	0.4	0.1	2.0	2.1	4.5	0.2	3.0	0.5	0.6	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	14.4	25.2	17.5	15.9	22.8	22.9	34.0	29.8	36.1	26.6	32.4	
Level of Service (LOS)	B	C	B	B	C	C	C	C	D	C	C	
Approach Delay, s/veh / LOS	24.3	C		22.8	C		34.5	C		29.2	C	
Intersection Delay, s/veh / LOS	26.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.10	B	1.91	B	2.29	B	2.45	B
Bicycle LOS Score / LOS	1.50	A	1.19	A	1.36	A	0.70	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst	Mihir Thakar	Analysis Date	Dec 1, 2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	University & Goodwin	File Name	University&GoodwinCombinedUnimproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	24	1008	92	6	762	19	287	26	171	67	21	32

Signal Information			
Cycle, s	128.9	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	7.2	57.5	25.7	25.7	0.0	0.0						
Yellow	3.2	3.2	3.2	3.2	0.0	0.0						
Red	0.0	0.0	0.0	0.0	0.0	0.0						

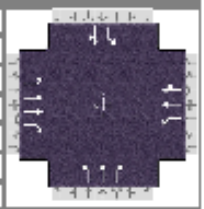
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		9.0		10.0
Phase Duration, s	10.4	60.7	10.4	60.7		28.9		28.9
Change Period, ($Y+R_c$), s	3.2	3.2	3.2	3.2		3.2		3.2
Max Allow Headway (*MAH*), s	3.1	3.0	3.1	3.0		3.2		3.2
Queue Clearance Time (g_s), s	3.0	33.7	2.2	23.5		23.9		6.4
Green Extension Time (g_e), s	0.0	5.3	0.0	5.5		0.3		0.2
Phase Call Probability	1.00	1.00	1.00	1.00		1.00		1.00
Max Out Probability	0.11	0.05	0.01	0.01		1.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	26	1096	100	7	432	417	312	28	186	73	58	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1781	1522	1781	1870	1802	1781	1870	1579	1781	1687	
Queue Service Time (g_s), s	1.0	31.7	5.0	0.2	21.5	21.5	21.9	1.6	13.8	4.4	3.6	
Cycle Queue Clearance Time (g_c), s	1.0	31.7	5.0	0.2	21.5	21.5	21.9	1.6	13.8	4.4	3.6	
Green Ratio (*g/C*)	0.50	0.45	0.45	0.50	0.45	0.45	0.20	0.20	0.20	0.20	0.20	
Capacity (*c*), veh/h	327	1589	679	250	834	804	355	373	315	355	336	
Volume-to-Capacity Ratio (*X*)	0.080	0.690	0.147	0.026	0.518	0.518	0.878	0.076	0.591	0.205	0.171	
Back of Queue (*Q*), ft/ln (50 th percentile)	11	349.8	47.6	2.8	252.1	239.8	308.5	19.7	154.2	52.6	41.4	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.4	13.8	1.9	0.1	9.9	9.6	12.1	0.8	6.1	2.1	1.6	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh	18.5	28.6	21.2	20.5	25.7	25.7	50.1	41.9	46.8	43.1	42.8	
Incremental Delay (d_2), s/veh	0.5	2.5	0.5	0.2	2.3	2.4	25.1	0.4	7.9	1.3	1.1	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	18.9	31.0	21.6	20.7	28.0	28.1	75.2	42.3	54.7	44.4	43.9	
Level of Service (LOS)	B	C	C	C	C	C	E	D	D	D	D	
Approach Delay, s/veh / LOS	30.0	C		28.0	C		66.2	E		44.2	D	
Intersection Delay, s/veh / LOS	37.0						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.11	B	1.92	B	2.33	B	2.46	B
Bicycle LOS Score / LOS	1.50	A	1.19	A	1.36	A	0.70	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst	Mihir Thakar	Analysis Date	Nov 20, 2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	University & Goodwin	File Name	University&GoodwinImproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	49	1231	378	254	897	21	335	66	205	132	45	76

Signal Information			
Cycle, s	109.8	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	7.0	55.0	10.0	25.0	0.0	0.0	
Yellow	3.2	3.2	3.2	3.2	0.0	0.0	
Red	0.0	0.0	0.0	0.0	0.0	0.0	

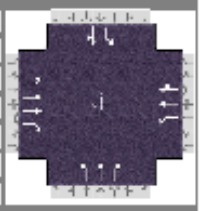
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	3.0	1.1	4.0	1.1	3.0	1.1	4.0
Phase Duration, s	10.2	58.2	10.2	58.2	13.2	28.2	13.2	28.2
Change Period, ($Y+R_c$), s	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.3	3.1	3.3
Queue Clearance Time (g_s), s	3.5	35.0	9.0	22.0	12.0	15.9	8.6	9.2
Green Extension Time (g_e), s	0.0	7.8	0.0	8.9	0.0	0.7	0.0	0.8
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	0.52	0.26	1.00	0.09	1.00	0.02	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	53	1338	411	276	501	497	364	72	223	143	132	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1781	1585	1781	1870	1855	1781	1870	1585	1781	1680	
Queue Service Time (g_s), s	1.5	33.0	19.2	7.0	20.0	20.0	10.0	3.4	13.9	6.6	7.2	
Cycle Queue Clearance Time (g_c), s	1.5	33.0	19.2	7.0	20.0	20.0	10.0	3.4	13.9	6.6	7.2	
Green Ratio (*g/C*)	0.56	0.50	0.50	0.56	0.50	0.50	0.32	0.23	0.23	0.32	0.23	
Capacity (*c*), veh/h	349	1784	794	254	937	929	409	426	361	465	383	
Volume-to-Capacity Ratio (*X*)	0.153	0.750	0.517	1.088	0.535	0.535	0.891	0.168	0.617	0.308	0.344	
Back of Queue (*Q*), ft/ln (50 th percentile)	16.4	349	183.9	235.5	225.1	219.9	192.2	41.3	154.2	75.5	80.6	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.6	13.7	7.2	9.3	8.9	8.8	7.6	1.6	6.1	3.0	3.2	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh	13.2	21.9	18.5	25.8	18.7	18.7	37.6	34.1	38.1	27.9	35.5	
Incremental Delay (d_2), s/veh	0.9	3.0	2.4	82.1	2.2	2.2	24.1	0.9	7.7	1.7	2.4	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	14.1	24.9	20.9	107.9	20.9	20.9	61.7	34.9	45.8	29.6	38.0	
Level of Service (LOS)	B	C	C	F	C	C	E	C	D	C	D	
Approach Delay, s/veh / LOS	23.6	C		39.7	D		53.4	D		33.6	C	
Intersection Delay, s/veh / LOS	34.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.09	B	1.90	B	2.30	B	2.45	B
Bicycle LOS Score / LOS	1.97	B	1.54	B	1.57	B	0.94	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst	Mihir Thakar	Analysis Date	11/22/2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	University & Goodwin	File Name	University&GoodwinUnimproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	49	1231	378	254	897	21	335	66	205	132	45	76

Signal Information			
Cycle, s	128.9	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	7.2	57.5	25.7	25.7	0.0	0.0	
Yellow	3.2	3.2	3.2	3.2	0.0	0.0	
Red	0.0	0.0	0.0	0.0	0.0	0.0	

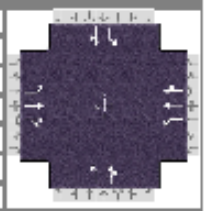
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		9.0		10.0
Phase Duration, s	10.4	60.7	10.4	60.7		28.9		28.9
Change Period, ($Y+R_c$), s	3.2	3.2	3.2	3.2		3.2		3.2
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1		3.2		3.2
Queue Clearance Time (g_s), s	4.0	45.0	9.2	28.1		27.7		11.0
Green Extension Time (g_e), s	0.0	6.3	0.0	8.7		0.0		0.4
Phase Call Probability	1.00	1.00	1.00	1.00		1.00		1.00
Max Out Probability	0.85	0.47	1.00	0.12		1.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	53	1338	411	276	501	497	364	72	223	143	132	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1781	1585	1781	1870	1855	1781	1870	1585	1781	1680	
Queue Service Time (g_s), s	2.0	43.0	25.0	7.2	26.1	26.1	25.7	4.1	16.9	9.0	8.8	
Cycle Queue Clearance Time (g_c), s	2.0	43.0	25.0	7.2	26.1	26.1	25.7	4.1	16.9	9.0	8.8	
Green Ratio (*g/C*)	0.50	0.45	0.45	0.50	0.45	0.45	0.20	0.20	0.20	0.20	0.20	
Capacity (*c*), veh/h	284	1589	707	195	834	827	355	373	316	355	335	
Volume-to-Capacity Ratio (*X*)	0.188	0.842	0.581	1.415	0.600	0.600	1.025	0.192	0.705	0.404	0.393	
Back of Queue (*Q*), ft/ln (50 th percentile)	23.4	486.5	252.7	376.7	309.3	302.1	424.4	51.5	196	109.8	100.8	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.9	19.2	9.9	14.8	12.2	12.1	16.7	2.0	7.7	4.3	4.0	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh	19.9	31.7	26.7	32.0	27.0	27.0	51.6	43.0	48.1	44.9	44.8	
Incremental Delay (d_2), s/veh	1.5	5.6	3.5	214.3	3.2	3.2	54.4	1.1	12.4	3.4	3.4	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	21.3	37.3	30.2	246.3	30.2	30.2	106.0	44.1	60.5	48.3	48.2	
Level of Service (LOS)	C	D	C	F	C	C	F	D	E	D	D	
Approach Delay, s/veh / LOS	35.2	D		77.0	E		83.9	F		48.3	D	
Intersection Delay, s/veh / LOS	57.4						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.11	B	1.92	B	2.33	B	2.46	B
Bicycle LOS Score / LOS	1.97	B	1.54	B	1.57	B	0.94	A

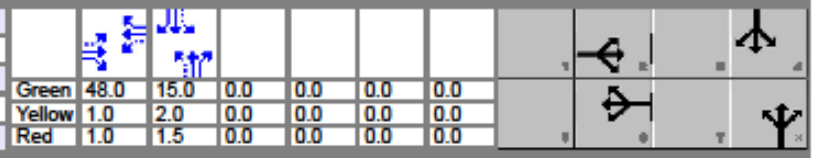
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst	Mihir Thakar	Analysis Date	Dec 1, 2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	University and Wright	File Name	University&WrightCombinedImproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	78	1134	13	18	1044	19	16	7	27	54	18	53

Signal Information			
Cycle, s	68.5	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



	EB			WB			NB			SB		
Green	48.0	15.0		0.0	0.0	0.0	0.0					
Yellow	1.0	2.0		0.0	0.0	0.0	0.0					
Red	1.0	1.5		0.0	0.0	0.0	0.0					

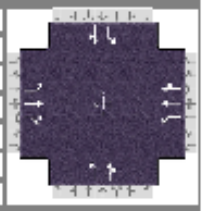
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		6.0		6.0
Phase Duration, s		50.0		50.0		18.5		18.5
Change Period, ($Y+R_c$), s		2.0		2.0		3.5		3.5
Max Allow Headway (*MAH*), s		3.2		3.2		3.2		3.2
Queue Clearance Time (g_s), s		17.8		14.1		5.4		5.7
Green Extension Time (g_e), s		7.5		7.6		0.2		0.2
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.11		0.08		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	85	639	608	20	591	564	17	37		59	77	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	486	1870	1781	446	1870	1784	1322	1630		1371	1642	
Queue Service Time (g_s), s	6.3	10.6	10.6	1.4	9.5	9.5	0.7	1.2		2.4	2.6	
Cycle Queue Clearance Time (g_c), s	15.8	10.6	10.6	12.1	9.5	9.5	3.4	1.2		3.7	2.6	
Green Ratio (*g/C*)	0.70	0.70	0.70	0.70	0.70	0.70	0.22	0.22		0.22	0.22	
Capacity (*c*), veh/h	379	1311	1248	348	1311	1250	344	357		380	360	
Volume-to-Capacity Ratio (*X*)	0.224	0.487	0.487	0.056	0.451	0.451	0.051	0.104		0.154	0.215	
Back of Queue (*Q*), ft/ln (50 th percentile)	17.2	75.5	71.4	3.6	67.1	63.5	6.3	12.7		21.2	27.6	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.7	3.0	2.9	0.1	2.6	2.5	0.2	0.5		0.8	1.1	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Uniform Delay (d_1), s/veh	7.9	4.7	4.7	7.4	4.5	4.5	23.3	21.4		22.9	21.9	
Incremental Delay (d_2), s/veh	1.4	1.3	1.4	0.3	1.1	1.2	0.3	0.6		0.9	1.4	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	9.3	6.0	6.0	7.7	5.6	5.7	23.6	22.0		23.7	23.3	
Level of Service (LOS)	A	A	A	A	A	A	C	C		C	C	
Approach Delay, s/veh / LOS	6.2	A		5.7	A		22.5	C		23.5	C	
Intersection Delay, s/veh / LOS	7.2						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.84	B	1.84	B	2.28	B	2.28	B
Bicycle LOS Score / LOS	1.59	B	1.46	A	0.58	A	0.71	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst	Mihir Thakar	Analysis Date	Dec 1, 2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	University and Wright	File Name	University&WrightCombinedUnimproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	78	1134	13	18	1044	19	16	7	27	54	18	53

Signal Information			
Cycle, s	98.8	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	79.0	9.8	0.0	0.0	0.0	0.0	
Yellow	3.5	3.0	0.0	0.0	0.0	0.0	
Red	2.0	1.5	0.0	0.0	0.0	0.0	

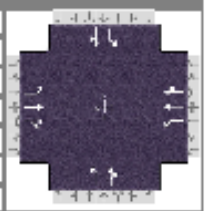
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		6.0		6.0
Phase Duration, s		84.5		84.5		14.3		14.3
Change Period, ($Y+R_c$), s		5.5		5.5		4.5		4.5
Max Allow Headway (*MAH*), s		3.2		3.2		3.2		3.2
Queue Clearance Time (g_s), s		17.3		13.7		7.6		8.1
Green Extension Time (g_e), s		7.8		7.9		0.1		0.1
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.01		0.01		1.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	85	639	608	20	591	564	17	37		59	77	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	486	1870	1781	446	1870	1784	1322	1630		1371	1642	
Queue Service Time (g_s), s	6.1	10.3	10.3	1.4	9.2	9.2	1.2	2.1		4.1	4.4	
Cycle Queue Clearance Time (g_c), s	15.3	10.3	10.3	11.7	9.2	9.2	5.6	2.1		6.1	4.4	
Green Ratio (*g/C*)	0.80	0.80	0.80	0.80	0.80	0.80	0.10	0.10		0.10	0.10	
Capacity (*c*), veh/h	417	1496	1424	383	1496	1426	145	162		180	163	
Volume-to-Capacity Ratio (*X*)	0.203	0.427	0.427	0.051	0.395	0.395	0.120	0.229		0.326	0.474	
Back of Queue (*Q*), ft/ln (50 th percentile)	16.1	68.9	65	3.4	61.3	57.9	11.9	24.5		40.6	55.4	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.6	2.7	2.6	0.1	2.4	2.3	0.5	1.0		1.6	2.2	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Uniform Delay (d_1), s/veh	5.1	3.0	3.0	4.8	2.9	2.9	44.7	41.0		43.8	42.1	
Incremental Delay (d_2), s/veh	1.1	0.9	0.9	0.3	0.8	0.8	1.7	3.3		4.8	9.6	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	6.2	3.9	4.0	5.0	3.7	3.7	46.4	44.3		48.6	51.6	
Level of Service (LOS)	A	A	A	A	A	A	D	D		D	D	
Approach Delay, s/veh / LOS	4.1	A		3.7	A		45.0	D		50.3	D	
Intersection Delay, s/veh / LOS	7.1						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.82	B	1.82	B	2.31	B	2.31	B
Bicycle LOS Score / LOS	1.59	B	1.46	A	0.58	A	0.71	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst	Mihir Thakar	Analysis Date	Nov 20, 2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	University & Wright	File Name	University&WrightImproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	70	1501	16	131	1308	40	53	186	81	76	25	156

Signal Information			
Cycle, s	75.5	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	52.0	18.0	0.0	0.0	0.0	0.0	
Yellow	1.0	2.0	0.0	0.0	0.0	0.0	
Red	1.0	1.5	0.0	0.0	0.0	0.0	

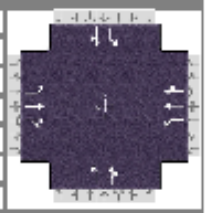
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		6.0		6.0
Phase Duration, s		54.0		54.0		21.5		21.5
Change Period, ($Y+R_c$), s		2.0		2.0		3.5		3.5
Max Allow Headway (*MAH*), s		3.5		3.5		3.3		3.3
Queue Clearance Time (g_s), s		27.6		54.0		13.3		18.9
Green Extension Time (g_e), s		14.0		0.0		0.8		0.0
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.58		1.00		0.52		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	76	825	824	142	736	730	58	290		83	197	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	362	1847	1840	303	1870	1851	1186	1774		1089	1619	
Queue Service Time (g_s), s	10.3	19.0	19.0	33.0	15.2	15.3	3.3	11.3		5.6	8.0	
Cycle Queue Clearance Time (g_c), s	25.6	19.0	19.0	52.0	15.2	15.3	11.3	11.3		16.9	8.0	
Green Ratio (*g/C*)	0.69	0.69	0.69	0.69	0.69	0.69	0.24	0.24		0.24	0.24	
Capacity (*c*), veh/h	271	1272	1267	228	1288	1275	253	423		193	386	
Volume-to-Capacity Ratio (*X*)	0.281	0.649	0.650	0.625	0.571	0.573	0.228	0.686		0.429	0.510	
Back of Queue (*Q*), ft/ln (50 th percentile)	23.6	152.4	152.2	79.2	121.6	121.4	26.9	139.4		45.6	86.1	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.9	6.0	6.0	3.1	4.8	4.8	1.1	5.5		1.8	3.4	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Uniform Delay (d_1), s/veh	12.6	6.6	6.6	22.4	6.0	6.0	29.8	26.2		33.9	24.9	
Incremental Delay (d_2), s/veh	2.6	2.6	2.6	12.3	1.8	1.9	2.1	8.8		6.8	4.7	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	15.2	9.2	9.2	34.8	7.9	7.9	31.9	35.0		40.7	29.7	
Level of Service (LOS)	B	A	A	C	A	A	C	C		D	C	
Approach Delay, s/veh / LOS	9.5	A		10.3	B		34.4	C		32.9	C	
Intersection Delay, s/veh / LOS	13.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.85	B	1.85	B	2.28	B	2.28	B
Bicycle LOS Score / LOS	1.91	B	1.81	B	1.06	A	0.95	A

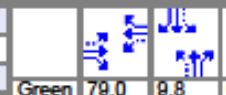
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst	Mihir Thakar	Analysis Date	Nov 20, 2020	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street		Analysis Year	2020	Analysis Period	1> 7:00
Intersection	University & Wright	File Name	University&WrightUnimproved.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	70	1501	16	131	1308	40	53	186	81	76	25	156

Signal Information			
Cycle, s	98.8	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



	EB		WB		NB	
Green	79.0	9.8	0.0	0.0	0.0	0.0
Yellow	3.5	3.0	0.0	0.0	0.0	0.0
Red	2.0	1.5	0.0	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		6.0		6.0
Phase Duration, s		84.5		84.5		14.3		14.3
Change Period, ($Y+R_c$), s		5.5		5.5		4.5		4.5
Max Allow Headway (*MAH*), s		3.5		3.5		3.3		3.3
Queue Clearance Time (g_s), s		23.6		49.8		11.8		11.8
Green Extension Time (g_e), s		19.6		15.5		0.0		0.0
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.25		0.51		1.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	76	825	824	142	736	730	58	290		83	197	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	362	1847	1840	303	1870	1851	1186	1774		1089	1619	
Queue Service Time (g_s), s	8.7	16.0	16.0	31.8	12.8	12.9	0.0	9.8		0.0	9.8	
Cycle Queue Clearance Time (g_c), s	21.6	16.0	16.0	47.8	12.8	12.9	9.8	9.8		9.8	9.8	
Green Ratio (*g/C*)	0.80	0.80	0.80	0.80	0.80	0.80	0.10	0.10		0.10	0.10	
Capacity (*c*), veh/h	315	1477	1471	266	1496	1480	73	176		73	161	
Volume-to-Capacity Ratio (*X*)	0.242	0.559	0.560	0.535	0.492	0.493	0.791	1.650		1.134	1.225	
Back of Queue (*Q*), ft/ln (50 th percentile)	18.6	107.4	107.3	60.8	86.4	85.9	65.3	499.8		120.2	261.1	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.7	4.2	4.2	2.4	3.4	3.4	2.6	19.7		4.7	10.3	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Uniform Delay (d_1), s/veh	6.8	3.6	3.6	12.3	3.3	3.3	49.4	44.5		49.4	44.5	
Incremental Delay (d_2), s/veh	1.8	1.5	1.5	7.5	1.2	1.2	57.8	316.4		146.3	144.1	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	8.7	5.1	5.1	19.8	4.4	4.5	107.2	360.9		195.7	188.6	
Level of Service (LOS)	A	A	A	B	A	A	F	F		F	F	
Approach Delay, s/veh / LOS	5.3	A		5.8	A		318.8	F		190.7	F	
Intersection Delay, s/veh / LOS	46.1						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.82	B	1.82	B	2.31	B	2.31	B
Bicycle LOS Score / LOS	1.91	B	1.81	B	1.06	A	0.95	A