JOHN F. KENNEDY RD ANALYSIS & REDESIGN

PROPOSAL

PREPARED FOR

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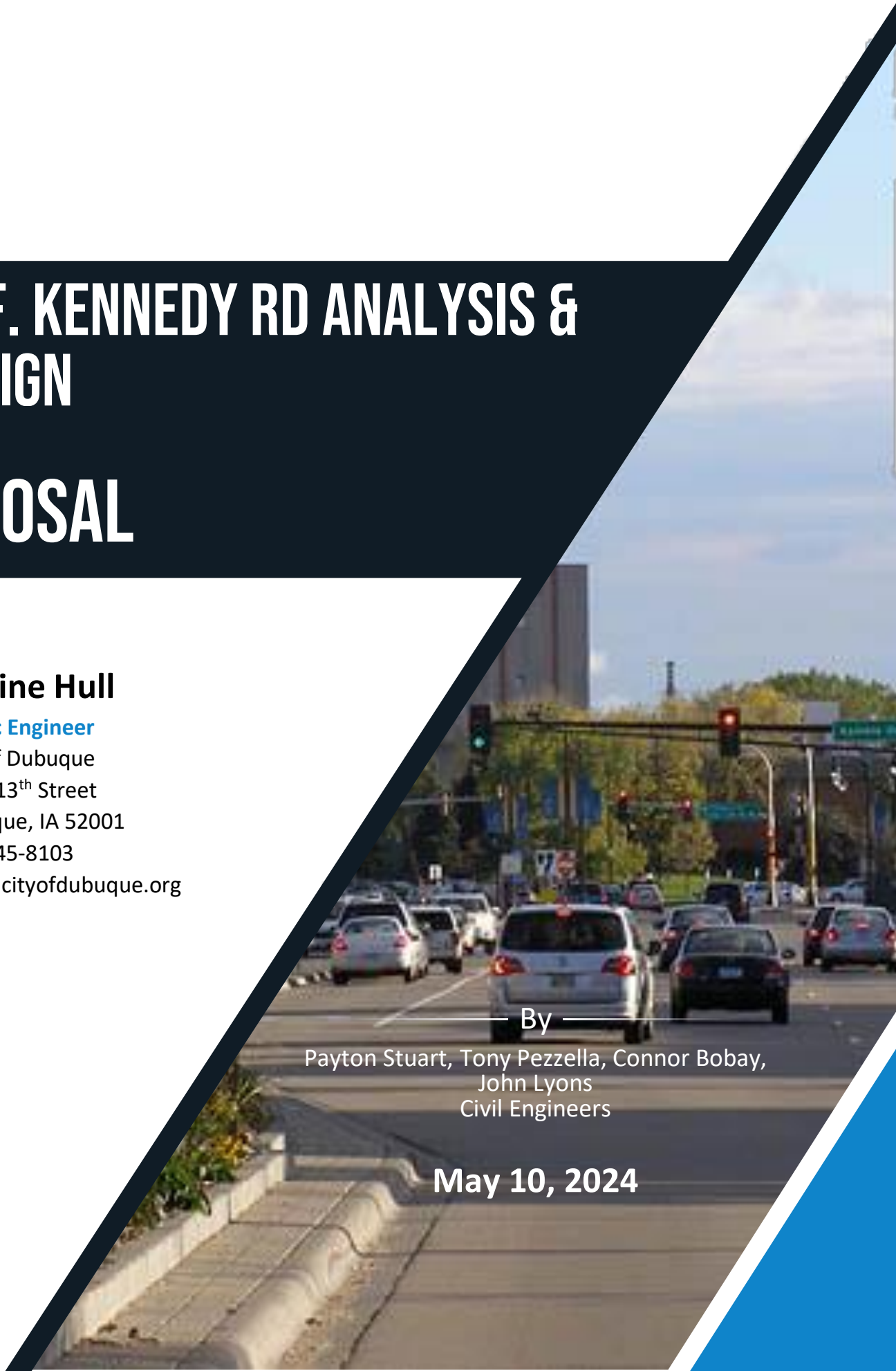

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Section I: Executive Summary

Introduction:

The project aims to enhance the John F. Kennedy corridor from Carter Rd to Highway 20 by improving both operational and geometric aspects, with a particular focus on pedestrian safety and non-motorized transportation. Data analysis, including vehicle and pedestrian counts, traffic signal timing plans, and road geometry, will inform comprehensive assessments of current and future conditions. Plans include implementing mixed-use designs to integrate residential and retail areas, creating pedestrian-friendly intersections to facilitate easy access to amenities like retail stores, Hoover Elementary School, and parks, while also ensuring efficient motorized service along the corridor. Overall, the project seeks to balance the needs of pedestrians and motorists while enhancing community connectivity and safety.

Purpose:

This study considers traffic operation and pedestrian accommodations within several intersections of the JFK corridor. The purpose of this report is to evaluate potential benefits and drawbacks associated with each intersection being analyzed to create recommendations as to what best fits each intersection's needs. The focus of the study evaluates the two major intersections, Wacker Dr and John F. Kennedy Rd (JFK), along with Pennsylvania Ave and JFK. Proposed alternative traffic control strategies include changes in traffic signaling and stop sign control on minor street intersections.

Existing Intersections Analysis:

The traffic analysis report provides comprehensive insights into the traffic conditions and intersections along the JFK corridor, focusing on critical intersections, such as Pennsylvania Ave and JFK, Wacker Dr and JFK, as well as minor street intersections. The analysis encompasses various aspects including traffic volumes, level of service (LOS), approach delays, and potential improvements needed for each intersection. The software used to complete this analysis required Highway Capacity Software (HCS) and Synchro, specifically SimTraffic a micro-simulation analysis tool. Along with these analysis tools we used Iowa DOT data from the Iowa Crash Analysis Tool (ICAT) to understand crash data along the corridor and major intersections.

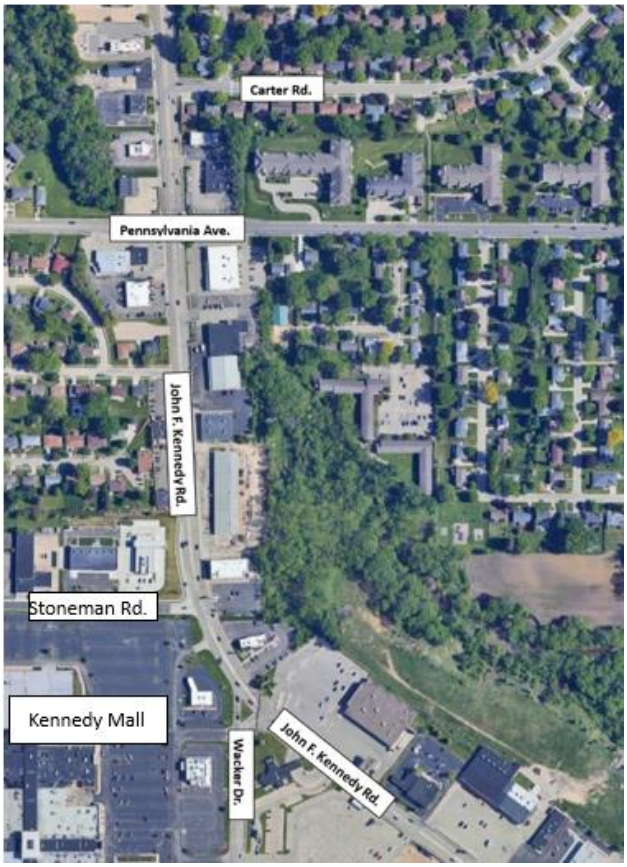


Figure 1. Aerial view displaying the southern portion of the JFK Corridor

At the intersection of Pennsylvania Avenue and JFK, varying levels of service were observed at various times, which include 11am-12pm, 12pm-1pm, 4pm-5pm, 5pm-6pm on Tuesday (February 6th, 2024) and Saturday (February 10th, 2024). Significant differences were noted between the northbound (NB)/southbound (SB) and eastbound (EB)/westbound (WB) directions. Similarly, at the Wacker Dr and JFK intersection, varying LOS and approach delays were observed, particularly for EB/WB traffic. The minor street, Carter Rd. was looked at as a possible area for sidewalk and crosswalk enhancements due to Hoover Elementary School's locatation just Northeast of the Carter Rd and JFK intersection. The LOS of all the intersections mentioned ranged from A to D. The analysis noted potential issues with the software's understanding of intersection geometry, leading to unrealistic delays and LOS ratings. By looking at the analysis, the team was able to determine the critical hour of traffic for each day. The critical hours of traffic found for both Saturday and Tuesday was 12-1 PM.

Additional intersections along the corridor, including Carter Rd, Crestwood Dr, Stoneman Rd, Daykin Ct, and University Ave, were also analyzed. These intersections generally achieved satisfactory LOS ratings of A and B with overall acceptable approach delays, with minimal need for operational or geometric modifications.

Overall, the analysis provides valuable insights into traffic dynamics along the JFK corridor, highlighting areas of congestion and potential improvements needed to optimize traffic

flow and enhance safety. Further studies and assessments are recommended to address specific issues identified, ensuring efficient transportation management and urban planning in the region.

Future Intersections Analysis:

The team conducted a comprehensive analysis of traffic conditions and projections for various intersections, focusing on Pennsylvania Ave and JFK Rd, as well as Wacker Dr and JFK Rd. Utilizing a 1% population growth rate, the group forecasted traffic volumes for 5, 10, and 20 years into the future. At the Pennsylvania Ave and JFK intersection with optimized signaling of the 5-year projection, there are decreases in delays compared to the existing traffic signaling, and the intersection maintains an acceptable level of service (LOS) of C. Optimization strategies effectively minimize overall delay, particularly in the northbound direction. Similar trends are observed in the 10-year projection, with notable improvements in the northbound direction. However, concerns arise in the 20-year projection as certain movements exceed acceptable delay thresholds, when optimizing the 20-year projection it will decrease the delay and allow the intersection to run with a LOS of C which is still acceptable, but this intersection is nearing an unacceptable LOS. This is a sign to look at potential geometric changes in the 20-year window with the delay approaching an unacceptable LOS. Despite improvements in delay, further analysis with sophisticated software is recommended for enhanced projected traffic flow.

Turning to the Wacker Dr and JFK Rd intersection, the 5-year projection demonstrates that existing operational signaling is effective, maintaining an acceptable LOS. Though optimization efforts yield marginal improvements, more sophisticated analysis is required to find significant enhancements. In the 10-year projection, multiple movements experience unacceptable delays, indicating ineffective functionality. Optimization strategies do not substantially improve traffic flow, necessitating further investigation. Similarly, in the 20-year projection, although marginal improvements are observed, several movements still exhibit unacceptable delays. Optimization efforts maintain an overall LOS of C, but more in-depth analysis is required for significant improvements.

Overall, the team's analysis underscores the importance of considering both operational and geometric changes to ensure smooth traffic flow within acceptable parameters as Dubuque's population grows over the next two decades.

Final Design Recommendations:

In the final design recommendations for the JFK Rd corridor, the team proposes a comprehensive set of enhancements to bolster pedestrian safety and optimize traffic flow. To kickstart these improvements, the team suggests utilizing optimization tables provided in the report to update signal timing at the Pennsylvania and JFK intersection. Meanwhile, for the Wacker and JFK intersection; a more sophisticated software system is recommended for further investigation due to minimal improvements observed in most movements.

Addressing pedestrian safety and sidewalk connectivity, the team advocates for the addition of a sidewalk along the west side of JFK from Stoneman Rd to the Wacker Dr and Kennedy Mall intersection. This addition aims to enhance sidewalk connectivity and is

complemented by the reconstruction of sections near the Sunshine Family Restaurant. To facilitate safe pedestrian crossings, the plan involves adding crosswalk markings across the Kennedy Mall entrance and Wacker Dr, along with updating markings across JFK. Additionally, pedestrian pushbuttons are proposed at Wacker Dr and JFK to provide pedestrians with control over signal changes.

To further enhance pedestrian safety, a pedestrian median is advised at the Carter Rd and JFK intersection. This feature will be supplemented by flexible delineators along the sidewalk perimeter, serving to improve safety and discourage cars from encroaching onto pedestrian paths. Moreover, the recommendation includes converting the Carter Rd and Ridge Rd intersection into a 3-way stop, a measure aimed at enhancing safety and traffic management.

In addition to pedestrian-focused enhancements, the proposal also entails adjusted signal timing at major intersections along the corridor's southern portion. These adjustments are intended to reduce overall delay and improve traffic efficiency.

Collectively, these measures represent a comprehensive approach to improving pedestrian infrastructure and traffic flow along the JFK corridor, aligning with the overarching goal of enhancing safety and efficiency for all road users.

Section II: Introduction

This project's objective is to enhance operational and geometric aspects of the John F. Kennedy corridor, particularly focusing on the stretch from Carter Rd to Highway 20. Alongside improvements for motorized vehicles, there's a significant emphasis on enhancing non-motorized transportation, especially pedestrian safety. To assess the corridor comprehensively, data including existing vehicle and pedestrian counts, traffic signal timing plans, and road geometry was utilized. Additionally, the project aimed to evaluate both current and future conditions. Specifically, the city of Dubuque is considering implementing changes aiming for a mixed-use design that integrates residential and retail areas. Given the community layout, it's crucial to create pedestrian-friendly intersections facilitating easy access for residents to nearby amenities such as retail stores, Hoover Elementary School, and parks. Ensuring efficient motorized service along the corridor is also a key consideration alongside pedestrian safety and service levels.

Study Area Description:

Figure 2. Aerial View of Dubuque, IA with JFK Rd highlighted.

Figure 2 (shown above) displays the aerial view of the John F Kennedy Rd. corridor which spans from the NW Arterial to Highway 20. The corridor serves as a key thoroughfare facilitating significant traffic flow.

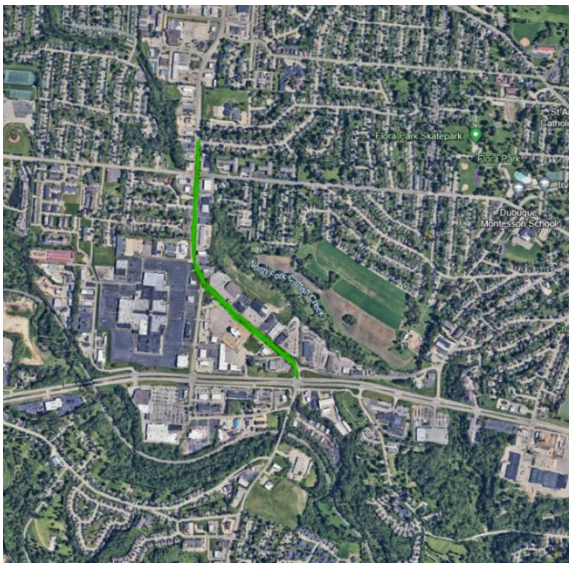


Figure 3. Aerial view of the section of JFK Rd the project is focused on.

The group decided to focus efforts on improving the pedestrian safety and traffic efficiency of the southern section of JFK (spanning from Carter Rd. to University Ave). JFK Rd serves as a major corridor for the city of Dubuque, with the southern section (shown in Figure 2) running adjacent to the Kennedy Mall. The Kennedy Mall is a center for dining and entertainment with approximately 63 businesses in operation. Additionally, JFK Road serves as a vital route for school children attending Hoover and Kennedy Elementary schools. Just south of Asbury Rd lies Dubuque Fire Station #2, overseeing a traffic light directly across the street, despite not marking an intersection. Further down the road, Our Redeemer Lutheran Church is positioned south of the fire station, contributing to the local community fabric.

Section III: Capacity and Level of Service (LOS) Analysis

Manual Vehicle Counts:

The team conducted comprehensive traffic assessments at two critical intersections: John F. Kennedy Road (JFK) and Pennsylvania Ave and Wacker Dr and JFK. Vehicular and pedestrian counts from both Tuesday, February 6th, and Saturday, February 10th, were utilized in the analysis. The video footage was captured during the morning and evening peaks, and the team manually counted the vehicles from 11 AM to 1 PM and from 4 PM to 6 PM, respectively. This comprehensive approach allowed for a thorough examination of traffic and pedestrian flow during peak hours on different days of the week. The limitations of this method of getting traffic counts were found when looking at Wacker and JFK with minimal vision from the footage showing SB left movements, along with no vision of the right turn movements off JFK onto Wacker on the Tuesday video footage.

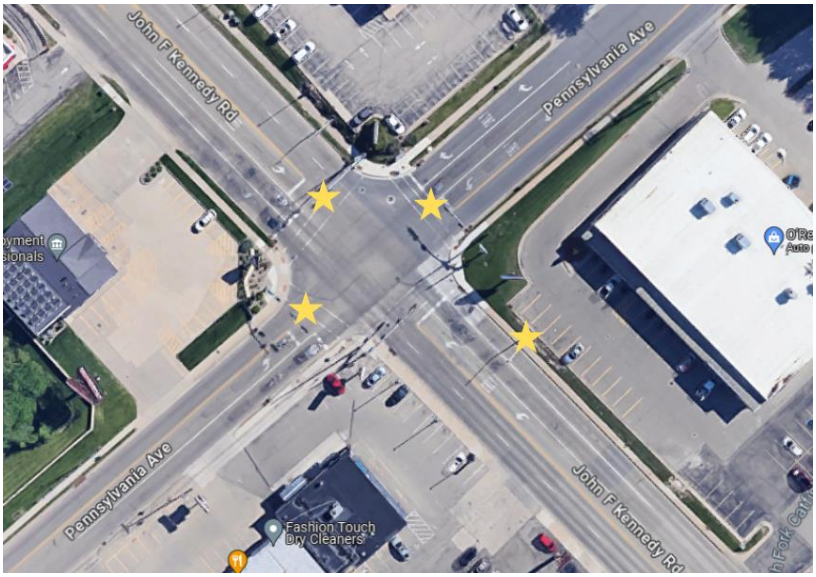


Figure 4. Aerial view displaying the location of cameras used to analyze the JFK Rd. and Pennsylvania Ave. intersection.

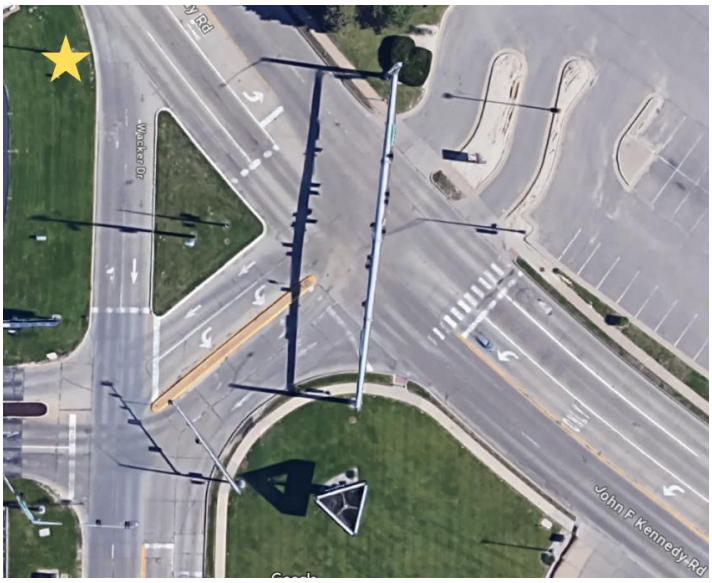


Figure 5. Aerial view displaying the location of cameras used to analyze the JFK Rd. and Wacker Dr. intersection.

The analysis of the Wacker and JFK intersection on Tuesday holds several assumptions. Firstly, due to limitations in the amount of camera angles provided, observations for southbound traffic on JFK turning left into PetSmart parking lot were unavailable during Tuesday's analysis. The team gathered data from Saturday's peak hours (counting 20 and 8 vehicles per hour for the evening peak, with 13 and 13 vehicles per hour for the morning peak) to accurately represent Tuesday's corresponding peak traffic periods. Secondly, right-hand turns from JFK onto Wacker were determined using traffic volume data provided by the Iowa Department of Transportation (DOT). Lastly, there was limited ability for the team to count the vehicles leaving the Kennedy Mall heading eastbound near the intersection of Wacker and JFK. We extrapolated Saturday's peak traffic analysis counts for this movement and included the values in Tuesday's analysis.

For both Tuesday and Saturday's analysis, the team was unable to view the number of vehicles turning right out of the PetSmart parking lot. To address this, the left-hand turn quantity was multiplied by 1.2 to approximate the right-hand turn quantity. This decision was made based on the understanding that northbound traffic on JFK from Wacker Dr typically experiences a 20% higher volume compared to the southbound traffic, indicating that travelers are more likely to go northbound. Under these assumptions, we aimed to ensure an accurate assessment of traffic dynamics at the Wacker and JFK intersection, thereby providing valuable insights for urban planning and transportation management.

Two-Way Stop Control:

The Two-Way Stop Control (TWSC) HCS was used to determine the level of service of minor street intersections (Carter Rd, St Anne Dr, Ridge Rd, Stoneman Rd, Crestwood Dr, University Ave, Daykin Ct) with JFK. The assumptions used for this analysis included using AADT data for volume of vehicles per hour along each intersection. The AADT was used for

these minor intersections as there are no cameras along these spots. Along with an excel sheet using MUTCD turning movement percentiles for arterial and collector roads. As for the pedestrian information in this analysis an assumption was made based on a reference relating to percentage of children who walk to school in the United States. This is from the National Center for Safe Routes to School. The team is using this percentage and multiplying it by the number of children that attend Hoover Elementary School to estimate the number of pedestrians crossing Carter Rd.

Crash Analysis:

In addition to completing manual counts, the team reviewed the Average Annual Daily Traffic (AADT) at all the sections of JFK to observe where heavy traffic was occurring. The team noted which areas of the corridor had the most collisions. Using the Iowa Crash Analysis Tool (ICAT) the intersection of Wacker Dr. and JFK was analyzed. There have been 8 crashes at the intersection since the beginning of 2023, none resulting in serious injury or fatality. The vast majority of incidents were side-swipe style collisions. Two of the 8 incidents involved vehicles running lights. The report also noted that 3 of the remaining 6 crashes were caused by improper or erratic lane change. Unclear lane markings (specifically when taking a right and then immediate left onto JFK) may have contributed to the collisions.

In addition, the intersection at Pennsylvania Ave and JFK was analyzed. Since the beginning of 2023, there have been 35 crashes that have taken place, none of which resulted in a fatality. Over half of the crashes that occurred at the intersection were the result of drivers losing control of their cars and failing to yield the right of way when making a left turn. Additionally, there have been 4 crashes where drivers have failed to yield from traffic making a right turn from the driveway coming out of Domino's heading eastbound onto Pennsylvania Ave. This could be due to the traffic backup that exists at this intersection because the phasing is not optimized at the intersection. The intersection of JFK and Carter Rd was also analyzed. There have been 13 crashes, all minor with no fatalities. Most of the crashes occurred due to either a driver failing to yield or losing control. The majority of crashes that occurred at the three intersections took place between 10 AM and 4 PM.

Synchro:

On Synchro, the team modeled the section of road from HWY 20 to Carter Rd for the existing conditions. The team modeled this section of JFK to mirror real world conditions, namely intersection geometry. All intersections were modeled to have the correct intersection control. At the signalized intersections, signal timing was also modeled correctly. In the model, eight different scenarios were created (corresponding to 8 peak hours) to see the effect traffic had on the corridor. The traffic volumes and turning movements at the various intersections were inputted into model based off the data collected from the traffic videos at the intersections of JFK Rd and Pennsylvania Ave as well as JFK and Wacker Dr. The traffic volumes at the intersections between JFK and some of the minor streets were also added using the calculated values from the excel spreadsheet.

In the Synchro analysis, the team ran 60 different simulation runs for each of the eight scenarios and gathered the data from each of those simulations for the existing conditions and for 5 years from now. Simulation runs were also done for two alternatives to see the impact of what the delay would be if the alternatives were put into place. The data can be seen in the reports for each of the scenarios for the existing conditions and the 5-year projected growth which includes the total amount of delay per vehicle (seconds) denied delay (hours), total delay (hours), stop delay (hours), travel distance (miles), travel time (hours), and density (ft/vehicle) for each of the intersections in the corridor as well as the whole corridor itself.

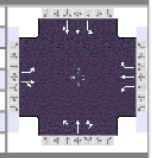
Highway Capacity Analysis Methods:

Tuesday, February 6th, 2024:

Table 1. Pennsylvania Ave and JFK Rd Tuesday Noon-1PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	12-1pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_existing.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	166	197	105	80	164	89	127	649	90	97	562	174

Signal Information												
Cycle, s	64.0	Reference Phase	2									
Offset, s	0	Reference Point	End	Green	5.6	1.0	17.8	5.3	1.3	12.3		
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.2	0.0	1.1	1.2	0.0	1.2		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	11.8	18.8	10.5	17.5	11.8	23.9	10.8	22.9
Change Period, (*Y+Rc*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s	6.7	12.6	4.2	7.0	5.6	16.9	4.1	13.0
Green Extension Time (*ge*), s	0.2	1.0	0.1	1.1	0.3	1.8	0.1	0.5
Phase Call Probability	0.95	1.00	0.76	1.00	0.94	1.00	0.80	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.06	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	166	302		80	164	89	154	459	439	90	353	327
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1746		1767	1856	1572	1838	1856	1776	1838	1856	1705
Queue Service Time (*gs*), s	4.7	10.6		2.2	5.0	3.1	3.6	14.9	14.9	2.1	10.9	11.0
Cycle Queue Clearance Time (*gc*), s	4.7	10.6		2.2	5.0	3.1	3.6	14.9	14.9	2.1	10.9	11.0
Green Ratio (*g/C*)	0.30	0.21		0.28	0.19	0.19	0.38	0.29	0.29	0.37	0.28	0.28
Capacity (*c*), veh/h	435	372		278	358	303	385	544	521	292	517	475
Volume-to-Capacity Ratio (*X*)	0.381	0.811		0.287	0.459	0.294	0.401	0.843	0.843	0.307	0.684	0.689
Back of Queue (*Q*), ft/ln (95 th percentile)	80	192		38	95	50	62	231	218	36	191	177
Back of Queue (*Q*), veh/ln (95 th percentile)	3.1	7.5		1.5	3.7	1.9	2.4	9.0	8.7	1.4	7.5	7.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.44	0.00		0.33	0.00	0.43	0.62	0.00	0.00	0.30	0.00	0.00
Uniform Delay (*d1*), s/veh	17.7	24.0		18.7	22.9	22.2	14.6	21.3	21.3	15.8	20.6	20.7
Incremental Delay (*d2*), s/veh	0.2	1.7		0.2	0.3	0.2	0.2	0.9	0.9	0.1	2.2	2.5
Initial Queue Delay (*d3*), 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	17.9	25.7		18.9	23.3	22.4	14.7	22.1	22.2	16.0	22.8	23.1
Level of Service (LOS)	B	C		B	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	22.9	C		22.0	C		21.1	C		22.1	C	
Intersection Delay, s/veh / LOS	21.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.26	A	1.04	A	1.20	A	1.17	A

The existing conditions at Pennsylvania Ave and JFK Rd. generate acceptable levels of service, which was to be expected considering it is a traditional four-leg intersection. All four of the left turns at the intersection are protected and permitted. It is important to note that vehicles approaching the intersection do so at a significant decline (inherently making braking more difficult).

Table 2. Pennsylvania Ave and JFK Rd Tuesday Noon-1PM HCS Optimized Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	12-1pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_existingFINA...		
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	166	197	105	80	164	89	127	649	90	97	562	174

Signal Information					EB			WB			NB			SB		
Cycle, s	66.6	Reference Phase	2		L	T	R	L	T	R	L	T	R	L	T	R
Offset, s	62	Reference Point	End	Green	5.7	0.9		19.7	5.4	1.4	12.7					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	0.0		4.0	4.0	0.0	4.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.2	0.0		1.1	1.2	0.0	1.2					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.0	19.3	10.6	17.9	11.8	25.7	10.9	24.8
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	6.9	13.0	4.3	7.2	5.7	17.1	4.1	13.2
Green Extension Time (g_e), s	0.2	1.0	0.1	1.0	0.3	3.4	0.1	3.4
Phase Call Probability	0.95	1.00	0.77	1.00	0.94	1.00	0.81	1.00
Max Out Probability	0.00	0.00	0.00	0.00	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	166	302		80	164	89	154	459	439	90	353	327
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1746		1767	1856	1572	1838	1856	1776	1838	1856	1705
Queue Service Time (g_s), s	4.9	11.0		2.3	5.2	3.2	3.7	15.1	15.1	2.1	11.1	11.2
Cycle Queue Clearance Time (g_c), s	4.9	11.0		2.3	5.2	3.2	3.7	15.1	15.1	2.1	11.1	11.2
Green Ratio (*g/C*)	0.29	0.21		0.27	0.19	0.19	0.40	0.31	0.31	0.38	0.30	0.30
Capacity (*c*), veh/h	428	372		272	355	301	394	576	551	300	551	506
Volume-to-Capacity Ratio (*X*)	0.388	0.813		0.294	0.462	0.296	0.392	0.796	0.797	0.299	0.641	0.646
Back of Queue (*Q*), ft/ln (95 th percentile)	85	200		41	100	52	63	237	223	37	186	171
Back of Queue (*Q*), veh/ln (95 th percentile)	3.3	7.8		1.6	3.9	2.0	2.5	9.3	8.9	1.4	7.3	6.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.47	0.00		0.35	0.00	0.46	0.63	0.00	0.00	0.31	0.00	0.00
Uniform Delay (d_1), s/veh	18.6	25.1		19.6	24.0	23.2	14.4	21.1	21.1	15.7	20.4	20.5
Incremental Delay (d_2), s/veh	0.2	1.7		0.2	0.3	0.2	0.2	0.6	0.7	0.1	0.3	0.4
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	18.8	26.7		19.8	24.3	23.4	14.6	21.8	21.8	15.8	20.7	20.8
Level of Service (LOS)	B	C		B	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	23.9	C		23.0	C		20.7	C		20.2	C	
Intersection Delay, s/veh / LOS	21.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.26	A	1.04	A	1.20	A	1.17	A

Analysis of the traffic conditions at the Pennsylvania Ave and JFK intersection on Tuesday from 12PM-1PM are shown above. The existing conditions were optimized to minimize overall delay and successfully did so in the NB/SB directions (with minimal increases in the EB/WB directions). Before and after optimization, the intersection maintained an acceptable level of service, going from an average delay of 21.8 seconds/vehicle to 21.4 seconds/vehicle after optimization (both delays falling into the LOS C range). The intersection experiences a level of service of B for all left turns, and C for all through movements. Pedestrian level of service is not negatively affected by the adjusted signal timing.

Table 3. Wacker Dr and JFK Rd Tuesday Noon-1PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK NOON-1PM	File Name	TUESDAY Intersection (Wacker-JFK)_existing.xus		
Project Description	Wacker/JFK TUESDAY				

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	360	3	64	4	5	6	79	511	5	13	415	213

Signal Information										
Cycle, s	53.0	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	Yes	Simult. Gap E/W	On	Green	0.9	4.1	15.4	9.9	1.2	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.0	3.0	3.0	0.0
				Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		15.4		6.7	10.0	25.0	5.9	20.9
Change Period, (*Y+Rc*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s		9.1		2.2	5.2	15.6	2.3	10.1
Green Extension Time (*ge*), s		0.9		0.0	0.2	3.8	0.0	3.8
Phase Call Probability		1.00		0.20	0.92	1.00	0.17	1.00
Max Out Probability		0.00		0.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	180	247		8		7	167	547	545	13	331	297
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1758		1853		1650	1810	1900	1893	1810	1900	1683
Queue Service Time (*gs*), s	4.8	7.1		0.2		0.2	3.2	13.6	13.6	0.3	7.9	8.1
Cycle Queue Clearance Time (*gc*), s	4.8	7.1		0.2		0.2	3.2	13.6	13.6	0.3	7.9	8.1
Green Ratio (*g/C*)	0.19	0.19		0.02		0.02	0.41	0.37	0.37	0.31	0.29	0.29
Capacity (*c*), veh/h	340	331		42		38	420	699	697	206	552	489
Volume-to-Capacity Ratio (*X*)	0.529	0.747		0.187		0.190	0.398	0.782	0.782	0.063	0.599	0.608
Back of Queue (*Q*), ft/ln (95 th percentile)	82	120		4		4	47	190	189	4	135	122
Back of Queue (*Q*), veh/ln (95 th percentile)	3.3	4.8		0.2		0.2	1.9	7.6	7.6	0.2	5.4	4.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.24		0.10		0.09	0.24	0.38	0.38	0.07	0.27	0.24
Uniform Delay (*d1*), s/veh	19.5	20.4		25.5		25.5	11.3	14.9	14.9	14.1	16.2	16.2
Incremental Delay (*d2*), s/veh	0.5	1.3		0.8		0.9	0.1	0.4	0.4	0.0	0.4	0.5
Initial Queue Delay (*d3*), 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	19.9	21.7		26.3		26.4	11.4	15.3	15.3	14.1	16.6	16.7
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	20.9	C		26.3	C		14.8	B		16.6	B	
Intersection Delay, s/veh / LOS	16.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.19	A	0.50	A	0.98	A	1.02	A

The existing conditions at the Wacker Dr and JFK Rd intersection (displayed above in Table 3) show that vehicles experience an intersection delay level of service of B. By and large delay at the intersection is low, except for vehicles going westbound (exiting the PetSmart parking lot). NB/SB traffic experiences an average approach delay of between 14.8 and 16.6 seconds/vehicle while the EB/WB traffic sees approach delays of between 20.9 and 26.3 seconds/vehicle. Considering vehicles exiting the PetSmart parking lot have by far the lowest volume (and there is an alternative parking lot exit south of the intersection) it is expected that this direction would see significantly higher delay than other directions.

Table 4. Wacker Dr and JFK Rd Tuesday Noon-1PM HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK NOON-1PM	File Name	TUESDAY Intersection (Wacker-JFK)_existingFIN...		
Project Description	Wacker/JFK TUESDAY				

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	360	3	64	4	5	6	79	511	5	13	415	213

Signal Information									
Cycle, s	52.3	Reference Phase	2						
Offset, s	0	Reference Point	End						
Uncoordinated	Yes	Simult. Gap E/W	On	Green	0.9	4.1	15.1	9.6	1.2	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.0	3.0	3.0	0.0
				Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		15.1		6.7	10.0	24.7	5.9	20.6
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		9.0		2.2	5.1	15.3	2.3	10.0
Green Extension Time (*g e*), s		0.6		0.0	0.2	3.7	0.0	2.9
Phase Call Probability		1.00		0.20	0.91	1.00	0.17	1.00
Max Out Probability		0.09		0.00	0.00	0.01	0.00	0.34

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	180	247		8		7	166	542	540	13	331	297
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1758		1853		1650	1810	1900	1893	1810	1900	1683
Queue Service Time (*g s*), s	4.7	7.0		0.2		0.2	3.1	13.3	13.3	0.3	7.9	8.0
Cycle Queue Clearance Time (*g c*), s	4.7	7.0		0.2		0.2	3.1	13.3	13.3	0.3	7.9	8.0
Green Ratio (*g/C*)	0.18	0.18		0.02		0.02	0.41	0.37	0.37	0.31	0.29	0.29
Capacity (*c*), veh/h	333	324		42		38	421	697	695	208	548	486
Volume-to-Capacity Ratio (*X*)	0.540	0.763		0.186		0.189	0.394	0.777	0.777	0.063	0.603	0.612
Back of Queue (*Q*), ft/ln (95 th percentile)	81	119		4		4	46	185	185	4	134	121
Back of Queue (*Q*), veh/ln (95 th percentile)	3.3	4.8		0.2		0.2	1.8	7.4	7.4	0.2	5.4	4.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.24		0.10		0.09	0.24	0.37	0.37	0.07	0.27	0.24
Uniform Delay (*d 1*), s/veh	19.4	20.3		25.2		25.2	11.2	14.7	14.7	14.0	16.1	16.1
Incremental Delay (*d 2*), s/veh	0.5	1.4		0.8		0.9	0.1	0.4	0.4	0.0	0.4	0.5
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	19.9	21.8		26.0		26.1	11.3	15.1	15.1	14.0	16.5	16.6
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.0	C		26.0	C		14.6	B		16.5	B	
Intersection Delay, s/veh / LOS	16.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.19	A	0.50	A	0.98	A	1.02	A

Analysis of the optimized traffic conditions at the Wacker Dr and JFK intersection on Tuesday from 12 PM-1PM are shown above. The existing conditions were optimized to minimize overall delay and successfully did so in the NB/SB and WB directions (with a minimal increase of .1 seconds/vehicle in the EB directions). Before and after optimization the intersection maintained an acceptable level of service, going from an average delay of 16.5 seconds/vehicle to 16.4 seconds/vehicle after optimization (both delays falling into the LOS B range). The intersection sees a level of service of B for all left turns apart from the WB direction (which receives a C), and C for all through movements. Pedestrian level of service is not negatively affected by the adjusted signal timing.

Saturday, February 10th, 2024:

Table 5.Pennsylvania Ave and JFK Rd Saturday Noon-1PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection		File Name	Wacker_Penn Existing Update 12-1.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	174	148	126	103	130	72	140	717	87	88	760	150

Signal Information										
Cycle, s	66.5	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	Yes	Simult. Gap E/W	On	Green	5.6	0.8	20.2	6.0	1.5	11.6
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0
				Red	1.2	0.0	1.1	1.2	0.0	1.2

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.6	18.3	11.2	16.8	11.7	26.2	10.8	25.3
Change Period, (*Y+R*$_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	7.2	12.2	5.0	6.1	5.4	14.8	4.1	17.6
Green Extension Time (g_e), s	0.3	0.9	0.1	0.9	0.2	3.7	0.1	2.6
Phase Call Probability	1.00	1.00	0.85	1.00	0.92	1.00	0.80	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.45

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	174	274		103	130	72	139	407	392	88	468	442
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1714		1767	1856	1572	1767	1856	1785	1767	1856	1749
Queue Service Time (g_s), s	5.2	10.2		3.0	4.1	2.6	3.4	12.8	12.8	2.1	15.6	15.6
Cycle Queue Clearance Time (g_c), s	5.2	10.2		3.0	4.1	2.6	3.4	12.8	12.8	2.1	15.6	15.6
Green Ratio (*g/C*)	0.29	0.20		0.26	0.17	0.17	0.40	0.32	0.32	0.39	0.30	0.30
Capacity (*c*), veh/h	448	338		283	324	275	323	589	566	322	565	533
Volume-to-Capacity Ratio (*X*)	0.389	0.811		0.364	0.401	0.262	0.431	0.692	0.693	0.273	0.828	0.829
Back of Queue (*Q*), ft/ln (95 th percentile)	90	184		54	80	43	56	217	205	36	292	273
Back of Queue (*Q*), veh/ln (95 th percentile)	3.5	7.2		2.1	3.1	1.7	2.2	8.5	8.2	1.4	11.4	10.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.50	0.00		0.47	0.00	0.37	0.56	0.00	0.00	0.30	0.00	0.00
Uniform Delay (d_1), s/veh	18.9	25.5		20.1	24.4	23.7	15.3	19.9	19.9	14.7	21.5	21.5
Incremental Delay (d_2), s/veh	0.2	1.8		0.3	0.3	0.2	0.3	0.5	0.5	0.2	6.0	6.4
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	19.1	27.4		20.3	24.7	23.9	15.6	20.3	20.4	14.9	27.5	27.9
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	24.2	C		23.0	C		19.6	B		26.6	C	
Intersection Delay, s/veh / LOS	23.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.23	A	0.99	A	1.27	A	1.31	A

 HCS™ Streets Version 2024 Generated: 5/6/2024 9:42:54 AM

The table provides an overview of the existing conditions during Saturday from 12-1 pm, showcasing results across various movement groups. Notably, the absence of data in the EB right movement is explained by the apparent configuration at the top right of the table indicating synchronization between the through movement and the right movement, consolidating data from both sections. Of particular significance for analysis are several key variables: Control Delay, Level of Service (LOS), Approach Delay alongside corresponding LOS, and the overall intersection delay and LOS. Examination of these variables reveals that the Pennsylvania and JFK intersection operates at an average LOS of C, which falls within acceptable parameters. There is no indication of approaching an undesirable LOS of D or exceeding a delay threshold of 35 s/veh. In summary, the existing operational signaling demonstrates effective functionality, ensuring smooth traffic flow within acceptable parameters.

Table 6.Pennsylvania Ave and JFK Rd Saturday Noon-1PM HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection		File Name	Wacker_Penn Existing Update 12-1 (Overall Dela...		
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	174	148	126	103	130	72	140	717	87	88	760	150

Signal Information												
Cycle, s	68.4	Reference Phase	2									
Offset, s	76	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	5.7	0.8	21.7	6.0	1.0	12.5		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0		
				Red	1.2	0.0	1.1	1.2	0.0	1.2		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.2	18.6	11.2	17.7	11.7	27.6	10.9	26.8
Change Period, (*Y+Rc*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s	7.4	12.5	5.1	6.2	5.4	15.0	4.2	17.8
Green Extension Time (*ge*), s	0.0	0.8	0.2	0.9	0.3	3.7	0.2	3.7
Phase Call Probability	1.00	1.00	0.86	1.00	0.93	1.00	0.81	1.00
Max Out Probability	1.00	0.01	0.00	0.00	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	174	274		103	130	72	139	407	392	88	468	442
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1714		1767	1856	1572	1767	1856	1785	1767	1856	1749
Queue Service Time (*gs*), s	5.4	10.5		3.1	4.2	2.7	3.4	13.0	13.0	2.2	15.8	15.8
Cycle Queue Clearance Time (*gc*), s	5.4	10.5		3.1	4.2	2.7	3.4	13.0	13.0	2.2	15.8	15.8
Green Ratio (*g/C*)	0.29	0.20		0.27	0.18	0.18	0.42	0.33	0.33	0.40	0.32	0.32
Capacity (*c*), veh/h	443	337		279	340	289	328	612	589	330	591	557
Volume-to-Capacity Ratio (*X*)	0.393	0.812		0.370	0.382	0.250	0.425	0.666	0.667	0.267	0.793	0.793
Back of Queue (*Q*), ft/ln (95 th percentile)	94	192		55	82	44	57	219	208	36	269	251
Back of Queue (*Q*), veh/ln (95 th percentile)	3.7	7.5		2.2	3.2	1.7	2.2	8.6	8.3	1.4	10.5	10.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.52	0.00		0.48	0.00	0.38	0.57	0.00	0.00	0.30	0.00	0.00
Uniform Delay (*d 1*), s/veh	19.6	26.4		20.4	24.6	24.0	15.2	19.8	19.8	14.6	21.4	21.4
Incremental Delay (*d 2*), s/veh	0.2	1.8		0.3	0.3	0.2	0.3	0.4	0.4	0.2	0.9	1.0
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	19.8	28.2		20.7	24.9	24.2	15.4	20.2	20.2	14.7	22.3	22.4
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	25.0	C		23.3	C		19.5	B		21.7	C	
Intersection Delay, s/veh / LOS	21.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.23	A	0.99	A	1.27	A	1.31	A

 HCS™ Streets Version 2024 Generated: 5/1/2024 5:41:53 PM

Displayed in the table above are the optimized results for the Pennsylvania and JFK intersection during Saturday from 12-1 pm, building on the previously examined existing conditions. Significantly, improvements are evident, particularly in the total intersection delay, which has decreased by 1.7 s/veh. On closer examination, it becomes apparent that while the control delay and approach delay have increased across certain movements, they have decreased notably from others. Noteworthy is the reduction of 5.2 s/veh in the control delay for SB through movements. This optimization strategy strategically manages delay in each direction, effectively aligning with the traffic volume dynamics of the intersection. In essence, these optimizations contribute to enhancing traffic flow within the intersection, exemplifying a targeted approach to delay management across various movement directions.

Table 7. Wacker Dr and JFK Rd Saturday Noon-1PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	JFK/Wacker	File Name	Wacker_Penn Existing Update 12-1.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	389	16	71	12	4	14	116	536	4	13	498	355

Signal Information										
Cycle, s	74.4	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	Yes	Simult. Gap E/W	Off	Green	1.9	4.5	24.1	17.8	4.6	0.0
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	3.5	0.0	4.0	3.0	3.0	0.0
				Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		23.3		10.1	11.4	34.1	6.9	29.6
Change Period, (*Y+R_c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.0	3.1	3.2
Queue Clearance Time (*g_s*), s		16.9		2.6	6.8	9.8	2.6	21.8
Green Extension Time (*g_e*), s		0.9		0.0	0.1	1.0	0.0	2.1
Phase Call Probability		1.00		0.46	0.91	1.00	0.26	1.00
Max Out Probability		0.00		0.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	117	359		16		14	116	270	270	15	524	451
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1731		1788		1576	1767	1856	1851	1767	1856	1597
Queue Service Time (*g_s*), s	4.0	14.9		0.6		0.6	4.8	7.8	7.8	0.6	19.8	19.8
Cycle Queue Clearance Time (*g_c*), s	4.0	14.9		0.6		0.6	4.8	7.8	7.8	0.6	19.8	19.8
Green Ratio (*g/C*)	0.24	0.24		0.06		0.06	0.09	0.38	0.38	0.03	0.32	0.32
Capacity (*c*), veh/h	424	415		112		99	151	713	711	44	601	517
Volume-to-Capacity Ratio (*X*)	0.275	0.866		0.141		0.144	0.766	0.379	0.379	0.335	0.871	0.871
Back of Queue (*Q*), ft/ln (95 th percentile)	74	260		12		11	97	142	138	12	295	254
Back of Queue (*Q*), veh/ln (95 th percentile)	2.9	10.1		0.5		0.4	3.8	5.5	5.5	0.5	11.5	10.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.15	0.52		0.27		0.25	0.19	0.28	0.28	0.02	0.59	0.52
Uniform Delay (*d₁*), s/veh	23.1	27.2		33.1		33.1	33.4	16.5	16.5	35.8	23.8	23.8
Incremental Delay (*d₂*), s/veh	0.1	3.0		0.2		0.2	3.1	0.1	0.1	0.9	0.9	1.0
Initial Queue Delay (*d₃*), s/veh	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	23.2	30.2		33.3		33.3	36.5	16.7	16.7	36.6	24.6	24.8
Level of Service (LOS)	C	C		C		C	D	B	B	D	C	C
Approach Delay, s/veh / LOS	28.5	C		33.3	C		20.2	C		24.9	C	
Intersection Delay, s/veh / LOS	24.4						C					

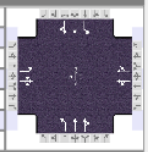
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.30	B	1.90	B	2.10	B
Bicycle LOS Score / LOS	1.27	A	0.51	A	1.03	A	1.20	A

The table provides a rundown of the existing conditions during Saturday from 12-1 pm at Wacker and JFK, displaying results across various movement groups. Notably, the absence of data in the EB right and WB through movement is explained by the apparent configuration at the top right of the table indicating synchronization between the through movement and the right movement of the EB direction, as for the WB the configuration combines the through movements with its respective turning lane consolidating data from both sections. Of particular significance for analysis are several key variables: Control Delay, Level of Service (LOS), Approach Delay alongside corresponding LOS, and the overall intersection delay and LOS. Examination of these variables reveals that the Wacker and JFK intersection operates at an average LOS of C, which falls within acceptable parameters. There is no indication of approaching an undesirable LOS of D or exceeding a delay threshold of 35 s/veh. In summary, the existing operational signaling demonstrates effective functionality, ensuring smooth traffic flow within acceptable parameters.

Table 8.Wacker Dr and JFK Rd Saturday Noon-1PM HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	JFK/Wacker	File Name	Wacker_Penn Existing Update 12-1 (Overall Dela...		
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	389	16	71	12	4	14	116	536	4	13	498	355

Signal Information					EB			WB			NB			SB		
Cycle, s	74.4	Reference Phase	2		L	T	R	L	T	R	L	T	R	L	T	R
Offset, s	0	Reference Point	End	Green	1.9	4.5		24.0	17.8	4.6	0.0					
Uncoordinated	Yes	Simult. Gap E/W	Off	Yellow	3.5	0.0		4.0	3.0	3.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	Off	Red	1.5	0.0		1.5	2.5	2.5	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		23.3		10.1	11.4	34.0	6.9	29.5
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.0	3.1	3.2
Queue Clearance Time (*g s*), s		16.8		2.6	6.8	9.8	2.6	21.8
Green Extension Time (*g e*), s		0.9		0.0	0.1	0.7	0.0	2.1
Phase Call Probability		1.00		0.46	0.91	1.00	0.26	1.00
Max Out Probability		0.00		0.00	0.01	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	117	359		16		14	116	270	270	15	524	451
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1731		1788		1576	1767	1856	1851	1767	1856	1597
Queue Service Time (*g s*), s	4.0	14.8		0.6		0.6	4.8	7.8	7.8	0.6	19.8	19.8
Cycle Queue Clearance Time (*g c*), s	4.0	14.8		0.6		0.6	4.8	7.8	7.8	0.6	19.8	19.8
Green Ratio (*g/C*)	0.24	0.24		0.06		0.06	0.09	0.38	0.38	0.03	0.32	0.32
Capacity (*c*), veh/h	424	415		112		99	151	713	711	44	600	516
Volume-to-Capacity Ratio (*X*)	0.275	0.865		0.141		0.144	0.766	0.379	0.380	0.335	0.873	0.872
Back of Queue (*Q*), ft/ln (95 th percentile)	73	256		12		11	97	142	138	12	298	258
Back of Queue (*Q*), veh/ln (95 th percentile)	2.9	10.0		0.5		0.4	3.8	5.5	5.5	0.5	11.7	10.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.15	0.51		0.27		0.25	0.19	0.28	0.28	0.02	0.60	0.53
Uniform Delay (*d 1*), s/veh	23.0	27.2		33.0		33.0	33.3	16.6	16.6	35.7	23.8	23.8
Incremental Delay (*d 2*), s/veh	0.1	2.2		0.2		0.2	3.1	0.1	0.1	0.9	0.9	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
Control Delay (*d*), s/veh	23.2	29.4		33.3		33.3	36.4	16.7	16.7	36.7	24.7	24.9
Level of Service (LOS)	C	C		C		C	D	B	B	D	C	C
Approach Delay, s/veh / LOS	27.9	C		33.3	C		20.2	C		25.0	C	
Intersection Delay, s/veh / LOS	24.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.30	B	1.90	B	2.10	B
Bicycle LOS Score / LOS	1.27	A	0.51	A	1.03	A	1.20	A

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The table above presents the optimized results for the Wacker and JFK intersection during Saturday from 12-1 pm, expanding upon the previously analyzed existing conditions. Although marginal, improvements are observable, particularly in the total intersection delay, which has decreased by a modest 0.1 s/veh. On closer look, it is evident that while the control delay and approach delay have remained relatively stable across most movements, there has been a notable decrease in the EB direction. Particularly noteworthy is the reduction of 0.6 s/veh in the approach delay for all EB movements. This optimization strategy tactically addresses delay in each direction, aligning effectively with the traffic volume dynamics of the intersection. In essence, these optimizations contribute incrementally to enhancing traffic flow within the intersection, showcasing a focused approach to managing delay across diverse movement directions.

Synchro Analysis Methods:

The following Synchro simulation analysis was done using the SimTraffic features. The directions analyzed were found to have the most significant delay per vehicle (seconds) for the two major signalized intersections for the current conditions.

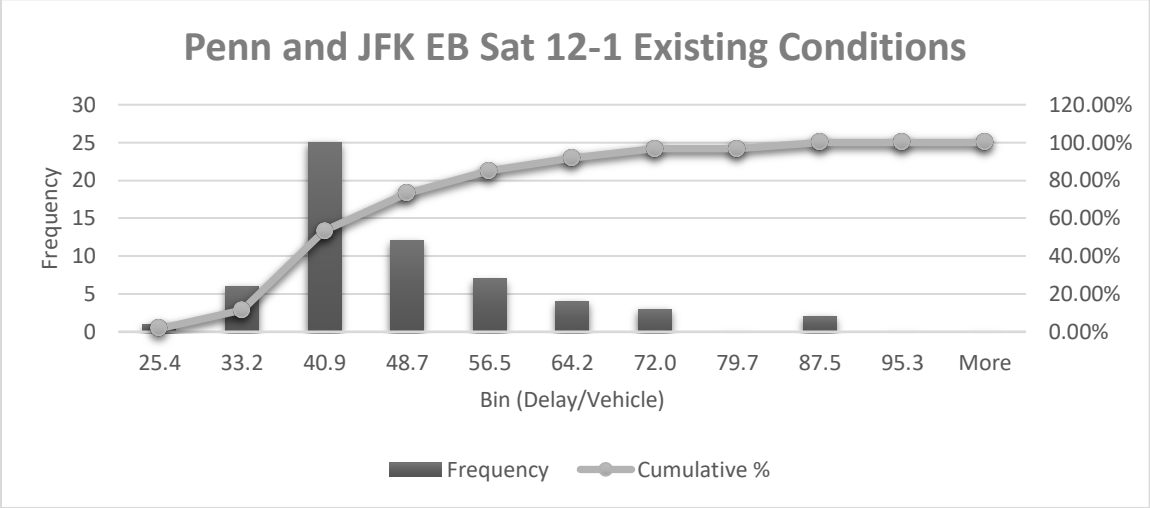


Figure 6. The total delay/vehicle the Penn and JFK intersection going eastbound experienced during the 60 simulation runs from 12-1 on a Saturday.

For each of the 60 simulation runs that were run on SimTraffic, our team obtained a total delay per vehicle. As shown on the graph above, on Saturday (February 10, 2024) at the Pennsylvania Ave and JFK intersection, the traffic going eastbound had approximately 70 percent of the simulation runs have a total delay per vehicle of 48.7 seconds or less. The eastbound direction at this intersection was significant since there were many collisions going out of the driveway about 205 feet from the stop bar of the leg as mentioned earlier. The minimum delay per vehicle for the EB direction was found to be 25.4 seconds while the maximum delay was found to be 87.5 seconds with an average delay of 44.3 seconds. With 95

percent confidence, one could say that the total delay per vehicle would fall between 41 and 47.5 seconds for the eastbound direction of Pennsylvania Ave and JFK.

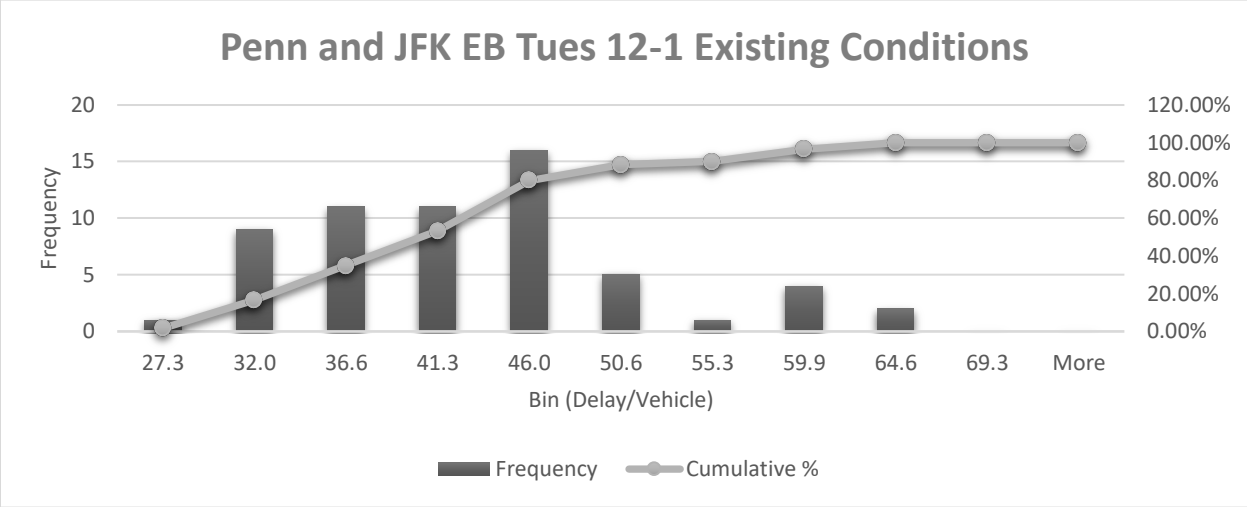


Figure 7. The total delay/vehicle the Penn and JFK intersection going eastbound experienced during the 60 simulation runs from 12-1 on a Tuesday.

For each of the 60 simulation runs off of SimTraffic, our team obtained a total delay per vehicle. As shown on the graph above, on Tuesday (February 6, 2024) at the Pennsylvania Ave and JFK intersection, the traffic going eastbound had approximately 70 percent of the simulation runs have a total delay per vehicle of 46 seconds or less. The minimum delay per vehicle for this direction was found to be 27.3 seconds while the maximum delay was found to be 64.6 seconds with an average delay of 40.6 seconds. With 95 percent confidence, one could say that the total delay per vehicle would fall between 38.3 seconds and 42.8 seconds for the eastbound direction of Pennsylvania Ave and JFK.

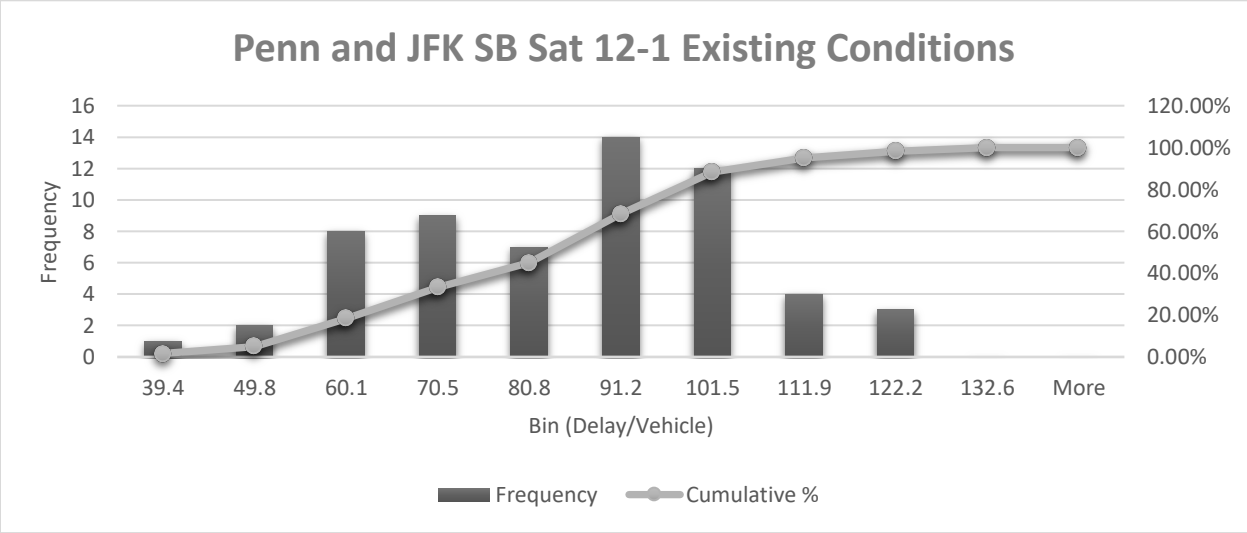


Figure 8. The total delay/vehicle the Penn and JFK intersection going southbound experienced during the 60 simulation runs from 12-1 on a Saturday.

Another direction that was found significant at this intersection was the southbound direction. This leg is significant because it had the largest total delay per vehicle. 60 simulation runs were done on SimTraffic for the southbound direction at Pennsylvania Ave and JFK. The team obtained a total delay per vehicle for each of the simulation runs as shown on the graph above. The Saturday (February 10, 2024) Pennsylvania Ave and JFK intersection results had vehicles going southbound having a delay of 91.2 seconds or less for 70 percent of the simulation runs. The minimum delay per vehicle for the SB direction was found to be 39.4 seconds while the maximum delay was found to be 122.2 seconds (with an average delay of 79.8 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 74.9 seconds and 84.8 seconds for the southbound direction of Pennsylvania Ave and JFK.

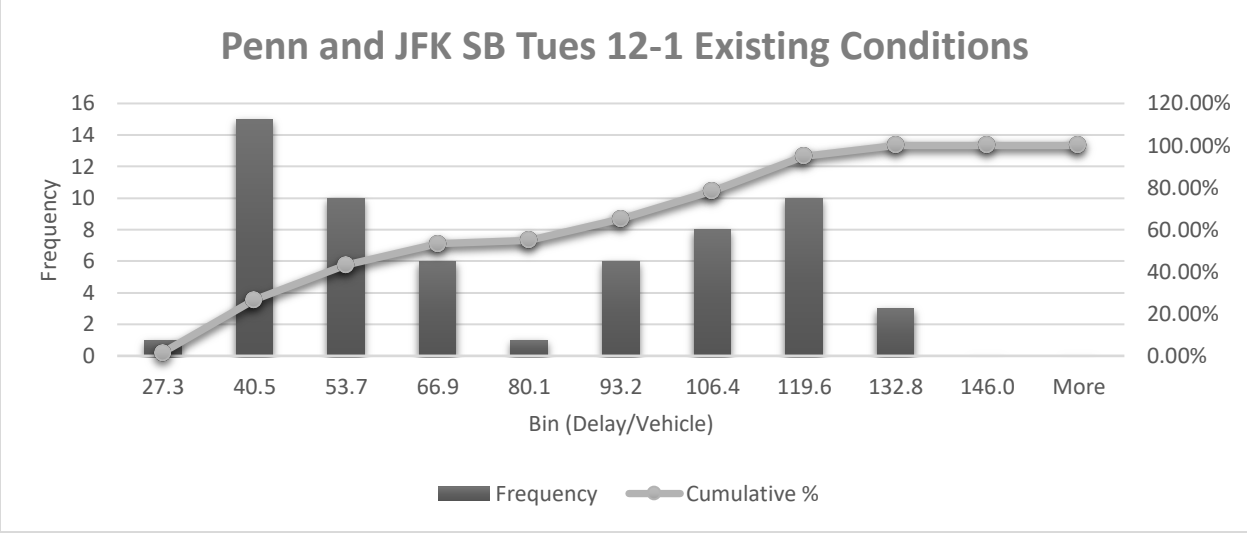


Figure 9. The total delay/vehicle the Penn and JFK intersection going southbound experienced during the 60 simulation runs from 12-1 on a Saturday.

Additionally, 60 simulation runs were done on SimTraffic for the southbound direction at Pennsylvania Ave and JFK for a Tuesday. For 70 percent of the simulation runs done on Tuesday (February 6, 2024) vehicles experienced a total delay of 106.4 seconds or less. The minimum delay per vehicle in the SB direction was found to be 27.3 seconds, while the maximum delay for this direction was 132.8 seconds (with an average delay of 71 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 62.5 seconds and 79.5 seconds for the southbound direction of Pennsylvania Ave and JFK.

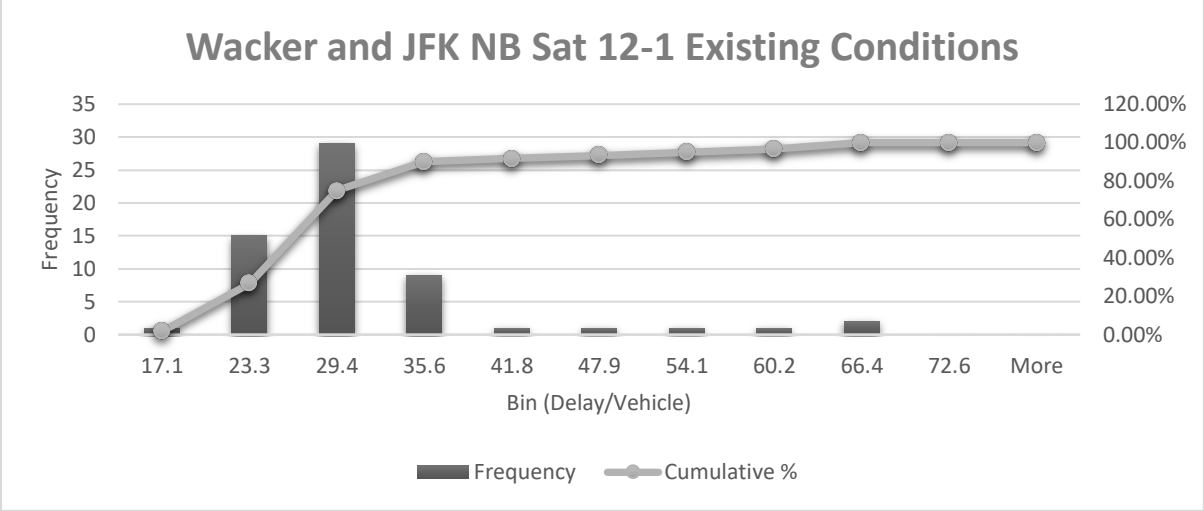


Figure 10. The total delay/vehicle the Wacker and JFK intersection going northbound experienced during the 60 simulation runs from 12-1 on a Saturday.

We also analyzed the total delay per vehicle for the Wacker Dr and JFK intersection. The team felt that the northbound direction was significant in this analysis. We believe this leg of the intersection to be significant because we wanted to analyze the total delay per vehicle at one of the JFK legs and this leg had the highest total delay per vehicle of the two. On Saturday (February 10, 2024) at the Wacker Dr and JFK intersection, northbound vehicles experienced a delay of 29.4 seconds or less for 70 percent of simulation runs. The minimum delay per vehicle for the NB direction was 17.1 seconds, while the maximum delay was 66.4 seconds (with an average delay of 28.4 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 25.9 seconds and 31 seconds for the northbound direction of Wacker Dr and JFK.

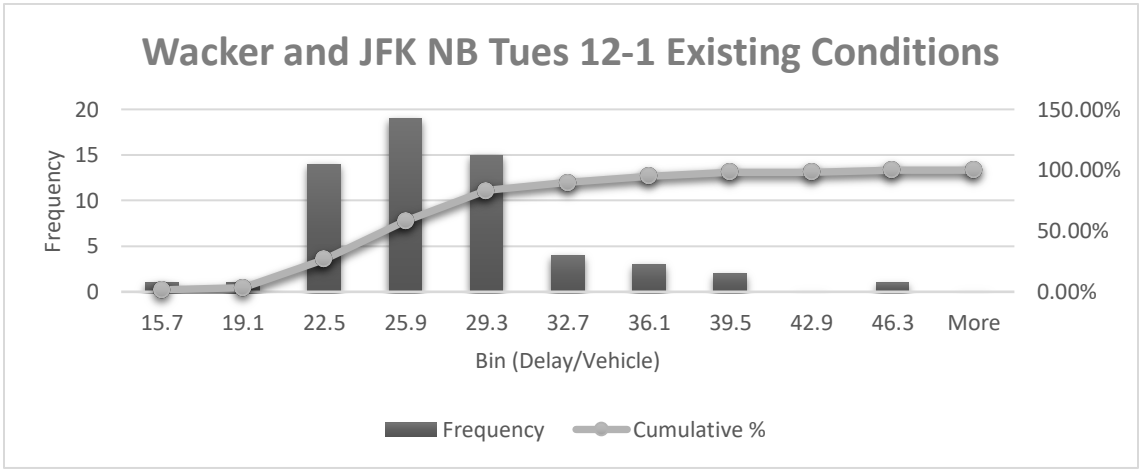


Figure 11. The total delay/vehicle the Wacker and JFK intersection going northbound experienced during the 60 simulation runs from 12-1 on a Tuesday.

The delay per vehicle was also analyzed at the intersection of Wacker Dr and JFK (for vehicles traveling northbound) on Tuesday (February 6, 2024). Vehicles going northbound experienced a delay of 29.3 seconds or less for 70 percent of simulation runs. The minimum delay per vehicle for the NB direction was found to be 15.7 seconds while the maximum delay was 42.9 seconds (with an average delay of 25.7 seconds). With 95 percent confidence, one could say that the total delay per vehicle in the northbound direction at Wacker Dr and JFK would fall between 24.3 seconds and 27 seconds.

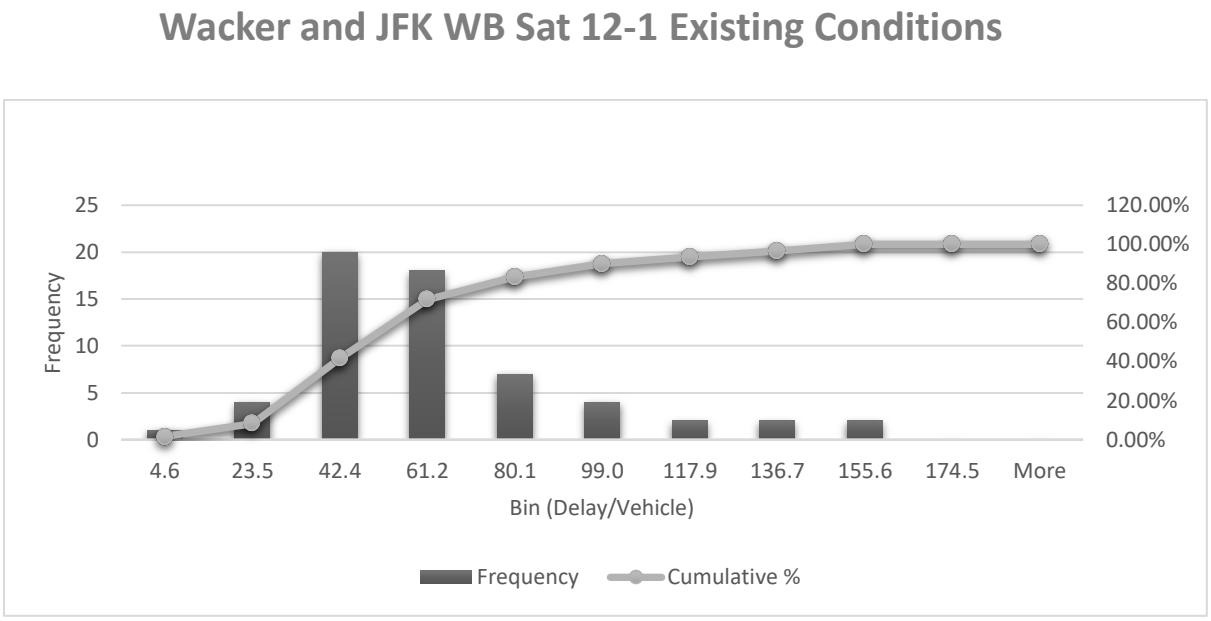


Figure 12. The total delay/vehicle the Wacker and JFK intersection going westbound experienced during the 60 simulation runs from 12-1 on a Saturday.

The delays experienced by a vehicle traveling westbound through Wacker and JFK was analyzed. The east leg of the intersection had the largest total delay per vehicle. On Saturday (February 10, 2024) the Wacker Dr and JFK intersection had westbound vehicles experiencing a delay of 61.2 seconds or less for 70 percent of simulation runs. The minimum delay per vehicle for the WB direction was 4 seconds, while the maximum delay was 155.6 seconds (with an average delay of 53.7 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 45.3 seconds and 62.1 seconds for the westbound direction of Wacker Dr and JFK.

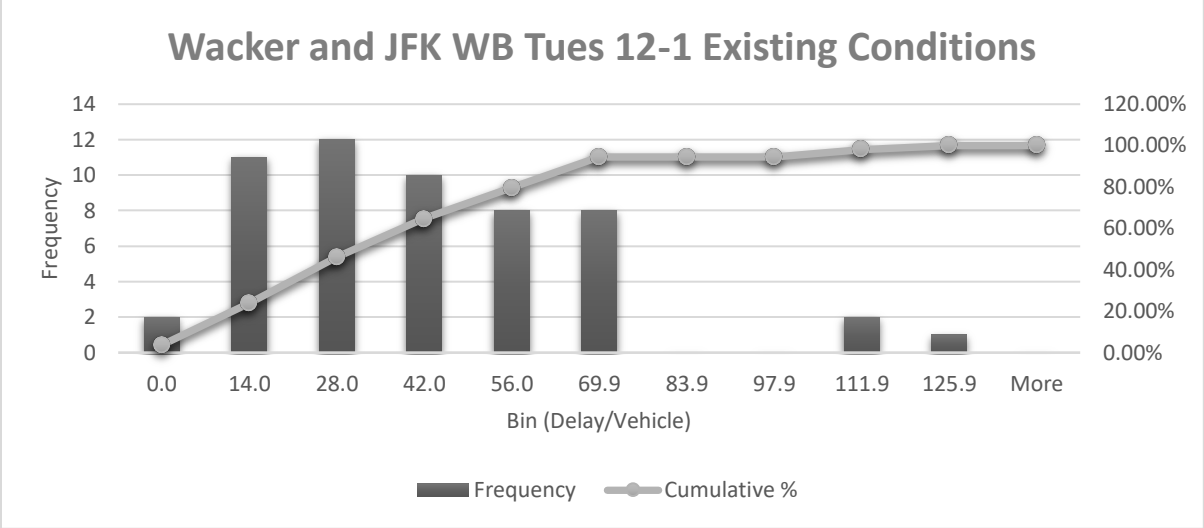


Figure 13. The total delay/vehicle the Wacker and JFK intersection going westbound experienced during the 60 simulation runs from 12-1 on a Tuesday.

Lastly, on Tuesday (February 6, 2024) westbound traffic at the Wacker Dr and JFK intersection, 70 percent of simulation runs resulted in a delay per vehicle of 42 seconds or less. The minimum delay per vehicle for the WB direction was 0 seconds, while the maximum delay was 111.9 seconds (with an average delay of 34.8 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 27.6 seconds and 42 seconds for the westbound direction of Wacker Dr and JFK.

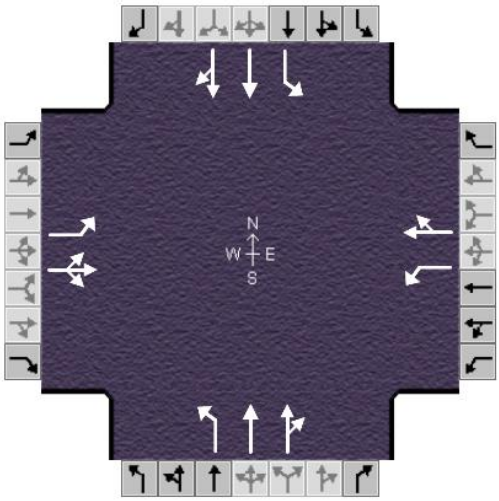


Figure 14. Existing intersection geometry of Wacker Dr and JFK Rd

Above is the existing intersection geometry of Wacker Dr and JFK. It is important to note that WB traffic is exiting a mall, while EB through would be entering the parking lot.

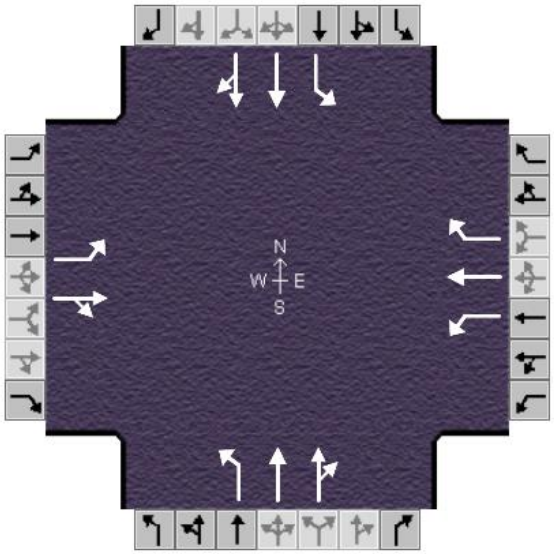


Figure 15. Existing intersection geometry of Pennsylvania Ave and JFK Rd

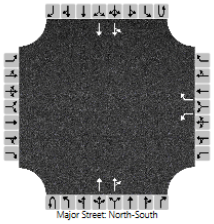
Shown above is the existing geometric layout of the Pennsylvania Ave and JFK intersection. It is important to note that vehicles driving towards the intersection do so at a significant decline, which contributes to the overall danger of the intersection (by increasing average vehicle speed).

Table 9. Carter Rd and JFK Rd Two-Way Stop HCS Control Report

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Payton Stuart	Intersection	Carter/JFK
Agency/Co.	University of Iowa	Jurisdiction	Dubuque County
Date Performed	2/15/2024	East/West Street	Carter Rd
Analysis Year	2024	North/South Street	John F. Kennedy
Time Analyzed	3:05	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	2	0	0	0	2	0
Configuration						L		R			T	TR		LT	T	
Volume (veh/h)						29		8			572	96		37	551	
Percent Heavy Vehicles (%)						1		1						1		
Proportion Time Blocked																
Percent Grade (%)						-7										
Right Turn Channelized						No										
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						7.5		6.9						4.1		
Critical Headway (sec)						5.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.51		3.31						2.21		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						32		9						40		
Capacity, c (veh/h)						301		683						879		
v/c Ratio						0.10		0.01						0.05		
95% Queue Length, Q_{95} (veh)						0.3		0.0						0.1		
95% Queue Length, Q_{95} (ft)						7.6		0.0						2.5		
Control Delay (s/veh)						18.4		10.3						9.3	0.4	
Level of Service (LOS)						C		B						A	A	
Approach Delay (s/veh)						16.6								1.0		
Approach LOS						C								A		

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Carter Stop Intersection.xtw

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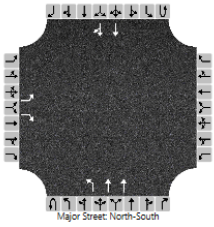
The analysis of the Carter and JFK intersection, as described above, presents the layout of the intersection alongside the vehicle volumes associated with the respective roadways, as determined by the Iowa DOT AADT maps. Additionally, a one-hour sample was conducted for all TWSC reports. The findings indicate a Level of Service (LOS) of A in the northbound and southbound directions, with an approach delay of 1 second per vehicle. However, in the westbound direction, the LOS is C with an approach delay of 16.6 seconds per vehicle. Overall, the intersection is in good standing, with potential opportunities for improvement in the westbound direction.

Table 10. Crestwood Dr and JFK Rd Two-Way Stop HCS Control Report

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Payton Stuart	Intersection	Crestwood/John F. Kennedy
Agency/Co.	U of I	Jurisdiction	Dubuque County
Date Performed	2/20/2024	East/West Street	Crestwood
Analysis Year	2024	North/South Street	John F. Kennedy
Time Analyzed	10:37	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	JFK Redesign		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	0	1		0	0	0	0	1	2	0	0	0	2	0
Configuration		L		R						L	T				T	TR
Volume (veh/h)		2		3					0	4	411				411	4
Percent Heavy Vehicles (%)		1		1					3	3						
Proportion Time Blocked																
Percent Grade (%)		2														
Right Turn Channelized		No														
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		7.22		7.12						4.16						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.51		3.31						2.23						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		2		3						4						
Capacity, c (veh/h)		352		761						1099						
v/c Ratio		0.01		0.00						0.00						
95% Queue Length, Q_{95} (veh)		0.0		0.0						0.0						
95% Queue Length, Q_{95} (ft)		0.0		0.0						0.0						
Control Delay (s/veh)		15.3		9.7						8.3						
Level of Service (LOS)		C		A						A						
Approach Delay (s/veh)		12.0								0.1						
Approach LOS		B								A						

HCS™ TWSC Version 2024
Crestwood Stop Intersection.xtw

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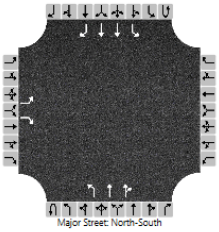
The analysis of the Crestwood and JFK intersection, as detailed above, reveals its layout and the traffic volumes observed on the respective roads, as determined by the Iowa DOT AADT maps. The report indicates that the intersection achieves a Level of Service (LOS) rating of A in the northbound and southbound directions, with an approach delay of 0.1 seconds per vehicle. In the eastbound direction, the intersection has a LOS of B with an approach delay of 12 seconds per vehicle. Based on these findings, it is concluded that the intersection does not require any operational or geometric modifications.

Table 11. Stoneman Rd and JFK Rd Two-Way Stop HCS Control Report

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Payton Stuart	Intersection	Stoneman/John F. Kennedy
Agency/Co.	U of I	Jurisdiction	Dubuque County
Date Performed	2/20/2024	East/West Street	Stoneman
Analysis Year	2024	North/South Street	John F. Kennedy
Time Analyzed	10:34	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	JFK Redesign		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	0	1		0	0	0	0	1	2	0	0	1	2	1
Configuration		L		R						L	T	TR		L	T	R
Volume (veh/h)		1		3					0	19	249	8	0	0	247	6
Percent Heavy Vehicles (%)		3		3					3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)		1														
Right Turn Channelized		No												No		
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1				4.1		
Critical Headway (sec)		7.76		7.06						4.16				4.16		
Base Follow-Up Headway (sec)		3.5		3.3						2.2				2.2		
Follow-Up Headway (sec)		3.53		3.33						2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1		3						21				0		
Capacity, c (veh/h)		471		884						1278				1273		
v/c Ratio		0.00		0.00						0.02				0.00		
95% Queue Length, Q_{95} (veh)		0.0		0.0						0.0				0.0		
95% Queue Length, Q_{95} (ft)		0.0		0.0						0.0						
Control Delay (s/veh)		12.7		9.1						7.9				7.8		
Level of Service (LOS)		B		A						A				A		
Approach Delay (s/veh)		10.0								0.5				0.0		
Approach LOS		A								A				A		

HCS™ TWSC Version 2024
Stoneman Stop Intersection.xtw
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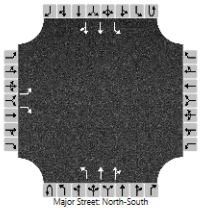
The examination of the Stoneman and JFK intersection, as outlined above, showcases its layout and the traffic volumes observed on the respective roads, as determined by the Iowa DOT AADT maps. The analysis reveals a Level of Service (LOS) rating of A in the northbound and southbound directions, with an approach delay of 0.5 seconds per vehicle. In the eastbound direction, the intersection achieves an LOS of A with an approach delay of 10 seconds per vehicle. In summary, it is determined that this intersection does not require any operational or geometric alterations.

Table 12. Daykin Ct and JFK Rd Two-Way Stop HCS Control Report

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Payton Stuart	Intersection	Daykin/John F. Kennedy
Agency/Co.	U of I	Jurisdiction	Dubuque County
Date Performed	2/20/2024	East/West Street	Daykin
Analysis Year	2024	North/South Street	John F. Kennedy
Time Analyzed	10:31	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	JFK Redesign		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	0	1		0	0	0	0	1	2	0	0	1	2	0
Configuration		L		R						L	T	TR		L	T	TR
Volume (veh/h)		4		35					0	181	565	13	0	19	534	13
Percent Heavy Vehicles (%)		3		3					3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)		1														
Right Turn Channelized		No														
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1				4.1		
Critical Headway (sec)		7.76		7.06						4.16				4.16		
Base Follow-Up Headway (sec)		3.5		3.3						2.2				2.2		
Follow-Up Headway (sec)		3.53		3.33						2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4		38						197				21		
Capacity, c (veh/h)		80		673						971				943		
v/c Ratio		0.05		0.06						0.20				0.02		
95% Queue Length, Q_{95} (veh)		0.2		0.2						0.8				0.1		
95% Queue Length, Q_{95} (ft)		5.1		5.1						20.5				2.6		
Control Delay (s/veh)		52.5		10.7						9.6				8.9		
Level of Service (LOS)		F		B						A				A		
Approach Delay (s/veh)		15.0								2.3				0.3		
Approach LOS		B								A				A		

HCS™ TWSC Version 2024
Daykin Stop Intersection.xtw
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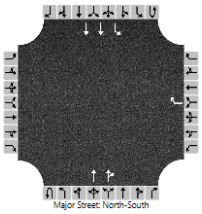
The examination of the Daykin and JFK intersection, as detailed above, presents the intersection's layout and the vehicle volumes related to the respective roadways, utilizing data from the Iowa DOT AADT maps. The report indicates a Level of Service (LOS) of A in the northbound and southbound directions, with an approach delay of 2.3 seconds per vehicle in the northbound direction and 0.3 seconds per vehicle in the southbound direction. In the eastbound direction, the intersection achieves a LOS of B with an approach delay of 15 seconds per vehicle. Overall, it is concluded that no operational or geometric changes are necessary for this intersection.

Table 13. University Ave and JFK Rd Two-Way Stop HCS Control Report

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Payton Stuart	Intersection	University/John F. Kennedy
Agency/Co.	U of I	Jurisdiction	Dubuque County
Date Performed	2/20/2024	East/West Street	University
Analysis Year	2024	North/South Street	John F. Kennedy
Time Analyzed	9:47	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	JFK Redesign		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	1	0	0	2	0	0	1	2	0
Configuration								R			T	TR		L	T	
Volume (veh/h)								91			247	20	0	21	277	
Percent Heavy Vehicles (%)								3					3	3		
Proportion Time Blocked																
Percent Grade (%)						3										
Right Turn Channelized						No										
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)								6.9						4.1		
Critical Headway (sec)								7.26						4.16		
Base Follow-Up Headway (sec)								3.3						2.2		
Follow-Up Headway (sec)								3.33						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)								99						23		
Capacity, c (veh/h)								862						1261		
v/c Ratio								0.11						0.02		
95% Queue Length, Q_{95} (veh)								0.4						0.1		
95% Queue Length, Q_{95} (ft)								10.2						2.6		
Control Delay (s/veh)								9.7						7.9		
Level of Service (LOS)								A						A		
Approach Delay (s/veh)						9.7								0.6		
Approach LOS						A								A		

HCS™ TWSC Version 2024
University Stop Intersection.xtw

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The assessment of the University and JFK intersection provided above outlines the intersection's layout and the traffic volumes associated with the respective roadways, sourced from the Iowa DOT AADT maps. According to the report, the intersection achieves a Level of Service (LOS) rating of A in the northbound and southbound directions, with an approach delay of 0.6 seconds per vehicle. In the eastbound direction, the intersection also attains an LOS of A with an approach delay of 9.7 seconds per vehicle. Overall, it is determined that there is no requirement for operational or geometric changes at this intersection.

Table 14. Pennsylvania Ave and JFK Rd Tuesday Noon-1PM HCS 5 Year Projection Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	12-1pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_5YEARprojec...		
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	174	207	110	84	172	94	133	682	95	102	591	183

Signal Information					EB			WB			NB			SB		
Cycle, s	67.3	Reference Phase	2		L	T	R	L	T	R	L	T	R	L	T	R
Offset, s	0	Reference Point	End	Green	5.8	0.9		19.6	5.6	1.6	13.2					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	0.0		4.0	4.0	0.0	4.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.2	0.0		1.1	1.2	0.0	1.2					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.3	20.0	10.8	18.4	11.9	25.6	11.0	24.7
Change Period, (*Y+Rc*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s	7.1	13.7	4.4	7.5	6.0	18.5	4.3	14.0
Green Extension Time (*ge*), s	0.3	1.1	0.1	1.1	0.3	1.9	0.1	0.0
Phase Call Probability	0.96	1.00	0.79	1.00	0.95	1.00	0.83	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.09	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	174	317		84	172	94	162	483	462	94	372	343
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1746		1767	1856	1572	1838	1856	1776	1838	1856	1704
Queue Service Time (*gs*), s	5.1	11.7		2.4	5.5	3.4	4.0	16.5	16.5	2.3	12.0	12.0
Cycle Queue Clearance Time (*gc*), s	5.1	11.7		2.4	5.5	3.4	4.0	16.5	16.5	2.3	12.0	12.0
Green Ratio (*g/C*)	0.30	0.22		0.28	0.20	0.20	0.39	0.30	0.30	0.38	0.29	0.29
Capacity (*c*), veh/h	433	384		271	365	309	375	564	540	284	541	497
Volume-to-Capacity Ratio (*X*)	0.402	0.825		0.309	0.471	0.304	0.431	0.855	0.855	0.332	0.687	0.691
Back of Queue (*Q*), ft/ln (95 th percentile)	89	210		43	106	56	68	254	239	40	206	190
Back of Queue (*Q*), veh/ln (95 th percentile)	3.5	8.2		1.7	4.1	2.2	2.7	9.9	9.6	1.5	8.1	7.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.49	0.00		0.37	0.00	0.48	0.68	0.00	0.00	0.33	0.00	0.00
Uniform Delay (*d1*), s/veh	18.5	25.1		19.6	24.0	23.1	15.1	22.1	22.1	16.4	21.2	21.2
Incremental Delay (*d2*), s/veh	0.2	1.8		0.2	0.4	0.2	0.2	1.2	1.3	0.2	2.1	2.4
Initial Queue Delay (*d3*), 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	18.7	26.8		19.8	24.3	23.4	15.3	23.3	23.3	16.6	23.3	23.6
Level of Service (LOS)	B	C		B	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	23.9	C		23.0	C		22.1	C		22.6	C	
Intersection Delay, s/veh / LOS	22.7						C					

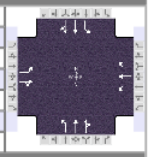
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.30	A	1.07	A	1.24	A	1.21	A

Table 14 presents the 5-year projections for the Pennsylvania Ave and JFK Rd intersection. A 1% population growth rate was applied to estimate future traffic volumes. The projected delays are slightly higher than those of the existing conditions. That being said, the intersection still maintains an acceptable level of service in all directions.

Table 15. Pennsylvania Ave and JFK Rd Tuesday Noon-1PM HCS 5 Year Projection Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	12-1pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_5YEARprojec...		
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	174	207	110	84	172	94	133	682	95	102	591	183

Signal Information												
Cycle, s	70.9	Reference Phase	2									
Offset, s	68	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.0	0.8	22.1	5.7	1.9	13.7		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0		
				Red	1.2	0.0	1.1	1.2	0.0	1.2		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.8	20.8	10.9	18.9	12.0	28.0	11.2	27.2
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	7.4	14.3	4.6	7.9	6.1	19.0	4.3	14.4
Green Extension Time (*g e*), s	0.3	1.1	0.2	1.1	0.3	3.6	0.2	3.4
Phase Call Probability	0.97	1.00	0.81	1.00	0.96	1.00	0.85	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	174	317		84	172	94	162	483	462	94	372	343
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1746		1767	1856	1572	1838	1856	1776	1838	1856	1704
Queue Service Time (*g s*), s	5.4	12.3		2.6	5.9	3.7	4.1	17.0	17.0	2.3	12.3	12.4
Cycle Queue Clearance Time (*g c*), s	5.4	12.3		2.6	5.9	3.7	4.1	17.0	17.0	2.3	12.3	12.4
Green Ratio (*g/C*)	0.30	0.22		0.28	0.19	0.19	0.41	0.32	0.32	0.40	0.31	0.31
Capacity (*c*), veh/h	430	387		267	361	306	384	601	575	292	581	534
Volume-to-Capacity Ratio (*X*)	0.405	0.818		0.315	0.477	0.308	0.421	0.803	0.803	0.322	0.639	0.643
Back of Queue (*Q*), ft/ln (95 th percentile)	97	220		47	114	60	71	262	247	41	204	187
Back of Queue (*Q*), veh/ln (95 th percentile)	3.8	8.6		1.8	4.5	2.3	2.8	10.2	9.9	1.6	8.0	7.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.53	0.00		0.41	0.00	0.52	0.71	0.00	0.00	0.34	0.00	0.00
Uniform Delay (*d 1*), s/veh	19.6	26.5		20.9	25.6	24.7	15.1	22.1	22.1	16.4	21.1	21.1
Incremental Delay (*d 2*), s/veh	0.2	1.7		0.2	0.4	0.2	0.2	0.6	0.6	0.2	0.3	0.3
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	19.8	28.1		21.1	26.0	24.9	15.2	22.7	22.7	16.6	21.4	21.5
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	25.2	C		24.5	C		21.6	C		20.9	C	
Intersection Delay, s/veh / LOS	22.4						C					

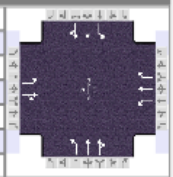
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.30	A	1.07	A	1.24	A	1.21	A

Analysis of the projected traffic conditions in 5 years at the Pennsylvania Ave and JFK intersection on Tuesday from Noon-1PM are shown above. The projection conditions were optimized to minimize overall delay and successfully did so in the NB/SB directions (with minimal increases in the EB/WB directions). Before and after optimization the intersection maintained an acceptable level of service, going from an average delay of 22.7 seconds/vehicle to 22.4 seconds/vehicle after optimization (both delays falling into the LOS C range). The intersection sees a level of service of B for all left turns (excluding that of the left-hand turn from Wacker Dr onto JFK which receives a C), and C for all through movements.

Table 16. Pennsylvania Ave and JFK Rd Tuesday Noon-1PM HCS 10 Year Projection Conditions

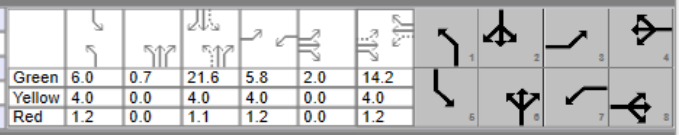
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	12-1pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_10YEARproje...		
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	183	218	116	88	181	98	140	717	99	107	621	192

Signal Information			
Cycle, s	71.0	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	6.0	0.7	21.6	5.8	2.0	14.2						
Yellow	4.0	0.0	4.0	4.0	0.0	4.0						
Red	1.2	0.0	1.1	1.2	0.0	1.2						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.0	21.4	11.0	19.4	12.0	27.5	11.2	26.7
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	7.7	15.0	4.7	8.2	6.4	20.3	4.5	15.3
Green Extension Time (*g e*), s	0.3	1.1	0.1	1.2	0.3	2.0	0.1	0.0
Phase Call Probability	0.97	1.00	0.82	1.00	0.97	1.00	0.86	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.15	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	183	334		88	181	98	170	507	486	99	391	360
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1746		1767	1856	1572	1838	1856	1776	1838	1856	1705
Queue Service Time (*g s*), s	5.7	13.0		2.7	6.2	3.8	4.4	18.3	18.3	2.5	13.2	13.3
Cycle Queue Clearance Time (*g c*), s	5.7	13.0		2.7	6.2	3.8	4.4	18.3	18.3	2.5	13.2	13.3
Green Ratio (*g/C*)	0.31	0.23		0.28	0.20	0.20	0.40	0.31	0.31	0.39	0.30	0.30
Capacity (*c*), veh/h	430	398		263	371	315	363	585	560	274	565	519
Volume-to-Capacity Ratio (*X*)	0.425	0.839		0.334	0.487	0.311	0.469	0.868	0.868	0.361	0.691	0.694
Back of Queue (*Q*), ft/ln (95 th percentile)	100	230		48	119	62	76	284	268	44	224	206
Back of Queue (*Q*), veh/ln (95 th percentile)	3.9	9.0		1.9	4.7	2.4	3.0	11.1	10.7	1.7	8.8	8.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.55	0.00		0.42	0.00	0.54	0.76	0.00	0.00	0.36	0.00	0.00
Uniform Delay (*d 1*), s/veh	19.2	26.2		20.6	25.2	24.3	15.7	23.0	23.0	17.1	21.8	21.8
Incremental Delay (*d 2*), s/veh	0.2	1.9		0.3	0.4	0.2	0.2	2.4	2.5	0.2	2.1	2.3
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	19.5	28.1		20.9	25.6	24.5	15.9	25.4	25.5	17.3	23.8	24.1
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	25.1	C		24.2	C		24.0	C		23.2	C	
Intersection Delay, s/veh / LOS	24.0						C					

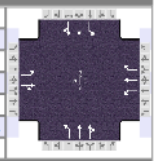
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.34	A	1.09	A	1.28	A	1.25	A

Table 16 presents the 10-year projections for the Pennsylvania Ave and JFK Rd intersection. The 1% population growth rate was applied to estimate future traffic volumes. The projected delays continue to increase further into the future the projection goes. Ten years into the future, the intersection still maintains an acceptable level of service in all directions.

Table 17. Pennsylvania Ave and JFK Rd Tuesday Noon-1PM HCS 10 Year Projection Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	12-1pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_10YEARproje...		
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	183	218	116	88	181	98	140	717	99	107	621	192

Signal Information										
Cycle, s	74.9	Reference Phase	2							
Offset, s	116	Reference Point	End							
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.1	0.7	24.3	5.9	2.1	15.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0
				Red	1.2	0.0	1.1	1.2	0.0	1.2

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.2	22.3	11.1	20.2	12.0	30.1	11.3	29.4
Change Period, (*Y+Rc*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s	8.0	15.7	4.8	8.5	6.5	20.9	4.5	15.6
Green Extension Time (*ge*), s	0.1	1.2	0.1	1.2	0.3	3.9	0.2	3.9
Phase Call Probability	0.98	1.00	0.84	1.00	0.97	1.00	0.87	1.00
Max Out Probability	1.00	0.00	0.00	0.00	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	183	334		88	181	98	170	507	486	99	391	360
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1746		1767	1856	1572	1838	1856	1776	1838	1856	1705
Queue Service Time (*gs*), s	6.0	13.7		2.8	6.5	4.0	4.5	18.9	18.9	2.5	13.6	13.6
Cycle Queue Clearance Time (*gc*), s	6.0	13.7		2.8	6.5	4.0	4.5	18.9	18.9	2.5	13.6	13.6
Green Ratio (*g/C*)	0.31	0.23		0.28	0.20	0.20	0.42	0.33	0.33	0.41	0.32	0.32
Capacity (*c*), veh/h	426	401		258	373	316	371	621	595	281	604	555
Volume-to-Capacity Ratio (*X*)	0.430	0.833		0.341	0.485	0.310	0.460	0.816	0.816	0.352	0.647	0.649
Back of Queue (*Q*), ft/ln (95 th percentile)	108	242		52	128	66	80	288	271	45	221	203
Back of Queue (*Q*), veh/ln (95 th percentile)	4.2	9.5		2.0	5.0	2.6	3.1	11.2	10.8	1.8	8.6	8.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.59	0.00		0.45	0.00	0.58	0.79	0.00	0.00	0.38	0.00	0.00
Uniform Delay (*d1*), s/veh	20.4	27.7		21.9	26.7	25.7	15.7	23.0	23.0	17.2	21.7	21.7
Incremental Delay (*d2*), s/veh	0.3	1.8		0.3	0.4	0.2	0.2	0.6	0.7	0.2	0.3	0.3
Initial Queue Delay (*d3*), 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	20.7	29.5		22.2	27.0	25.9	15.9	23.6	23.6	17.4	22.0	22.1
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	26.3	C		25.6	C		22.5	C		21.5	C	
Intersection Delay, s/veh / LOS	23.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.34	A	1.09	A	1.28	A	1.25	A

Analysis of the projected traffic conditions in 10 years at the Pennsylvania Ave and JFK intersection on Tuesday from Noon-1PM are shown above. Conditions were optimized to minimize overall delay and did so in the NB/SB directions (with minimal increases in the EB/WB directions). The intersection maintained an acceptable level of service, going from an average delay of 24 seconds/vehicle to 23.3 seconds/vehicle after optimization (both delays receiving an acceptable level of service of C). The intersection sees a level of service of B for both the NB and SB left turns, a C for the EB and WB left turns, and C for all through movements.

Table 18. Pennsylvania Ave and JFK Rd Tuesday Noon-1PM HCS 20 Year Projection Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	12-1pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_20YEARproje...		
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	203	240	128	98	200	109	155	792	110	118	685	212

Signal Information												
Cycle, s	79.3	Reference Phase	2									
Offset, s	0	Reference Point	End	Green	6.4	1.1	25.6	6.2	3.0	16.3		
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.2	0.0	1.1	1.2	0.0	1.2		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	14.4	24.5	11.4	21.5	12.7	31.8	11.6	30.7
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	9.0	18.0	5.3	9.6	7.3	24.7	5.0	18.4
Green Extension Time (*g e*), s	0.3	1.2	0.1	1.3	0.3	1.9	0.1	0.0
Phase Call Probability	0.99	1.00	0.88	1.00	0.98	1.00	0.91	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.40	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	203	368		98	200	109	188	559	536	109	432	398
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1746		1767	1856	1572	1838	1856	1776	1838	1856	1704
Queue Service Time (*g s*), s	7.0	16.0		3.3	7.6	4.7	5.3	22.7	22.7	3.0	16.3	16.4
Cycle Queue Clearance Time (*g c*), s	7.0	16.0		3.3	7.6	4.7	5.3	22.7	22.7	3.0	16.3	16.4
Green Ratio (*g/C*)	0.32	0.24		0.28	0.21	0.21	0.42	0.34	0.34	0.40	0.32	0.32
Capacity (*c*), veh/h	425	426		246	382	324	344	626	599	252	599	550
Volume-to-Capacity Ratio (*X*)	0.478	0.864		0.399	0.523	0.337	0.547	0.894	0.895	0.433	0.722	0.723
Back of Queue (*Q*), ft/ln (95 th percentile)	127	278		62	151	78	95	357	337	54	267	244
Back of Queue (*Q*), veh/ln (95 th percentile)	4.9	10.8		2.4	5.9	3.1	3.7	13.9	13.5	2.1	10.4	9.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.70	0.00		0.54	0.00	0.68	0.95	0.00	0.00	0.45	0.00	0.00
Uniform Delay (*d 1*), s/veh	21.1	28.8		23.1	28.1	26.9	17.3	25.0	25.0	19.1	23.8	23.8
Incremental Delay (*d 2*), s/veh	0.3	2.5		0.4	0.4	0.2	0.3	5.5	5.8	0.3	2.3	2.5
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	21.4	31.3		23.5	28.5	27.1	17.6	30.5	30.8	19.3	26.1	26.3
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	27.8	C		26.9	C		28.7	C		25.4	C	
Intersection Delay, s/veh / LOS	27.3						C					

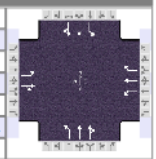
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.43	A	1.16	A	1.36	A	1.32	A

Table 18 presents the 20-year projections for the Pennsylvania Ave and JFK Rd intersection. The projected delays continue to increase further into the future. Twenty years into the future, the intersection still maintains an acceptable level of service in all directions (although it is steadily approaching the unacceptable LOS of 35 second/vehicle delay).

Table 19. Pennsylvania Ave and JFK Rd Tuesday Noon-1PM HCS 20 Year Projection Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	12-1pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_20YEARproje...		
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	203	240	128	98	200	109	155	792	110	118	685	212

Signal Information												
Cycle, s	83.8	Reference Phase	2									
Offset, s	56	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.5	0.9	29.2	6.3	3.5	16.6		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0		
				Red	1.2	0.0	1.1	1.2	0.0	1.2		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	15.0	25.3	11.5	21.8	12.6	35.2	11.7	34.3
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	9.4	19.1	5.6	10.2	7.4	25.3	5.1	18.7
Green Extension Time (*g e*), s	0.4	0.7	0.1	0.0	0.0	4.5	0.2	4.3
Phase Call Probability	0.99	1.00	0.90	1.00	0.99	1.00	0.92	1.00
Max Out Probability	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.06

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	203	368		98	200	109	188	559	536	109	432	398
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1746		1767	1856	1572	1838	1856	1776	1838	1856	1704
Queue Service Time (*g s*), s	7.4	17.1		3.6	8.2	5.0	5.4	23.3	23.3	3.1	16.7	16.7
Cycle Queue Clearance Time (*g c*), s	7.4	17.1		3.6	8.2	5.0	5.4	23.3	23.3	3.1	16.7	16.7
Green Ratio (*g/C*)	0.32	0.24		0.28	0.20	0.20	0.44	0.36	0.36	0.43	0.35	0.35
Capacity (*c*), veh/h	416	421		235	369	313	352	670	641	260	648	595
Volume-to-Capacity Ratio (*X*)	0.488	0.873		0.417	0.542	0.348	0.534	0.835	0.836	0.419	0.667	0.668
Back of Queue (*Q*), ft/ln (95 th percentile)	137	294		68	166	85	99	346	326	56	264	241
Back of Queue (*Q*), veh/ln (95 th percentile)	5.3	11.5		2.6	6.5	3.3	3.9	13.5	13.0	2.2	10.3	9.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.75	0.00		0.59	0.00	0.74	0.99	0.00	0.00	0.47	0.00	0.00
Uniform Delay (*d 1*), s/veh	22.5	30.8		25.1	30.4	29.1	17.1	24.7	24.7	19.1	23.3	23.3
Incremental Delay (*d 2*), s/veh	0.3	2.3		0.4	0.9	0.2	0.4	0.6	0.7	0.3	0.3	0.3
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	22.8	33.1		25.5	31.3	29.4	17.5	25.3	25.4	19.4	23.6	23.6
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	29.5	C		29.4	C		24.2	C		23.1	C	
Intersection Delay, s/veh / LOS	25.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.43	A	1.16	A	1.36	A	1.32	A

Analysis of the projected traffic conditions in 20 years at the Pennsylvania Ave and JFK intersection on Tuesday from 12PM-1PM are shown above. Conditions were optimized to minimize overall delay and did so in the NB/SB directions. The NB direction saw a relatively significant drop in delay. The EB/WB directions delays increased (due to the fact that in order to minimize overall delay longer green times were needed for the NB/SB directions). The intersection maintained an acceptable level of service, going from an average delay of 27.3 seconds/vehicle to 25.5 seconds/vehicle after optimization (both delays receiving an acceptable level of service of C). The intersection sees a level of service of B for both the NB and SB left turns, a C for the EB and WB left turns, and C for all through movements.

Table 20. Wacker Dr and JFK Rd Tuesday Noon-1PM HCS 5 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK NOON-1PM	File Name	TUESDAY Intersection (Wacker-JFK)_5YEARproj...		
Project Description	Wacker/JFK TUESDAY				

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	378	3	67	4	5	5	83	537	5	14	444	224

Signal Information										
Cycle, s	55.2	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	Yes	Simult. Gap E/W	On	Green	1.0	4.3	16.6	10.7	1.2	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.0	3.0	3.0	0.0
				Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		16.2		6.7	10.3	26.4	6.0	22.1
Change Period, (*Y+Rc*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s		9.7		2.2	5.4	16.7	2.3	10.9
Green Extension Time (*ge*), s		0.9		0.0	0.2	4.0	0.0	4.0
Phase Call Probability		1.00		0.19	0.93	1.00	0.19	1.00
Max Out Probability		0.00		0.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	189	259		7		7	174	569	567	14	352	316
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1759		1850		1674	1810	1900	1894	1810	1900	1685
Queue Service Time (*gs*), s	5.2	7.7		0.2		0.2	3.4	14.7	14.7	0.3	8.8	8.9
Cycle Queue Clearance Time (*gc*), s	5.2	7.7		0.2		0.2	3.4	14.7	14.7	0.3	8.8	8.9
Green Ratio (*g/C*)	0.19	0.19		0.02		0.02	0.42	0.38	0.38	0.32	0.30	0.30
Capacity (*c*), veh/h	350	340		39		36	414	720	718	202	573	508
Volume-to-Capacity Ratio (*X*)	0.540	0.761		0.186		0.186	0.420	0.789	0.789	0.069	0.615	0.622
Back of Queue (*Q*), ft/ln (95 th percentile)	90	133		4		4	51	201	201	5	151	136
Back of Queue (*Q*), veh/ln (95 th percentile)	3.6	5.3		0.2		0.2	2.0	8.1	8.0	0.2	6.0	5.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.18	0.27		0.10		0.09	0.26	0.40	0.40	0.08	0.30	0.27
Uniform Delay (*d1*), s/veh	20.1	21.1		26.6		26.6	11.5	15.2	15.2	14.3	16.6	16.6
Incremental Delay (*d2*), s/veh	0.5	1.3		0.8		0.9	0.1	0.4	0.4	0.1	0.4	0.5
Initial Queue Delay (*d3*), 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	20.6	22.5		27.5		27.6	11.6	15.6	15.6	14.4	17.0	17.1
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.7	C		27.5	C		15.1	B		17.0	B	
Intersection Delay, s/veh / LOS	16.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.23	A	0.50	A	1.00	A	1.05	A

The 5-year pre-optimization projections at the Wacker Dr and JFK Rd intersection (displayed above in Table 20) show that vehicles experience an intersection delay level of service of B. By and large delay at the intersection is low, except for vehicles going westbound (exiting the PetSmart parking lot). NB/SB traffic experiences an average approach delay of between 15.1 and 17 seconds/vehicle while the EB/WB traffic sees approach delays of between 21.7 and 27.5 seconds/vehicle. Considering vehicles exiting the PetSmart parking lot have by far the lowest volume (and there is an alternative parking lot exit south of the intersection) it is expected that this direction (WB) would see significantly higher delay than other directions.

Table 21. Wacker Dr and JFK Rd Tuesday Noon-1PM HCS 5 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK NOON-1PM	File Name	TUESDAY Intersection (Wacker-JFK)_5YEARproj...		
Project Description	Wacker/JFK TUESDAY				

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	378	3	67	4	5	5	83	537	5	14	444	224

Signal Information									
Cycle, s	54.9	Reference Phase	2						
Offset, s	0	Reference Point	End						
Uncoordinated	Yes	Simult. Gap E/W	On	Green	1.0	4.1	16.5	10.6	1.2	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.0	3.0	3.0	0.0
				Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		16.1		6.7	10.1	26.2	6.0	22.0
Change Period, (*Y+Rc*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s		9.7		2.2	5.4	16.5	2.3	10.9
Green Extension Time (*ge*), s		0.9		0.0	0.0	4.0	0.0	4.0
Phase Call Probability		1.00		0.19	0.93	1.00	0.19	1.00
Max Out Probability		0.00		0.00	1.00	0.00	0.03	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	189	259		7		7	172	564	562	14	352	316
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1759		1850		1674	1810	1900	1894	1810	1900	1685
Queue Service Time (*gs*), s	5.2	7.7		0.2		0.2	3.4	14.5	14.5	0.3	8.8	8.9
Cycle Queue Clearance Time (*gc*), s	5.2	7.7		0.2		0.2	3.4	14.5	14.5	0.3	8.8	8.9
Green Ratio (*g/C*)	0.19	0.19		0.02		0.02	0.42	0.38	0.38	0.32	0.30	0.30
Capacity (*c*), veh/h	350	340		40		36	412	717	715	203	575	510
Volume-to-Capacity Ratio (*X*)	0.540	0.762		0.186		0.186	0.419	0.785	0.785	0.069	0.613	0.620
Back of Queue (*Q*), ft/ln (95 th percentile)	90	132		4		4	50	198	198	5	150	135
Back of Queue (*Q*), veh/ln (95 th percentile)	3.6	5.3		0.2		0.2	2.0	7.9	7.9	0.2	6.0	5.4
Queue Storage Ratio (*RQ*) (95 th percentile)	0.18	0.26		0.10		0.09	0.26	0.40	0.40	0.08	0.30	0.27
Uniform Delay (*d1*), s/veh	20.0	21.0		26.5		26.5	11.5	15.2	15.2	14.3	16.5	16.5
Incremental Delay (*d2*), s/veh	0.5	1.4		0.8		0.9	0.1	0.4	0.4	0.1	0.4	0.5
Initial Queue Delay (*d3*), 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	20.5	22.4		27.3		27.4	11.7	15.6	15.6	14.3	16.9	17.0
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.6	C		27.4	C		15.0	B		16.9	B	
Intersection Delay, s/veh / LOS	16.8						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.23	A	0.50	A	1.00	A	1.05	A

Intersection signal timing was optimized to minimize overall delay and successfully did so in all directions. Optimization produced slight decreases in delay, but nothing significant enough to improve the (already good) level of service of B. The average intersection delay/vehicle went from 16.9 seconds/vehicle to 16.8 seconds/vehicle.

Table 22. Wacker Dr and JFK Rd Tuesday Noon-1PM HCS 10 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK NOON-1PM	File Name	TUESDAY Intersection (Wacker-JFK)_10YEARpr...		
Project Description	Wacker/JFK TUESDAY				

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	397	3	70	4	6	5	87	564	6	14	466	235

Signal Information										
Cycle, s	57.2	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	Yes	Simult. Gap E/W	On	Green	1.0	4.5	17.5	11.4	1.3	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.0	3.0	3.0	0.0
				Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		16.9		6.8	10.5	27.5	6.0	23.0
Change Period, (Y+R c), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (MAH), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g s), s		10.4		2.2	5.6	17.6	2.3	11.7
Green Extension Time (g e), s		0.9		0.0	0.2	4.2	0.0	4.3
Phase Call Probability		1.00		0.21	0.94	1.00	0.20	1.00
Max Out Probability		0.00		0.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	199	272		8		7	178	583	581	14	370	331
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	1759		1853		1687	1810	1900	1893	1810	1900	1685
Queue Service Time (g s), s	5.7	8.4		0.2		0.2	3.6	15.6	15.6	0.3	9.6	9.7
Cycle Queue Clearance Time (g c), s	5.7	8.4		0.2		0.2	3.6	15.6	15.6	0.3	9.6	9.7
Green Ratio (g/C)	0.20	0.20		0.02		0.02	0.43	0.38	0.38	0.33	0.31	0.31
Capacity (c), veh/h	361	351		42		38	405	733	730	197	584	518
Volume-to-Capacity Ratio (X)	0.550	0.773		0.188		0.187	0.438	0.796	0.796	0.071	0.633	0.639
Back of Queue (Q), ft/ln (95 th percentile)	99	146		5		4	54	212	212	5	167	150
Back of Queue (Q), veh/ln (95 th percentile)	4.0	5.8		0.2		0.2	2.1	8.5	8.5	0.2	6.7	6.0
Queue Storage Ratio (RQ) (95 th percentile)	0.20	0.29		0.11		0.10	0.27	0.42	0.42	0.08	0.33	0.30
Uniform Delay (d 1), s/veh	20.7	21.7		27.5		27.5	11.8	15.6	15.6	14.7	17.1	17.1
Incremental Delay (d 2), s/veh	0.5	1.4		0.8		0.9	0.1	0.4	0.4	0.1	0.4	0.5
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	21.1	23.1		28.3		28.4	11.9	16.0	16.0	14.8	17.5	17.6
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	22.3	C		28.4	C		15.5	B		17.5	B	
Intersection Delay, s/veh / LOS	17.4						B					

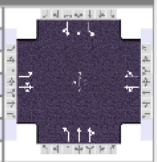
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.26	A	0.50	A	1.03	A	1.08	A

The 10-year pre-optimization projections at the Wacker Dr and JFK Rd intersection (displayed above in Table 19) show that vehicles experience an intersection delay level of service of B. Delay at the intersection is low, except for vehicles going westbound (exiting the PetSmart parking lot). NB/SB traffic experiences an average approach delay of between 15.5 and 17.5 seconds/vehicle while the EB/WB traffic sees approach delays of between 22.3 and 28.4 seconds/vehicle. Vehicles exiting the PetSmart parking lot have by far the lowest volume (and there is an alternative parking lot exit south of the intersection), so it is expected that this direction (WB) would see significantly higher delay than other directions.

Table 23. Wacker Dr and JFK Rd Tuesday Noon-1PM HCS 10 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK NOON-1PM	File Name	TUESDAY Intersection (Wacker-JFK)_10YEARpr...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	397	3	70	4	6	5	87	564	6	14	466	235

Signal Information										
Cycle, s	56.7	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	Yes	Simult. Gap E/W	On	Green	1.0	4.0	17.6	11.3	1.3	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.0	3.0	3.0	0.0
				Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		16.8		6.8	10.0	27.1	6.0	23.1
Change Period, (*Y+Rc*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s		10.3		2.2	5.6	17.3	2.3	11.6
Green Extension Time (*ge*), s		0.9		0.0	0.0	4.2	0.0	4.2
Phase Call Probability		1.00		0.21	0.94	1.00	0.20	1.00
Max Out Probability		0.00		0.00	1.00	0.01	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	199	272		8		7	175	576	574	14	370	331
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1759		1853		1687	1810	1900	1893	1810	1900	1685
Queue Service Time (*gs*), s	5.6	8.3		0.2		0.2	3.6	15.3	15.3	0.3	9.5	9.6
Cycle Queue Clearance Time (*gc*), s	5.6	8.3		0.2		0.2	3.6	15.3	15.3	0.3	9.5	9.6
Green Ratio (*g/C*)	0.20	0.20		0.02		0.02	0.42	0.38	0.38	0.33	0.31	0.31
Capacity (*c*), veh/h	361	351		42		38	398	727	724	197	594	526
Volume-to-Capacity Ratio (*X*)	0.550	0.774		0.188		0.188	0.441	0.792	0.792	0.071	0.623	0.629
Back of Queue (*Q*), ft/ln (95 th percentile)	98	144		5		4	54	208	208	5	164	147
Back of Queue (*Q*), veh/ln (95 th percentile)	3.9	5.8		0.2		0.2	2.2	8.3	8.3	0.2	6.5	5.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.20	0.29		0.11		0.10	0.28	0.42	0.42	0.08	0.33	0.29
Uniform Delay (*d1*), s/veh	20.5	21.6		27.3		27.3	11.9	15.6	15.6	14.5	16.7	16.7
Incremental Delay (*d2*), s/veh	0.5	1.4		0.8		0.9	0.1	0.4	0.4	0.1	0.4	0.5
Initial Queue Delay (*d3*), 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	21.0	23.0		28.1		28.2	12.1	15.9	16.0	14.5	17.1	17.2
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	22.1	C		28.2	C		15.4	B		17.1	B	
Intersection Delay, s/veh / LOS	17.2						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.26	A	0.50	A	1.03	A	1.08	A

Intersection signal timing was optimized to minimize overall delay and successfully did so in all directions. Optimization produced slight decreases in delay. The intersection maintained a level of service of B. The average intersection delay/vehicle went from 17.4 seconds/vehicle to 17.2 seconds/vehicle.

Table 24. Wacker Dr and JFK Rd Tuesday Noon-1PM HCS 20 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK NOON-1PM	File Name	TUESDAY Intersection (Wacker-JFK)_20YEARpr...		
Project Description	Wacker/JFK TUESDAY				

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	439	4	78	5	6	6	96	623	6	16	515	260

Signal Information					EB			WB			NB			SB		
Cycle, s	64.9	Reference Phase	2													
Offset, s	0	Reference Point	End	Green	1.3	0.1		21.7	13.8	1.6	0.0					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	3.5		4.0	3.0	3.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.5	1.5		1.5	2.5	2.5	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		19.3		7.1	11.3	32.3	6.3	27.2
Change Period, (*Y+R_c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		12.6		2.3	6.2	21.6	2.4	14.0
Green Extension Time (g_e), s		1.0		0.0	0.2	4.9	0.0	5.0
Phase Call Probability		1.00		0.27	0.97	1.00	0.25	1.00
Max Out Probability		0.00		0.00	0.00	0.01	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	220	302		9		8	196	643	641	16	410	365
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1759		1848		1676	1810	1900	1893	1810	1900	1684
Queue Service Time (g_s), s	7.1	10.6		0.3		0.3	4.2	19.6	19.6	0.4	11.9	12.0
Cycle Queue Clearance Time (g_c), s	7.1	10.6		0.3		0.3	4.2	19.6	19.6	0.4	11.9	12.0
Green Ratio (*g/C*)	0.21	0.21		0.02		0.02	0.47	0.41	0.41	0.36	0.33	0.33
Capacity (*c*), veh/h	385	374		46		42	397	786	783	182	637	565
Volume-to-Capacity Ratio (*X*)	0.570	0.806		0.194		0.194	0.494	0.818	0.818	0.088	0.644	0.647
Back of Queue (*Q*), ft/ln (95 th percentile)	128	190		6		6	66	256	255	6	208	191
Back of Queue (*Q*), veh/ln (95 th percentile)	5.1	7.6		0.3		0.2	2.6	10.2	10.2	0.3	8.3	7.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.26	0.38		0.14		0.13	0.34	0.51	0.51	0.10	0.42	0.38
Uniform Delay (d_1), s/veh	23.0	24.4		31.2		31.2	12.5	17.0	17.0	15.9	18.4	18.4
Incremental Delay (d_2), s/veh	0.5	1.6		0.8		0.8	0.1	0.3	0.3	0.1	0.4	0.5
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	23.5	26.0		32.0		32.0	12.7	17.3	17.3	15.9	18.8	18.9
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	25.0	C		32.0	C		16.7	B		18.8	B	
Intersection Delay, s/veh / LOS	18.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.30	B	1.89	B	2.10	B
Bicycle LOS Score / LOS	1.35	A	0.50	A	1.09	A	1.14	A

The 20-year pre-optimization projections at the Wacker Dr and JFK Rd intersection (displayed above in Table 24) show that vehicles experience an intersection delay level of service of B. NB/SB traffic experiences an average approach delay of between 16.7 and 18.8 seconds/vehicle while the EB/WB traffic sees approach delays of between 25 and 32 seconds/vehicle. Vehicles exiting the PetSmart parking lot have by far the lowest volume (and there is an alternative parking lot exit south of the intersection), so it is expected that this direction (WB) would see significantly higher delay than other directions.

Table 25. Wacker Dr and JFK Rd Tuesday Noon-1PM HCS 20 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK NOON-1PM	File Name	TUESDAY Intersection (Wacker-JFK)_20YEARpr…		
Project Description	Wacker/JFK TUESDAY				

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	439	4	78	5	6	6	96	623	6	16	515	260

Signal Information													
Cycle, s	65.3	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	1.3	3.7	23.3	13.9	1.6	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.0	3.0	3.0	0.0			
				Red	1.5	0.0	1.5	2.5	2.5	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		19.4		7.1	10.0	32.5	6.3	28.8
Change Period, (*Y+Rc*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s		12.7		2.3	6.4	21.7	2.4	13.7
Green Extension Time (*ge*), s		1.0		0.0	0.0	5.0	0.0	5.0
Phase Call Probability		1.00		0.27	0.97	1.00	0.25	1.00
Max Out Probability		0.00		0.00	1.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	220	302		9		8	196	643	641	16	410	365
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1759		1848		1676	1810	1900	1893	1810	1900	1684
Queue Service Time (*gs*), s	7.2	10.7		0.3		0.3	4.4	19.7	19.7	0.4	11.6	11.7
Cycle Queue Clearance Time (*gc*), s	7.2	10.7		0.3		0.3	4.4	19.7	19.7	0.4	11.6	11.7
Green Ratio (*g/C*)	0.21	0.21		0.02		0.02	0.45	0.41	0.41	0.38	0.36	0.36
Capacity (*c*), veh/h	385	374		46		42	381	790	787	183	683	606
Volume-to-Capacity Ratio (*X*)	0.570	0.805		0.193		0.193	0.514	0.814	0.814	0.087	0.600	0.603
Back of Queue (*Q*), ft/ln (95 th percentile)	129	192		6		6	70	257	256	6	202	183
Back of Queue (*Q*), veh/ln (95 th percentile)	5.2	7.7		0.3		0.2	2.8	10.3	10.3	0.2	8.1	7.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.26	0.38		0.14		0.13	0.36	0.51	0.51	0.10	0.40	0.37
Uniform Delay (*d1*), s/veh	23.2	24.6		31.5		31.5	12.8	17.0	17.0	15.3	17.2	17.2
Incremental Delay (*d2*), s/veh	0.5	1.6		0.7		0.8	0.2	0.3	0.3	0.1	0.3	0.4
Initial Queue Delay (*d3*), 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	23.7	26.2		32.2		32.3	13.0	17.3	17.3	15.4	17.5	17.6
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	25.2	C		32.2	C		16.7	B		17.5	B	
Intersection Delay, s/veh / LOS	18.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.30	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.35	A	0.50	A	1.09	A	1.14	A

Intersection signal timing was optimized to minimize overall delay and successfully did so in the NB/SB directions. EB/WB traffic saw increases in approach delay of .2 seconds/vehicle. The intersection maintained a level of service of B. The average intersection delay/vehicle went from 18.9 seconds/vehicle to 18.6 seconds/vehicle.

Saturday, February 10th, 2024:

Table 26.Pennsylvania Ave and JFK Rd Saturday Noon-1PM HCS 5 Year Projection Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection		File Name	Wacker_Penn 5yr Update 12-1.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	193	181	176	105	141	86	147	776	82	107	721	147

Signal Information									
Cycle, s	71.5	Reference Phase	2						
Offset, s	0	Reference Point	End	Green	6.2	0.4	20.6	6.1	2.0	15.4
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.2	0.0	1.1	1.2	0.0	1.2

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.4	22.7	11.3	20.6	11.7	26.1	11.4	25.7
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	7.9	16.3	5.2	6.6	5.7	16.1	4.9	18.2
Green Extension Time (g_e), s	0.3	1.1	0.1	1.2	0.2	3.5	0.1	2.4
Phase Call Probability	1.00	1.00	0.88	1.00	0.93	1.00	0.88	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.49

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	193	357		105	141	86	137	405	392	107	447	421
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1704		1767	1856	1572	1767	1856	1793	1767	1856	1746
Queue Service Time (g_s), s	5.9	14.3		3.2	4.6	3.2	3.7	14.1	14.1	2.9	16.2	16.2
Cycle Queue Clearance Time (g_c), s	5.9	14.3		3.2	4.6	3.2	3.7	14.1	14.1	2.9	16.2	16.2
Green Ratio (*g/C*)	0.33	0.24		0.30	0.22	0.22	0.38	0.29	0.29	0.38	0.29	0.29
Capacity (*c*), veh/h	492	417		270	401	340	302	545	527	299	536	504
Volume-to-Capacity Ratio (*X*)	0.393	0.856		0.389	0.352	0.253	0.452	0.743	0.744	0.357	0.835	0.835
Back of Queue (*Q*), ft/ln (95 th percentile)	102	243		56	89	53	64	241	230	50	309	290
Back of Queue (*Q*), veh/ln (95 th percentile)	4.0	9.5		2.2	3.5	2.1	2.5	9.4	9.2	1.9	12.1	11.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.56	0.00		0.49	0.00	0.46	0.64	0.00	0.00	0.41	0.00	0.00
Uniform Delay (d_1), s/veh	18.2	25.8		20.1	23.8	23.3	17.2	22.8	22.8	16.9	23.9	23.9
Incremental Delay (d_2), s/veh	0.2	2.0		0.3	0.2	0.1	0.3	0.7	0.7	0.3	7.1	7.6
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	18.4	27.9		20.4	24.0	23.4	17.6	23.5	23.5	17.2	31.0	31.5
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	24.5	C		22.7	C		22.6	C		29.7	C	
Intersection Delay, s/veh / LOS	25.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.40	A	1.04	A	1.32	A	1.29	A

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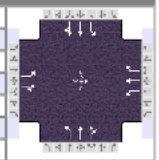
The table above is an overview of the projected 5-yr conditions during Saturday from 12PM-1PM, showcasing results across various movement groups. Notably, the absence of data in the EB right movement is explained by the apparent configuration at the top right of the table indicating synchronization between the through movement and the right movement, consolidating data from both sections. Of particular significance for analysis are several key variables: Control Delay, Level of Service (LOS), Approach Delay alongside corresponding LOS, and the overall intersection delay and LOS. Examination of these variables reveals that the Pennsylvania and JFK intersection operates at an average LOS of C, which falls within acceptable parameters. There is no indication of approaching an undesirable LOS of D or exceeding a delay threshold of 35 s/veh. In summary, the existing operational signaling demonstrates effective functionality for the 5-yr projection, ensuring smooth traffic flow within acceptable parameters.

Table 27.Pennsylvania Ave and JFK Rd Saturday Noon-1PM HCS 5 Year Projection Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection		File Name	Wacker_Penn 5yr Update 12-1(Overall Delay).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	193	181	176	105	141	86	147	776	82	107	721	147

Signal Information			
Cycle, s	73.5	Reference Phase	2
Offset, s	112	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.2	0.4		22.0	6.2	0.8		17.3				
Yellow	4.0	0.0		4.0	4.0	0.0		4.0				
Red	1.2	0.0		1.1	1.2	0.0		1.2				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.2	23.3	11.4	22.5	11.8	27.4	11.4	27.1
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	8.1	16.8	5.2	6.6	5.8	16.4	4.9	18.4
Green Extension Time (g_e), s	0.0	1.2	0.2	1.2	0.2	3.6	0.0	3.4
Phase Call Probability	1.00	1.00	0.88	1.00	0.94	1.00	0.89	1.00
Max Out Probability	1.00	0.00	0.00	0.00	0.00	0.00	1.00	0.05

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	193	357		105	141	86	136	405	391	107	447	421
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1704		1767	1856	1572	1767	1856	1793	1767	1856	1746
Queue Service Time (g_s), s	6.1	14.8		3.2	4.6	3.3	3.8	14.3	14.4	2.9	16.4	16.4
Cycle Queue Clearance Time (g_c), s	6.1	14.8		3.2	4.6	3.3	3.8	14.3	14.4	2.9	16.4	16.4
Green Ratio (*g/C*)	0.33	0.25		0.32	0.23	0.23	0.39	0.30	0.30	0.39	0.30	0.30
Capacity (*c*), veh/h	484	420		268	438	371	305	565	546	305	556	523
Volume-to-Capacity Ratio (*X*)	0.399	0.850		0.392	0.322	0.232	0.447	0.716	0.717	0.351	0.804	0.805
Back of Queue (*Q*), ft/ln (95 th percentile)	107	250		57	89	53	65	244	232	51	283	264
Back of Queue (*Q*), veh/ln (95 th percentile)	4.2	9.7		2.2	3.5	2.1	2.5	9.5	9.3	2.0	11.1	10.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.59	0.00		0.49	0.00	0.46	0.65	0.00	0.00	0.42	0.00	0.00
Uniform Delay (d_1), s/veh	18.7	26.5		20.0	23.3	22.8	17.2	22.9	22.9	16.9	23.9	23.9
Incremental Delay (d_2), s/veh	0.2	1.9		0.3	0.2	0.1	0.3	0.6	0.6	0.3	1.1	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	28.5		20.4	23.5	22.9	17.6	23.4	23.4	17.2	24.9	25.0
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	25.1	C		22.4	C		22.6	C		24.1	C	
Intersection Delay, s/veh / LOS	23.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.40	A	1.04	A	1.32	A	1.29	A

 HCS™ Streets Version 2024 Generated: 5/1/2024 5:54:27 PM

Displayed in the table above are the optimized results for the 5-yr projected conditions at Pennsylvania and JFK intersection during Saturday from 12PM -1PM, building upon the

previously examined 5-yr conditions. Significantly, improvements are evident, particularly in the overall intersection delay, which has decreased by 1.9 s/veh. Upon closer examination, it becomes clear that while the control delay and approach delay remain mostly constant across certain movements, they have notably decreased in the NB direction as the approach delay decreases by 5.6 s/veh. This is ultimately the control delay and approach delay in the NB direction have the contributing factors in the optimization to bring the overall intersection delay down. This optimization strategy strategically manages delay in each direction, effectively aligning with the traffic volume dynamics of the intersection. In essence, these optimizations were able to minimize overall intersection delay to maintain an acceptable LOS.

Table 28.Pennsylvania Ave and JFK Rd Saturday 12PM-1PM HCS 10 Year Projection Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection		File Name	Wacker_Penn 10yr Update 12-1.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	203	190	184	110	148	91	155	815	86	113	758	155

Signal Information			
Cycle, s	74.5	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	6.3	0.3	22.0	6.3	2.4	16.4	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.9	24.1	11.5	21.6	11.8	27.4	11.5	27.1
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	8.4	17.7	5.4	7.0	6.1	17.5	5.2	19.8
Green Extension Time (g_e), s	0.3	1.2	0.1	1.2	0.3	3.8	0.1	2.1
Phase Call Probability	1.00	1.00	0.90	1.00	0.95	1.00	0.90	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.69

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	203	374		110	148	91	143	424	410	113	470	443
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1705		1767	1856	1572	1767	1856	1793	1767	1856	1746
Queue Service Time (g_s), s	6.4	15.7		3.4	5.0	3.6	4.1	15.5	15.5	3.2	17.8	17.8
Cycle Queue Clearance Time (g_c), s	6.4	15.7		3.4	5.0	3.6	4.1	15.5	15.5	3.2	17.8	17.8
Green Ratio (*g/C*)	0.34	0.25		0.31	0.22	0.22	0.39	0.30	0.30	0.38	0.30	0.30
Capacity (*c*), veh/h	493	432		263	409	347	288	557	538	290	549	516
Volume-to-Capacity Ratio (*X*)	0.412	0.866		0.419	0.362	0.263	0.497	0.761	0.762	0.390	0.857	0.857
Back of Queue (*Q*), ft/ln (95 th percentile)	113	263		62	98	58	71	261	248	55	351	329
Back of Queue (*Q*), veh/ln (95 th percentile)	4.4	10.3		2.4	3.8	2.3	2.8	10.2	9.9	2.1	13.7	13.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.62	0.00		0.54	0.00	0.51	0.71	0.00	0.00	0.46	0.00	0.00
Uniform Delay (d_1), s/veh	18.7	26.6		20.9	24.6	24.1	18.1	23.7	23.7	17.7	24.8	24.8
Incremental Delay (d_2), s/veh	0.2	2.1		0.4	0.2	0.1	0.4	0.7	0.7	0.3	10.4	11.1
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	28.8		21.3	24.8	24.2	18.5	24.4	24.4	18.0	35.2	35.9
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	D	D
Approach Delay, s/veh / LOS	25.3	C		23.6	C		23.6	C		33.6	C	
Intersection Delay, s/veh / LOS	27.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.44	A	1.06	A	1.36	A	1.33	A

The table provided above is an overview of the projected 10-yr conditions during Saturday from 12-1 pm, showcasing results across various movement groups. There is no indication of approaching an undesirable LOS of D or exceeding a delay threshold of 35 s/veh. In summary, the existing operational signaling demonstrates effective functionality for the 10-yr projection, ensuring smooth traffic flow within acceptable parameters.

Table 29.Pennsylvania Ave and JFK Rd Saturday 12PM-1PM HCS 10 Year Projection Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection		File Name	Wacker_Penn 10yr Update 12-1(Overall Delay).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	203	190	184	110	148	91	155	815	86	113	758	155

Signal Information					EB			WB			NB			SB		
Cycle, s	78.1	Reference Phase	2													
Offset, s	111	Reference Point	End	Green	6.4	0.3		24.4	6.4	2.8	17.1					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	0.0		4.0	4.0	0.0	4.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.2	0.0		1.1	1.2	0.0	1.2					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	14.4	25.1	11.6	22.3	11.9	29.8	11.6	29.5
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	8.8	18.4	5.6	7.3	6.2	18.0	5.2	20.3
Green Extension Time (*g e*), s	0.4	1.2	0.2	1.2	0.2	3.8	0.1	3.8
Phase Call Probability	1.00	1.00	0.91	1.00	0.96	1.00	0.92	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.02

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	203	374		110	148	91	144	426	412	113	470	443
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1705		1767	1856	1572	1767	1856	1793	1767	1856	1746
Queue Service Time (*g s*), s	6.8	16.4		3.6	5.3	3.8	4.2	16.0	16.0	3.2	18.3	18.3
Cycle Queue Clearance Time (*g c*), s	6.8	16.4		3.6	5.3	3.8	4.2	16.0	16.0	3.2	18.3	18.3
Green Ratio (*g/C*)	0.34	0.25		0.30	0.22	0.22	0.40	0.32	0.32	0.40	0.31	0.31
Capacity (*c*), veh/h	492	437		259	407	345	292	588	568	295	581	547
Volume-to-Capacity Ratio (*X*)	0.413	0.857		0.424	0.364	0.264	0.493	0.724	0.725	0.383	0.810	0.810
Back of Queue (*Q*), ft/ln (95 th percentile)	121	274		67	104	62	74	270	257	57	313	291
Back of Queue (*Q*), veh/ln (95 th percentile)	4.7	10.7		2.6	4.1	2.4	2.9	10.5	10.3	2.2	12.2	11.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.66	0.00		0.58	0.00	0.54	0.73	0.00	0.00	0.47	0.00	0.00
Uniform Delay (*d 1*), s/veh	19.7	27.9		22.2	26.0	25.4	18.2	23.8	23.8	17.7	24.8	24.9
Incremental Delay (*d 2*), s/veh	0.2	2.0		0.4	0.2	0.2	0.4	0.6	0.6	0.3	1.1	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	19.9	29.8		22.6	26.2	25.6	18.7	24.4	24.4	18.0	25.9	26.0
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	26.3	C		24.9	C		23.5	C		25.1	C	
Intersection Delay, s/veh / LOS	24.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.44	A	1.06	A	1.36	A	1.33	A

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Displayed in the table above are the optimized results for the 10-yr projected conditions at Pennsylvania and JFK intersection during Saturday from 12PM-1PM, building upon the previously examined 10-yr conditions. Significantly, improvements are evident, particularly in the overall intersection delay, which has decreased by 2.6 s/veh. Upon closer examination, it becomes clear that while the control delay and approach delay remain mostly constant across certain movements, they have notably decreased in the NB direction as the approach delay decreases by 8.5 s/veh. This ultimately indicates the control delay and approach delay in the NB direction have the main contributing factors in the optimization to bring the overall intersection delay down. This optimization strategy manages delay in each direction, effectively aligning with the traffic volume dynamics of the intersection. In essence, these optimizations were able to minimize overall intersection delay to maintain an acceptable LOS.

Table 30.Pennsylvania Ave and JFK Rd Saturday 12PM-1PM HCS 20 Year Projection Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection		File Name	Wacker_Penn 20yr Update 12-1.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	225	210	204	122	164	100	171	901	95	124	837	171

Signal Information			
Cycle, s	80.8	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	6.6	0.3	24.6	6.6	3.4	18.7						
Yellow	4.0	0.0	4.0	4.0	0.0	4.0						
Red	1.2	0.0	1.1	1.2	0.0	1.2						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	15.1	27.3	11.8	23.9	12.1	30.0	11.8	29.7
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	9.6	20.9	6.1	8.0	6.8	20.5	5.8	23.9
Green Extension Time (*g e*), s	0.3	1.2	0.2	1.4	0.3	4.3	0.2	0.7
Phase Call Probability	1.00	1.00	0.94	1.00	0.97	1.00	0.94	1.00
Max Out Probability	0.00	0.02	0.00	0.00	0.00	0.04	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	225	414		122	164	100	156	461	446	124	519	489
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1704		1767	1856	1572	1767	1856	1793	1767	1856	1746
Queue Service Time (*g s*), s	7.6	18.9		4.1	6.0	4.2	4.8	18.5	18.5	3.8	21.9	21.9
Cycle Queue Clearance Time (*g c*), s	7.6	18.9		4.1	6.0	4.2	4.8	18.5	18.5	3.8	21.9	21.9
Green Ratio (*g/C*)	0.36	0.27		0.31	0.23	0.23	0.39	0.31	0.31	0.39	0.30	0.30
Capacity (*c*), veh/h	498	467		248	431	365	257	571	552	266	565	531
Volume-to-Capacity Ratio (*X*)	0.452	0.887		0.491	0.381	0.274	0.605	0.807	0.807	0.467	0.920	0.920
Back of Queue (*Q*), ft/ln (95 th percentile)	136	330		76	118	70	86	308	293	67	487	458
Back of Queue (*Q*), veh/ln (95 th percentile)	5.3	12.9		3.0	4.6	2.7	3.3	12.0	11.7	2.6	19.0	18.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.75	0.00		0.66	0.00	0.61	0.86	0.00	0.00	0.56	0.00	0.00
Uniform Delay (*d 1*), s/veh	19.4	28.2		22.6	26.2	25.5	20.1	25.8	25.8	19.6	27.2	27.2
Incremental Delay (*d 2*), s/veh	0.2	7.5		0.6	0.2	0.1	0.7	0.9	0.9	0.5	25.7	27.1
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	19.7	35.6		23.2	26.4	25.6	20.9	26.7	26.7	20.1	52.9	54.3
Level of Service (LOS)	B	D		C	C	C	C	C	C	C	D	D
Approach Delay, s/veh / LOS	30.0	C		25.2	C		25.9	C		49.9	D	
Intersection Delay, s/veh / LOS	35.1						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.54	B	1.12	A	1.45	A	1.42	A

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The table provided above is an overview of the projected 20-yr conditions during Saturday from 12PM - 1 PM, showcasing results across various movement groups. There is a concern for the 20-yr projections as based on the 1% growth rate provided to use for volume projections. As the SB through and right movements exceed the acceptable threshold by 15-20 s/veh. Also the EB through movement hits the unacceptable LOS mark by 0.6 s/veh. In summary, the existing operational signaling indicates that geometric changes will need to be examined at this intersection within the 20-yr window of this corridor to ensure smooth traffic flow within acceptable parameters.

Table 31.Pennsylvania Ave and JFK Rd Saturday 12PM-1PM HCS 20 Year Projection Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection		File Name	Wacker_Penn 20yr Update 12-1(Overall Delay).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	225	210	204	122	164	100	171	901	95	124	837	171

Signal Information									
Cycle, s	89.8	Reference Phase	2						
Offset, s	92	Reference Point	End						
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.7	0.7	30.3	6.7	4.3	20.3		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0		
				Red	1.2	0.0	1.1	1.2	0.0	1.2		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	16.3	29.8	11.9	25.5	12.6	36.1	11.9	35.4
Change Period, (*Y+Rc*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s	10.5	23.2	6.7	8.8	7.1	21.8	6.0	25.4
Green Extension Time (*ge*), s	0.4	0.9	0.0	1.2	0.3	4.3	0.2	4.3
Phase Call Probability	1.00	1.00	0.95	1.00	0.98	1.00	0.96	1.00
Max Out Probability	0.00	0.00	1.00	0.04	0.00	0.04	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	225	414		122	164	100	156	463	448	124	519	489
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1704		1767	1856	1572	1767	1856	1793	1767	1856	1746
Queue Service Time (*gs*), s	8.5	21.2		4.7	6.8	4.8	5.1	19.8	19.8	4.0	23.4	23.4
Cycle Queue Clearance Time (*gc*), s	8.5	21.2		4.7	6.8	4.8	5.1	19.8	19.8	4.0	23.4	23.4
Green Ratio (*g/C*)	0.37	0.27		0.31	0.23	0.23	0.43	0.35	0.35	0.42	0.34	0.34
Capacity (*c*), veh/h	488	470		231	421	357	270	645	624	278	630	592
Volume-to-Capacity Ratio (*X*)	0.462	0.881		0.528	0.389	0.280	0.579	0.718	0.718	0.446	0.825	0.825
Back of Queue (*Q*), ft/ln (95 th percentile)	155	344		90	138	82	93	327	310	73	389	362
Back of Queue (*Q*), veh/ln (95 th percentile)	6.1	13.4		3.5	5.4	3.2	3.6	12.8	12.4	2.9	15.2	14.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.85	0.00		0.78	0.00	0.71	0.93	0.00	0.00	0.61	0.00	0.00
Uniform Delay (*d1*), s/veh	21.5	31.6		26.1	29.9	29.1	20.9	25.8	25.8	19.8	27.6	27.6
Incremental Delay (*d2*), s/veh	0.3	2.2		0.7	0.2	0.2	0.6	0.5	0.5	0.4	1.1	1.2
Initial Queue Delay (*d3*), 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	21.7	33.8		26.8	30.1	29.2	21.5	26.3	26.3	20.2	28.7	28.8
Level of Service (LOS)	C	C		C	C	C	C	C	C	C	C	C
Approach Delay, s/veh / LOS	29.6	C		28.8	C		25.6	C		27.8	C	
Intersection Delay, s/veh / LOS	27.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.54	B	1.12	A	1.45	A	1.42	A

Displayed in the table above are the optimized results for the 10-yr projected conditions at Pennsylvania and JFK intersection during Saturday from 12PM-1PM, building upon the previously examined 10-yr conditions. Significantly, improvements are evident, particularly in the overall intersection delay, which has decreased by 2.6 s/veh.

While the control delay and approach delay remain mostly constant across certain movements, they have notably decreased in the NB direction as the approach delay decreases by 8.5 s/veh. This ultimately indicates the control delay and approach delay in the NB direction have the main contributing factors in the optimization to bring the overall intersection delay down. This optimization strategy strategically manages delay in each direction, effectively aligning with the traffic volume dynamics of the intersection. In essence, these optimizations were able to minimize overall intersection delay to maintain an acceptable LOS.

Table 32.Wacker Dr and JFK Rd Saturday 12PM-1PM HCS 5 Year Projection Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	JFK/Wacker	File Name	Wacker_Penn 5yr Update 12-1.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	446	12	69	20	12	24	165	542	5	14	474	387

Signal Information												
Cycle, s	81.4	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	Off	Green	2.1	2.2	26.5	16.9	7.2	0.0		
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	3.5	3.5	4.0	3.0	3.0	0.0		
				Red	1.5	1.5	1.5	2.5	2.5	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		22.4		12.7	14.4	39.2	7.1	32.0
Change Period, (*Y+Rc*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.0	3.1	3.2
Queue Clearance Time (*gs*), s		15.8		3.3	9.4	10.3	2.7	24.2
Green Extension Time (*ge*), s		1.0		0.0	0.1	1.0	0.0	2.2
Phase Call Probability		1.00		1.00	0.98	1.00	0.30	1.00
Max Out Probability		0.00		0.00	0.07	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	223	304		30		26	165	274	273	16	533	453
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1725		1795		1595	1767	1856	1849	1767	1856	1578
Queue Service Time (*gs*), s	9.3	13.8		1.2		1.3	7.4	8.3	8.3	0.7	22.2	22.2
Cycle Queue Clearance Time (*gc*), s	9.3	13.8		1.2		1.3	7.4	8.3	8.3	0.7	22.2	22.2
Green Ratio (*g/C*)	0.21	0.21		0.09		0.09	0.12	0.41	0.41	0.03	0.33	0.33
Capacity (*c*), veh/h	367	358		159		141	204	769	766	47	604	513
Volume-to-Capacity Ratio (*X*)	0.608	0.849		0.186		0.188	0.810	0.356	0.357	0.344	0.883	0.883
Back of Queue (*Q*), ft/ln (95 th percentile)	178	246		24		22	151	152	148	15	328	280
Back of Queue (*Q*), veh/ln (95 th percentile)	6.9	9.6		1.0		0.9	5.9	5.9	5.9	0.6	12.8	11.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.36	0.49		0.55		0.49	0.30	0.30	0.30	0.03	0.66	0.57
Uniform Delay (*d1*), s/veh	29.3	31.1		34.5		34.5	35.2	16.4	16.4	39.0	26.1	26.1
Incremental Delay (*d2*), s/veh	0.6	2.3		0.2		0.2	3.5	0.1	0.1	0.8	0.9	1.1
Initial Queue Delay (*d3*), 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	29.9	33.4		34.7		34.7	38.8	16.5	16.5	39.9	27.0	27.1
Level of Service (LOS)	C	C		C		C	D	B	B	D	C	C
Approach Delay, s/veh / LOS	31.9	C		34.7	C		21.7	C		27.3	C	
Intersection Delay, s/veh / LOS	26.8						C					

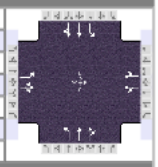
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.31	B	1.90	B	2.11	B
Bicycle LOS Score / LOS	1.36	A	0.53	A	1.08	A	1.21	A

The table above provides a rundown of the 5-yr projected conditions during Saturday from 12PM-1PM at Wacker and JFK, displaying results across various movement groups. Notably, the absence of data in the EB right and WB through movement is explained by the apparent configuration at the top right of the table indicating synchronization between the through movement and the right movement of the EB direction, as for the WB the configuration combines the through movements with its respective turning lane consolidating data from both sections. Of particular significance for analysis are several key variables: Control Delay, Level of Service (LOS), Approach Delay alongside corresponding LOS, and the overall intersection delay and LOS. Examination of these variables reveals that the Wacker and JFK intersection operates at an average LOS of C, which falls within acceptable parameters. There is one indication of approaching an undesirable LOS of D or exceeding a delay threshold of 35 s/veh at the SB left movement. In summary, the overall existing operational signaling demonstrates effective functionality, ensuring smooth traffic flow within acceptable parameters.

Table 33.Wacker Dr and JFK Rd Saturday 12PM-1PM HCS 5 Year Projection Conditions Optimized

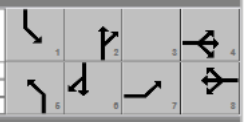
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	JFK/Wacker	File Name	Wacker_Penn 5yr Update 12-1(Overall Delay).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	446	12	69	20	12	24	165	542	5	14	474	387

Signal Information				EB			WB			NB			SB		
Cycle, s	81.3	Reference Phase	2												
Offset, s	0	Reference Point	End	Green	2.1	2.2		26.4	16.8	7.2	0.0				
Uncoordinated	Yes	Simult. Gap E/W	Off	Yellow	3.5	3.5		4.0	3.0	3.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	Off	Red	1.5	1.5		1.5	2.5	2.5	0.0				



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		22.3		12.7	14.4	39.1	7.1	31.9
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.0	3.1	3.2
Queue Clearance Time (g_s), s		15.8		3.3	9.4	10.3	2.7	24.1
Green Extension Time (g_e), s		1.0		0.0	0.1	0.7	0.0	2.2
Phase Call Probability		1.00		1.00	0.98	1.00	0.30	1.00
Max Out Probability		0.00		0.00	0.02	0.06	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	223	304		30		26	165	274	273	16	533	453
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1725		1795		1595	1767	1856	1849	1767	1856	1578
Queue Service Time (g_s), s	9.3	13.8		1.2		1.3	7.4	8.3	8.3	0.7	22.1	22.1
Cycle Queue Clearance Time (g_c), s	9.3	13.8		1.2		1.3	7.4	8.3	8.3	0.7	22.1	22.1
Green Ratio (*g/C*)	0.21	0.21		0.09		0.09	0.12	0.41	0.41	0.03	0.32	0.32
Capacity (*c*), veh/h	366	357		159		141	204	768	766	47	603	513
Volume-to-Capacity Ratio (*X*)	0.609	0.851		0.186		0.188	0.810	0.357	0.357	0.345	0.884	0.884
Back of Queue (*Q*), ft/ln (95 th percentile)	177	246		24		22	150	151	148	15	332	283
Back of Queue (*Q*), veh/ln (95 th percentile)	6.9	9.6		1.0		0.9	5.8	5.9	5.9	0.6	13.0	11.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.35	0.49		0.55		0.49	0.30	0.30	0.30	0.03	0.66	0.58
Uniform Delay (d_1), s/veh	29.3	31.1		34.4		34.4	35.1	16.4	16.4	39.0	26.0	26.0
Incremental Delay (d_2), s/veh	0.6	2.3		0.2		0.2	3.0	0.1	0.1	0.9	1.0	1.2
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	29.9	33.3		34.6		34.6	38.1	16.5	16.5	39.8	27.0	27.2
Level of Service (LOS)	C	C		C		C	D	B	B	D	C	C
Approach Delay, s/veh / LOS	31.9	C		34.6	C		21.5	C		27.3	C	
Intersection Delay, s/veh / LOS	26.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.31	B	1.90	B	2.11	B
Bicycle LOS Score / LOS	1.36	A	0.53	A	1.08	A	1.21	A

The table above presents the optimized results for the Wacker and JFK intersection during Saturday from 12PM-1PM, expanding upon the previously analyzed 5-yr projected conditions. Although marginal, improvements are observable, particularly in the total intersection delay,

which has decreased by a modest 0.1 s/veh. Upon closer look, it is evident that while the control delay and approach delay have remained relatively stable across most movements, there has not been much improvement to delay at this intersection. This optimization strategy does not improve traffic delay through this software by a marginal amount therefore it will need to be investigated with a more sophisticated software to allow the exact configuration of the Wacker and JFK intersection. In essence, these optimizations from HCS are unable to enhance traffic flow within the intersection needing a more in-depth analysis tool to dissect this intersection.

Table 34.Wacker Dr and JFK Rd Saturday 12PM-1PM HCS 10 Year Projection Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	JFK/Wacker	File Name	Wacker_Penn 10yr Update 12-1.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	468	13	76	21	12	25	173	570	6	14	498	407

Signal Information					EB			WB			NB		
Cycle, s	88.5	Reference Phase	2										
Offset, s	0	Reference Point	End	Green	2.3	3.2		29.8	19.1	7.6	0.0		
Uncoordinated	Yes	Simult. Gap E/W	Off	Yellow	3.5	3.5		4.0	3.0	3.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	Off	Red	1.5	1.5		1.5	2.5	2.5	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		24.6		13.1	15.5	43.5	7.3	35.3
Change Period, (*Y+Rc*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.0	3.1	3.2
Queue Clearance Time (*gs*), s		18.0		3.4	10.5	11.3	2.8	27.4
Green Extension Time (*ge*), s		1.0		0.0	0.1	1.0	0.0	2.3
Phase Call Probability		1.00		1.00	0.99	1.00	0.33	1.00
Max Out Probability		0.01		0.00	0.22	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	234	323		31		27	173	288	288	16	560	476
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1723		1794		1594	1767	1856	1849	1767	1856	1578
Queue Service Time (*gs*), s	10.6	16.0		1.4		1.4	8.5	9.3	9.3	0.8	25.4	25.4
Cycle Queue Clearance Time (*gc*), s	10.6	16.0		1.4		1.4	8.5	9.3	9.3	0.8	25.4	25.4
Green Ratio (*g/C*)	0.22	0.22		0.09		0.09	0.12	0.43	0.43	0.03	0.34	0.34
Capacity (*c*), veh/h	382	372		154		137	209	798	795	46	626	532
Volume-to-Capacity Ratio (*X*)	0.613	0.868		0.198		0.200	0.826	0.362	0.362	0.350	0.895	0.895
Back of Queue (*Q*), ft/ln (95 th percentile)	202	291		28		25	188	173	168	16	370	315
Back of Queue (*Q*), veh/ln (95 th percentile)	7.9	11.4		1.1		1.0	7.4	6.8	6.7	0.6	14.5	12.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.40	0.58		0.63		0.56	0.38	0.35	0.35	0.03	0.74	0.65
Uniform Delay (*d1*), s/veh	31.4	33.6		37.7		37.7	38.2	17.1	17.1	42.5	27.9	27.9
Incremental Delay (*d2*), s/veh	0.6	5.6		0.2		0.3	8.9	0.1	0.1	0.8	0.9	1.1
Initial Queue Delay (*d3*), 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	32.0	39.1		37.9		38.0	47.1	17.2	17.2	43.3	28.8	29.0
Level of Service (LOS)	C	D		D		D	D	B	B	D	C	C
Approach Delay, s/veh / LOS	36.2	D		37.9	D		24.1	C		29.1	C	
Intersection Delay, s/veh / LOS	29.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.31	B	1.90	B	2.11	B
Bicycle LOS Score / LOS	1.41	A	0.54	A	1.11	A	1.25	A

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The table above provides a rundown of the 10-yr projected conditions during Saturday from 12PM-1PM at Wacker and JFK, displaying results across various movement groups. There are multiple unacceptable movements as shown in the table above. This shows undesirable LOS of D or exceeding a delay threshold of 35 s/veh at all movements in certain directions. In summary, the overall existing operational signaling demonstrates ineffective functionality, causing large delays and unacceptable traffic flow through the corridor.

Table 35.Wacker Dr and JFK Rd Saturday 12PM-1PM HCS 10 Year Projection Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	JFK/Wacker	File Name	Wacker_Penn 10yr Update 12-1(Overall Delay).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	468	13	76	21	12	25	173	570	6	14	498	407

Signal Information					EB			WB			NB			SB		
Cycle, s	89.9	Reference Phase	2													
Offset, s	0	Reference Point	End	Green	2.3	3.4		30.4	19.6	7.7	0.0					
Uncoordinated	Yes	Simult. Gap E/W	Off	Yellow	3.5	3.5		4.0	3.0	3.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	Off	Red	1.5	1.5		1.5	2.5	2.5	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		25.1		13.2	15.7	44.3	7.3	35.9
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.0	3.1	3.2
Queue Clearance Time (*g s*), s		18.3		3.4	10.6	11.5	2.8	27.8
Green Extension Time (*g e*), s		1.2		0.0	0.2	0.6	0.0	2.3
Phase Call Probability		1.00		1.00	0.99	1.00	0.33	1.00
Max Out Probability		0.00		0.01	0.01	0.24	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	234	323		31		27	173	288	288	16	560	476
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1723		1794		1594	1767	1856	1849	1767	1856	1578
Queue Service Time (*g s*), s	10.8	16.3		1.4		1.4	8.6	9.4	9.5	0.8	25.8	25.8
Cycle Queue Clearance Time (*g c*), s	10.8	16.3		1.4		1.4	8.6	9.4	9.5	0.8	25.8	25.8
Green Ratio (*g/C*)	0.22	0.22		0.09		0.09	0.12	0.43	0.43	0.03	0.34	0.34
Capacity (*c*), veh/h	386	376		153		136	212	802	799	46	628	534
Volume-to-Capacity Ratio (*X*)	0.607	0.859		0.199		0.201	0.818	0.360	0.360	0.347	0.891	0.892
Back of Queue (*Q*), ft/ln (95 th percentile)	205	284		28		25	176	176	172	16	383	327
Back of Queue (*Q*), veh/ln (95 th percentile)	8.0	11.1		1.1		1.0	6.9	6.9	6.9	0.6	15.0	13.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.41	0.57		0.64		0.58	0.35	0.35	0.35	0.03	0.77	0.67
Uniform Delay (*d 1*), s/veh	31.8	34.0		38.4		38.4	38.8	17.3	17.3	43.2	28.3	28.3
Incremental Delay (*d 2*), s/veh	0.6	2.3		0.2		0.3	3.0	0.1	0.1	0.9	1.0	1.2
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	32.4	36.3		38.7		38.7	41.8	17.4	17.4	44.1	29.3	29.5
Level of Service (LOS)	C	D		D		D	D	B	B	D	C	C
Approach Delay, s/veh / LOS	34.7	C		38.7	D		23.0	C		29.6	C	
Intersection Delay, s/veh / LOS	29.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.31	B	1.90	B	2.11	B
Bicycle LOS Score / LOS	1.41	A	0.54	A	1.11	A	1.25	A

The table above presents the optimized results for the Wacker and JFK intersection during Saturday from 12PM-1PM, expanding upon the previously analyzed 20-yr projected conditions. Although marginal, improvements are observable, particularly in the total intersection delay, which has decreased by a modest 0.4 s/veh. Upon closer look, it is evident that while the control delay and approach delay have remained relatively stable across most movements, there has not been much improvement to delay at this intersection. This optimization strategy does not improve traffic delay through this software therefore it will need to be investigated with a more sophisticated software to allow the exact configuration of the Wacker and JFK intersection. In essence, these optimizations from HCS are does maintain a overall LOS of C.

Table 36.Wacker Dr and JFK Rd Saturday Noon-1PM HCS 20 Year Projection Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	JFK/Wacker	File Name	Wacker_Penn 20yr Update 12-1.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	517	15	84	23	13	28	192	630	6	16	550	449

Signal Information									
Cycle, s	106.3	Reference Phase	2						
Offset, s	0	Reference Point	End						
Uncoordinated	Yes	Simult. Gap E/W	Off						
Force Mode	Fixed	Simult. Gap N/S	Off						
				Green	2.9	5.4	38.6	24.3	8.5	0.0
				Yellow	3.5	3.5	4.0	3.0	3.0	0.0
				Red	1.5	1.5	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		29.8		14.0	18.4	54.6	7.9	44.1
Change Period, (*Y+R_c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.0	3.1	3.2
Queue Clearance Time (*g_s*), s		23.5		3.9	13.3	13.9	3.1	36.0
Green Extension Time (*g_e*), s		0.9		0.1	0.1	1.1	0.0	2.6
Phase Call Probability		1.00		1.00	1.00	1.00	0.42	1.00
Max Out Probability		0.20		0.00	1.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	259	358		34		30	192	318	318	18	617	527
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1724		1794		1590	1767	1856	1849	1767	1856	1578
Queue Service Time (*g_s*), s	14.1	21.5		1.9		1.9	11.3	11.9	11.9	1.1	33.7	34.0
Cycle Queue Clearance Time (*g_c*), s	14.1	21.5		1.9		1.9	11.3	11.9	11.9	1.1	33.7	34.0
Green Ratio (*g/C*)	0.23	0.23		0.08		0.08	0.13	0.46	0.46	0.03	0.36	0.36
Capacity (*c*), veh/h	405	395		143		127	222	856	853	49	674	574
Volume-to-Capacity Ratio (*X*)	0.639	0.906		0.236		0.238	0.865	0.372	0.372	0.377	0.915	0.920
Back of Queue (*Q*), ft/ln (95 th percentile)	258	424		38		34	276	220	214	22	484	415
Back of Queue (*Q*), veh/ln (95 th percentile)	10.1	16.5		1.5		1.4	10.8	8.6	8.6	0.9	18.9	16.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.52	0.85		0.86		0.77	0.55	0.44	0.44	0.04	0.97	0.85
Uniform Delay (*d₁*), s/veh	37.0	39.9		45.9		45.9	45.6	18.6	18.6	50.8	32.3	32.4
Incremental Delay (*d₂*), s/veh	0.9	20.1		0.3		0.4	27.0	0.1	0.1	0.7	2.6	3.3
Initial Queue Delay (*d₃*), 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	37.9	60.0		46.2		46.3	72.6	18.7	18.7	51.5	34.9	35.7
Level of Service (LOS)	D	E		D		D	E	B	B	D	C	D
Approach Delay, s/veh / LOS	50.7	D		46.2	D		31.2	C		35.5	D	
Intersection Delay, s/veh / LOS	37.9						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.31	B	2.32	B	1.91	B	2.11	B
Bicycle LOS Score / LOS	1.50	B	0.54	A	1.17	A	1.32	A

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The table above provides a rundown of the 20-yr projected conditions during Saturday from 12PM-1PM acceptable movements as shown in the table above. This shows undesirable LOS of D or exceeding a delay threshold of 35 s/veh at all movements in certain directions. In summary, the overall existing operational signaling demonstrates ineffective functionality, causing large delays and unacceptable traffic flow through the corridor.

Table 37.Wacker Dr and JFK Rd Saturday 12 PM-1PM HCS 20 Year Projection Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	JFK/Wacker	File Name	Wacker_Penn 20yr Update 12-1(Overall Delay).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	517	15	84	23	13	28	192	630	6	16	550	449

Signal Information											
Cycle, s	108.2	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	Off	Green	3.0	5.8	39.3	25.1	8.5	0.0	
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	3.5	3.5	4.0	3.0	3.0	0.0	
				Red	1.5	1.5	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		30.6		14.0	18.8	55.6	8.0	44.8
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.0	3.1	3.2
Queue Clearance Time (*g s*), s		23.8		3.9	13.5	14.0	3.1	36.6
Green Extension Time (*g e*), s		1.3		0.1	0.3	1.1	0.0	2.7
Phase Call Probability		1.00		1.00	1.00	1.00	0.42	1.00
Max Out Probability		0.00		0.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	259	358		34		30	192	318	318	18	617	527
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1724		1794		1590	1767	1856	1849	1767	1856	1578
Queue Service Time (*g s*), s	14.3	21.8		1.9		1.9	11.5	12.0	12.0	1.1	34.4	34.6
Cycle Queue Clearance Time (*g c*), s	14.3	21.8		1.9		1.9	11.5	12.0	12.0	1.1	34.4	34.6
Green Ratio (*g/C*)	0.23	0.23		0.08		0.08	0.13	0.46	0.46	0.03	0.36	0.36
Capacity (*c*), veh/h	410	400		142		126	225	859	857	48	674	573
Volume-to-Capacity Ratio (*X*)	0.631	0.895		0.238		0.241	0.853	0.371	0.371	0.378	0.916	0.920
Back of Queue (*Q*), ft/ln (95 th percentile)	261	368		39		35	229	223	218	23	500	427
Back of Queue (*Q*), veh/ln (95 th percentile)	10.2	14.4		1.5		1.4	9.0	8.7	8.7	0.9	19.5	17.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.52	0.74		0.88		0.79	0.46	0.45	0.45	0.05	1.00	0.87
Uniform Delay (*d 1*), s/veh	37.4	40.3		46.8		46.8	46.2	18.8	18.8	51.7	32.9	33.0
Incremental Delay (*d 2*), s/veh	0.6	3.0		0.3		0.4	3.7	0.1	0.1	0.9	1.1	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	38.0	43.3		47.1		47.2	49.9	18.9	18.9	52.6	34.0	34.4
Level of Service (LOS)	D	D		D		D	D	B	B	D	C	C
Approach Delay, s/veh / LOS	41.1	D		47.2	D		26.1	C		34.5	C	
Intersection Delay, s/veh / LOS	33.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.31	B	2.32	B	1.91	B	2.11	B
Bicycle LOS Score / LOS	1.50	B	0.54	A	1.17	A	1.32	A

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The table above presents the optimized results for the Wacker and JFK intersection during Saturday from 12PM-1PM, expanding upon the previously analyzed 20-yr projected conditions. Although marginal, improvements are observable, particularly in the total intersection delay, which has decreased by 3.8 s/veh. Upon closer look, it is evident that while the control delay and approach delay have changed drastically across most movements with a decrease of nearly 10 s/veh for the approach delays and 15 s/veh for the EB through and NB left turn, there has been much improvement to delay at this intersection. This optimization strategy does improve traffic delay through this software therefore it will provide Wacker and JFK intersection to efficiently run with a LOS C. As seen the highlighted portions in red are indicating high areas of concern and will need to be considered when looking to decide between geometric and operational changes to these intersections. In essence, these optimizations from HCS did maintain an overall LOS of C.

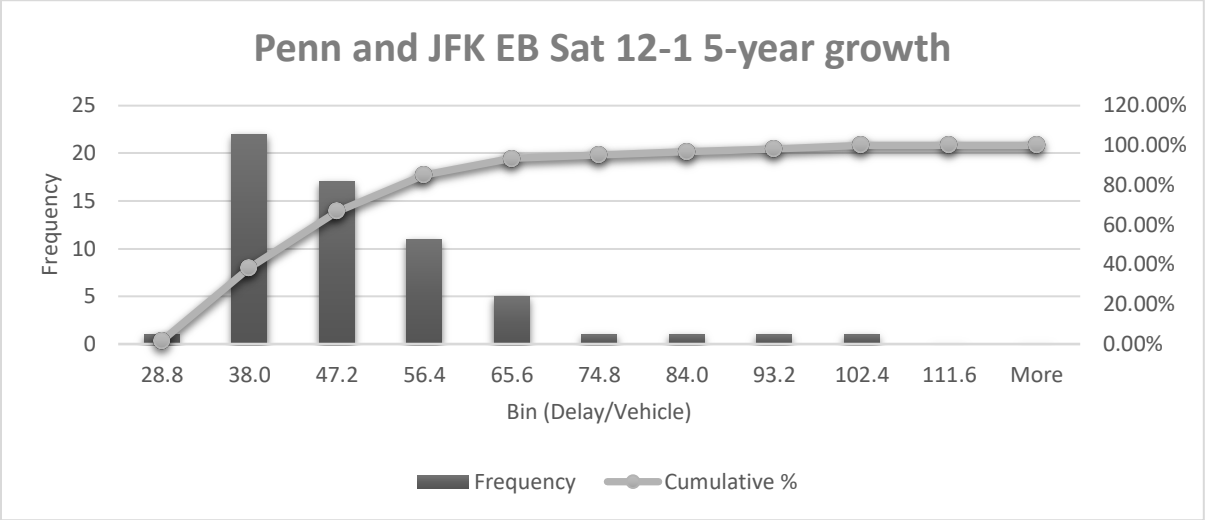


Figure 16. The total delay/vehicle the Penn and JFK intersection going eastbound experienced during the 60 simulation runs from 12-1 on a Saturday with a 5-year population growth.

Using a 1% population growth rate to project traffic volumes 5 years into the future, the team found that at the Pennsylvania and JFK intersection, eastbound traffic experienced a total delay per vehicle of 47.2 seconds or less for 70 percent of simulation runs using extrapolated traffic volumes from Saturday, (February 10th, 2024). The minimum delay per vehicle for the EB direction was found to be 28.8 seconds, while the maximum delay was 102.4 seconds (with an average delay of 45.7 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 42 and 49.3 seconds for the eastbound traffic at Pennsylvania Ave and JFK. Compared to existing conditions where the total delay per vehicle would be between 41 and 47.5 seconds with 95 percent confidence. Since there is some overlap between the two intervals, the change in the total delay per vehicle 5 years from now would not be significant.

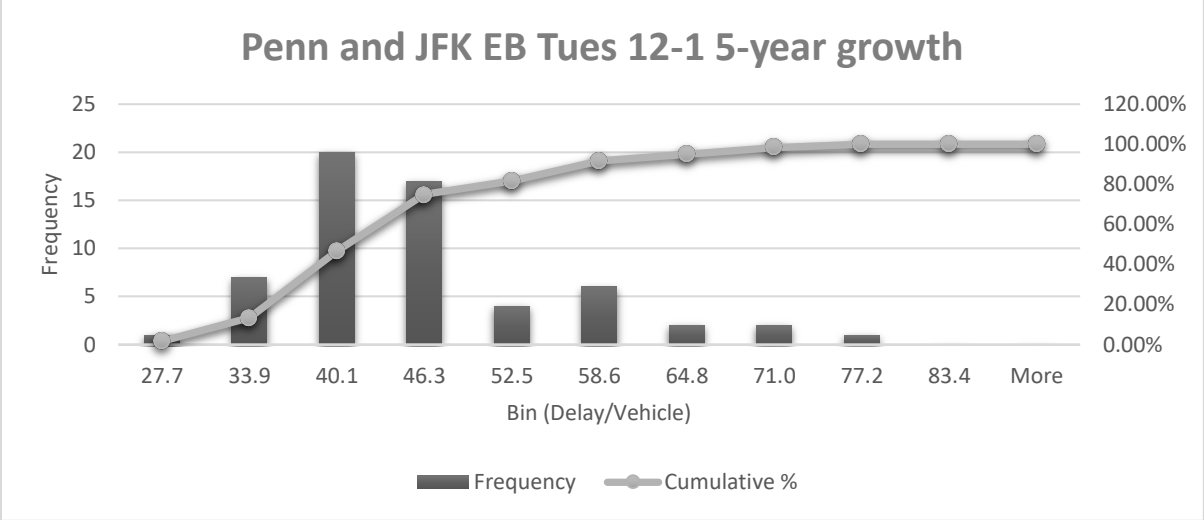


Figure 17. The total delay/vehicle the Penn and JFK intersection going eastbound experienced during the 60 simulation runs from 12PM-1PM on a Tuesday with a 5-year population growth.

Using projected traffic volumes from the Tuesday (February 6th, 2024) the total delay per vehicle 5 years from now was found to be 46.3 seconds or less for 70 percent of simulation runs. The minimum delay per vehicle for the EB direction was found to be 27.7 seconds, while the maximum delay was 77.2 seconds, with an average delay of 43.7 seconds. With 95 percent confidence, one could say that the total delay per vehicle of eastbound traffic would fall between 41 and 46.2 seconds. Comparing that to the existing, the total delay per vehicle would be between 38.3 and 42.8 seconds with 95 percent confidence. Since there is some overlap between the two intervals, the change in the total delay per vehicle 5 years from now would not be significant.

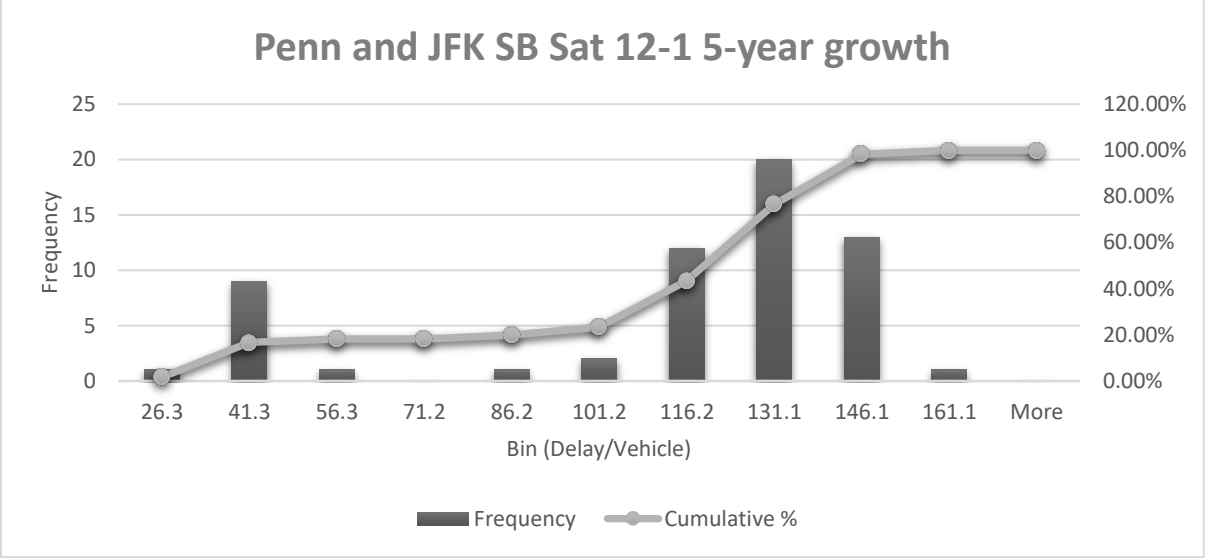


Figure 18. The total delay/vehicle the Penn and JFK intersection going southbound experienced during the 60 simulation runs from 12PM-1PM on a Saturday with a 5-year population growth.

For Southbound traffic at Pennsylvania Ave and JFK (in 5 years), 70 percent of simulations totaled a delay per vehicle of 131.1 seconds or less. The minimum delay per vehicle for the SB direction was 26.3 seconds, while the maximum delay was 146.1 seconds (with an average delay of 105.6 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 96.3 and 114.9 seconds for the southbound direction of Pennsylvania Ave and JFK. Compared to the existing, the total delay per vehicle would be between 74.9 and 84.8 seconds with 95 percent confidence. Since there is no overlap between the two intervals, the change in the total delay per vehicle 5 years from now would be significant.

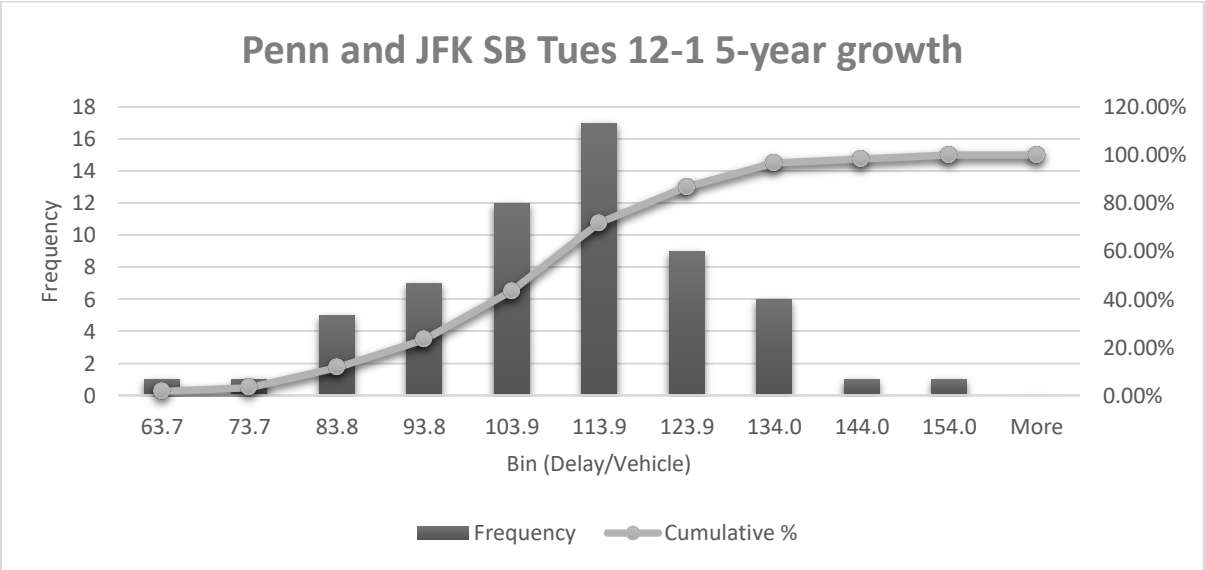


Figure 19. The total delay/vehicle the Penn and JFK intersection going southbound experienced during the 60 simulation runs from 12PM-1PM on a Tuesday with a 5-year population growth.

Using volumes from Tuesday, the team found that 70 percent of the 60 simulation runs resulted in a total delay per vehicle (southbound traffic) of 113.9 seconds or less. The minimum delay per vehicle for the SB direction was found to be 63.7 seconds, while the maximum delay was 144 seconds (with an average delay of 105.3 seconds). With 95 percent confidence, one could say that the total delay per vehicle, in the southbound direction, would fall between 101 and 109.6 seconds. Comparing that to the existing, the total delay per vehicle would be between 62.5 and 79.5 seconds with 95 percent confidence. Since there is no overlap between the two intervals, the change in the total delay per vehicle 5 years from now would be significant.

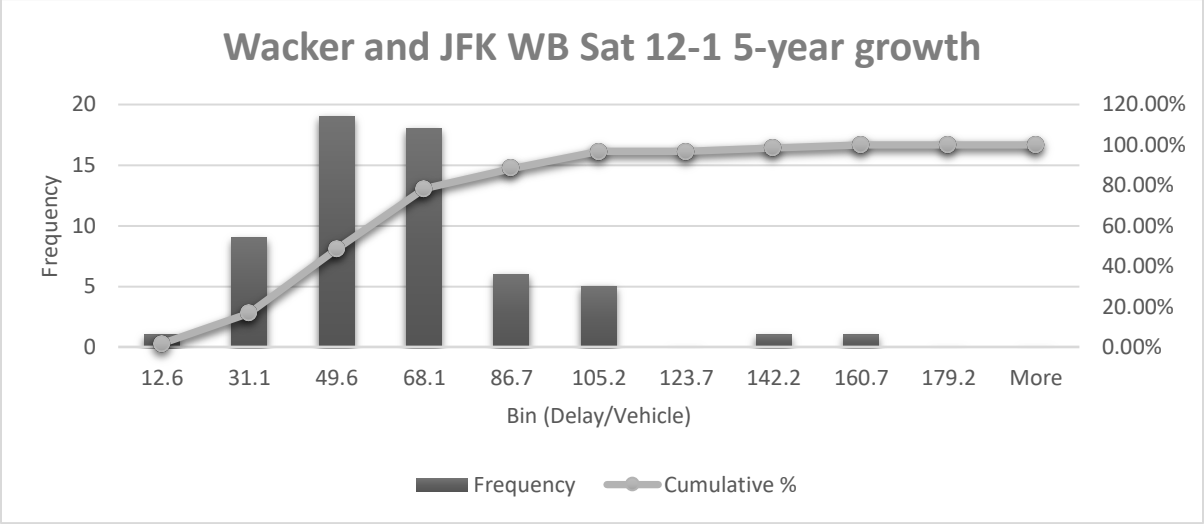


Figure 20. The total delay/vehicle the Wacker and JFK intersection going westbound experienced during the 60 simulation runs from 12PM-1PM on a Saturday with a 5-year population growth.

Traffic forecasting was also done for westbound traffic at the Wacker Dr and JFK intersection, with a 1% population growth rate to simulate conditions 5 years from now. Using the extrapolated volumes from Saturday (February 10th, 2024) the team found that 70 percent of simulation runs resulted in a total delay per vehicle of 68.1 seconds or less, for westbound traffic. The minimum delay per vehicle for the WB direction was 12.6 seconds, while the maximum delay was 160.7 seconds (with an average delay of 53.9 seconds). With 95 percent confidence, one could say that the total delay per vehicle (experienced by westbound traffic) would fall between 47 and 60.9 seconds. Compared to the existing, the total delay per vehicle was found to be in between 45.3 and 62 seconds with 95 percent confidence. Since there is an overlap between the two intervals, the change in the total delay per vehicle 5 years from now would not be significant.

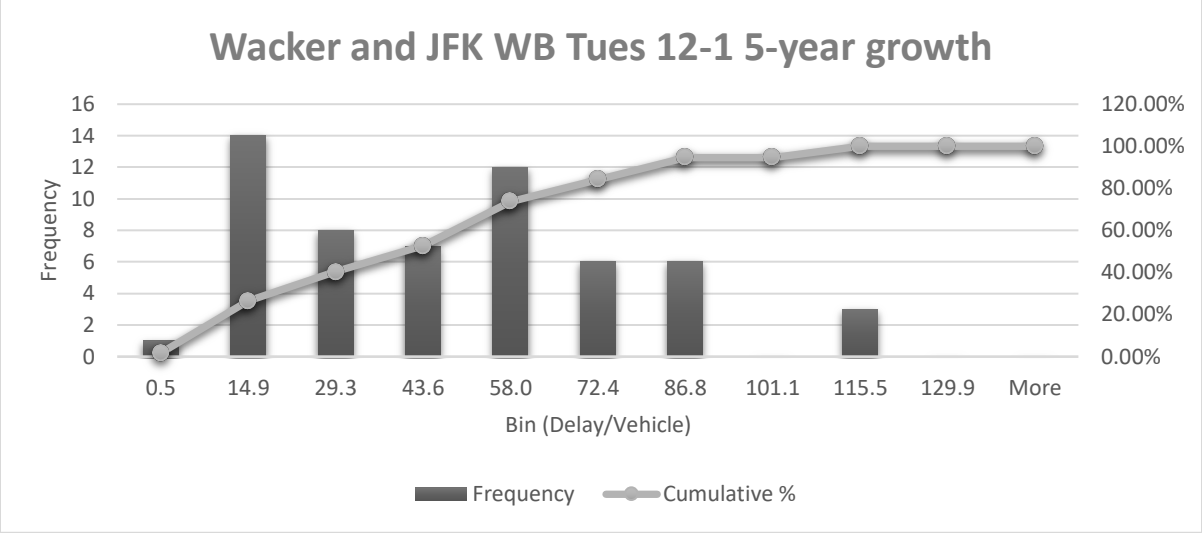


Figure 21. The total delay/vehicle the Wacker and JFK intersection going westbound experienced during the 60 simulation runs from 12PM-1PM on a Tuesday with a 5-year population growth.

Using extrapolated volumes from Tuesday (February 6th, 2024) the team found that 70 percent of simulation runs (of westbound traffic at Wacker Dr and JFK) resulted in a total delay per vehicle of 58 seconds or less. The minimum delay per vehicle for the WB direction was 0.5 seconds, while the max delay was 115.5 seconds (with an average delay of 41.1 seconds). With 95 percent confidence, one could say that the total delay per westbound vehicle would fall between 33.4 and 48.7 seconds. Comparing that to the existing, the total delay per vehicle was found to be in between 27.6 and 42 seconds with 95 percent confidence. Since there is an overlap between the two intervals, the change in the total delay per vehicle 5 years from now would not be significant.

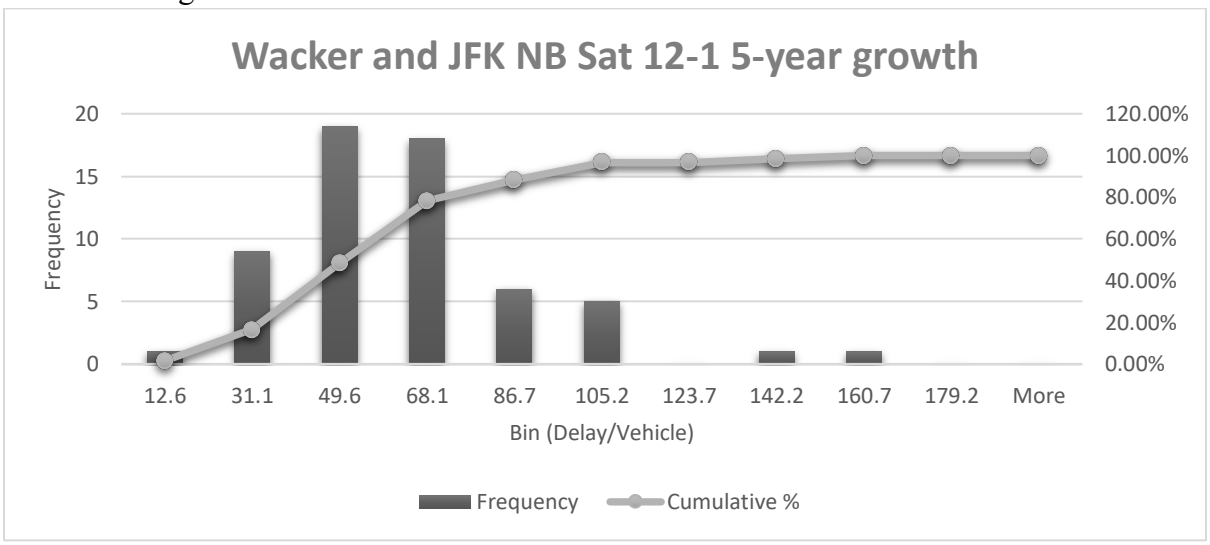


Figure 22. The total delay/vehicle the Wacker and JFK intersection going northbound experienced during the 60 simulation runs from 12-1 on a Saturday with a 5-year population growth.

The last direction analyzed by the team at Wacker Dr and JFK for a 5-year traffic forecast was the northbound direction. Using extrapolated volumes from Saturday (February 10th, 2024) the team found that 70 percent of the 60 simulation runs resulted in a total delay per northbound vehicle of 68.1 seconds or less. The minimum delay per vehicle for the NB direction was 12.6 seconds, while the maximum delay was 160.7 seconds, with an average delay of 53.9 seconds. With 95 percent confidence, one could say that the total delay per northbound vehicle (at Wacker Dr and JFK) would fall between 47 and 60.9 seconds. Comparing that to the existing, the total delay per vehicle was found to be in between 25.9 and 31 seconds with 95 percent confidence. Since there is no overlap between the two intervals, the change in the total delay per vehicle 5 years from now would be significant.

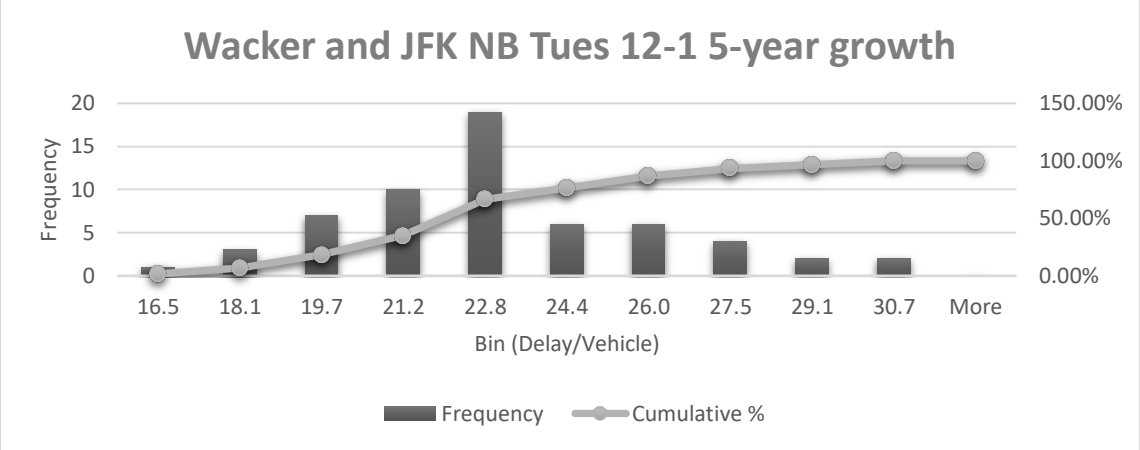


Figure 23. The total delay/vehicle the Wacker and JFK intersection going northbound experienced during the 60 simulation runs from 12PM-1PM on a Tuesday with a 5-year population growth.

Using extrapolated volumes from Tuesday, February 6th, 2024, 70 percent of simulation runs resulted in a total delay per northbound vehicle of 22.8 seconds or less. The minimum delay per vehicle for the NB direction was 16.5 seconds, while the maximum delay was 29.1 seconds (with an average delay of 22.2 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 21.5 and 23 seconds for the northbound direction of Wacker Dr and JFK. Comparing that to the existing, the total delay per vehicle was found to be in between 24.3 and 27 seconds with 95 percent confidence. Since there is overlap between the two intervals, the change in the total delay per vehicle 5 years from now would not be significant.

The team is using a 1% population growth rate for the city of Dubuque to forecast the future traffic volumes that would occur at each intersection from University Ave and JFK to Carter Rd and JFK. The impact of traffic is being analyzed for 5, 10, and 20 years from now. At the Pennsylvania Ave and JFK intersection.

Impact Assessment

The most common cause of crashes at the intersection of Wacker Dr and JFK Rd was improper or erratic lane changing. To improve clarity for drivers, the team recommends repainting all intersection markings, especially that of the left-hand turn from Wacker Dr onto

JFK (going NB). When the team visited the intersection the left-hand turn striping had been completely worn off, essentially leaving the width of the turn up to driver's discretion. Since snow plowing and the application of sand/salt wears the markings down quickly, the team recommends the city consider including reflective turn striping on the turn (possibly installed in divets).

Comparing the results of the two alternatives (the three-way stop with and without the pedestrian median), there was a significant drop in delays on Carter (because people going westbound on Carter instead of waiting for the left will be taking the right. That said, installing the pedestrian median does lead to a slight increase in delay at the Pennsylvania Ave and JFK intersection due to the fact that vehicles traveling southbound on JFK will not be able to take a left onto Carter. Shown in red is the route likely to be used by vehicles coming from the north (as you can see there will be an increase in volume of vehicles traveling on Hillcrest Rd). Shown in green and yellow are the routes most likely to be used by vehicles from the south dropping kids off at school (with the yellow area representing the area most kids will be dropped off at). As you can see there will be an increase in traffic on residential streets especially Churchill Dr.

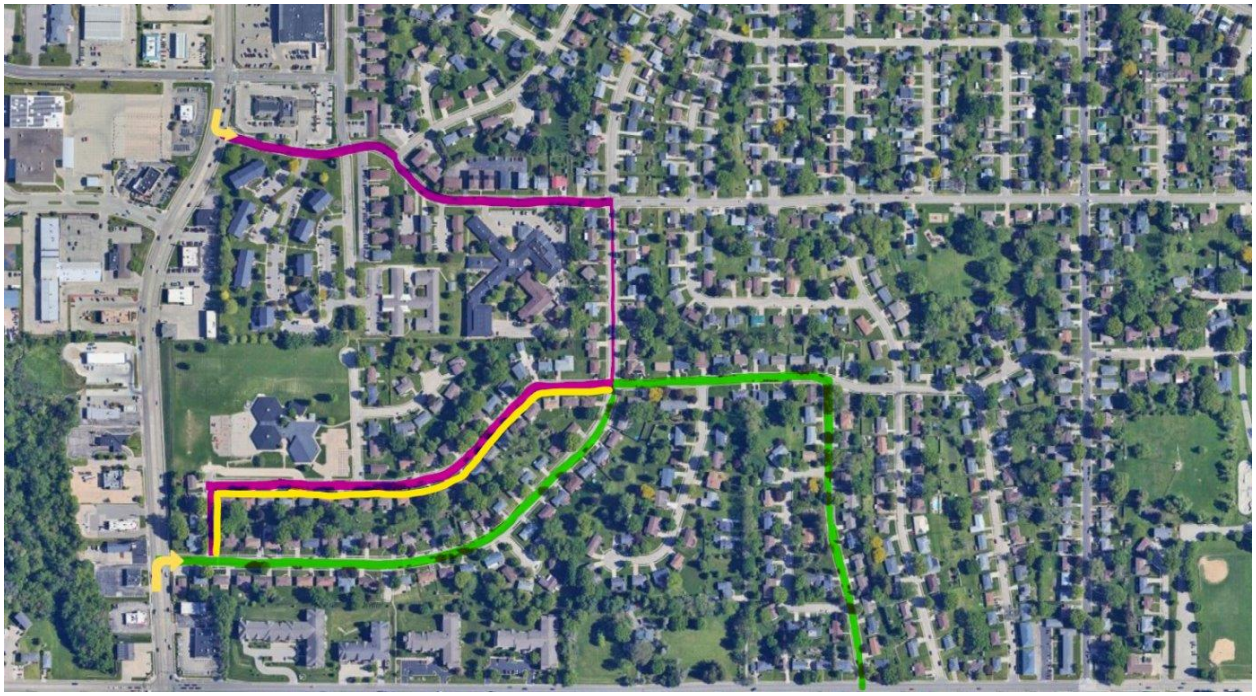


Figure 24. Aerial view of the routes likely to be taken by parents dropping children off at school if the pedestrian median at Carter Rd. and JFK Rd is constructed.

Mitigation Measures:

As a result of the increased volume of traffic on the residential roads, further analysis will need to be done to identify if the roads can handle the increased volume. A trial run of the pedestrian median using flexible delineators or barriers can be used to test the effectiveness of the design as well as the driver's response to the changes.

Section V: Alternative Solutions to be Considered

One of the main alternatives our team is proposing is adding a 3-way stop at Carter Rd and Ridge Rd. Additionally, another alternative our team is proposing is adding a pedestrian median on Carter Rd and JFK while also incorporating a 3-way stop on Carter Rd and Ridge Rd. While adding the three-way stop at Carter Rd and Ridge Rd may be the cheaper option, our team recommends constructing a pedestrian median at the Carter Rd and JFK intersection, while also incorporating the 3-way stop at Carter Rd and Ridge Rd. The affect this option would have at the intersection is that it would cause there to be a right-in and right-out only into and out of Carter Rd from JFK. This option is also more expensive and will be more impactful on the flow of traffic, however it addresses the issue of pedestrians trying to cross JFK.

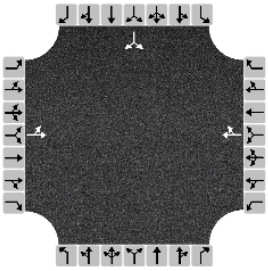
Table 38. All-Way Stop at Carter and Ridge Existing

HCS All-Way Stop Control Report

General and Site Information

Analyst	Payton Stuart
Agency/Co.	University of Iowa
Date Performed	4/25/2024
Analysis Year	2024
Analysis Time Period (hrs)	1.00
Time Analyzed	2:43
Project Description	
Intersection	Carter/Ridge
Jurisdiction	
East/West Street	Carter Rd
North/South Street	Ridge Rd
Peak Hour Factor	0.92

Lanes



Turning Movement Demand Volumes

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume (veh/h)	7	51			96	29				12		24
% Thrus in Shared Lane												

Lane Flow Rate and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT			TR						LR		
Flow Rate, v (veh/h)	63			136						39		
Percent Heavy Vehicles	2			2						2		
Initial Departure Headway, h_d (s)	3.20			3.20						3.20		
Initial Degree of Utilization, x	0.056			0.121						0.035		
Final Departure Headway, h_d (s)	4.17			3.94						4.02		
Final Degree of Utilization, x	0.073			0.149						0.044		
Move-Up Time, m (s)	2.0			2.0						2.0		
Service Time, t_s (s)	2.17			1.94						2.02		

Capacity, Delay and Level of Service

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT			TR						LR		
Flow Rate, v (veh/h)	63			136						39		
Capacity (veh/h)	864			914						897		
95% Queue Length, Q_{95} (veh)	0.2			0.5						0.1		
95% Queue Length, Q_{95} (ft)	5.1			12.7						2.5		
Control Delay (s/veh)	7.5			7.6						7.2		
Level of Service, LOS	A			A						A		
Approach Delay (s/veh) | LOS	7.5		A	7.6		A				7.2		A
Intersection Delay (s/veh) | LOS	7.5						A					

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The table above depicts the introduction of an all-way stop at the Carter and Ridge Intersection, positioned east of the Carter and JFK intersection. It's clear that even with this proposed alteration, the intersection maintains its efficiency, mirroring its current functionality with only the stop sign at Ridge. Our main aim was to gauge whether the eastbound direction would encounter significant delays due to vehicles entering Carter from JFK. However, the data indicates that this addition does not hinder the intersection's performance. This trend persists across all projected conditions spanning 5 years, 10 years, and 20 years. There's minimal variance in control and approach delays among all conditions, while the Level of Service (LOS) remains consistently rated as A. As shown in the tables below.

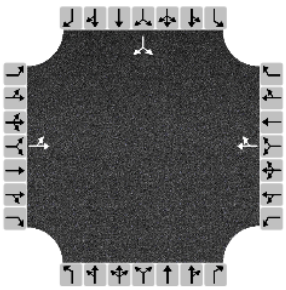
Table 39. All-Way Stop at Carter and Ridge 5-yr projection

HCS All-Way Stop Control Report

General and Site Information

Analyst	Payton Stuart
Agency/Co.	University of Iowa
Date Performed	4/25/2024
Analysis Year	2024
Analysis Time Period (hrs)	1.00
Time Analyzed	2:43
Project Description	
Intersection	Carter/Ridge
Jurisdiction	
East/West Street	Carter Rd
North/South Street	Ridge Rd
Peak Hour Factor	0.92

Lanes



Turning Movement Demand Volumes

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume (veh/h)	8	54			118	30				13		25
% Thrus in Shared Lane												

Lane Flow Rate and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT			TR						LR		
Flow Rate, v (veh/h)	67			161						41		
Percent Heavy Vehicles	2			2						2		
Initial Departure Headway, h_d (s)	3.20			3.20						3.20		
Initial Degree of Utilization, x	0.060			0.143						0.037		
Final Departure Headway, h_d (s)	4.20			3.97						4.09		
Final Degree of Utilization, x	0.079			0.177						0.047		
Move-Up Time, m (s)	2.0			2.0						2.0		
Service Time, t_s (s)	2.20			1.97						2.09		

Capacity, Delay and Level of Service

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT			TR						LR		
Flow Rate, v (veh/h)	67			161						41		
Capacity (veh/h)	857			907						881		
95% Queue Length, Q_{95} (veh)	0.3			0.6						0.1		
95% Queue Length, Q_{95} (ft)	7.6			15.2						2.5		
Control Delay (s/veh)	7.6			7.8						7.3		
Level of Service, LOS	A			A						A		
Approach Delay (s/veh) | LOS	7.6	A		7.8	A					7.3	A	
Intersection Delay (s/veh) | LOS	7.7						A					

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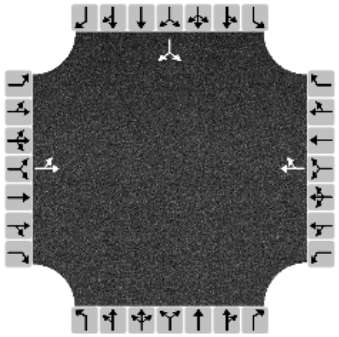
Table 40. All-Way Stop at Carter and Ridge 10-yr projection

HCS All-Way Stop Control Report

General and Site Information

Analyst	Payton Stuart
Agency/Co.	University of Iowa
Date Performed	4/25/2024
Analysis Year	2024
Analysis Time Period (hrs)	1.00
Time Analyzed	2:43
Project Description	
Intersection	Carter/Ridge
Jurisdiction	
East/West Street	Carter Rd
North/South Street	Ridge Rd
Peak Hour Factor	0.92

Lanes



Turning Movement Demand Volumes

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume (veh/h)	8	57			106	32				13		27
% Thrus in Shared Lane												

Lane Flow Rate and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT			TR						LR		
Flow Rate, v (veh/h)	71			150						43		
Percent Heavy Vehicles	2			2						2		
Initial Departure Headway, h_d (s)	3.20			3.20						3.20		
Initial Degree of Utilization, x	0.063			0.133						0.039		
Final Departure Headway, h_d (s)	4.19			3.96						4.06		
Final Degree of Utilization, x	0.082			0.165						0.049		
Move-Up Time, m (s)	2.0			2.0						2.0		
Service Time, t_s (s)	2.19			1.96						2.06		

Capacity, Delay and Level of Service

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT			TR						LR		
Flow Rate, v (veh/h)	71			150						43		
Capacity (veh/h)	859			910						888		
95% Queue Length, Q_{95} (veh)	0.3			0.6						0.2		
95% Queue Length, Q_{95} (ft)	7.6			15.2						5.1		
Control Delay (s/veh)	7.6			7.7						7.3		
Level of Service, LOS	A			A						A		
Approach Delay (s/veh) | LOS	7.6		A	7.7		A				7.3		A
Intersection Delay (s/veh) | LOS	7.6						A					

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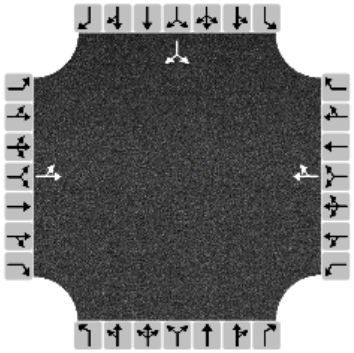
Table 41. All-Way Stop at Carter and Ridge 20-yr projection

HCS All-Way Stop Control Report

General and Site Information

Analyst	Payton Stuart
Agency/Co.	University of Iowa
Date Performed	4/25/2024
Analysis Year	2024
Analysis Time Period (hrs)	1.00
Time Analyzed	2:43
Project Description	
Intersection	Carter/Ridge
Jurisdiction	
East/West Street	Carter Rd
North/South Street	Ridge Rd
Peak Hour Factor	0.92

Lanes



Turning Movement Demand Volumes

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume (veh/h)	9	63			117	35				15		29
% Thrus in Shared Lane												

Lane Flow Rate and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT			TR						LR		
Flow Rate, v (veh/h)	78			165						48		
Percent Heavy Vehicles	2			2						2		
Initial Departure Headway, h_d (s)	3.20			3.20						3.20		
Initial Degree of Utilization, x	0.070			0.147						0.043		
Final Departure Headway, h_d (s)	4.22			3.98						4.12		
Final Degree of Utilization, x	0.092			0.183						0.055		
Move-Up Time, m (s)	2.0			2.0						2.0		
Service Time, t_s (s)	2.22			1.98						2.12		

Capacity, Delay and Level of Service

Approach	Eastbound			Westbound			Northbound			Southbound		
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT			TR						LR		
Flow Rate, v (veh/h)	78			165						48		
Capacity (veh/h)	854			905						875		
95% Queue Length, Q_{95} (veh)	0.3			0.7						0.2		
95% Queue Length, Q_{95} (ft)	7.6			17.8						5.1		
Control Delay (s/veh)	7.6			7.9						7.4		
Level of Service, LOS	A			A						A		
Approach Delay (s/veh) | LOS	7.6	A		7.9	A					7.4	A	
Intersection Delay (s/veh) | LOS	7.7						A					

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3-WAY STOP GRAPHS:

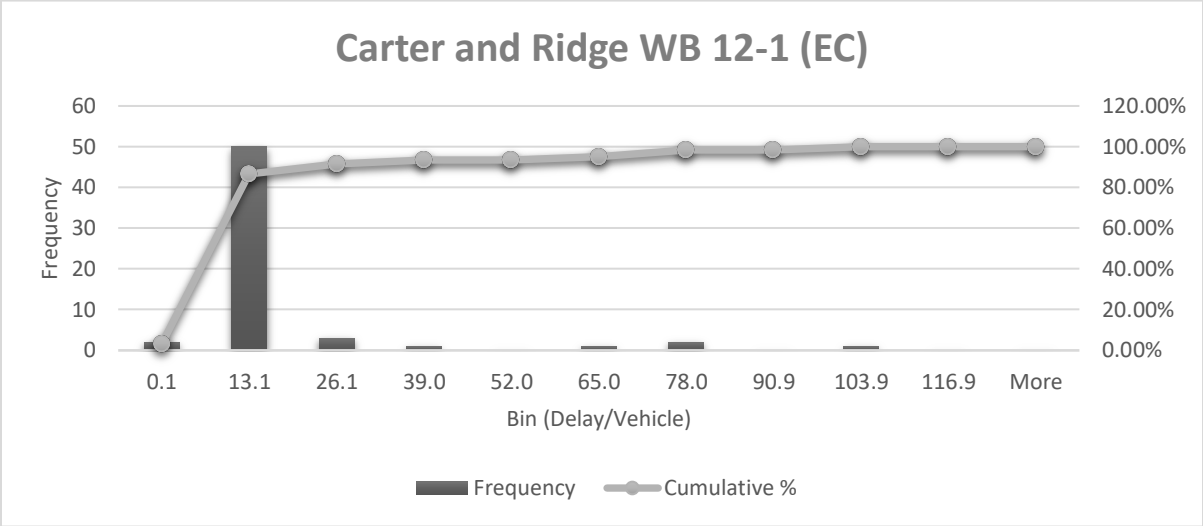


Figure 17. The total delay/vehicle the Carter and Ridge intersection going westbound experienced during the 60 simulation runs from 12PM-1PM on a Saturday.

Out of the 60 simulations ran simulating the existing conditions at Carter and Ridge Rd (on Saturday from 12-1), 90 percent resulted in a total delay per westbound vehicle of approximately 13.1 seconds or less.

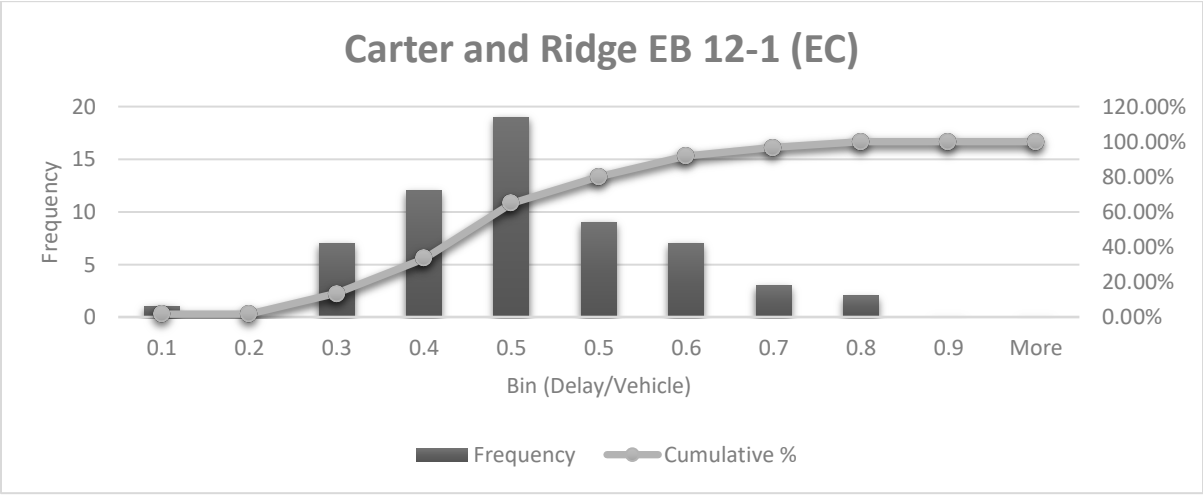


Figure 18. The total delay/vehicle the Carter and Ridge intersection going eastbound experienced during the 60 simulation runs from 12PM-1PM on a Saturday.

Out of the 60 simulations ran simulating the existing conditions at Carter and Ridge Rd (on Saturday from 12-1), 90 percent resulted in a total delay per eastbound vehicle of approximately .6 seconds or less.

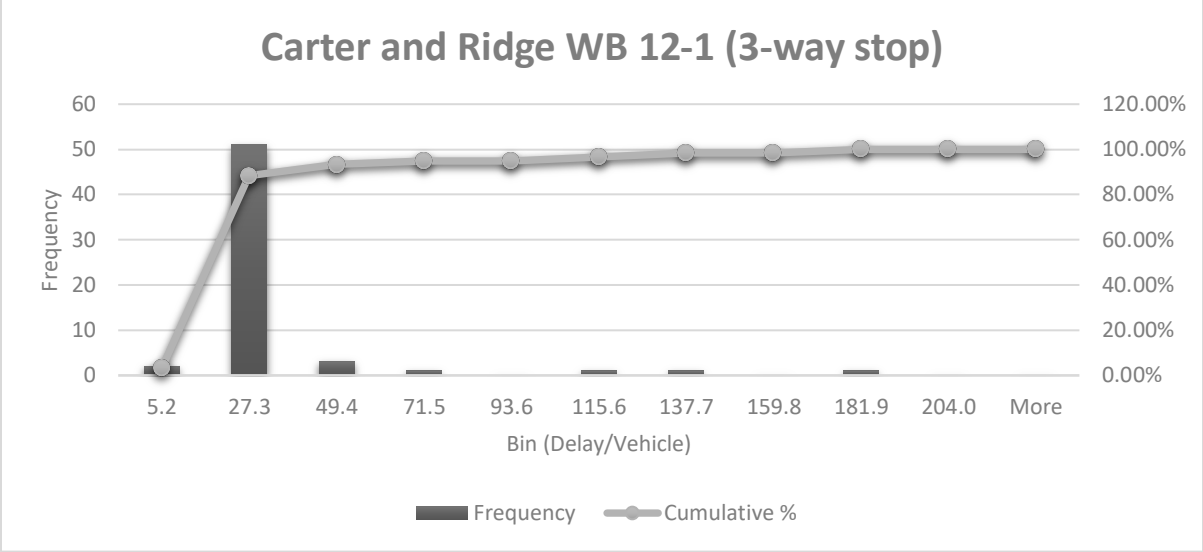


Figure 19. The total delay/vehicle the Carter and Ridge intersection with a 3-way stop going westbound experienced during the 60 simulation runs from 12pm-1 pm on a Saturday.

Out of the 60 simulations ran, simulating the conditions at Carter and Ridge Rd (if a 3-way stop was implemented) 90 percent resulted in a total delay per westbound vehicle of approximately 27.3 seconds or less.

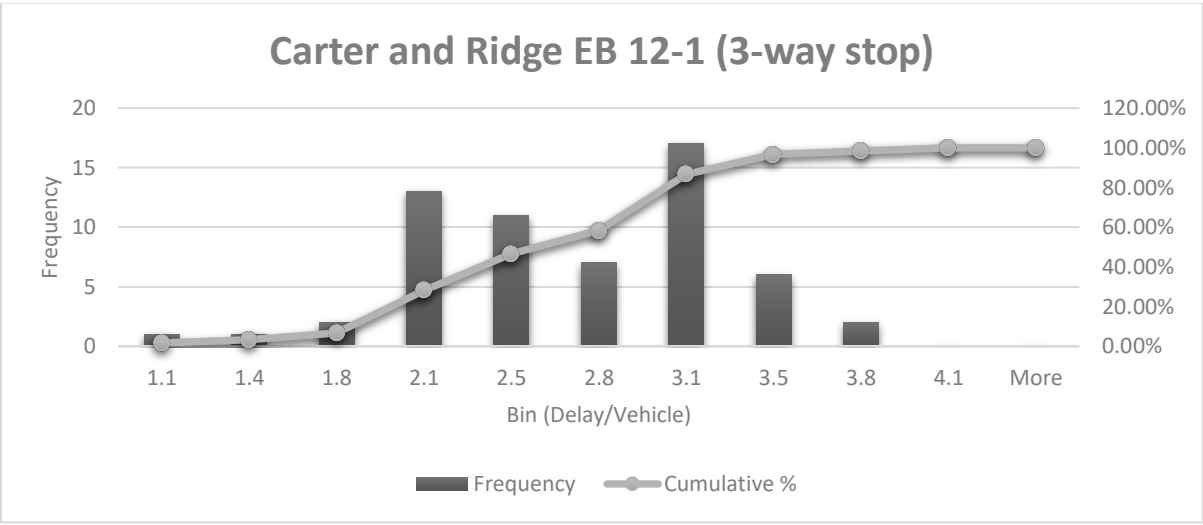


Figure 20. The total delay/vehicle the Carter and Ridge intersection with a 3-way stop going eastbound experienced during the 60 simulation runs from 12PM-1PM on a Saturday.

Out of the 60 simulations ran, simulating the conditions at Carter and Ridge Rd (if a 3-way stop was implemented) 90 percent resulted in a total delay per eastbound vehicle of approximately 3.1 seconds or less.

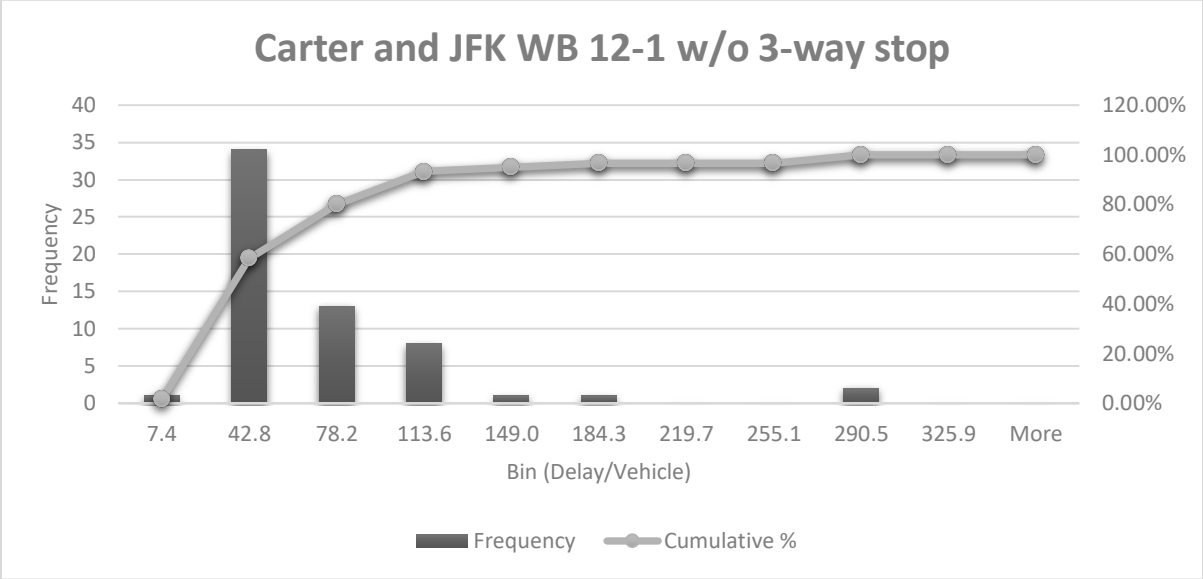


Figure 21. The total delay/vehicle the Carter and JFK intersection without a 3-way stop going westbound experienced during the 60 simulation runs from 12PM-1PM on a Saturday.

Of the 60 simulations ran at Carter Rd and JFK without a 3-way stop, around 80 percent resulted in a total delay per vehicle of 78.2 seconds or less going westbound. The minimum delay per vehicle for the westbound direction was 7.4 seconds, while the maximum delay was 290.5 seconds (with an average delay of 53.9 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 40.2 and 67.5 seconds for the westbound direction of Carter Rd and JFK.

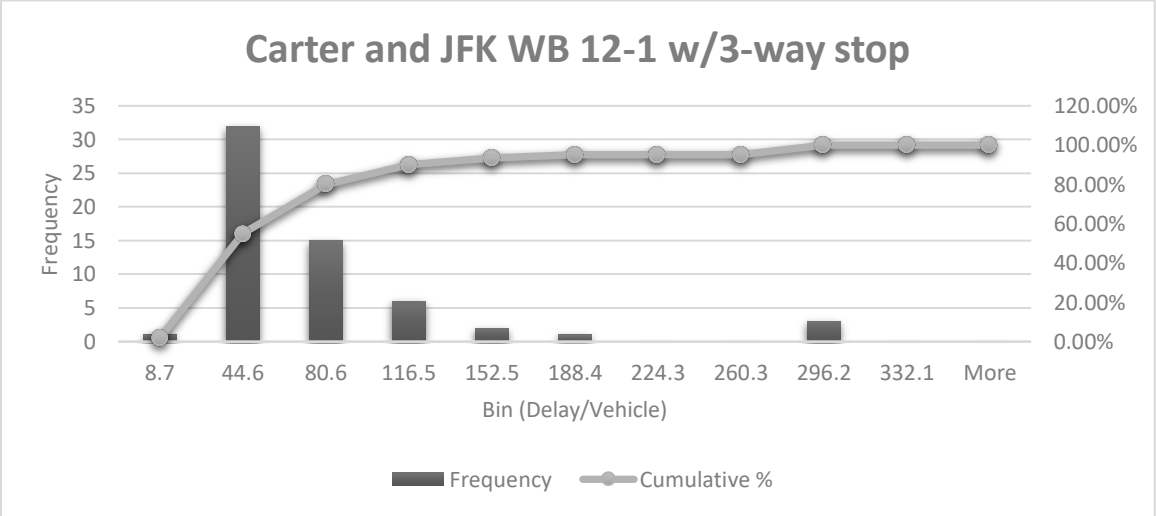


Figure 22. The total delay/vehicle the Carter and JFK intersection with a 3-way stop going westbound experienced during the 60 simulation runs from 12PM-1PM on a Saturday.

Of the 60 simulations ran at Carter Rd and JFK with a 3-way stop, around 80 percent resulted in a total delay per vehicle of 116.5 seconds or less going westbound. The minimum delay per vehicle for the westbound direction was 8.7 seconds, while the maximum delay was 296.2 seconds (with an average delay of 61.4 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 45.5 and 77.3 seconds for the westbound direction of Carter Rd and JFK.

Pedestrian-Median GRAPHS:

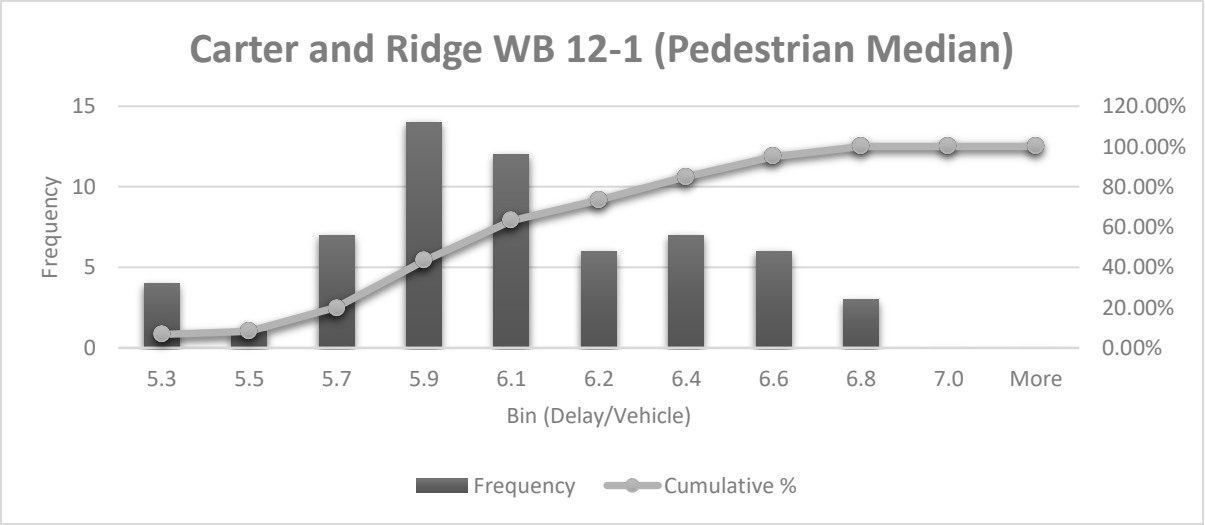


Figure 23. The total delay/vehicle the Carter and Ridge intersection with a pedestrian median going westbound experienced during the 60 simulation runs from 12-1PM on a Saturday.

Of the 60 simulations ran at Carter Rd and Ridge Rd with a pedestrian median, around 80 percent resulted in a total delay per vehicle of 6.4 seconds or less going westbound. The minimum delay per vehicle for the westbound direction was 5.3 seconds, while the maximum delay was 6.8 seconds (with an average delay of 6 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 5.9 and 6.1 seconds for the westbound direction of Carter Rd and JFK with a pedestrian median.

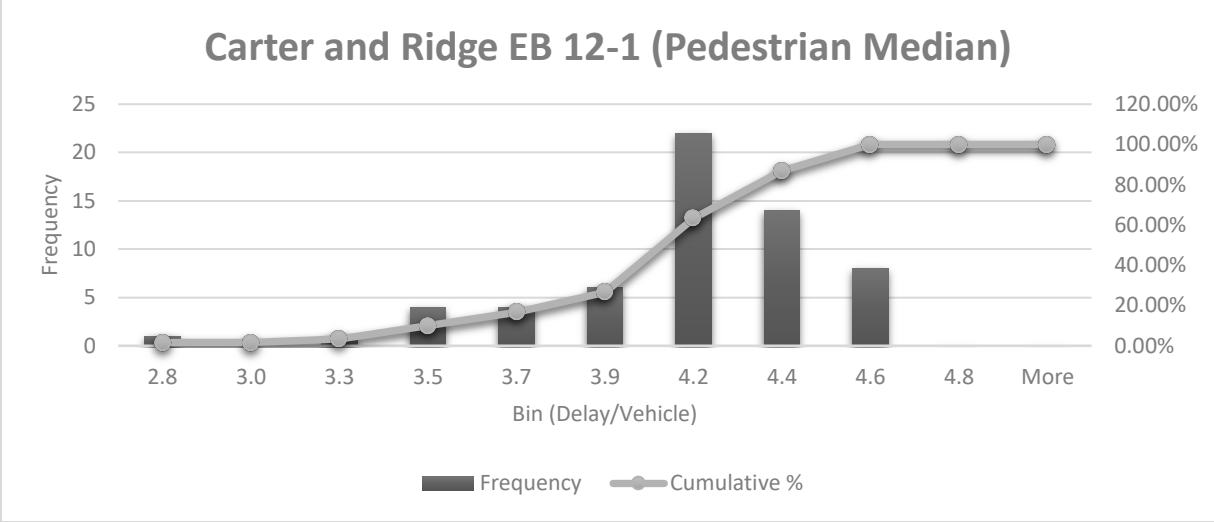


Figure 24. The total delay/vehicle the Carter and Ridge intersection with a pedestrian median going eastbound experienced during the 60 simulation runs from 12-1 PM on a Saturday.

Of the 60 simulations ran at Carter Rd and Ridge Rd with a pedestrian median, around 80 percent resulted in a total delay per vehicle of 4.4 seconds or less going eastbound. The minimum delay per vehicle for the eastbound direction was 2.8 seconds, while the maximum delay was 4.6 seconds (with an average delay of 4 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 3.9 and 4.1 seconds for the eastbound direction of Carter Rd and Ridge Rd with a pedestrian median.

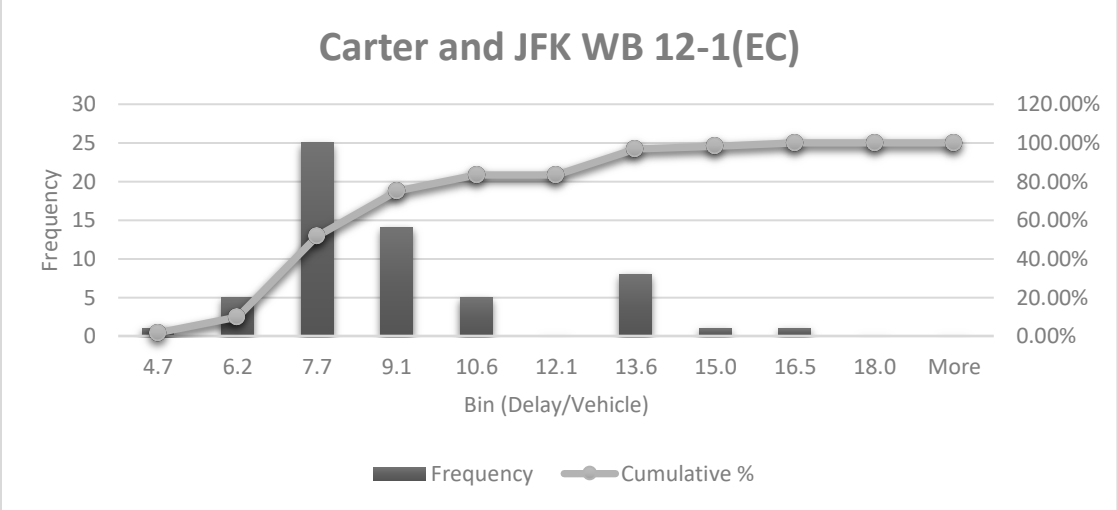


Figure 25. The total delay/vehicle the Carter and JFK intersection with a pedestrian median going westbound experienced during the 60 simulation runs from 12-1PM on a Saturday.

Of the 60 simulations ran at Carter Rd and JFK with a pedestrian median, around 80 percent resulted in a total delay per vehicle of 12.1 seconds or less going westbound. The minimum delay per vehicle for the westbound direction was 4.7 seconds, while the maximum

delay was 16.5 seconds (with an average delay of 8.4 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 7.7 and 9 seconds for the westbound direction of Carter Rd and JFK with a pedestrian median.

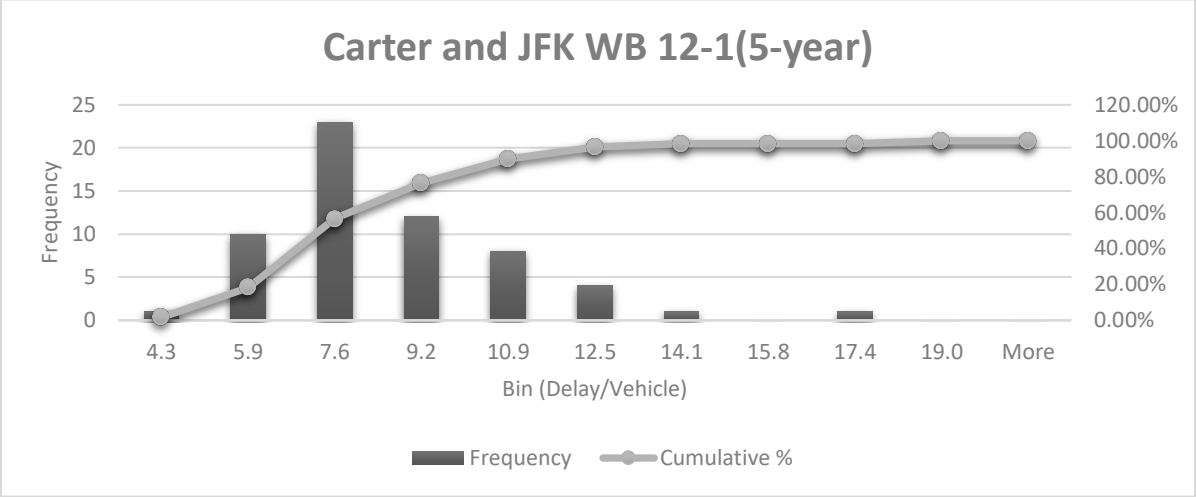


Figure 26. The total delay/vehicle the Carter and JFK intersection with a pedestrian median going westbound experiences 5 years from now during the 60 simulation runs from 12-1PM on a Saturday.

Of the 60 simulations ran at Carter Rd and JFK with a pedestrian median for a 5-year projected traffic forecast, around 80 percent resulted in a total delay per vehicle of 9.2 seconds or less going westbound. The minimum delay per vehicle for the westbound direction was 4.3 seconds, while the maximum delay was 17.4 seconds (with an average delay of 7.9 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 7.2 and 8.5 seconds for the westbound direction of Carter Rd and JFK with a pedestrian median.

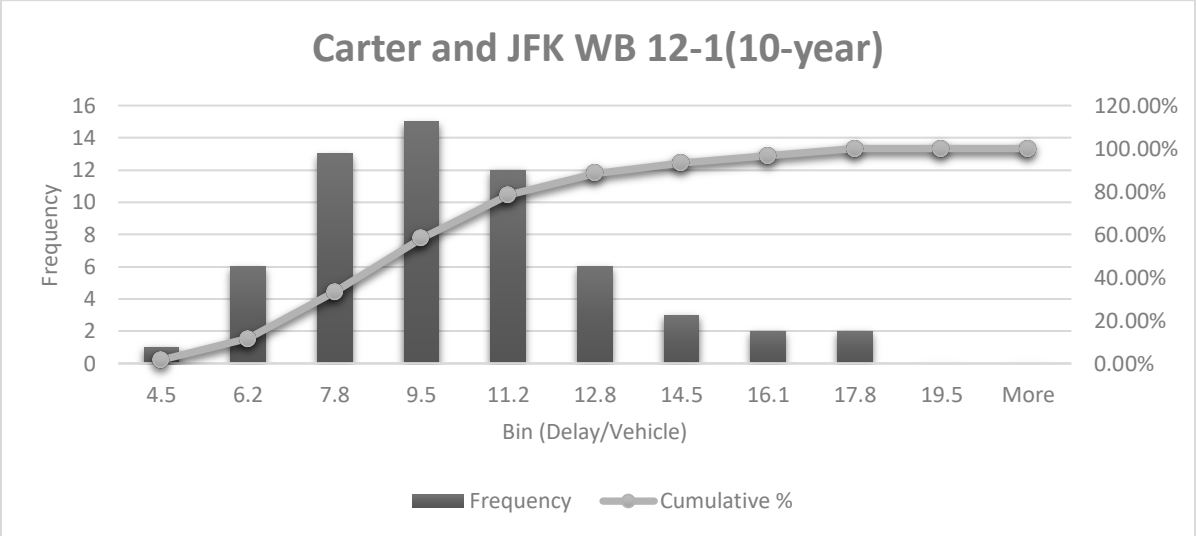


Figure 27. The total delay/vehicle the Carter and JFK intersection with a pedestrian median going westbound experiences 10 years from now during the 60 simula on runs from 12-1PM on a Saturday.

Of the 60 simulations ran at Carter Rd and JFK with a pedestrian median for a 10-year projected traffic forecast, around 80 percent resulted in a total delay per vehicle of 11.2 seconds or less going westbound. The minimum delay per vehicle for the westbound direction was 4.5 seconds, while the maximum delay was 17.8 seconds (with an average delay of 9.3 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 8.6 and 10.1 seconds for the westbound direction of Carter Rd and JFK with a pedestrian median.

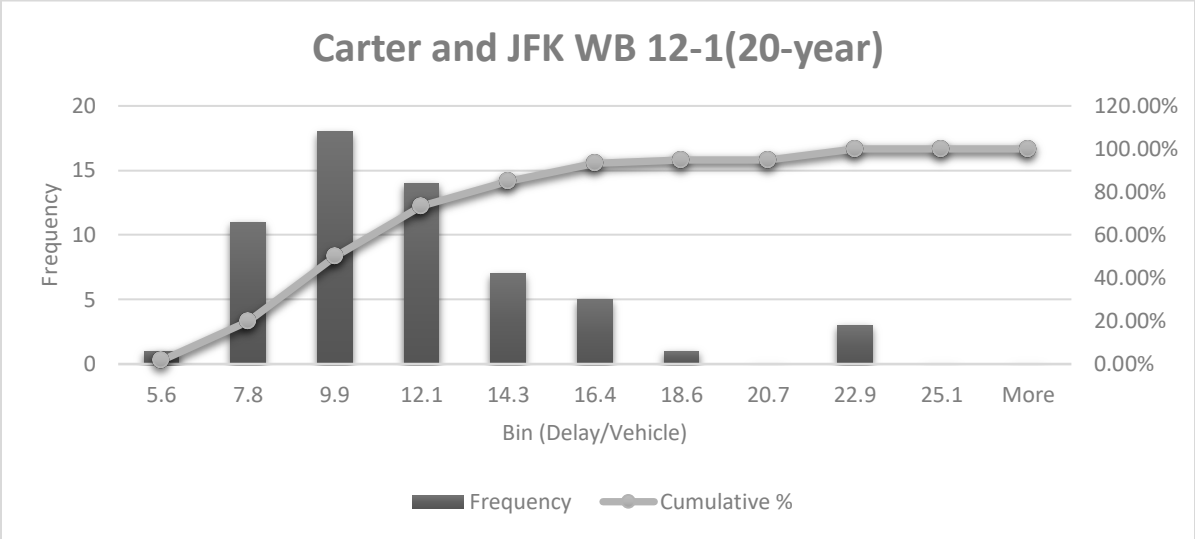


Figure 28. The total delay/vehicle the Carter and JFK intersection with a pedestrian median going westbound experiences 20 years from now during the 60 simulation runs from 12-1PM on a Saturday.

Of the 60 simulations ran at Carter Rd and JFK with a pedestrian median for a 20-year projected traffic forecast, around 80 percent resulted in a total delay per vehicle of 14.3 seconds or less going westbound. The minimum delay per vehicle for the westbound direction was 5.6 seconds, while the maximum delay was 22.9 seconds (with an average delay of 10.6 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 5.6 and 22.9 seconds for the westbound direction of Carter Rd and JFK with a pedestrian median.

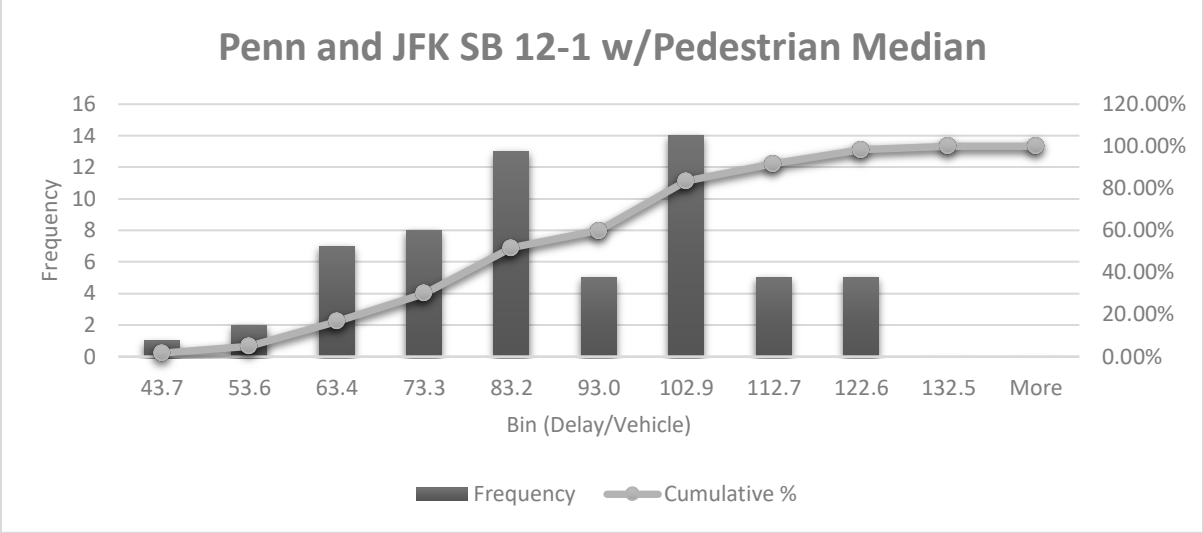


Figure 29. The total delay/vehicle the Pennsylvania and JFK intersection with a pedestrian median going southbound experienced during the 60 simulation runs from 12-1PM on a Saturday.

Of the 60 simulations run at Pennsylvania Ave and JFK with a pedestrian median, around 80 percent resulted in a total delay per vehicle of 102.9 seconds or less going southbound. The minimum delay per vehicle for the southbound direction was 43.7 seconds, while the maximum delay was 122.6 seconds (with an average delay of 84.8 seconds). With 95 percent confidence, one could say that the total delay per vehicle would fall between 79.8 and 89.9 seconds for the southbound direction of Pennsylvania Ave and JFK with a pedestrian median.

Section VI: Final Design Details

In the final design, the team recommends adding a sidewalk along the west side of JFK starting on the south side of Stoneman Rd down to the Wacker Dr and Kennedy Mall intersection. The team also recommends the reconstruction of the section of sidewalk adjacent to the Sunshine Family Restaurant.

Additionally, the team recommends adding crosswalk markings across the Kennedy mall entrance and Wacker Dr while also updating the crosswalk markings across JFK as seen in Figure 41. The group also proposes adding pedestrian pushbuttons at Wacker Dr and JFK also denoted by Figure 41.

The group also advises constructing a pedestrian median at the Carter Rd and JFK intersection and including flexible delineators on the sides of the sidewalk to help aid the safety of pedestrians. The flexible delineators will also make the cars less inclined to drive near the median. These delineators will be placed on the perimeter of the sidewalk as seen in Figure 42. Moreover, the group advises making the Carter Rd and Ridge Rd intersection a 3-way stop.

Finally, the team recommends implementing adjusted signal timing to reduce overall delay at both major signalized intersections at the southern portion of the John F Kennedy Rd corridor.

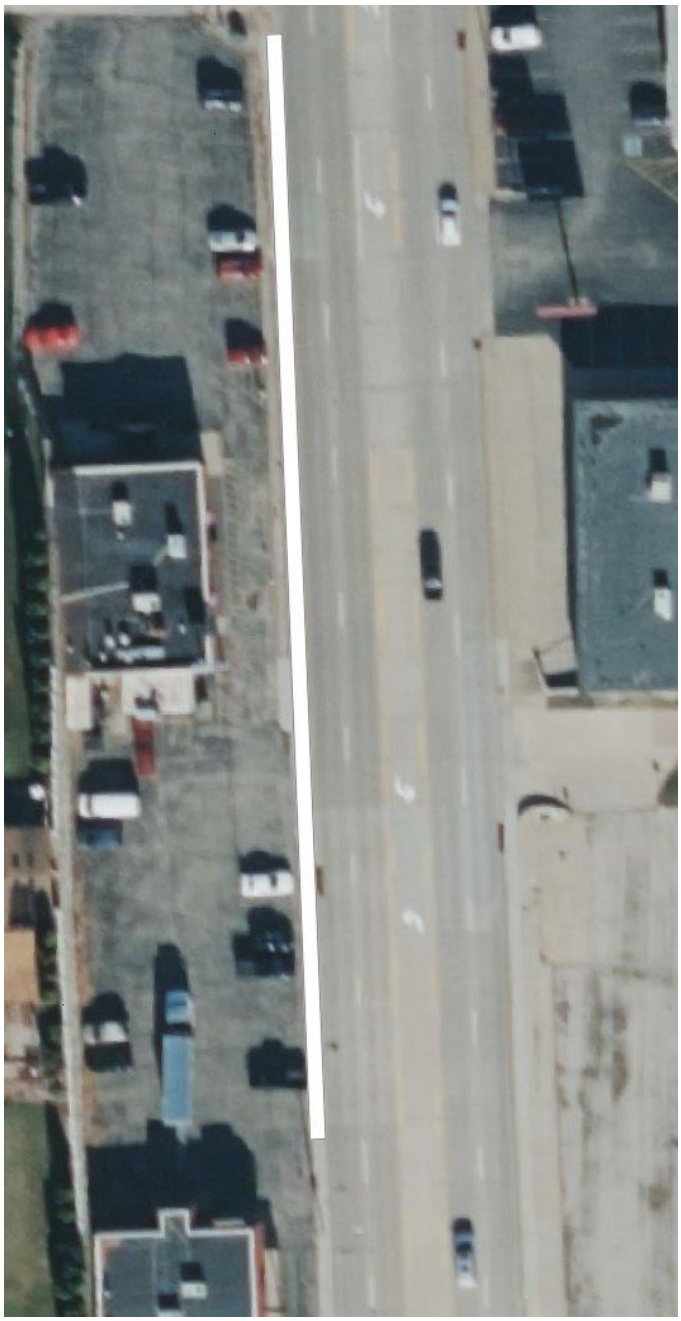


Figure 30. Proposed Sidewalk Reconstruction

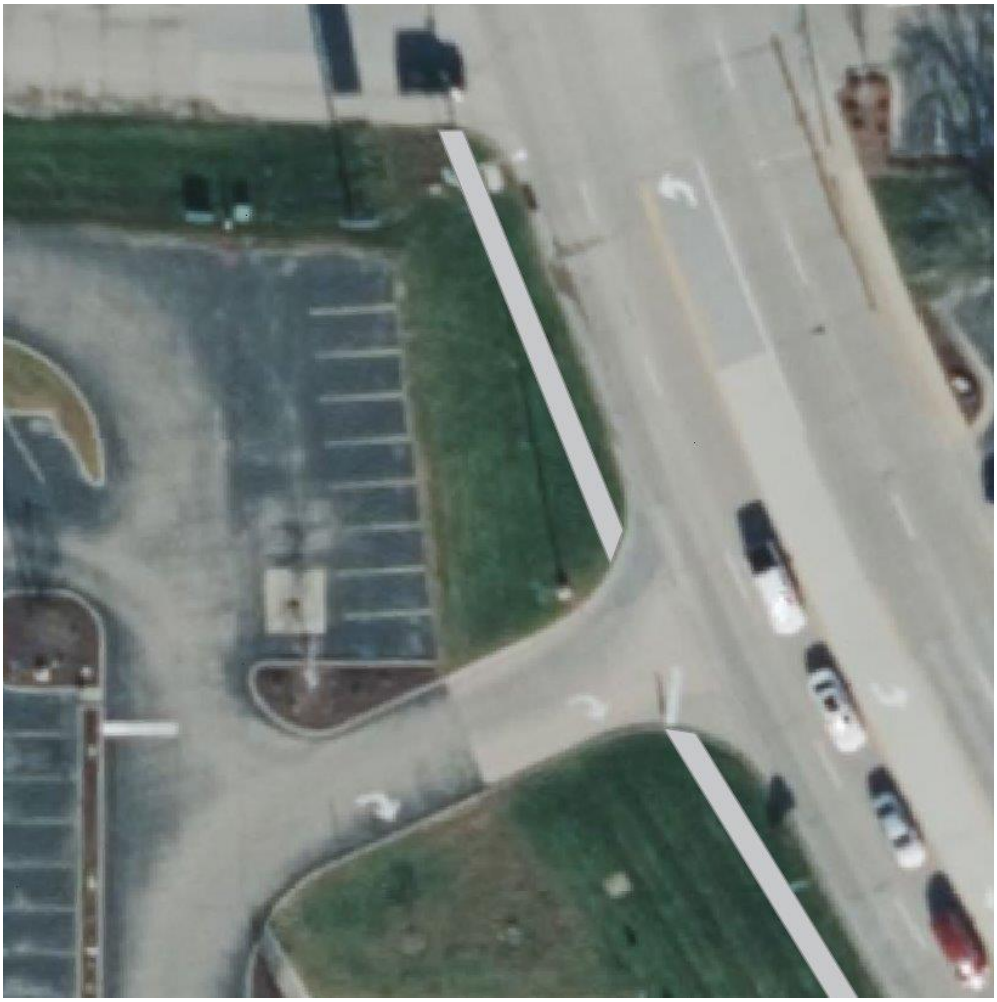


Figure 31. New Sidewalk South of Stoneman Rd

Figure 32. New Sidewalk Between Stoneman Rd and Wacker Dr

Figure 33. New Sidewalk at Wacker Dr Intersection

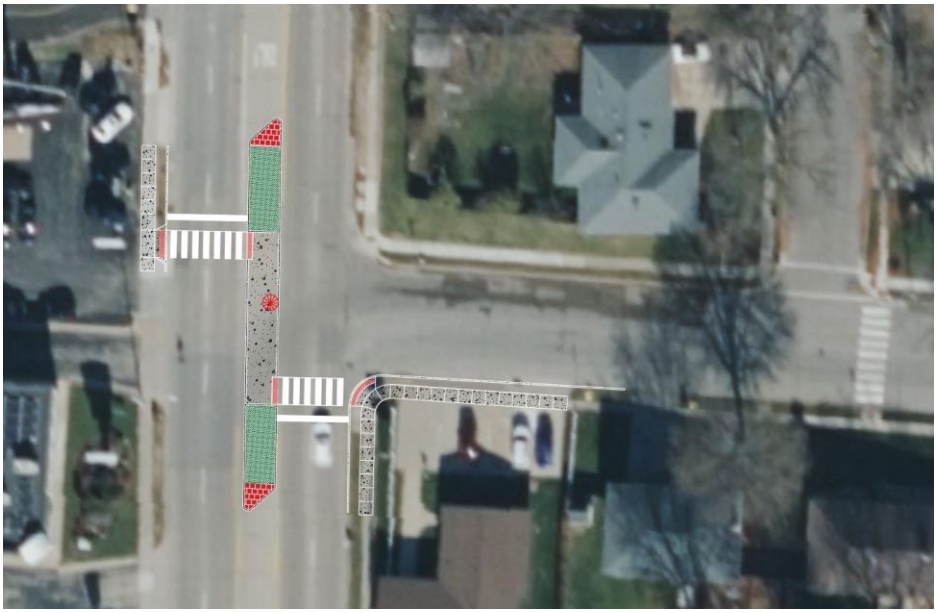


Figure 34. Proposed Pedestrian Median at Carter Rd and JFK

Figure 35. Ideal placement of the flexible delineators on the pedestrian median as denoted by a star.

Section VII: Engineer's Cost Estimate

The cost estimate was split into two sections. One for the sidewalk improvements and another for the pedestrian median. The sidewalk improvements include both the removal of the existing sidewalk next to the Sunshine Family Restaurant as well as the cost to replace it and add the new sidewalk. Also included is the estimated cost of the right of way acquisition for the new sidewalk, crosswalk pavement markings and pedestrian signs. The cost estimate for the pedestrian median includes the concrete, pavers, metal detectable warnings, flexible delineators, and stop signs. The total cost for both comes out to be $107,609.24. Adding an additional 20% contingency brings the total cost to $129,131.08.

Table 42. Budget Summary

Sidewalk Cost Estimate				
Item	Quantity	Unit	Unit Price	Total
Removal of sidewalk	194.90	SY	35	$ 6,821.50
Sidewalk PCC, 4"	443.57	SY	125	$ 55,446.0
Right of way Acquisition	1629.06	SF	3.89	$ 6,337.04
Crosswalk pavement markings	114	LF	1.27	$ 144.78
Pedestrian crosswalk signs	3	EACH	45.9	$ 137.70
Push button with sign and post	2	EACH	4715	$ 9,430.00
Sub-Total				$ 78,317.01
Pedestrian Median Cost Estimate				
Item	Quantity	Unit	Unit Price	Total
Brick Pavers	141.86	SF	11.09	$ 1,573.23
PCC	162.52	SY	125	$ 20,315.6
Detectable Warnings	20	EACH	162	$ 3,240.00
Top Soil 6"	656.8	SF	5.58	$ 3,664.94
Stop Signs 24" Octagon	2	EACH	34.25	$ 68.50
Flexible Delineators	10	EACH	43	$ 430.00
Sub-Total				$ 29,292.23
Total w/o Contingency				$107,609.24
20% Contingency				$ 21,521.85
Total				$129,131.08

Section VIII: Conclusions

Figure 36. Key points of concern along the John F Kennedy Rd Corridor.

The three main points of concern along the John F. Kennedy corridor are shown above. To improve pedestrian safety the team increased sidewalk connectivity and included additional crosswalks in areas of need. The team proposes construction of a pedestrian median at the intersection of Carter Rd and JFK. Moreover, the team recommends the installation of pedestrian pushbuttons at the intersection of Wacker Dr. and JFK to encourage freedom of pedestrian mobility and promote intersection safety. Additionally, the team recommends repainting intersection markings at both major intersections, especially that of the left hand turn from Wacker Dr. onto JFK (going northbound). Finally, the team recommends implementing adjusted signal timing to minimize overall delay at both major intersections.

Section X: References

FHWA Pedestrian Safety Action Plan. (2020, November). Retrieved from **https://highways.dot.gov/sites/fhwa.dot.gov/files/2020-11/FHWA_PedSafety_ActionPlan_Nov2020.pdf**

Intersection Control. Retrieved from **http://www.ce.memphis.edu/4162/L9_Intersection%20Control.pdf**

Iowa Department of Transportation Average Annual Daily Traffic data. Retrieved from **https://iowadot.maps.arcgis.com/apps/MapSeries/index.html?appid=0cce99afb78e4d3b9b24f8263717f910**

Iowa Department of Transportation Crash Data. Retrieved from **https://icat.iowadot.gov/**

Iowa Department of Transportation Maps. Retrieved from **https://iowadot.gov/maps/Digital-maps/Traffic-maps/County**

Manual on Uniform Traffic Control Devices. Retrieved from **https://mutcd.fhwa.dot.gov/kno_11th_Edition.htm**

National Highway Traffic Safety Administration. Retrieved from **https://www.pedbikeinfo.org/cms/downloads/PBIC_InfoBrief_NHTS.pdf**

Traffic Detector Handbook. Retrieved from **https://ops.fhwa.dot.gov/publications/fhwaop04010/chapter6.pdf**

Traffic Impact Study Example. Retrieved from Traffic_Impact_Study_Example.pdf

SeniorDesign Urban Street Design Guide. Retrieved from SeniorDesign_UrbanStreetDesignGuide.pdf

STREETS Systems Engineering Document Final Report. Retrieved from STREETS_Systems_Engineering_Document_Final_Report.pdf

Organization Qualifications and Experience

The team completing this report was comprised of University of Iowa students enrolled in the capstone design class in Civil & Environmental Engineering. They combined diverse expertise to tackle projects effectively. Connor Bobay specialized in the structural CEE program; John Lyons focusds on civil practic; Tony Pezzella and Payton Stuart specialized in transportation CEE . Payton Stuart served as the project manager, overseeing the operational traffic study and implementation. Tony Pezzella was the tech support manager, managing geometric enhancements. Connor Bobay and John Lyons served as editors, overseeing structural elements and support geometric and operational implementations.

Experience: Payton Stuart interned at a Cedar Rapids consulting firm, where he split his time between roadway design using Bentley's MicroStation and managing the city of Cedar Rapids sidewalk program. John Lyons gained experience with the Walsh Group, where he interned as part of the track team on the CTA Red Line project and worked in the transportation estimation department. Tony Pezzella interned at WSP, contributing to demolition cost estimation, Bentley product utilization for pavement patching and station labeling, and road/ sidewalk inspection. Currently, Tony is enrolled in a class that utilizes the traffic software "Synchro". Connor Bobay interned for the City of Cedar Rapids Public Works Department, collaborating with city inspectors, and overseeing various construction projects, including road reconstruction and sidewalk installation.

Constraints, Challenges, and Impacts

The project is limited to the evaluation of JFK in Dubuque, IA. The project's initial period of performance goes from 2/5/2024 to 5/3/2024. The section of JFK the project is focused on stretches from HWY 20 to Carter Rd. There is a limited number of camera angles at the JFK and Wacker Dr intersection. At the JFK and minor street intersections, no traffic cameras are available to count the turning movements. These intersections include JFK and University Ave, Daykin Ct, Stoneman Rd, Crestwood Dr, and Carter Rd. The improvement of the intersections is also limited to the property boundaries where one could expand the roadway or potentially add sidewalks. Some parts of the corridor have more space to work with than other parts where intruding into other properties would be an issue and a challenge to improve the area.

A major challenge of the project is to develop a solution that is cost-effective, while having a positive societal impact on residents. Ensuring community assets such as the elementary schools, churches, and the fire station are positively impacted is paramount. Accurately analyzing traffic flow through an intersection became more of a challenge with limited camera angles at Wacker and JFK. The team responded by utilizing Iowa Department of Transportation data to predict the quantity of vehicles taking a right off JFK, onto Wacker Dr. Another challenge of the project is helping the highway capacity software to correctly analyze flow. The non-traditional intersection at Wacker and JFK created software issues.

Another constraint is the limited ability to create a precise report of the minor street intersections with JFK. As the HCS software is incapable of doing a one-way stop control analysis. In turn a challenge involving the minor street intersections is the lack of volume in Crestwood Dr. creating a proximate report of what is occurring at the Crestwood and JFK intersection. Also, the Excel sheet cannot correctly estimate the University Ave. turning movements, making the team use the AADT data from the Iowa DOT.

Adding a sidewalk along JFK from Stoneman Rd through Wacker Dr could have a positive societal impact on the Dubuque community. The sidewalks would provide easier access for pedestrians to navigate the neighborhood while increasing safety. The addition of sidewalks would also encourage more people to walk or bike to their destination instead of driving. This in turn could also cause there to be less traffic on the roadway, which could improve the delay and level of service at some of the intersections where it is a problem. Changes involving the signal timing of corridor intersections could improve efficiency, allowing residents of Dubuque to arrive at their destination quicker. Consequently, residents may go through the corridor more frequently, feeling that the route is more reliable. This could increase the number of cars going through this section of roadway, which is good for businesses. Further examination is recommended to address these discrepancies and ensure accurate modeling of traffic conditions in this area.

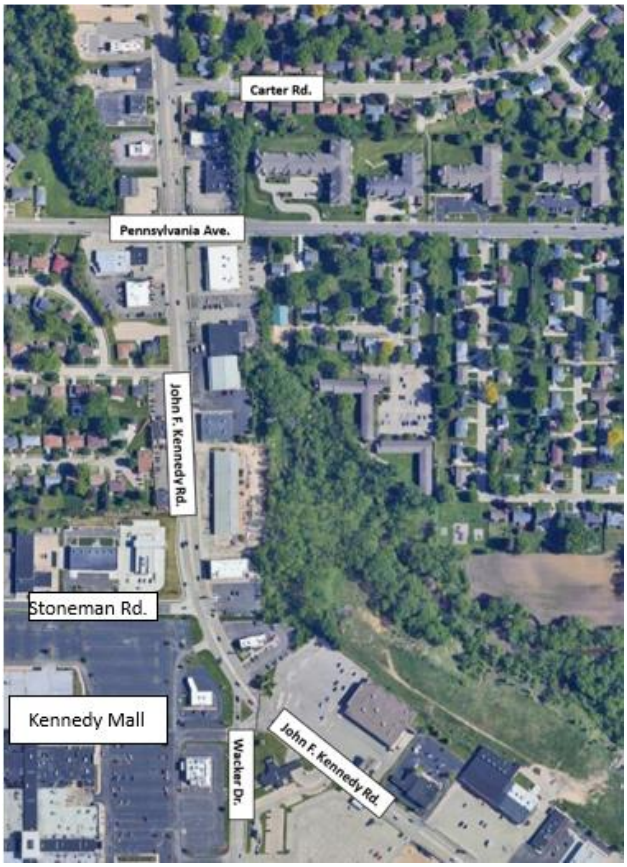


Figure 1. Aerial view displaying the southern portion of the JFK Corridor

Figure 2. Aerial View of Dubuque, IA with JFK Rd highlighted.

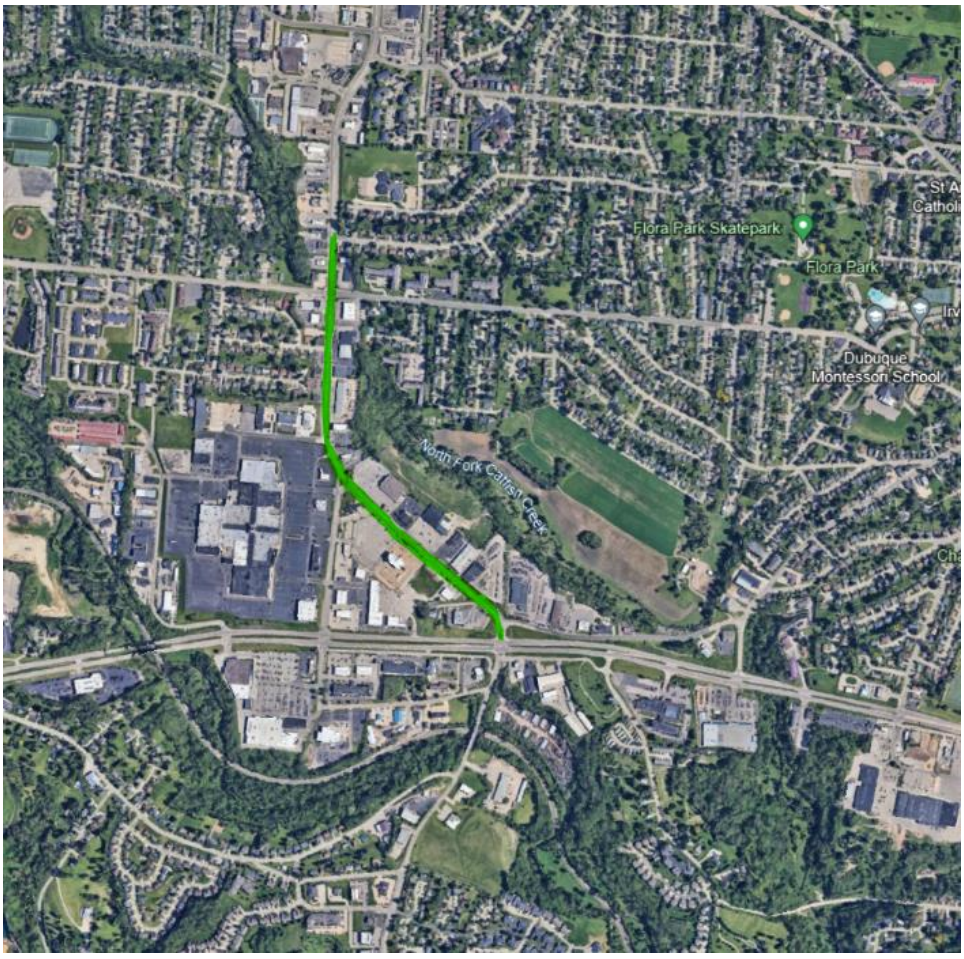


Figure 3. Aerial view of the section of JFK Rd the project is focused on.

The Gantt chart (Figure 4) presented below provides a visual representation of the allocation of time dedicated to each of the project's tasks. Each bar on the chart corresponds to a specific task, and the length of each bar illustrates the amount of time dedicated to completing that task. As Figure 45 shows, the most time-consuming project task was the evaluation of existing roadway conditions (using Highway Capacity and Synchro software).

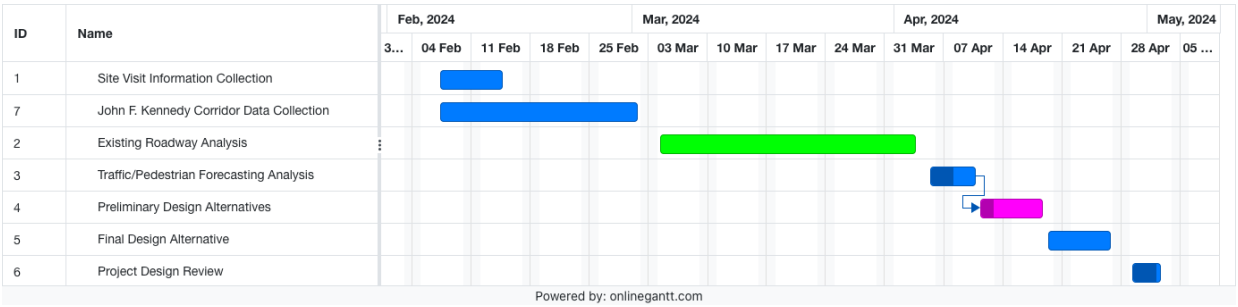


Figure 4. Gantt Chart of Project Schedule

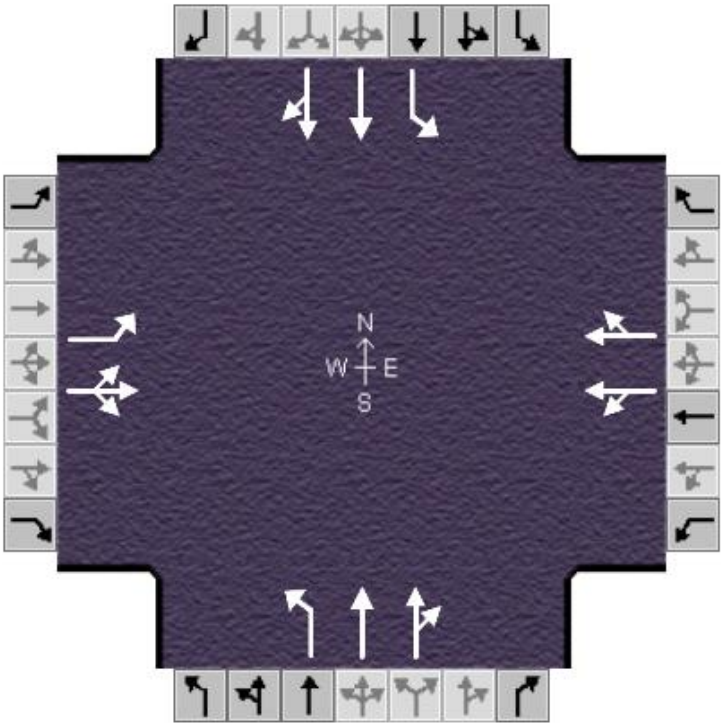


Figure 14. Existing intersection geometry of Wacker Dr and JFK Rd

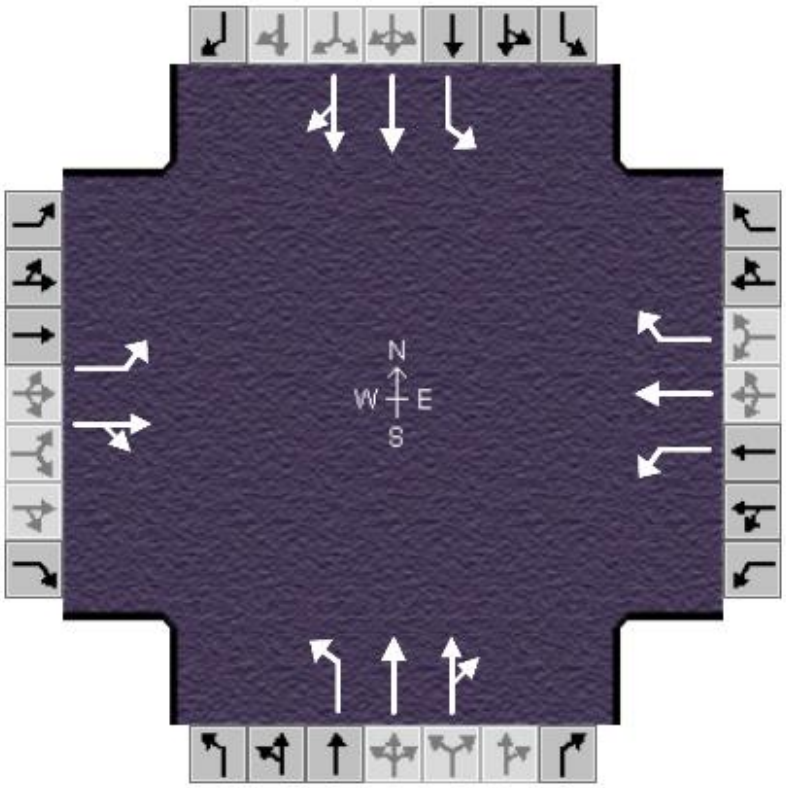


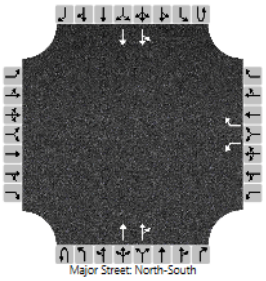
Figure 15. Existing intersection geometry of Pennsylvania Ave and JFK Rd

Table 43. Carter Rd and JFK Rd Two-Way Stop HCS Control Report

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Payton Stuart	Intersection	Carter/JFK
Agency/Co.	University of Iowa	Jurisdiction	Dubuque County
Date Performed	2/15/2024	East/West Street	Carter Rd
Analysis Year	2024	North/South Street	John F. Kennedy
Time Analyzed	3:05	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	2	0	0	0	2	0
Configuration						L		R			T	TR		LT	T	
Volume (veh/h)						29		8			572	96		37	551	
Percent Heavy Vehicles (%)						1		1						1		
Proportion Time Blocked																
Percent Grade (%)						-7										
Right Turn Channelized						No										
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						7.5		6.9						4.1		
Critical Headway (sec)						5.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.51		3.31						2.21		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						32		9						40		
Capacity, c (veh/h)						301		683						879		
v/c Ratio						0.10		0.01						0.05		
95% Queue Length, Q_{95} (veh)						0.3		0.0						0.1		
95% Queue Length, Q_{95} (ft)						7.6		0.0						2.5		
Control Delay (s/veh)						18.4		10.3						9.3	0.4	
Level of Service (LOS)						C		B						A	A	
Approach Delay (s/veh)						16.6								1.0		
Approach LOS						C								A		

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Carter Stop Intersection.xtw

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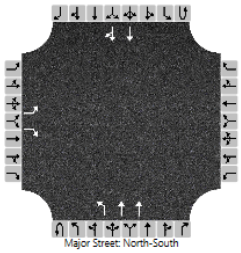
Table 11. Crestwood Dr and JFK Rd Two-Way Stop HCS Control Report

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Payton Stuart	Intersection	Crestwood/John F. Kennedy
Agency/Co.	U of I	Jurisdiction	Dubuque County
Date Performed	2/20/2024	East/West Street	Crestwood
Analysis Year	2024	North/South Street	John F. Kennedy
Time Analyzed	10:37	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	JFK Redesign		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	0	1		0	0	0	0	1	2	0	0	0	2	0
Configuration		L		R						L	T				T	TR
Volume (veh/h)		2		3					0	4	411				411	4
Percent Heavy Vehicles (%)		1		1					3	3						
Proportion Time Blocked																
Percent Grade (%)	2															
Right Turn Channelized	No															
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		7.22		7.12						4.16						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.51		3.31						2.23						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		2		3						4						
Capacity, c (veh/h)		352		761						1099						
v/c Ratio		0.01		0.00						0.00						
95% Queue Length, Q_{95} (veh)		0.0		0.0						0.0						
95% Queue Length, Q_{95} (ft)		0.0		0.0						0.0						
Control Delay (s/veh)		15.3		9.7						8.3						
Level of Service (LOS)		C		A						A						
Approach Delay (s/veh)	12.0								0.1							
Approach LOS	B								A							

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Crestwood Stop Intersection.xtw

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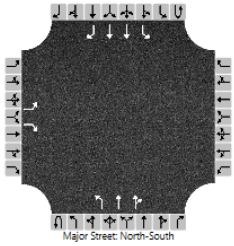
Table 12. Stoneman Rd and JFK Rd Two-Way Stop HCS Control Report

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Payton Stuart	Intersection	Stoneman/John F. Kennedy
Agency/Co.	U of I	Jurisdiction	Dubuque County
Date Performed	2/20/2024	East/West Street	Stoneman
Analysis Year	2024	North/South Street	John F. Kennedy
Time Analyzed	10:34	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	JFK Redesign		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	0	1		0	0	0	0	1	2	0	0	1	2	1
Configuration		L		R						L	T	TR		L	T	R
Volume (veh/h)		1		3					0	19	249	8	0	0	247	6
Percent Heavy Vehicles (%)		3		3					3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)		1														
Right Turn Channelized		No												No		
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1				4.1		
Critical Headway (sec)		7.76		7.06						4.16				4.16		
Base Follow-Up Headway (sec)		3.5		3.3						2.2				2.2		
Follow-Up Headway (sec)		3.53		3.33						2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1		3						21				0		
Capacity, c (veh/h)		471		884						1278				1273		
v/c Ratio		0.00		0.00						0.02				0.00		
95% Queue Length, Q_{95} (veh)		0.0		0.0						0.0				0.0		
95% Queue Length, Q_{95} (ft)		0.0		0.0						0.0						
Control Delay (s/veh)		12.7		9.1						7.9				7.8		
Level of Service (LOS)		B		A						A				A		
Approach Delay (s/veh)		10.0								0.5				0.0		
Approach LOS		A								A				A		

HCS™ TWSC Version 2024
Stoneman Stop Intersection.xtw

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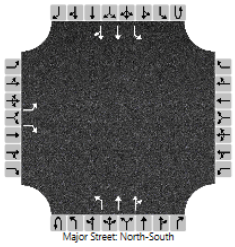
Table 13. Daykin Ct and JFK Rd Two-Way Stop HCS Control Report

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Payton Stuart	Intersection	Daykin/John F. Kennedy
Agency/Co.	U of I	Jurisdiction	Dubuque County
Date Performed	2/20/2024	East/West Street	Daykin
Analysis Year	2024	North/South Street	John F. Kennedy
Time Analyzed	10:31	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	JFK Redesign		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	0	1		0	0	0	0	1	2	0	0	1	2	0
Configuration		L		R						L	T	TR		L	T	TR
Volume (veh/h)		4		35					0	181	565	13	0	19	534	13
Percent Heavy Vehicles (%)		3		3					3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)		1														
Right Turn Channelized		No														
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1				4.1		
Critical Headway (sec)		7.76		7.06						4.16				4.16		
Base Follow-Up Headway (sec)		3.5		3.3						2.2				2.2		
Follow-Up Headway (sec)		3.53		3.33						2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4		38						197				21		
Capacity, c (veh/h)		80		673						971				943		
v/c Ratio		0.05		0.06						0.20				0.02		
95% Queue Length, Q_{95} (veh)		0.2		0.2						0.8				0.1		
95% Queue Length, Q_{95} (ft)		5.1		5.1						20.5				2.6		
Control Delay (s/veh)		52.5		10.7						9.6				8.9		
Level of Service (LOS)		F		B						A				A		
Approach Delay (s/veh)		15.0								2.3				0.3		
Approach LOS		B								A				A		

HCS™ TWSC Version 2024
Daykin Stop Intersection.xtw

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Table 14. University Ave and JFK Rd Two-Way Stop HCS Control Report

HCS Two-Way Stop-Control Report

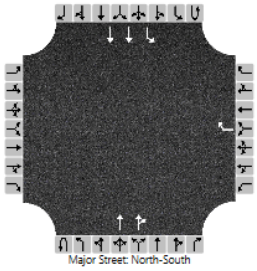
General Information

Analyst	Payton Stuart
Agency/Co.	U of I
Date Performed	2/20/2024
Analysis Year	2024
Time Analyzed	9:47
Intersection Orientation	North-South
Project Description	JFK Redesign

Site Information

Intersection	University/John F. Kennedy
Jurisdiction	Dubuque County
East/West Street	University
North/South Street	John F. Kennedy
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	1	0	0	2	0	0	1	2	0
Configuration								R			T	TR		L	T	
Volume (veh/h)								91			247	20	0	21	277	
Percent Heavy Vehicles (%)								3					3	3		
Proportion Time Blocked																
Percent Grade (%)						3										
Right Turn Channelized						No										
Median Type | Storage						Undivided										

Critical and Follow-up Headways

Base Critical Headway (sec)								6.9						4.1		
Critical Headway (sec)								7.26						4.16		
Base Follow-Up Headway (sec)								3.3						2.2		
Follow-Up Headway (sec)								3.33						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)								99						23		
Capacity, c (veh/h)								862						1261		
v/c Ratio								0.11						0.02		
95% Queue Length, Q_{95} (veh)								0.4						0.1		
95% Queue Length, Q_{95} (ft)								10.2						2.6		
Control Delay (s/veh)								9.7						7.9		
Level of Service (LOS)								A						A		
Approach Delay (s/veh)						9.7								0.6		
Approach LOS						A								A		

HCS™ TWSC Version 2024
University Stop Intersection.xtw

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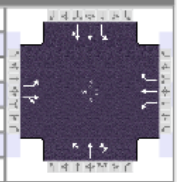
Tuesday (February 6th, 2024) Highway Capacity Software Tables:

Table 144. Pennsylvania Ave and JFK Rd Tuesday Noon-1PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	12-1pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_existing.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	166	197	105	80	164	89	127	649	90	97	562	174

Signal Information											
Cycle, s	64.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On	Green	5.6	1.0	17.8	5.3	1.3	12.3	
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
				Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	11.8	18.8	10.5	17.5	11.8	23.9	10.8	22.9
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	6.7	12.6	4.2	7.0	5.6	16.9	4.1	13.0
Green Extension Time (g_e), s	0.2	1.0	0.1	1.1	0.3	1.8	0.1	0.5
Phase Call Probability	0.95	1.00	0.76	1.00	0.94	1.00	0.80	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.06	0.00	1.00

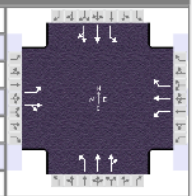
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	166	302		80	164	89	154	459	439	90	353	327
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1746		1767	1856	1572	1838	1856	1776	1838	1856	1705
Queue Service Time (g_s), s	4.7	10.6		2.2	5.0	3.1	3.6	14.9	14.9	2.1	10.9	11.0
Cycle Queue Clearance Time (g_c), s	4.7	10.6		2.2	5.0	3.1	3.6	14.9	14.9	2.1	10.9	11.0
Green Ratio (*g/C*)	0.30	0.21		0.28	0.19	0.19	0.38	0.29	0.29	0.37	0.28	0.28
Capacity (*c*), veh/h	435	372		278	358	303	385	544	521	292	517	475
Volume-to-Capacity Ratio (*X*)	0.381	0.811		0.287	0.459	0.294	0.401	0.843	0.843	0.307	0.684	0.689
Back of Queue (*Q*), ft/ln (95 th percentile)	80	192		38	95	50	62	231	218	36	191	177
Back of Queue (*Q*), veh/ln (95 th percentile)	3.1	7.5		1.5	3.7	1.9	2.4	9.0	8.7	1.4	7.5	7.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.44	0.00		0.33	0.00	0.43	0.62	0.00	0.00	0.30	0.00	0.00
Uniform Delay (d_1), s/veh	17.7	24.0		18.7	22.9	22.2	14.6	21.3	21.3	15.8	20.6	20.7
Incremental Delay (d_2), s/veh	0.2	1.7		0.2	0.3	0.2	0.2	0.9	0.9	0.1	2.2	2.5
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	17.9	25.7		18.9	23.3	22.4	14.7	22.1	22.2	16.0	22.8	23.1
Level of Service (LOS)	B	C		B	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	22.9	C		22.0	C		21.1	C		22.1	C	
Intersection Delay, s/veh / LOS	21.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.26	A	1.04	A	1.20	A	1.17	A

Table 2. Pennsylvania Ave and JFK Rd Tuesday Noon-1PM HCS Optimized Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	12-1pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_existingFINA...		
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	166	197	105	80	164	89	127	649	90	97	562	174

Signal Information			
Cycle, s	66.6	Reference Phase	2
Offset, s	62	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.7	0.9	19.7	5.4	1.4	12.7	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.0	19.3	10.6	17.9	11.8	25.7	10.9	24.8
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	6.9	13.0	4.3	7.2	5.7	17.1	4.1	13.2
Green Extension Time (g_e), s	0.2	1.0	0.1	1.0	0.3	3.4	0.1	3.4
Phase Call Probability	0.95	1.00	0.77	1.00	0.94	1.00	0.81	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

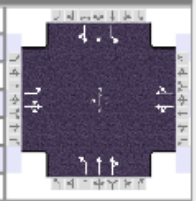
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	166	302		80	164	89	154	459	439	90	353	327
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1746		1767	1856	1572	1838	1856	1776	1838	1856	1705
Queue Service Time (g_s), s	4.9	11.0		2.3	5.2	3.2	3.7	15.1	15.1	2.1	11.1	11.2
Cycle Queue Clearance Time (g_c), s	4.9	11.0		2.3	5.2	3.2	3.7	15.1	15.1	2.1	11.1	11.2
Green Ratio (*g/C*)	0.29	0.21		0.27	0.19	0.19	0.40	0.31	0.31	0.38	0.30	0.30
Capacity (*c*), veh/h	428	372		272	355	301	394	576	551	300	551	506
Volume-to-Capacity Ratio (*X*)	0.388	0.813		0.294	0.462	0.296	0.392	0.796	0.797	0.299	0.641	0.646
Back of Queue (*Q*), ft/ln (95 th percentile)	85	200		41	100	52	63	237	223	37	186	171
Back of Queue (*Q*), veh/ln (95 th percentile)	3.3	7.8		1.6	3.9	2.0	2.5	9.3	8.9	1.4	7.3	6.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.47	0.00		0.35	0.00	0.46	0.63	0.00	0.00	0.31	0.00	0.00
Uniform Delay (d_1), s/veh	18.6	25.1		19.6	24.0	23.2	14.4	21.1	21.1	15.7	20.4	20.5
Incremental Delay (d_2), s/veh	0.2	1.7		0.2	0.3	0.2	0.2	0.6	0.7	0.1	0.3	0.4
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	18.8	26.7		19.8	24.3	23.4	14.6	21.8	21.8	15.8	20.7	20.8
Level of Service (LOS)	B	C		B	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	23.9	C		23.0	C		20.7	C		20.2	C	
Intersection Delay, s/veh / LOS	21.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.26	A	1.04	A	1.20	A	1.17	A

Table 345. Wacker Dr and JFK Rd Tuesday Noon-1PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK NOON-1PM	File Name	TUESDAY Intersection (Wacker-JFK)_existing.xus		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	360	3	64	4	5	6	79	511	5	13	415	213

Signal Information			
Cycle, s	53.0	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	0.9	4.1	15.4	9.9	1.2	0.0	
Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
Red	1.5	0.0	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		15.4		6.7	10.0	25.0	5.9	20.9
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		9.1		2.2	5.2	15.6	2.3	10.1
Green Extension Time (*g e*), s		0.9		0.0	0.2	3.8	0.0	3.8
Phase Call Probability		1.00		0.20	0.92	1.00	0.17	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.00

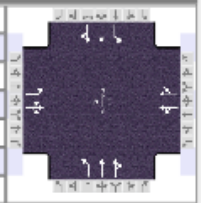
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	180	247		8		7	167	547	545	13	331	297
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1758		1853		1650	1810	1900	1893	1810	1900	1683
Queue Service Time (*g s*), s	4.8	7.1		0.2		0.2	3.2	13.6	13.6	0.3	7.9	8.1
Cycle Queue Clearance Time (*g c*), s	4.8	7.1		0.2		0.2	3.2	13.6	13.6	0.3	7.9	8.1
Green Ratio (*g/C*)	0.19	0.19		0.02		0.02	0.41	0.37	0.37	0.31	0.29	0.29
Capacity (*c*), veh/h	340	331		42		38	420	699	697	206	552	489
Volume-to-Capacity Ratio (*X*)	0.529	0.747		0.187		0.190	0.398	0.782	0.782	0.063	0.599	0.608
Back of Queue (*Q*), ft/ln (95 th percentile)	82	120		4		4	47	190	189	4	135	122
Back of Queue (*Q*), veh/ln (95 th percentile)	3.3	4.8		0.2		0.2	1.9	7.6	7.6	0.2	5.4	4.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.24		0.10		0.09	0.24	0.38	0.38	0.07	0.27	0.24
Uniform Delay (*d 1*), s/veh	19.5	20.4		25.5		25.5	11.3	14.9	14.9	14.1	16.2	16.2
Incremental Delay (*d 2*), s/veh	0.5	1.3		0.8		0.9	0.1	0.4	0.4	0.0	0.4	0.5
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	19.9	21.7		26.3		26.4	11.4	15.3	15.3	14.1	16.6	16.7
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	20.9	C		26.3	C		14.8	B		16.6	B	
Intersection Delay, s/veh / LOS	16.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.19	A	0.50	A	0.98	A	1.02	A

Table 446. Wacker Dr and JFK Rd Tuesday Noon-1PM HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK NOON-1PM	File Name	TUESDAY Intersection (Wacker-JFK)_existingFIN...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	360	3	64	4	5	6	79	511	5	13	415	213

Signal Information			
Cycle, s	52.3	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	0.9	4.1	15.1	9.6	1.2	0.0
Yellow	3.5	0.0	4.0	3.0	3.0	0.0
Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		15.1		6.7	10.0	24.7	5.9	20.6
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		9.0		2.2	5.1	15.3	2.3	10.0
Green Extension Time (*g e*), s		0.6		0.0	0.2	3.7	0.0	2.9
Phase Call Probability		1.00		0.20	0.91	1.00	0.17	1.00
Max Out Probability		0.09		0.00	0.00	0.01	0.00	0.34

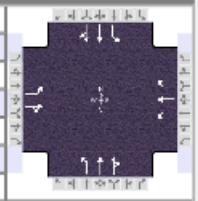
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	180	247		8		7	166	542	540	13	331	297
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1758		1853		1650	1810	1900	1893	1810	1900	1683
Queue Service Time (*g s*), s	4.7	7.0		0.2		0.2	3.1	13.3	13.3	0.3	7.9	8.0
Cycle Queue Clearance Time (*g c*), s	4.7	7.0		0.2		0.2	3.1	13.3	13.3	0.3	7.9	8.0
Green Ratio (*g/C*)	0.18	0.18		0.02		0.02	0.41	0.37	0.37	0.31	0.29	0.29
Capacity (*c*), veh/h	333	324		42		38	421	697	695	208	548	486
Volume-to-Capacity Ratio (*X*)	0.540	0.763		0.186		0.189	0.394	0.777	0.777	0.063	0.603	0.612
Back of Queue (*Q*), ft/ln (95 th percentile)	81	119		4		4	46	185	185	4	134	121
Back of Queue (*Q*), veh/ln (95 th percentile)	3.3	4.8		0.2		0.2	1.8	7.4	7.4	0.2	5.4	4.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.24		0.10		0.09	0.24	0.37	0.37	0.07	0.27	0.24
Uniform Delay (*d 1*), s/veh	19.4	20.3		25.2		25.2	11.2	14.7	14.7	14.0	16.1	16.1
Incremental Delay (*d 2*), s/veh	0.5	1.4		0.8		0.9	0.1	0.4	0.4	0.0	0.4	0.5
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	19.9	21.8		26.0		26.1	11.3	15.1	15.1	14.0	16.5	16.6
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.0	C		26.0	C		14.6	B		16.5	B	
Intersection Delay, s/veh / LOS	16.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.19	A	0.50	A	0.98	A	1.02	A

Table 1447. Pennsylvania Ave and JFK Rd Tuesday Noon-1PM HCS 5 Year Projection Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	12-1pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_5YEARprojec...		
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	174	207	110	84	172	94	133	682	95	102	591	183

Signal Information			
Cycle, s	67.3	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	5.8	0.9	19.6	5.6	1.6	13.2	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.3	20.0	10.8	18.4	11.9	25.6	11.0	24.7
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	7.1	13.7	4.4	7.5	6.0	18.5	4.3	14.0
Green Extension Time (g_e), s	0.3	1.1	0.1	1.1	0.3	1.9	0.1	0.0
Phase Call Probability	0.96	1.00	0.79	1.00	0.95	1.00	0.83	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.09	0.00	1.00

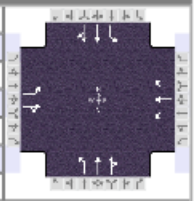
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	174	317		84	172	94	162	483	462	94	372	343
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1746		1767	1856	1572	1838	1856	1776	1838	1856	1704
Queue Service Time (g_s), s	5.1	11.7		2.4	5.5	3.4	4.0	16.5	16.5	2.3	12.0	12.0
Cycle Queue Clearance Time (g_c), s	5.1	11.7		2.4	5.5	3.4	4.0	16.5	16.5	2.3	12.0	12.0
Green Ratio (*g/C*)	0.30	0.22		0.28	0.20	0.20	0.39	0.30	0.30	0.38	0.29	0.29
Capacity (*c*), veh/h	433	384		271	365	309	375	564	540	284	541	497
Volume-to-Capacity Ratio (*X*)	0.402	0.825		0.309	0.471	0.304	0.431	0.855	0.855	0.332	0.687	0.691
Back of Queue (*Q*), ft/ln (95 th percentile)	89	210		43	106	56	68	254	239	40	206	190
Back of Queue (*Q*), veh/ln (95 th percentile)	3.5	8.2		1.7	4.1	2.2	2.7	9.9	9.6	1.5	8.1	7.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.49	0.00		0.37	0.00	0.48	0.68	0.00	0.00	0.33	0.00	0.00
Uniform Delay (d_1), s/veh	18.5	25.1		19.6	24.0	23.1	15.1	22.1	22.1	16.4	21.2	21.2
Incremental Delay (d_2), s/veh	0.2	1.8		0.2	0.4	0.2	0.2	1.2	1.3	0.2	2.1	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	18.7	26.8		19.8	24.3	23.4	15.3	23.3	23.3	16.6	23.3	23.6
Level of Service (LOS)	B	C		B	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	23.9	C		23.0	C		22.1	C		22.6	C	
Intersection Delay, s/veh / LOS	22.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.30	A	1.07	A	1.24	A	1.21	A

Table 1548. Pennsylvania Ave and JFK Rd Tuesday Noon-1PM HCS 5 Year Projection Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	12-1pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_5YEARprojec...		
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	174	207	110	84	172	94	133	682	95	102	591	183

Signal Information													
Cycle, s	70.9	Reference Phase	2										
Offset, s	68	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.0	0.8	22.1	5.7	1.9	13.7			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0			
				Red	1.2	0.0	1.1	1.2	0.0	1.2			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.8	20.8	10.9	18.9	12.0	28.0	11.2	27.2
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	7.4	14.3	4.6	7.9	6.1	19.0	4.3	14.4
Green Extension Time (*g e*), s	0.3	1.1	0.2	1.1	0.3	3.6	0.2	3.4
Phase Call Probability	0.97	1.00	0.81	1.00	0.96	1.00	0.85	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08

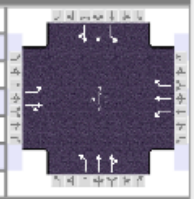
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	174	317		84	172	94	162	483	462	94	372	343
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1746		1767	1856	1572	1838	1856	1776	1838	1856	1704
Queue Service Time (*g s*), s	5.4	12.3		2.6	5.9	3.7	4.1	17.0	17.0	2.3	12.3	12.4
Cycle Queue Clearance Time (*g c*), s	5.4	12.3		2.6	5.9	3.7	4.1	17.0	17.0	2.3	12.3	12.4
Green Ratio (*g/C*)	0.30	0.22		0.28	0.19	0.19	0.41	0.32	0.32	0.40	0.31	0.31
Capacity (*c*), veh/h	430	387		267	361	306	384	601	575	292	581	534
Volume-to-Capacity Ratio (*X*)	0.405	0.818		0.315	0.477	0.308	0.421	0.803	0.803	0.322	0.639	0.643
Back of Queue (*Q*), ft/ln (95 th percentile)	97	220		47	114	60	71	262	247	41	204	187
Back of Queue (*Q*), veh/ln (95 th percentile)	3.8	8.6		1.8	4.5	2.3	2.8	10.2	9.9	1.6	8.0	7.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.53	0.00		0.41	0.00	0.52	0.71	0.00	0.00	0.34	0.00	0.00
Uniform Delay (*d 1*), s/veh	19.6	26.5		20.9	25.6	24.7	15.1	22.1	22.1	16.4	21.1	21.1
Incremental Delay (*d 2*), s/veh	0.2	1.7		0.2	0.4	0.2	0.2	0.6	0.6	0.2	0.3	0.3
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	19.8	28.1		21.1	26.0	24.9	15.2	22.7	22.7	16.6	21.4	21.5
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	25.2	C		24.5	C		21.6	C		20.9	C	
Intersection Delay, s/veh / LOS	22.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.30	A	1.07	A	1.24	A	1.21	A

Table 1649. Pennsylvania Ave and JFK Rd Tuesday Noon-1PM HCS 10 Year Projection Conditions

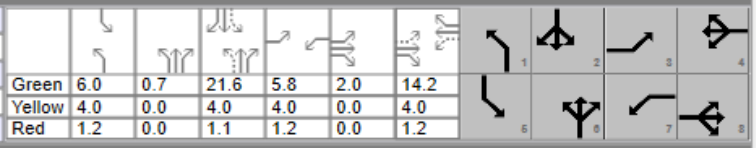
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	12-1pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_10YEARproje...		
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	183	218	116	88	181	98	140	717	99	107	621	192

Signal Information			
Cycle, s	71.0	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	6.0	0.7	21.6	5.8	2.0	14.2	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.0	21.4	11.0	19.4	12.0	27.5	11.2	26.7
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	7.7	15.0	4.7	8.2	6.4	20.3	4.5	15.3
Green Extension Time (*g e*), s	0.3	1.1	0.1	1.2	0.3	2.0	0.1	0.0
Phase Call Probability	0.97	1.00	0.82	1.00	0.97	1.00	0.86	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.15	0.00	1.00

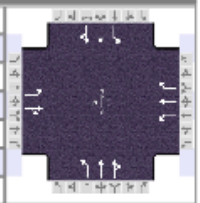
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	183	334		88	181	98	170	507	486	99	391	360
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1746		1767	1856	1572	1838	1856	1776	1838	1856	1705
Queue Service Time (*g s*), s	5.7	13.0		2.7	6.2	3.8	4.4	18.3	18.3	2.5	13.2	13.3
Cycle Queue Clearance Time (*g c*), s	5.7	13.0		2.7	6.2	3.8	4.4	18.3	18.3	2.5	13.2	13.3
Green Ratio (*g/C*)	0.31	0.23		0.28	0.20	0.20	0.40	0.31	0.31	0.39	0.30	0.30
Capacity (*c*), veh/h	430	398		263	371	315	363	585	560	274	565	519
Volume-to-Capacity Ratio (*X*)	0.425	0.839		0.334	0.487	0.311	0.469	0.868	0.868	0.361	0.691	0.694
Back of Queue (*Q*), ft/ln (95 th percentile)	100	230		48	119	62	76	284	268	44	224	206
Back of Queue (*Q*), veh/ln (95 th percentile)	3.9	9.0		1.9	4.7	2.4	3.0	11.1	10.7	1.7	8.8	8.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.55	0.00		0.42	0.00	0.54	0.76	0.00	0.00	0.36	0.00	0.00
Uniform Delay (*d 1*), s/veh	19.2	26.2		20.6	25.2	24.3	15.7	23.0	23.0	17.1	21.8	21.8
Incremental Delay (*d 2*), s/veh	0.2	1.9		0.3	0.4	0.2	0.2	2.4	2.5	0.2	2.1	2.3
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	19.5	28.1		20.9	25.6	24.5	15.9	25.4	25.5	17.3	23.8	24.1
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	25.1	C		24.2	C		24.0	C		23.2	C	
Intersection Delay, s/veh / LOS	24.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.34	A	1.09	A	1.28	A	1.25	A

Table 1750. Pennsylvania Ave and JFK Rd Tuesday Noon-1PM HCS 10 Year Projection Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	12-1pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_10YEARproje...		
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	183	218	116	88	181	98	140	717	99	107	621	192

Signal Information													
Cycle, s	74.9	Reference Phase	2										
Offset, s	116	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.1	0.7	24.3	5.9	2.1	15.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0			
				Red	1.2	0.0	1.1	1.2	0.0	1.2			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.2	22.3	11.1	20.2	12.0	30.1	11.3	29.4
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	8.0	15.7	4.8	8.5	6.5	20.9	4.5	15.6
Green Extension Time (*g e*), s	0.1	1.2	0.1	1.2	0.3	3.9	0.2	3.9
Phase Call Probability	0.98	1.00	0.84	1.00	0.97	1.00	0.87	1.00
Max Out Probability	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

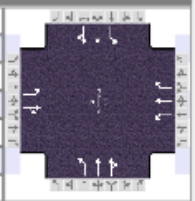
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	183	334		88	181	98	170	507	486	99	391	360
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1746		1767	1856	1572	1838	1856	1776	1838	1856	1705
Queue Service Time (*g s*), s	6.0	13.7		2.8	6.5	4.0	4.5	18.9	18.9	2.5	13.6	13.6
Cycle Queue Clearance Time (*g c*), s	6.0	13.7		2.8	6.5	4.0	4.5	18.9	18.9	2.5	13.6	13.6
Green Ratio (*g/C*)	0.31	0.23		0.28	0.20	0.20	0.42	0.33	0.33	0.41	0.32	0.32
Capacity (*c*), veh/h	426	401		258	373	316	371	621	595	281	604	555
Volume-to-Capacity Ratio (*X*)	0.430	0.833		0.341	0.485	0.310	0.460	0.816	0.816	0.352	0.647	0.649
Back of Queue (*Q*), ft/ln (95 th percentile)	108	242		52	128	66	80	288	271	45	221	203
Back of Queue (*Q*), veh/ln (95 th percentile)	4.2	9.5		2.0	5.0	2.6	3.1	11.2	10.8	1.8	8.6	8.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.59	0.00		0.45	0.00	0.58	0.79	0.00	0.00	0.38	0.00	0.00
Uniform Delay (*d 1*), s/veh	20.4	27.7		21.9	26.7	25.7	15.7	23.0	23.0	17.2	21.7	21.7
Incremental Delay (*d 2*), s/veh	0.3	1.8		0.3	0.4	0.2	0.2	0.6	0.7	0.2	0.3	0.3
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	20.7	29.5		22.2	27.0	25.9	15.9	23.6	23.6	17.4	22.0	22.1
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	26.3	C		25.6	C		22.5	C		21.5	C	
Intersection Delay, s/veh / LOS	23.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.34	A	1.09	A	1.28	A	1.25	A

Table 1851. Pennsylvania Ave and JFK Rd Tuesday Noon-1PM HCS 20 Year Projection Conditions

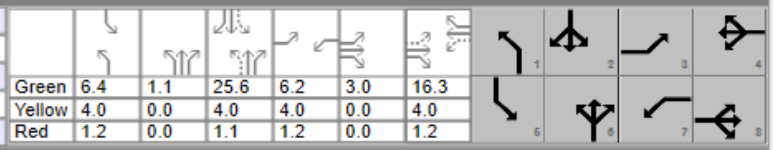
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	12-1pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_20YEARproje...		
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	203	240	128	98	200	109	155	792	110	118	685	212

Signal Information			
Cycle, s	79.3	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	6.4	1.1	25.6	6.2	3.0	16.3
Yellow	4.0	0.0	4.0	4.0	0.0	4.0
Red	1.2	0.0	1.1	1.2	0.0	1.2

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	14.4	24.5	11.4	21.5	12.7	31.8	11.6	30.7
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	9.0	18.0	5.3	9.6	7.3	24.7	5.0	18.4
Green Extension Time (*g e*), s	0.3	1.2	0.1	1.3	0.3	1.9	0.1	0.0
Phase Call Probability	0.99	1.00	0.88	1.00	0.98	1.00	0.91	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.40	0.00	1.00

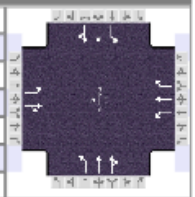
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	203	368		98	200	109	188	559	536	109	432	398
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1746		1767	1856	1572	1838	1856	1776	1838	1856	1704
Queue Service Time (*g s*), s	7.0	16.0		3.3	7.6	4.7	5.3	22.7	22.7	3.0	16.3	16.4
Cycle Queue Clearance Time (*g c*), s	7.0	16.0		3.3	7.6	4.7	5.3	22.7	22.7	3.0	16.3	16.4
Green Ratio (*g/C*)	0.32	0.24		0.28	0.21	0.21	0.42	0.34	0.34	0.40	0.32	0.32
Capacity (*c*), veh/h	425	426		246	382	324	344	626	599	252	599	550
Volume-to-Capacity Ratio (*X*)	0.478	0.864		0.399	0.523	0.337	0.547	0.894	0.895	0.433	0.722	0.723
Back of Queue (*Q*), ft/ln (95 th percentile)	127	278		62	151	78	95	357	337	54	267	244
Back of Queue (*Q*), veh/ln (95 th percentile)	4.9	10.8		2.4	5.9	3.1	3.7	13.9	13.5	2.1	10.4	9.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.70	0.00		0.54	0.00	0.68	0.95	0.00	0.00	0.45	0.00	0.00
Uniform Delay (*d 1*), s/veh	21.1	28.8		23.1	28.1	26.9	17.3	25.0	25.0	19.1	23.8	23.8
Incremental Delay (*d 2*), s/veh	0.3	2.5		0.4	0.4	0.2	0.3	5.5	5.8	0.3	2.3	2.5
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	21.4	31.3		23.5	28.5	27.1	17.6	30.5	30.8	19.3	26.1	26.3
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	27.8	C		26.9	C		28.7	C		25.4	C	
Intersection Delay, s/veh / LOS	27.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.43	A	1.16	A	1.36	A	1.32	A

Table 1952. Pennsylvania Ave and JFK Rd Tuesday Noon-1PM HCS 20 Year Projection Conditions Optimized

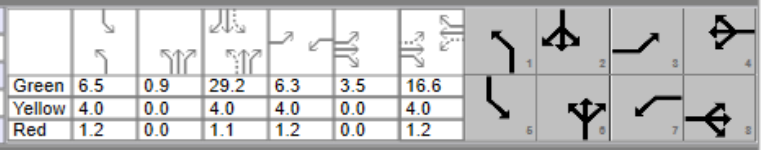
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	12-1pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_20YEARproje...		
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	203	240	128	98	200	109	155	792	110	118	685	212

Signal Information			
Cycle, s	83.8	Reference Phase	2
Offset, s	56	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	6.5	0.9	29.2	6.3	3.5	16.6
Yellow	4.0	0.0	4.0	4.0	0.0	4.0
Red	1.2	0.0	1.1	1.2	0.0	1.2

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	15.0	25.3	11.5	21.8	12.6	35.2	11.7	34.3
Change Period, (*Y+Rc*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s	9.4	19.1	5.6	10.2	7.4	25.3	5.1	18.7
Green Extension Time (*ge*), s	0.4	0.7	0.1	0.0	0.0	4.5	0.2	4.3
Phase Call Probability	0.99	1.00	0.90	1.00	0.99	1.00	0.92	1.00
Max Out Probability	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.06

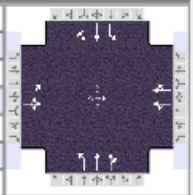
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	203	368		98	200	109	188	559	536	109	432	398
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1746		1767	1856	1572	1838	1856	1776	1838	1856	1704
Queue Service Time (*gs*), s	7.4	17.1		3.6	8.2	5.0	5.4	23.3	23.3	3.1	16.7	16.7
Cycle Queue Clearance Time (*gc*), s	7.4	17.1		3.6	8.2	5.0	5.4	23.3	23.3	3.1	16.7	16.7
Green Ratio (*g/C*)	0.32	0.24		0.28	0.20	0.20	0.44	0.36	0.36	0.43	0.35	0.35
Capacity (*c*), veh/h	416	421		235	369	313	352	670	641	260	648	595
Volume-to-Capacity Ratio (*X*)	0.488	0.873		0.417	0.542	0.348	0.534	0.835	0.836	0.419	0.667	0.668
Back of Queue (*Q*), ft/ln (95 th percentile)	137	294		68	166	85	99	346	326	56	264	241
Back of Queue (*Q*), veh/ln (95 th percentile)	5.3	11.5		2.6	6.5	3.3	3.9	13.5	13.0	2.2	10.3	9.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.75	0.00		0.59	0.00	0.74	0.99	0.00	0.00	0.47	0.00	0.00
Uniform Delay (*d1*), s/veh	22.5	30.8		25.1	30.4	29.1	17.1	24.7	24.7	19.1	23.3	23.3
Incremental Delay (*d2*), s/veh	0.3	2.3		0.4	0.9	0.2	0.4	0.6	0.7	0.3	0.3	0.3
Initial Queue Delay (*d3*), 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	22.8	33.1		25.5	31.3	29.4	17.5	25.3	25.4	19.4	23.6	23.6
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	29.5	C		29.4	C		24.2	C		23.1	C	
Intersection Delay, s/veh / LOS	25.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.43	A	1.16	A	1.36	A	1.32	A

Table 2053. Wacker Dr and JFK Rd Tuesday Noon-1PM HCS 5 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK NOON-1PM	File Name	TUESDAY Intersection (Wacker-JFK)_5YEARproj...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	378	3	67	4	5	5	83	537	5	14	444	224

Signal Information					EB			WB			NB			SB		
Cycle, s	55.2	Reference Phase	2		L	T	R	L	T	R	L	T	R	L	T	R
Offset, s	0	Reference Point	End	Green	1.0	4.3		16.6	10.7	1.2	0.0					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	0.0		4.0	3.0	3.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.5	0.0		1.5	2.5	2.5	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		16.2		6.7	10.3	26.4	6.0	22.1
Change Period, (*Y+Rc*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s		9.7		2.2	5.4	16.7	2.3	10.9
Green Extension Time (*ge*), s		0.9		0.0	0.2	4.0	0.0	4.0
Phase Call Probability		1.00		0.19	0.93	1.00	0.19	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.00

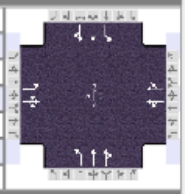
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	189	259		7		7	174	569	567	14	352	316
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1759		1850		1674	1810	1900	1894	1810	1900	1685
Queue Service Time (*gs*), s	5.2	7.7		0.2		0.2	3.4	14.7	14.7	0.3	8.8	8.9
Cycle Queue Clearance Time (*gc*), s	5.2	7.7		0.2		0.2	3.4	14.7	14.7	0.3	8.8	8.9
Green Ratio (*g/C*)	0.19	0.19		0.02		0.02	0.42	0.38	0.38	0.32	0.30	0.30
Capacity (*c*), veh/h	350	340		39		36	414	720	718	202	573	508
Volume-to-Capacity Ratio (*X*)	0.540	0.761		0.186		0.186	0.420	0.789	0.789	0.069	0.615	0.622
Back of Queue (*Q*), ft/ln (95 th percentile)	90	133		4		4	51	201	201	5	151	136
Back of Queue (*Q*), veh/ln (95 th percentile)	3.6	5.3		0.2		0.2	2.0	8.1	8.0	0.2	6.0	5.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.18	0.27		0.10		0.09	0.26	0.40	0.40	0.08	0.30	0.27
Uniform Delay (*d1*), s/veh	20.1	21.1		26.6		26.6	11.5	15.2	15.2	14.3	16.6	16.6
Incremental Delay (*d2*), s/veh	0.5	1.3		0.8		0.9	0.1	0.4	0.4	0.1	0.4	0.5
Initial Queue Delay (*d3*), 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	20.6	22.5		27.5		27.6	11.6	15.6	15.6	14.4	17.0	17.1
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.7	C		27.5	C		15.1	B		17.0	B	
Intersection Delay, s/veh / LOS	16.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.23	A	0.50	A	1.00	A	1.05	A

Table 2154. Wacker Dr and JFK Rd Tuesday Noon-1PM HCS 5 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK NOON-1PM	File Name	TUESDAY Intersection (Wacker-JFK)_5YEARproj...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	378	3	67	4	5	5	83	537	5	14	444	224

Signal Information					EB			WB			NB			SB		
Cycle, s	54.9	Reference Phase	2		L	T	R	L	T	R	L	T	R	L	T	R
Offset, s	0	Reference Point	End	Green	1.0	4.1		16.5	10.6	1.2	0.0					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	0.0		4.0	3.0	3.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.5	0.0		1.5	2.5	2.5	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		16.1		6.7	10.1	26.2	6.0	22.0
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		9.7		2.2	5.4	16.5	2.3	10.9
Green Extension Time (*g e*), s		0.9		0.0	0.0	4.0	0.0	4.0
Phase Call Probability		1.00		0.19	0.93	1.00	0.19	1.00
Max Out Probability		0.00		0.00	1.00	0.00	0.03	0.00

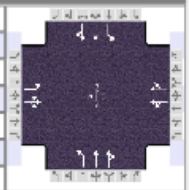
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	189	259		7		7	172	564	562	14	352	316
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1759		1850		1674	1810	1900	1894	1810	1900	1685
Queue Service Time (*g s*), s	5.2	7.7		0.2		0.2	3.4	14.5	14.5	0.3	8.8	8.9
Cycle Queue Clearance Time (*g c*), s	5.2	7.7		0.2		0.2	3.4	14.5	14.5	0.3	8.8	8.9
Green Ratio (*g/C*)	0.19	0.19		0.02		0.02	0.42	0.38	0.38	0.32	0.30	0.30
Capacity (*c*), veh/h	350	340		40		36	412	717	715	203	575	510
Volume-to-Capacity Ratio (*X*)	0.540	0.762		0.186		0.186	0.419	0.785	0.785	0.069	0.613	0.620
Back of Queue (*Q*), ft/ln (95 th percentile)	90	132		4		4	50	198	198	5	150	135
Back of Queue (*Q*), veh/ln (95 th percentile)	3.6	5.3		0.2		0.2	2.0	7.9	7.9	0.2	6.0	5.4
Queue Storage Ratio (*RQ*) (95 th percentile)	0.18	0.26		0.10		0.09	0.26	0.40	0.40	0.08	0.30	0.27
Uniform Delay (*d 1*), s/veh	20.0	21.0		26.5		26.5	11.5	15.2	15.2	14.3	16.5	16.5
Incremental Delay (*d 2*), s/veh	0.5	1.4		0.8		0.9	0.1	0.4	0.4	0.1	0.4	0.5
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	20.5	22.4		27.3		27.4	11.7	15.6	15.6	14.3	16.9	17.0
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.6	C		27.4	C		15.0	B		16.9	B	
Intersection Delay, s/veh / LOS	16.8						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.23	A	0.50	A	1.00	A	1.05	A

Table 2255. Wacker Dr and JFK Rd Tuesday Noon-1PM HCS 10 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK NOON-1PM	File Name	TUESDAY Intersection (Wacker-JFK)_10YEARpr...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	397	3	70	4	6	5	87	564	6	14	466	235

Signal Information			
Cycle, s	57.2	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	1.0	4.5	17.5	11.4	1.3	0.0
Yellow	3.5	0.0	4.0	3.0	3.0	0.0
Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		16.9		6.8	10.5	27.5	6.0	23.0
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		10.4		2.2	5.6	17.6	2.3	11.7
Green Extension Time (g_e), s		0.9		0.0	0.2	4.2	0.0	4.3
Phase Call Probability		1.00		0.21	0.94	1.00	0.20	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.00

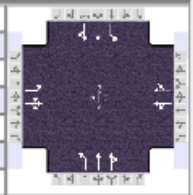
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	199	272		8		7	178	583	581	14	370	331
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1759		1853		1687	1810	1900	1893	1810	1900	1685
Queue Service Time (g_s), s	5.7	8.4		0.2		0.2	3.6	15.6	15.6	0.3	9.6	9.7
Cycle Queue Clearance Time (g_c), s	5.7	8.4		0.2		0.2	3.6	15.6	15.6	0.3	9.6	9.7
Green Ratio (*g/C*)	0.20	0.20		0.02		0.02	0.43	0.38	0.38	0.33	0.31	0.31
Capacity (*c*), veh/h	361	351		42		38	405	733	730	197	584	518
Volume-to-Capacity Ratio (*X*)	0.550	0.773		0.188		0.187	0.438	0.796	0.796	0.071	0.633	0.639
Back of Queue (*Q*), ft/ln (95 th percentile)	99	146		5		4	54	212	212	5	167	150
Back of Queue (*Q*), veh/ln (95 th percentile)	4.0	5.8		0.2		0.2	2.1	8.5	8.5	0.2	6.7	6.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.20	0.29		0.11		0.10	0.27	0.42	0.42	0.08	0.33	0.30
Uniform Delay (d_1), s/veh	20.7	21.7		27.5		27.5	11.8	15.6	15.6	14.7	17.1	17.1
Incremental Delay (d_2), s/veh	0.5	1.4		0.8		0.9	0.1	0.4	0.4	0.1	0.4	0.5
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	21.1	23.1		28.3		28.4	11.9	16.0	16.0	14.8	17.5	17.6
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	22.3	C		28.4	C		15.5	B		17.5	B	
Intersection Delay, s/veh / LOS	17.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.26	A	0.50	A	1.03	A	1.08	A

Table 2356. Wacker Dr and JFK Rd Tuesday Noon-1PM HCS 10 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK NOON-1PM	File Name	TUESDAY Intersection (Wacker-JFK)_10YEARpr...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	397	3	70	4	6	5	87	564	6	14	466	235

Signal Information											
Cycle, s	56.7	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On	Green	1.0	4.0	17.6	11.3	1.3	0.0	
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
				Red	1.5	0.0	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		16.8		6.8	10.0	27.1	6.0	23.1
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		10.3		2.2	5.6	17.3	2.3	11.6
Green Extension Time (*g e*), s		0.9		0.0	0.0	4.2	0.0	4.2
Phase Call Probability		1.00		0.21	0.94	1.00	0.20	1.00
Max Out Probability		0.00		0.00	1.00	0.01	0.00	0.00

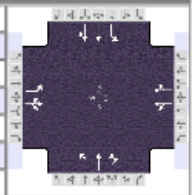
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	199	272		8		7	175	576	574	14	370	331
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1759		1853		1687	1810	1900	1893	1810	1900	1685
Queue Service Time (*g s*), s	5.6	8.3		0.2		0.2	3.6	15.3	15.3	0.3	9.5	9.6
Cycle Queue Clearance Time (*g c*), s	5.6	8.3		0.2		0.2	3.6	15.3	15.3	0.3	9.5	9.6
Green Ratio (*g/C*)	0.20	0.20		0.02		0.02	0.42	0.38	0.38	0.33	0.31	0.31
Capacity (*c*), veh/h	361	351		42		38	398	727	724	197	594	526
Volume-to-Capacity Ratio (*X*)	0.550	0.774		0.188		0.188	0.441	0.792	0.792	0.071	0.623	0.629
Back of Queue (*Q*), ft/ln (95 th percentile)	98	144		5		4	54	208	208	5	164	147
Back of Queue (*Q*), veh/ln (95 th percentile)	3.9	5.8		0.2		0.2	2.2	8.3	8.3	0.2	6.5	5.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.20	0.29		0.11		0.10	0.28	0.42	0.42	0.08	0.33	0.29
Uniform Delay (*d 1*), s/veh	20.5	21.6		27.3		27.3	11.9	15.6	15.6	14.5	16.7	16.7
Incremental Delay (*d 2*), s/veh	0.5	1.4		0.8		0.9	0.1	0.4	0.4	0.1	0.4	0.5
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	21.0	23.0		28.1		28.2	12.1	15.9	16.0	14.5	17.1	17.2
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	22.1	C		28.2	C		15.4	B		17.1	B	
Intersection Delay, s/veh / LOS	17.2						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.26	A	0.50	A	1.03	A	1.08	A

Table 2457. Wacker Dr and JFK Rd Tuesday Noon-1PM HCS 20 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK NOON-1PM	File Name	TUESDAY Intersection (Wacker-JFK)_20YEARpr...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	439	4	78	5	6	6	96	623	6	16	515	260

Signal Information					EB			WB			NB			SB		
Cycle, s	64.9	Reference Phase	2		L	T	R	L	T	R	L	T	R	L	T	R
Offset, s	0	Reference Point	End	Green	1.3	0.1		21.7	13.8	1.6	0.0					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	3.5		4.0	3.0	3.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.5	1.5		1.5	2.5	2.5	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		19.3		7.1	11.3	32.3	6.3	27.2
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		12.6		2.3	6.2	21.6	2.4	14.0
Green Extension Time (g_e), s		1.0		0.0	0.2	4.9	0.0	5.0
Phase Call Probability		1.00		0.27	0.97	1.00	0.25	1.00
Max Out Probability		0.00		0.00	0.00	0.01	0.00	0.00

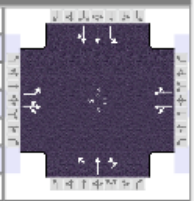
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	220	302		9		8	196	643	641	16	410	365
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1759		1848		1676	1810	1900	1893	1810	1900	1684
Queue Service Time (g_s), s	7.1	10.6		0.3		0.3	4.2	19.6	19.6	0.4	11.9	12.0
Cycle Queue Clearance Time (g_c), s	7.1	10.6		0.3		0.3	4.2	19.6	19.6	0.4	11.9	12.0
Green Ratio (*g/C*)	0.21	0.21		0.02		0.02	0.47	0.41	0.41	0.36	0.33	0.33
Capacity (*c*), veh/h	385	374		46		42	397	786	783	182	637	565
Volume-to-Capacity Ratio (*X*)	0.570	0.806		0.194		0.194	0.494	0.818	0.818	0.088	0.644	0.647
Back of Queue (*Q*), ft/ln (95 th percentile)	128	190		6		6	66	256	255	6	208	191
Back of Queue (*Q*), veh/ln (95 th percentile)	5.1	7.6		0.3		0.2	2.6	10.2	10.2	0.3	8.3	7.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.26	0.38		0.14		0.13	0.34	0.51	0.51	0.10	0.42	0.38
Uniform Delay (d_1), s/veh	23.0	24.4		31.2		31.2	12.5	17.0	17.0	15.9	18.4	18.4
Incremental Delay (d_2), s/veh	0.5	1.6		0.8		0.8	0.1	0.3	0.3	0.1	0.4	0.5
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	23.5	26.0		32.0		32.0	12.7	17.3	17.3	15.9	18.8	18.9
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	25.0	C		32.0	C		16.7	B		18.8	B	
Intersection Delay, s/veh / LOS	18.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.30	B	1.89	B	2.10	B
Bicycle LOS Score / LOS	1.35	A	0.50	A	1.09	A	1.14	A

Table 2558. Wacker Dr and JFK Rd Tuesday Noon-1PM HCS 20 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK NOON-1PM	File Name	TUESDAY Intersection (Wacker-JFK)_20YEARpr...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	439	4	78	5	6	6	96	623	6	16	515	260

Signal Information											
Cycle, s	65.3	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On	Green	1.3	3.7	23.3	13.9	1.6	0.0	
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
				Red	1.5	0.0	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		19.4		7.1	10.0	32.5	6.3	28.8
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		12.7		2.3	6.4	21.7	2.4	13.7
Green Extension Time (*g e*), s		1.0		0.0	0.0	5.0	0.0	5.0
Phase Call Probability		1.00		0.27	0.97	1.00	0.25	1.00
Max Out Probability		0.00		0.00	1.00	0.00	0.00	0.00

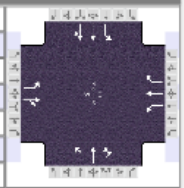
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	220	302		9		8	196	643	641	16	410	365
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1759		1848		1676	1810	1900	1893	1810	1900	1684
Queue Service Time (*g s*), s	7.2	10.7		0.3		0.3	4.4	19.7	19.7	0.4	11.6	11.7
Cycle Queue Clearance Time (*g c*), s	7.2	10.7		0.3		0.3	4.4	19.7	19.7	0.4	11.6	11.7
Green Ratio (*g/C*)	0.21	0.21		0.02		0.02	0.45	0.41	0.41	0.38	0.36	0.36
Capacity (*c*), veh/h	385	374		46		42	381	790	787	183	683	606
Volume-to-Capacity Ratio (*X*)	0.570	0.805		0.193		0.193	0.514	0.814	0.814	0.087	0.600	0.603
Back of Queue (*Q*), ft/ln (95 th percentile)	129	192		6		6	70	257	256	6	202	183
Back of Queue (*Q*), veh/ln (95 th percentile)	5.2	7.7		0.3		0.2	2.8	10.3	10.3	0.2	8.1	7.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.26	0.38		0.14		0.13	0.36	0.51	0.51	0.10	0.40	0.37
Uniform Delay (*d 1*), s/veh	23.2	24.6		31.5		31.5	12.8	17.0	17.0	15.3	17.2	17.2
Incremental Delay (*d 2*), s/veh	0.5	1.6		0.7		0.8	0.2	0.3	0.3	0.1	0.3	0.4
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	23.7	26.2		32.2		32.3	13.0	17.3	17.3	15.4	17.5	17.6
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	25.2	C		32.2	C		16.7	B		17.5	B	
Intersection Delay, s/veh / LOS	18.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.30	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.35	A	0.50	A	1.09	A	1.14	A

Table 59. Pennsylvania Ave and JFK Rd Tuesday 11AM-Noon HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_existing.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	164	188	109	84	153	97	119	606	70	81	577	147

Signal Information			
Cycle, s	65.4	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	5.4	1.2	18.9	5.5	1.5	12.2	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.2	18.9	10.7	17.4	11.8	25.2	10.6	24.0
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	6.7	12.6	4.4	6.8	5.7	16.6	3.9	13.8
Green Extension Time (*g e*), s	0.2	1.0	0.1	1.0	0.3	3.4	0.1	2.9
Phase Call Probability	1.00	1.00	0.78	1.00	0.94	1.00	0.77	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.20

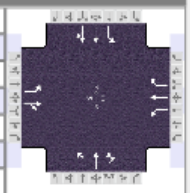
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	164	297		84	153	97	156	452	435	81	374	350
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1741		1767	1856	1572	1838	1856	1788	1838	1856	1725
Queue Service Time (*g s*), s	4.7	10.6		2.4	4.8	3.5	3.7	14.6	14.6	1.9	11.8	11.8
Cycle Queue Clearance Time (*g c*), s	4.7	10.6		2.4	4.8	3.5	3.7	14.6	14.6	1.9	11.8	11.8
Green Ratio (*g/C*)	0.29	0.21		0.27	0.19	0.19	0.39	0.31	0.31	0.37	0.29	0.29
Capacity (*c*), veh/h	440	366		277	347	294	378	570	549	297	536	499
Volume-to-Capacity Ratio (*X*)	0.373	0.812		0.303	0.441	0.330	0.414	0.793	0.793	0.273	0.698	0.701
Back of Queue (*Q*), ft/ln (95 th percentile)	82	194		42	91	56	63	227	215	33	214	198
Back of Queue (*Q*), veh/ln (95 th percentile)	3.2	7.6		1.6	3.6	2.2	2.5	8.9	8.6	1.3	8.3	7.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.45	0.00		0.37	0.00	0.49	0.63	0.00	0.00	0.27	0.00	0.00
Uniform Delay (*d 1*), s/veh	18.2	24.6		19.3	23.6	23.1	14.7	20.8	20.8	15.6	20.7	20.8
Incremental Delay (*d 2*), s/veh	0.2	1.7		0.2	0.3	0.2	0.2	0.6	0.6	0.2	1.0	1.2
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	18.4	26.3		19.5	23.9	23.3	14.8	21.4	21.4	15.8	21.8	21.9
Level of Service (LOS)	B	C		B	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	23.5	C		22.6	C		20.4	C		21.2	C	
Intersection Delay, s/veh / LOS	21.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.25	A	1.04	A	1.14	A	1.15	A

Table 60. Pennsylvania Ave and JFK Rd Tuesday 11AM-Noon HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_existingFINA...		
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	164	188	109	84	153	97	119	606	70	81	577	147

Signal Information												
Cycle, s	65.5	Reference Phase	2									
Offset, s	0	Reference Point	End	Green	5.4	1.2	18.9	5.5	1.5	12.3		
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.2	0.0	1.1	1.2	0.0	1.2		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.2	19.0	10.7	17.5	11.8	25.2	10.6	24.0
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	6.7	12.7	4.4	6.8	5.7	16.7	3.9	13.9
Green Extension Time (g_e), s	0.1	1.0	0.1	1.0	0.3	3.3	0.1	3.4
Phase Call Probability	1.00	1.00	0.78	1.00	0.94	1.00	0.77	1.00
Max Out Probability	0.03	0.00	0.00	0.00	0.00	0.05	0.00	0.00

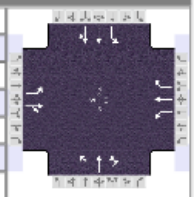
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	164	297		84	153	97	156	452	435	81	374	350
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1741		1767	1856	1572	1838	1856	1788	1838	1856	1725
Queue Service Time (g_s), s	4.7	10.7		2.4	4.8	3.5	3.7	14.7	14.7	1.9	11.8	11.9
Cycle Queue Clearance Time (g_c), s	4.7	10.7		2.4	4.8	3.5	3.7	14.7	14.7	1.9	11.8	11.9
Green Ratio (*g/C*)	0.30	0.21		0.27	0.19	0.19	0.39	0.31	0.31	0.37	0.29	0.29
Capacity (*c*), veh/h	442	367		279	349	296	378	570	549	297	537	499
Volume-to-Capacity Ratio (*X*)	0.371	0.809		0.301	0.438	0.328	0.413	0.793	0.793	0.273	0.697	0.700
Back of Queue (*Q*), ft/ln (95 th percentile)	82	194		42	91	57	64	231	219	33	212	197
Back of Queue (*Q*), veh/ln (95 th percentile)	3.2	7.6		1.6	3.6	2.2	2.5	9.0	8.8	1.3	8.3	7.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.45	0.00		0.37	0.00	0.49	0.64	0.00	0.00	0.28	0.00	0.00
Uniform Delay (d_1), s/veh	18.2	24.7		19.3	23.6	23.1	14.7	20.9	20.9	15.6	20.8	20.8
Incremental Delay (d_2), s/veh	0.2	1.7		0.2	0.3	0.2	0.2	0.6	0.7	0.2	0.6	0.7
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	0.0
Control Delay (*d*), s/veh	18.4	26.3		19.5	23.9	23.3	14.9	21.5	21.6	15.8	21.4	21.5
Level of Service (LOS)	B	C		B	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	23.5	C		22.7	C		20.5	C		20.9	C	
Intersection Delay, s/veh / LOS	21.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.25	A	1.04	A	1.14	A	1.15	A

Table 61. Pennsylvania Ave and JFK Rd Tuesday 4-5PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_existing.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	172	294	96	76	234	74	118	645	58	81	606	141

Signal Information			
Cycle, s	67.9	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	5.1	1.5		17.8	5.3	1.5		16.0				
Yellow	4.0	0.0		4.0	4.0	0.0		4.0				
Red	1.2	0.0		1.1	1.2	0.0		1.2				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.1	22.7	10.5	21.2	11.8	24.3	10.3	22.9
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	6.9	16.2	4.1	9.5	5.8	17.4	3.8	12.9
Green Extension Time (g_e), s	0.3	1.3	0.1	1.3	0.3	1.7	0.1	0.6
Phase Call Probability	0.96	1.00	0.76	1.00	0.94	1.00	0.73	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.05	0.00	1.00

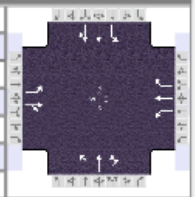
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	172	390		76	234	74	147	446	433	69	327	308
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1777		1767	1856	1572	1838	1856	1801	1838	1856	1734
Queue Service Time (g_s), s	4.9	14.2		2.1	7.5	2.6	3.8	15.4	15.4	1.8	10.8	10.9
Cycle Queue Clearance Time (g_c), s	4.9	14.2		2.1	7.5	2.6	3.8	15.4	15.4	1.8	10.8	10.9
Green Ratio (*g/C*)	0.34	0.26		0.32	0.24	0.24	0.36	0.28	0.28	0.34	0.26	0.26
Capacity (*c*), veh/h	428	459		266	438	371	368	526	510	262	486	454
Volume-to-Capacity Ratio (*X*)	0.401	0.849		0.286	0.534	0.199	0.401	0.848	0.848	0.263	0.673	0.679
Back of Queue (*Q*), ft/ln (95 th percentile)	84	245		37	142	41	67	243	232	31	193	181
Back of Queue (*Q*), veh/ln (95 th percentile)	3.3	9.6		1.4	5.6	1.6	2.6	9.5	9.3	1.2	7.5	7.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.46	0.00		0.32	0.00	0.36	0.67	0.00	0.00	0.26	0.00	0.00
Uniform Delay (d_1), s/veh	17.0	24.0		18.4	22.7	20.8	16.3	23.0	23.0	17.6	22.5	22.5
Incremental Delay (d_2), s/veh	0.2	1.8		0.2	0.4	0.1	0.2	1.0	1.0	0.1	2.1	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	17.3	25.7		18.6	23.1	20.9	16.4	24.0	24.0	17.8	24.6	24.9
Level of Service (LOS)	B	C		B	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	23.1	C		21.8	C		22.9	C		24.1	C	
Intersection Delay, s/veh / LOS	23.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.27	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.41	A	1.12	A	1.16	A	1.17	A

Table 62. Pennsylvania Ave and JFK Rd Tuesday 4-5PM HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_existingFINA...		
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	172	294	96	76	234	74	118	645	58	81	606	141

Signal Information			
Cycle, s	69.2	Reference Phase	2
Offset, s	39	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

	EB			WB			NB			SB		
Green	5.2	1.4		19.1	5.4	1.5	15.9					
Yellow	4.0	0.0		4.0	4.0	0.0	4.0					
Red	1.2	0.0		1.1	1.2	0.0	1.2					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.1	22.6	10.6	21.1	11.8	25.6	10.4	24.2
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	7.0	16.6	4.2	9.7	5.8	17.4	3.8	12.9
Green Extension Time (*g e*), s	0.1	0.8	0.1	0.8	0.3	3.0	0.1	3.0
Phase Call Probability	0.96	1.00	0.77	1.00	0.94	1.00	0.73	1.00
Max Out Probability	0.05	0.00	0.00	0.36	0.00	0.02	0.00	0.04

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	172	390		76	234	74	147	446	433	69	327	308
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1777		1767	1856	1572	1838	1856	1801	1838	1856	1734
Queue Service Time (*g s*), s	5.0	14.6		2.2	7.7	2.6	3.8	15.4	15.4	1.8	10.7	10.9
Cycle Queue Clearance Time (*g c*), s	5.0	14.6		2.2	7.7	2.6	3.8	15.4	15.4	1.8	10.7	10.9
Green Ratio (*g/C*)	0.33	0.25		0.31	0.23	0.23	0.37	0.30	0.30	0.35	0.28	0.28
Capacity (*c*), veh/h	416	448		255	426	361	378	551	535	271	513	479
Volume-to-Capacity Ratio (*X*)	0.413	0.871		0.299	0.549	0.205	0.390	0.809	0.809	0.254	0.638	0.643
Back of Queue (*Q*), ft/ln (95 th percentile)	87	254		38	150	42	67	245	233	31	187	174
Back of Queue (*Q*), veh/ln (95 th percentile)	3.4	9.9		1.5	5.8	1.7	2.6	9.6	9.3	1.2	7.3	7.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.48	0.00		0.33	0.00	0.37	0.67	0.00	0.00	0.26	0.00	0.00
Uniform Delay (*d 1*), s/veh	17.8	24.9		19.1	23.5	21.6	15.9	22.6	22.6	17.2	22.0	22.1
Incremental Delay (*d 2*), s/veh	0.2	2.2		0.2	0.9	0.1	0.2	0.7	0.8	0.1	0.4	0.4
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	18.0	27.0		19.4	24.4	21.7	16.1	23.3	23.3	17.4	22.4	22.5
Level of Service (LOS)	B	C		B	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	24.3	C		22.9	C		22.3	C		22.0	C	
Intersection Delay, s/veh / LOS	22.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.41	A	1.12	A	1.16	A	1.17	A

Table 63. Pennsylvania Ave and JFK Rd Tuesday 5-6PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_existing.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	180	318	111	99	250	86	134	760	78	103	649	174

Signal Information												
Cycle, s	71.4	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	5.5	1.0	18.2	6.0	1.2	18.7		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0		
				Red	1.2	0.0	1.1	1.2	0.0	1.2		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.4	25.1	11.2	23.9	11.7	24.4	10.7	23.3
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	7.2	18.5	4.8	10.2	5.7	17.6	4.1	13.0
Green Extension Time (g_e), s	0.3	1.4	0.1	1.5	0.2	1.6	0.1	0.5
Phase Call Probability	0.97	1.00	0.86	1.00	0.93	1.00	0.78	1.00
Max Out Probability	0.00	0.01	0.00	0.00	0.00	0.05	0.00	1.00

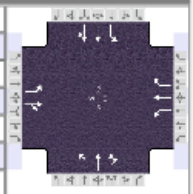
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	180	429		99	250	86	134	426	412	76	316	296
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1773		1767	1856	1572	1838	1856	1794	1838	1856	1720
Queue Service Time (g_s), s	5.2	16.5		2.8	8.2	3.1	3.7	15.5	15.6	2.1	10.9	11.0
Cycle Queue Clearance Time (g_c), s	5.2	16.5		2.8	8.2	3.1	3.7	15.5	15.6	2.1	10.9	11.0
Green Ratio (*g/C*)	0.36	0.28		0.35	0.26	0.26	0.35	0.27	0.27	0.33	0.26	0.26
Capacity (*c*), veh/h	446	495		270	486	412	354	501	485	259	474	440
Volume-to-Capacity Ratio (*X*)	0.404	0.867		0.366	0.514	0.209	0.379	0.850	0.850	0.296	0.665	0.672
Back of Queue (*Q*), ft/ln (95 th percentile)	89	282		49	156	49	66	274	261	38	197	184
Back of Queue (*Q*), veh/ln (95 th percentile)	3.5	11.0		1.9	6.1	1.9	2.6	10.7	10.4	1.5	7.7	7.4
Queue Storage Ratio (*RQ*) (95 th percentile)	0.49	0.00		0.42	0.00	0.42	0.66	0.00	0.00	0.31	0.00	0.00
Uniform Delay (d_1), s/veh	16.7	24.5		18.5	22.5	20.6	17.5	24.7	24.7	18.8	23.9	23.9
Incremental Delay (d_2), s/veh	0.2	2.9		0.3	0.3	0.1	0.2	1.6	1.7	0.2	2.0	2.3
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	16.9	27.4		18.8	22.8	20.7	17.7	26.3	26.4	18.9	25.9	26.3
Level of Service (LOS)	B	C		B	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	24.3	C		21.5	C		25.2	C		25.3	C	
Intersection Delay, s/veh / LOS	24.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.27	B	2.28	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.49	A	1.21	A	1.29	A	1.25	A

Table 64. Pennsylvania Ave and JFK Rd Tuesday 5-6PM HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_existingFINA...		
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	180	318	111	99	250	86	134	760	78	103	649	174

Signal Information			
Cycle, s	73.2	Reference Phase	2
Offset, s	38	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.6	1.0	19.7	6.1	1.4	18.8	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.7	25.4	11.3	24.0	11.8	25.8	10.8	24.8
Change Period, (*Y+Rc*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s	7.3	19.0	4.9	10.5	5.7	17.7	4.1	13.1
Green Extension Time (*ge*), s	0.3	1.0	0.1	1.1	0.2	2.8	0.1	3.0
Phase Call Probability	0.97	1.00	0.87	1.00	0.94	1.00	0.79	1.00
Max Out Probability	0.00	0.00	0.00	0.15	0.00	0.05	0.00	0.00

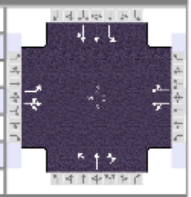
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	180	429		99	250	86	134	426	412	76	316	296
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1773		1767	1856	1572	1838	1856	1794	1838	1856	1720
Queue Service Time (*gs*), s	5.3	17.0		2.9	8.5	3.2	3.7	15.7	15.7	2.1	11.0	11.1
Cycle Queue Clearance Time (*gc*), s	5.3	17.0		2.9	8.5	3.2	3.7	15.7	15.7	2.1	11.0	11.1
Green Ratio (*g/C*)	0.36	0.28		0.34	0.26	0.26	0.36	0.28	0.28	0.35	0.27	0.27
Capacity (*c*), veh/h	438	489		262	476	403	364	526	508	267	501	464
Volume-to-Capacity Ratio (*X*)	0.411	0.877		0.377	0.525	0.213	0.368	0.810	0.811	0.287	0.630	0.636
Back of Queue (*Q*), ft/ln (95 th percentile)	93	287		51	164	51	67	275	262	38	193	179
Back of Queue (*Q*), veh/ln (95 th percentile)	3.6	11.2		2.0	6.4	2.0	2.6	10.7	10.5	1.5	7.5	7.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.51	0.00		0.44	0.00	0.44	0.67	0.00	0.00	0.32	0.00	0.00
Uniform Delay (*d1*), s/veh	17.4	25.4		19.3	23.5	21.5	17.2	24.5	24.5	18.5	23.6	23.7
Incremental Delay (*d2*), s/veh	0.2	2.1		0.3	0.5	0.1	0.2	1.2	1.2	0.2	0.4	0.4
Initial Queue Delay (*d3*), 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	17.6	27.5		19.6	24.0	21.6	17.5	25.7	25.7	18.7	24.0	24.1
Level of Service (LOS)	B	C		B	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	24.6	C		22.5	C		24.6	C		23.4	C	
Intersection Delay, s/veh / LOS	24.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.49	A	1.21	A	1.29	A	1.25	A

Table 65. Wacker Dr and JFK Rd Tuesday 11AM-Noon HCS Existing Conditions

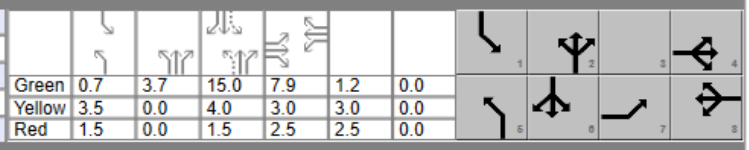
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 11AM-NOON	File Name	TUESDAY Intersection (Wacker-JFK)_existing.xus		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	286	6	49	6	2	8	75	494	5	13	383	213

Signal Information			
Cycle, s	50.0	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	0.7	3.7	15.0	7.9	1.2	0.0
Yellow	3.5	0.0	4.0	3.0	3.0	0.0
Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		13.4		6.7	9.4	24.2	5.7	20.5
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		7.3		2.2	4.6	12.8	2.2	7.4
Green Extension Time (*g e*), s		0.7		0.0	0.2	3.0	0.0	3.0
Phase Call Probability		0.99		0.20	0.87	1.00	0.13	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.00

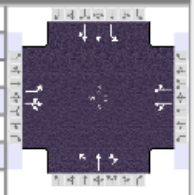
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	143	198		8		8	147	488	487	10	248	225
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1762		1831		1610	1810	1900	1893	1810	1900	1674
Queue Service Time (*g s*), s	3.6	5.3		0.2		0.2	2.6	10.8	10.8	0.2	5.2	5.4
Cycle Queue Clearance Time (*g c*), s	3.6	5.3		0.2		0.2	2.6	10.8	10.8	0.2	5.2	5.4
Green Ratio (*g/C*)	0.16	0.16		0.02		0.02	0.40	0.37	0.37	0.31	0.30	0.30
Capacity (*c*), veh/h	287	280		44		39	481	710	708	236	570	502
Volume-to-Capacity Ratio (*X*)	0.497	0.707		0.182		0.207	0.305	0.688	0.688	0.044	0.434	0.448
Back of Queue (*Q*), ft/ln (95 th percentile)	62	90		4		4	38	154	153	3	86	79
Back of Queue (*Q*), veh/ln (95 th percentile)	2.5	3.6		0.2		0.2	1.5	6.1	6.1	0.1	3.4	3.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.12	0.18		0.09		0.09	0.19	0.31	0.31	0.05	0.17	0.16
Uniform Delay (*d 1*), s/veh	19.2	19.9		23.9		23.9	10.2	13.2	13.2	12.7	14.1	14.2
Incremental Delay (*d 2*), s/veh	0.5	1.2		0.7		1.0	0.1	0.3	0.3	0.0	0.2	0.2
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	19.7	21.2		24.7		24.9	10.3	13.5	13.5	12.7	14.2	14.3
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	20.6	C		24.8	C		13.0	B		14.3	B	
Intersection Delay, s/veh / LOS	14.7						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.05	A	0.50	A	0.96	A	0.99	A

Table 66. Wacker Dr and JFK Rd Tuesday 11AM-Noon HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 11AM-NOON	File Name	TUESDAY Intersection (Wacker-JFK)_existingFIN...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	286	6	49	6	2	8	75	494	5	13	383	213

Signal Information			
Cycle, s	49.6	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	0.7	3.7	15.0	7.6	1.2	0.0	
Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
Red	1.5	0.0	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		13.1		6.7	9.3	24.2	5.7	20.5
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		7.3		2.2	4.6	12.7	2.2	7.4
Green Extension Time (g_e), s		0.3		0.0	0.2	3.0	0.0	3.0
Phase Call Probability		0.99		0.20	0.87	1.00	0.13	1.00
Max Out Probability		0.35		0.00	0.00	0.00	0.00	0.00

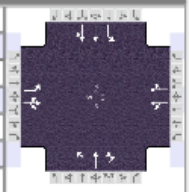
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	143	198		8		8	146	486	485	10	248	225
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1762		1831		1610	1810	1900	1893	1810	1900	1674
Queue Service Time (g_s), s	3.6	5.3		0.2		0.2	2.6	10.7	10.7	0.2	5.2	5.4
Cycle Queue Clearance Time (g_c), s	3.6	5.3		0.2		0.2	2.6	10.7	10.7	0.2	5.2	5.4
Green Ratio (*g/C*)	0.15	0.15		0.02		0.02	0.40	0.38	0.38	0.32	0.30	0.30
Capacity (*c*), veh/h	277	270		44		39	485	715	712	240	574	506
Volume-to-Capacity Ratio (*X*)	0.516	0.733		0.182		0.206	0.301	0.680	0.680	0.043	0.431	0.445
Back of Queue (*Q*), ft/ln (95 th percentile)	62	91		4		4	37	150	150	3	85	78
Back of Queue (*Q*), veh/ln (95 th percentile)	2.5	3.6		0.2		0.2	1.5	6.0	6.0	0.1	3.4	3.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.12	0.18		0.09		0.09	0.19	0.30	0.30	0.05	0.17	0.15
Uniform Delay (d_1), s/veh	19.3	20.1		23.8		23.8	10.0	13.0	13.0	12.5	13.9	14.0
Incremental Delay (d_2), s/veh	0.6	1.5		0.7		1.0	0.1	0.2	0.2	0.0	0.2	0.2
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	19.9	21.5		24.5		24.7	10.1	13.2	13.2	12.6	14.1	14.2
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	20.8	C		24.6	C		12.8	B		14.1	B	
Intersection Delay, s/veh / LOS	14.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.05	A	0.50	A	0.96	A	0.99	A

Table 67. Wacker Dr and JFK Rd Tuesday 4-5PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 4-5PM	File Name	TUESDAY Intersection (Wacker-JFK)_existing.xus		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	347	2	63	5	9	6	96	586	5	20	459	213

Signal Information											
Cycle, s	51.1	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On	Green	0.6	3.2	15.0	9.4	1.5	0.0	
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
				Red	1.5	0.0	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		14.9		7.0	8.7	23.7	5.6	20.5
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		8.6		2.3	4.7	8.1	2.2	5.2
Green Extension Time (g_e), s		0.8		0.0	0.1	1.6	0.0	1.6
Phase Call Probability		1.00		0.25	0.74	1.00	0.11	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.00

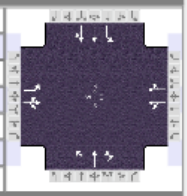
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	174	239		10		10	96	296	295	8	145	137
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1757		1856		1706	1810	1900	1894	1810	1900	1700
Queue Service Time (g_s), s	4.4	6.6		0.3		0.3	2.7	6.1	6.1	0.2	3.0	3.2
Cycle Queue Clearance Time (g_c), s	4.4	6.6		0.3		0.3	2.7	6.1	6.1	0.2	3.0	3.2
Green Ratio (*g/C*)	0.18	0.18		0.03		0.03	0.07	0.36	0.36	0.01	0.29	0.29
Capacity (*c*), veh/h	332	322		54		50	132	676	674	20	558	499
Volume-to-Capacity Ratio (*X*)	0.523	0.740		0.194		0.191	0.727	0.438	0.438	0.420	0.260	0.274
Back of Queue (*Q*), ft/ln (95 th percentile)	75	111		6		5	51	97	97	5	49	47
Back of Queue (*Q*), veh/ln (95 th percentile)	3.0	4.4		0.2		0.2	2.0	3.9	3.9	0.2	2.0	1.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.15	0.22		0.12		0.11	0.26	0.19	0.19	0.09	0.10	0.09
Uniform Delay (d_1), s/veh	18.8	19.7		24.2		24.2	23.2	12.6	12.6	25.1	13.8	13.9
Incremental Delay (d_2), s/veh	0.5	1.3		0.6		0.7	2.9	0.2	0.2	5.0	0.1	0.1
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	19.3	21.0		24.9		24.9	26.1	12.7	12.7	30.1	13.9	14.0
Level of Service (LOS)	B	C		C		C	C	B	B	C	B	B
Approach Delay, s/veh / LOS	20.3	C		24.9	C		14.6	B		14.4	B	
Intersection Delay, s/veh / LOS	16.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.17	A	0.50	A	1.05	A	1.06	A

Table 68. Wacker Dr and JFK Rd Tuesday 4-5PM HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 4-5PM	File Name	TUESDAY Intersection (Wacker-JFK)_existingFIN...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	347	2	63	5	9	6	96	586	5	20	459	213

Signal Information										
Cycle, s	49.8	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	0.6	3.1	13.9	9.2	1.5	0.0
				Yellow	3.5	0.0	4.0	3.0	3.0	0.0
				Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		14.7		7.0	8.7	22.5	5.6	19.4
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		8.4		2.3	4.6	8.0	2.2	5.1
Green Extension Time (*g e*), s		0.9		0.0	0.0	1.2	0.0	0.5
Phase Call Probability		1.00		0.24	0.74	1.00	0.11	1.00
Max Out Probability		0.00		0.00	1.00	0.21	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	174	239		10		10	96	296	295	8	145	137
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1757		1856		1706	1810	1900	1894	1810	1900	1700
Queue Service Time (*g s*), s	4.3	6.4		0.3		0.3	2.6	6.0	6.0	0.2	3.0	3.1
Cycle Queue Clearance Time (*g c*), s	4.3	6.4		0.3		0.3	2.6	6.0	6.0	0.2	3.0	3.1
Green Ratio (*g/C*)	0.19	0.19		0.03		0.03	0.07	0.34	0.34	0.01	0.28	0.28
Capacity (*c*), veh/h	336	326		55		50	134	650	648	20	530	475
Volume-to-Capacity Ratio (*X*)	0.517	0.731		0.192		0.190	0.715	0.455	0.455	0.415	0.273	0.289
Back of Queue (*Q*), ft/ln (95 th percentile)	72	106		5		5	49	96	96	5	49	47
Back of Queue (*Q*), veh/ln (95 th percentile)	2.9	4.3		0.2		0.2	2.0	3.8	3.8	0.2	2.0	1.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.14	0.21		0.12		0.11	0.25	0.19	0.19	0.08	0.10	0.09
Uniform Delay (*d 1*), s/veh	18.3	19.1		23.6		23.6	22.5	12.8	12.8	24.5	14.0	14.1
Incremental Delay (*d 2*), s/veh	0.5	1.2		0.6		0.7	2.7	0.2	0.2	4.9	0.1	0.1
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	18.7	20.3		24.2		24.3	25.2	13.0	13.0	29.3	14.1	14.2
Level of Service (LOS)	B	C		C		C	C	B	B	C	B	B
Approach Delay, s/veh / LOS	19.6	B		24.2	C		14.7	B		14.6	B	
Intersection Delay, s/veh / LOS	16.2						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.17	A	0.50	A	1.05	A	1.06	A

Table 69. Wacker Dr and JFK Rd Tuesday 5-6PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 5-6PM	File Name	TUESDAY Intersection (Wacker-JFK)_existing.xus		
Project Description	Wacker/JFK TUESDAY				

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	378	2	52	9	8	11	110	603	5	8	392	213

Signal Information										
Cycle, s	52.6	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	Yes	Simult. Gap E/W	On	Green	0.3	4.0	15.0	9.7	2.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.0	3.0	3.0	0.0
				Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		15.2		7.5	9.4	24.5	5.3	20.5
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		8.8		2.4	4.7	10.7	2.1	6.2
Green Extension Time (g_e), s		0.9		0.0	0.2	2.2	0.0	2.2
Phase Call Probability		1.00		0.34	0.87	1.00	0.07	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.00

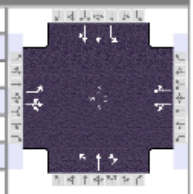
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	189	243		15		13	142	392	391	5	184	170
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1767		1844		1654	1810	1900	1894	1810	1900	1679
Queue Service Time (g_s), s	5.0	6.8		0.4		0.4	2.7	8.7	8.7	0.1	4.0	4.2
Cycle Queue Clearance Time (g_c), s	5.0	6.8		0.4		0.4	2.7	8.7	8.7	0.1	4.0	4.2
Green Ratio (*g/C*)	0.18	0.18		0.04		0.04	0.39	0.36	0.36	0.29	0.29	0.29
Capacity (*c*), veh/h	334	326		71		64	501	688	686	259	542	479
Volume-to-Capacity Ratio (*X*)	0.566	0.745		0.208		0.209	0.283	0.570	0.570	0.018	0.339	0.356
Back of Queue (*Q*), ft/ln (95 th percentile)	86	117		8		7	40	138	138	2	68	64
Back of Queue (*Q*), veh/ln (95 th percentile)	3.4	4.7		0.3		0.3	1.6	5.5	5.5	0.1	2.7	2.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.17	0.23		0.17		0.16	0.21	0.28	0.28	0.02	0.14	0.13
Uniform Delay (d_1), s/veh	19.5	20.3		24.5		24.5	11.0	13.5	13.5	13.7	14.9	15.0
Incremental Delay (d_2), s/veh	0.6	1.3		0.5		0.6	0.1	0.2	0.2	0.0	0.1	0.2
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	20.1	21.6		25.1		25.1	11.1	13.7	13.7	13.7	15.0	15.1
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	20.9	C		25.1	C		13.3	B		15.0	B	
Intersection Delay, s/veh / LOS	15.7						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.20	A	0.51	A	1.08	A	0.99	A

Table 70. Wacker Dr and JFK Rd Tuesday 5-6PM HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 5-6PM	File Name	TUESDAY Intersection (Wacker-JFK)_existingFIN...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	378	2	52	9	8	11	110	603	5	8	392	213

Signal Information			
Cycle, s	52.3	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	0.3	4.1	15.0	9.4	2.0	0.0	
Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
Red	1.5	0.0	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		14.9		7.5	9.4	24.6	5.3	20.5
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		8.8		2.4	4.7	10.7	2.1	6.2
Green Extension Time (g_e), s		0.5		0.0	0.3	2.2	0.0	2.2
Phase Call Probability		1.00		0.33	0.87	1.00	0.07	1.00
Max Out Probability		0.16		0.07	0.00	0.00	0.00	0.00

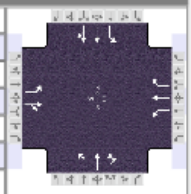
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	189	243		15		13	142	394	393	5	184	170
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1767		1844		1654	1810	1900	1894	1810	1900	1679
Queue Service Time (g_s), s	5.0	6.8		0.4		0.4	2.7	8.7	8.7	0.1	4.0	4.2
Cycle Queue Clearance Time (g_c), s	5.0	6.8		0.4		0.4	2.7	8.7	8.7	0.1	4.0	4.2
Green Ratio (*g/C*)	0.18	0.18		0.04		0.04	0.39	0.36	0.36	0.29	0.29	0.29
Capacity (*c*), veh/h	325	318		71		64	505	692	690	260	545	481
Volume-to-Capacity Ratio (*X*)	0.581	0.765		0.207		0.208	0.282	0.569	0.569	0.018	0.337	0.354
Back of Queue (*Q*), ft/ln (95 th percentile)	86	118		8		7	40	137	136	2	67	63
Back of Queue (*Q*), veh/ln (95 th percentile)	3.5	4.7		0.3		0.3	1.6	5.5	5.5	0.1	2.7	2.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.17	0.24		0.17		0.16	0.21	0.27	0.27	0.02	0.13	0.13
Uniform Delay (d_1), s/veh	19.7	20.4		24.4		24.4	10.8	13.3	13.3	13.5	14.7	14.8
Incremental Delay (d_2), s/veh	0.6	1.5		0.5		0.6	0.1	0.2	0.2	0.0	0.1	0.2
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	20.3	21.9		24.9		25.0	10.9	13.5	13.5	13.5	14.9	15.0
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.2	C		24.9	C		13.1	B		14.9	B	
Intersection Delay, s/veh / LOS	15.7						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.20	A	0.51	A	1.08	A	0.99	A

Table 71. Pennsylvania Ave and JFK Rd Tuesday 11AM-Noon HCS 5 Year Projected Conditions

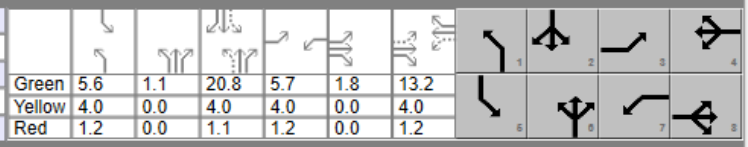
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_5YEARprojec...		
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	172	198	115	88	161	102	125	637	74	85	606	154

Signal Information			
Cycle, s	68.9	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	5.6	1.1	20.8	5.7	1.8	13.2
Yellow	4.0	0.0	4.0	4.0	0.0	4.0
Red	1.2	0.0	1.1	1.2	0.0	1.2

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.7	20.2	10.9	18.4	11.9	27.0	10.8	25.9
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	7.2	13.8	4.6	7.3	6.1	18.2	4.1	15.0
Green Extension Time (g_e), s	0.2	1.1	0.1	1.1	0.3	3.6	0.1	2.9
Phase Call Probability	1.00	1.00	0.82	1.00	0.96	1.00	0.80	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.28

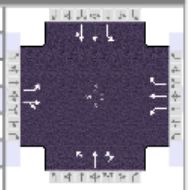
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	172	313		88	161	102	164	475	458	85	393	367
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1740		1767	1856	1572	1838	1856	1787	1838	1856	1725
Queue Service Time (g_s), s	5.2	11.8		2.6	5.3	3.9	4.1	16.2	16.2	2.1	12.9	13.0
Cycle Queue Clearance Time (g_c), s	5.2	11.8		2.6	5.3	3.9	4.1	16.2	16.2	2.1	12.9	13.0
Green Ratio (*g/C*)	0.30	0.22		0.28	0.19	0.19	0.40	0.32	0.32	0.38	0.30	0.30
Capacity (*c*), veh/h	437	379		269	356	302	367	590	568	288	561	522
Volume-to-Capacity Ratio (*X*)	0.394	0.827		0.327	0.452	0.338	0.447	0.805	0.805	0.295	0.700	0.703
Back of Queue (*Q*), ft/ln (95 th percentile)	91	213		47	102	63	70	248	235	36	236	219
Back of Queue (*Q*), veh/ln (95 th percentile)	3.6	8.3		1.8	4.0	2.5	2.7	9.7	9.4	1.4	9.2	8.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.50	0.00		0.41	0.00	0.55	0.70	0.00	0.00	0.30	0.00	0.00
Uniform Delay (d_1), s/veh	18.9	25.8		20.3	24.7	24.1	15.2	21.6	21.6	16.2	21.3	21.3
Incremental Delay (d_2), s/veh	0.2	1.8		0.3	0.3	0.2	0.2	0.6	0.6	0.2	1.8	2.0
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	19.2	27.6		20.5	25.0	24.4	15.4	22.2	22.2	16.4	23.1	23.3
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	24.6	C		23.7	C		21.2	C		22.5	C	
Intersection Delay, s/veh / LOS	22.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.29	A	1.07	A	1.18	A	1.18	A

Table 72. Pennsylvania Ave and JFK Rd Tuesday 11AM-Noon HCS 5 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_5YEARprojec...		
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	172	198	115	88	161	102	125	637	74	85	606	154

Signal Information												
Cycle, s	69.1	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	5.7	1.0	21.1	5.8	1.9	12.9		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0		
				Red	1.2	0.0	1.1	1.2	0.0	1.2		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.9	20.0	11.0	18.1	11.9	27.3	10.9	26.2
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	7.3	14.0	4.7	7.4	6.1	18.3	4.1	15.0
Green Extension Time (*g e*), s	0.3	0.6	0.2	0.4	0.3	3.7	0.1	3.6
Phase Call Probability	1.00	1.00	0.82	1.00	0.96	1.00	0.81	1.00
Max Out Probability	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.01

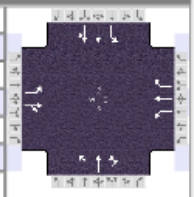
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	172	313		88	161	102	164	475	458	85	393	367
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1740		1767	1856	1572	1838	1856	1787	1838	1856	1725
Queue Service Time (*g s*), s	5.3	12.0		2.7	5.4	3.9	4.1	16.3	16.3	2.1	13.0	13.0
Cycle Queue Clearance Time (*g c*), s	5.3	12.0		2.7	5.4	3.9	4.1	16.3	16.3	2.1	13.0	13.0
Green Ratio (*g/C*)	0.30	0.21		0.27	0.19	0.19	0.41	0.32	0.32	0.39	0.31	0.31
Capacity (*c*), veh/h	437	374		267	347	294	371	597	576	293	570	530
Volume-to-Capacity Ratio (*X*)	0.394	0.836		0.329	0.464	0.347	0.442	0.795	0.795	0.290	0.690	0.692
Back of Queue (*Q*), ft/ln (95 th percentile)	93	215		48	104	64	70	253	240	36	230	213
Back of Queue (*Q*), veh/ln (95 th percentile)	3.6	8.4		1.9	4.1	2.5	2.8	9.9	9.6	1.4	9.0	8.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.51	0.00		0.41	0.00	0.56	0.70	0.00	0.00	0.30	0.00	0.00
Uniform Delay (*d 1*), s/veh	19.2	26.2		20.6	25.2	24.6	15.1	21.5	21.5	16.0	21.2	21.2
Incremental Delay (*d 2*), s/veh	0.2	2.0		0.3	0.4	0.3	0.2	0.6	0.6	0.2	0.6	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	19.4	28.1		20.9	25.6	24.9	15.3	22.1	22.2	16.2	21.8	21.8
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	25.0	C		24.2	C		21.1	C		21.2	C	
Intersection Delay, s/veh / LOS	22.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.29	A	1.07	A	1.18	A	1.18	A

Table 73. Pennsylvania Ave and JFK Rd Tuesday 4-5PM HCS 5 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_5YEARprojec...		
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	181	309	101	80	246	78	124	678	61	85	637	148

Signal Information			
Cycle, s	72.0	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	5.4	1.3	19.8	5.6	1.9	17.4	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.7	24.5	10.8	22.6	11.9	26.2	10.6	24.9
Change Period, (*Y+Rc*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s	7.4	17.9	4.3	10.4	6.2	19.2	3.9	14.0
Green Extension Time (*ge*), s	0.3	1.3	0.1	1.4	0.3	1.8	0.1	0.0
Phase Call Probability	0.97	1.00	0.80	1.00	0.96	1.00	0.77	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.09	0.00	1.00

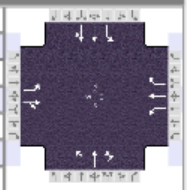
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	181	410		80	246	78	155	468	455	72	344	324
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1777		1767	1856	1572	1838	1856	1801	1838	1856	1734
Queue Service Time (*gs*), s	5.4	15.9		2.3	8.4	2.9	4.2	17.2	17.2	1.9	11.9	12.0
Cycle Queue Clearance Time (*gc*), s	5.4	15.9		2.3	8.4	2.9	4.2	17.2	17.2	1.9	11.9	12.0
Green Ratio (*g/C*)	0.35	0.27		0.32	0.24	0.24	0.37	0.29	0.29	0.35	0.27	0.27
Capacity (*c*), veh/h	425	476		257	448	380	357	544	528	254	510	477
Volume-to-Capacity Ratio (*X*)	0.426	0.862		0.311	0.549	0.205	0.434	0.861	0.861	0.285	0.674	0.678
Back of Queue (*Q*), ft/ln (95 th percentile)	94	272		41	160	46	75	272	260	35	210	196
Back of Queue (*Q*), veh/ln (95 th percentile)	3.7	10.6		1.6	6.3	1.8	2.9	10.6	10.4	1.4	8.2	7.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.52	0.00		0.36	0.00	0.40	0.75	0.00	0.00	0.29	0.00	0.00
Uniform Delay (*d1*), s/veh	17.8	25.2		19.4	23.9	21.8	17.0	24.1	24.1	18.4	23.3	23.3
Incremental Delay (*d2*), s/veh	0.3	2.1		0.3	0.4	0.1	0.2	1.8	1.9	0.2	2.0	2.3
Initial Queue Delay (*d3*), 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	18.1	27.3		19.7	24.3	21.9	17.2	25.9	26.0	18.6	25.3	25.6
Level of Service (LOS)	B	C		B	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	24.4	C		22.9	C		24.7	C		24.8	C	
Intersection Delay, s/veh / LOS	24.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.92	B
Bicycle LOS Score / LOS	1.46	A	1.15	A	1.20	A	1.21	A

Table 74. Pennsylvania Ave and JFK Rd Tuesday 4-5PM HCS 5 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_5YEARprojec...		
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	181	309	101	80	246	78	124	678	61	85	637	148

Signal Information												
Cycle, s	74.4	Reference Phase	2									
Offset, s	102	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	5.5	1.3	21.7	5.7	2.2	17.4		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0		
				Red	1.2	0.0	1.1	1.2	0.0	1.2		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.1	24.8	10.9	22.6	11.9	28.0	10.7	26.8
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	7.6	18.5	4.4	10.8	6.3	19.5	3.9	14.1
Green Extension Time (g_e), s	0.3	0.8	0.1	0.6	0.3	3.3	0.1	3.4
Phase Call Probability	0.98	1.00	0.81	1.00	0.96	1.00	0.78	1.00
Max Out Probability	0.00	0.00	0.00	0.94	0.00	0.02	0.00	0.00

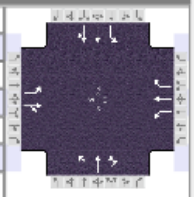
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	181	410		80	246	78	155	468	455	72	344	324
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1777		1767	1856	1572	1838	1856	1801	1838	1856	1734
Queue Service Time (g_s), s	5.6	16.5		2.4	8.8	3.0	4.3	17.5	17.5	1.9	12.1	12.1
Cycle Queue Clearance Time (g_c), s	5.6	16.5		2.4	8.8	3.0	4.3	17.5	17.5	1.9	12.1	12.1
Green Ratio (*g/C*)	0.34	0.26		0.31	0.23	0.23	0.39	0.31	0.31	0.37	0.29	0.29
Capacity (*c*), veh/h	418	469		249	435	369	368	574	557	263	543	508
Volume-to-Capacity Ratio (*X*)	0.433	0.874		0.322	0.565	0.212	0.421	0.816	0.816	0.275	0.633	0.637
Back of Queue (*Q*), ft/ln (95 th percentile)	100	283		44	174	49	76	275	262	35	207	192
Back of Queue (*Q*), veh/ln (95 th percentile)	3.9	11.1		1.7	6.8	1.9	3.0	10.7	10.5	1.4	8.1	7.7
Queue Storage Ratio (*RQ*) (95 th percentile)	0.55	0.00		0.38	0.00	0.43	0.76	0.00	0.00	0.29	0.00	0.00
Uniform Delay (d_1), s/veh	18.7	26.4		20.5	25.3	23.1	16.7	23.9	23.9	18.1	23.0	23.0
Incremental Delay (d_2), s/veh	0.3	2.1		0.3	1.1	0.1	0.2	0.7	0.8	0.2	0.3	0.4
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	19.0	28.5		20.8	26.4	23.2	16.9	24.6	24.6	18.3	23.3	23.4
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	25.6	C		24.7	C		23.5	C		22.9	C	
Intersection Delay, s/veh / LOS	23.9						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.46	A	1.15	A	1.20	A	1.21	A

Table 75. Pennsylvania Ave and JFK Rd Tuesday 5-6PM HCS 5 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_5YEARprojec...		
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	189	334	117	104	263	90	140	799	82	108	682	183

Signal Information													
Cycle, s	75.6	Reference Phase	2										
Offset, s	0	Reference Point	End	Green	5.7	0.9	20.2	6.2	1.6	20.2			
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0			
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.2	0.0	1.1	1.2	0.0	1.2			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.1	27.1	11.4	25.4	11.8	26.2	10.9	25.3
Change Period, (*Y+Rc*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s	7.7	20.4	5.1	11.2	6.0	19.4	4.3	14.2
Green Extension Time (*ge*), s	0.3	1.4	0.1	1.6	0.2	1.7	0.1	0.0
Phase Call Probability	0.98	1.00	0.89	1.00	0.95	1.00	0.82	1.00
Max Out Probability	0.00	0.02	0.00	0.00	0.00	0.08	0.00	1.00

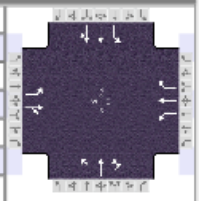
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	189	451		104	263	90	140	448	433	80	332	310
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1773		1767	1856	1572	1838	1856	1794	1838	1856	1720
Queue Service Time (*gs*), s	5.7	18.4		3.1	9.2	3.4	4.0	17.4	17.4	2.3	12.1	12.2
Cycle Queue Clearance Time (*gc*), s	5.7	18.4		3.1	9.2	3.4	4.0	17.4	17.4	2.3	12.1	12.2
Green Ratio (*g/C*)	0.37	0.29		0.35	0.27	0.27	0.36	0.28	0.28	0.34	0.27	0.27
Capacity (*c*), veh/h	442	513		260	497	421	343	519	502	250	496	460
Volume-to-Capacity Ratio (*X*)	0.428	0.879		0.401	0.529	0.214	0.408	0.863	0.863	0.321	0.669	0.674
Back of Queue (*Q*), ft/ln (95 th percentile)	100	324		55	176	54	74	310	295	42	215	200
Back of Queue (*Q*), veh/ln (95 th percentile)	3.9	12.6		2.1	6.9	2.1	2.9	12.1	11.8	1.6	8.4	8.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.55	0.00		0.48	0.00	0.47	0.74	0.00	0.00	0.35	0.00	0.00
Uniform Delay (*d1*), s/veh	17.4	25.7		19.6	23.7	21.6	18.2	25.9	25.9	19.6	24.8	24.8
Incremental Delay (*d2*), s/veh	0.2	5.8		0.4	0.3	0.1	0.3	3.2	3.4	0.2	2.0	2.3
Initial Queue Delay (*d3*), 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	17.7	31.5		20.0	24.0	21.6	18.5	29.1	29.3	19.8	26.7	27.1
Level of Service (LOS)	B	C		B	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	27.4	C		22.6	C		27.7	C		26.1	C	
Intersection Delay, s/veh / LOS	26.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.54	B	1.24	A	1.33	A	1.29	A

Table 76. Pennsylvania Ave and JFK Rd Tuesday 5-6PM HCS 5 Year Projected Conditions Optimized

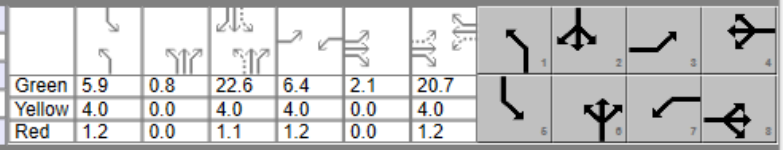
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_5YEARprojec...		
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	189	334	117	104	263	90	140	799	82	108	682	183

Signal Information			
Cycle, s	79.1	Reference Phase	2
Offset, s	110	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	5.9	0.8	22.6	6.4	2.1	20.7	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.6	27.9	11.6	25.9	11.9	28.6	11.1	27.7
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	8.0	21.4	5.3	11.8	6.1	19.9	4.3	14.6
Green Extension Time (*g e*), s	0.3	0.9	0.2	1.2	0.2	3.2	0.1	3.2
Phase Call Probability	0.99	1.00	0.90	1.00	0.96	1.00	0.83	1.00
Max Out Probability	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00

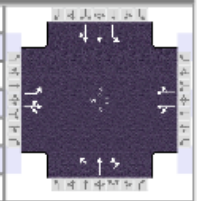
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	189	451		104	263	90	140	448	433	80	332	310
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1773		1767	1856	1572	1838	1856	1794	1838	1856	1720
Queue Service Time (*g s*), s	6.0	19.4		3.3	9.8	3.6	4.1	17.9	17.9	2.3	12.4	12.6
Cycle Queue Clearance Time (*g c*), s	6.0	19.4		3.3	9.8	3.6	4.1	17.9	17.9	2.3	12.4	12.6
Green Ratio (*g/C*)	0.37	0.29		0.35	0.26	0.26	0.38	0.30	0.30	0.37	0.29	0.29
Capacity (*c*), veh/h	437	513		253	486	412	356	553	535	260	534	495
Volume-to-Capacity Ratio (*X*)	0.432	0.880		0.412	0.541	0.218	0.394	0.810	0.810	0.309	0.622	0.627
Back of Queue (*Q*), ft/ln (95 th percentile)	107	322		60	192	59	77	308	294	43	215	199
Back of Queue (*Q*), veh/ln (95 th percentile)	4.2	12.6		2.3	7.5	2.3	3.0	12.1	11.7	1.7	8.4	8.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.59	0.00		0.52	0.00	0.51	0.77	0.00	0.00	0.36	0.00	0.00
Uniform Delay (*d 1*), s/veh	18.5	27.1		21.0	25.4	23.1	18.2	26.0	26.0	19.6	24.7	24.8
Incremental Delay (*d 2*), s/veh	0.3	2.0		0.4	0.7	0.1	0.3	1.1	1.1	0.2	0.3	0.4
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	18.8	29.2		21.4	26.1	23.2	18.5	27.1	27.1	19.8	25.1	25.1
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	26.1	C		24.4	C		25.9	C		24.5	C	
Intersection Delay, s/veh / LOS	25.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.54	B	1.24	A	1.33	A	1.29	A

Table 77. Wacker Dr and JFK Rd Tuesday 11AM-Noon HCS 5 Year Projected Conditions

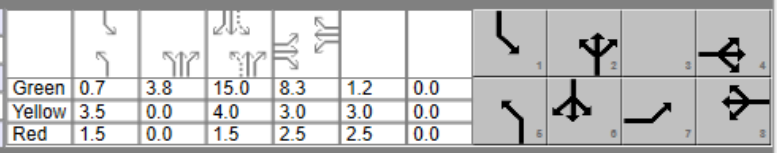
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 11AM-NOON	File Name	TUESDAY Intersection (Wacker-JFK)_5YEARproj...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	301	6	51	6	2	8	81	519	5	14	406	224

Signal Information			
Cycle, s	50.5	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	0.7	3.8	15.0	8.3	1.2	0.0
Yellow	3.5	0.0	4.0	3.0	3.0	0.0
Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		13.8		6.7	9.5	24.3	5.7	20.5
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		7.6		2.2	4.9	13.6	2.2	7.9
Green Extension Time (g_e), s		0.7		0.0	0.2	3.2	0.0	3.2
Phase Call Probability		0.99		0.20	0.89	1.00	0.15	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.00

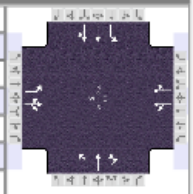
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	151	208		8		8	157	507	505	11	264	240
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1762		1831		1610	1810	1900	1893	1810	1900	1675
Queue Service Time (g_s), s	3.8	5.6		0.2		0.2	2.9	11.6	11.6	0.2	5.7	5.9
Cycle Queue Clearance Time (g_c), s	3.8	5.6		0.2		0.2	2.9	11.6	11.6	0.2	5.7	5.9
Green Ratio (*g/C*)	0.16	0.16		0.02		0.02	0.40	0.37	0.37	0.31	0.30	0.30
Capacity (*c*), veh/h	298	290		44		39	467	706	704	226	564	497
Volume-to-Capacity Ratio (*X*)	0.505	0.716		0.182		0.206	0.335	0.718	0.718	0.049	0.469	0.482
Back of Queue (*Q*), ft/ln (95 th percentile)	66	96		4		4	41	161	161	3	95	86
Back of Queue (*Q*), veh/ln (95 th percentile)	2.6	3.8		0.2		0.2	1.6	6.4	6.4	0.1	3.8	3.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.13	0.19		0.09		0.10	0.21	0.32	0.32	0.05	0.19	0.17
Uniform Delay (d_1), s/veh	19.2	20.0		24.2		24.2	10.4	13.6	13.6	13.0	14.5	14.6
Incremental Delay (d_2), s/veh	0.5	1.3		0.7		1.0	0.1	0.3	0.3	0.0	0.2	0.2
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	19.7	21.3		24.9		25.2	10.5	13.9	13.9	13.1	14.7	14.8
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	20.6	C		25.0	C		13.4	B		14.7	B	
Intersection Delay, s/veh / LOS	15.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.08	A	0.50	A	0.99	A	1.02	A

Table 78. Wacker Dr and JFK Rd Tuesday 11AM-Noon HCS 5 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 11AM-NOON	File Name	TUESDAY Intersection (Wacker-JFK)_5YEARproj...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	301	6	51	6	2	8	81	519	5	14	406	224

Signal Information			
Cycle, s	50.1	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	0.7	3.7	15.0	7.9	1.2	0.0	
Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
Red	1.5	0.0	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		13.4		6.7	9.5	24.2	5.7	20.5
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		7.6		2.2	4.8	13.4	2.2	7.9
Green Extension Time (g_e), s		0.3		0.0	0.1	3.2	0.0	3.2
Phase Call Probability		0.99		0.20	0.89	1.00	0.14	1.00
Max Out Probability		0.45		0.00	0.10	0.00	0.00	0.00

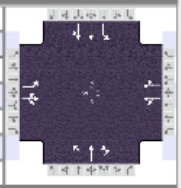
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	151	208		8		8	156	506	505	11	264	240
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1762		1831		1610	1810	1900	1893	1810	1900	1675
Queue Service Time (g_s), s	3.8	5.6		0.2		0.2	2.8	11.4	11.4	0.2	5.7	5.9
Cycle Queue Clearance Time (g_c), s	3.8	5.6		0.2		0.2	2.8	11.4	11.4	0.2	5.7	5.9
Green Ratio (*g/C*)	0.16	0.16		0.02		0.02	0.40	0.37	0.37	0.31	0.30	0.30
Capacity (*c*), veh/h	287	280		44		39	472	710	708	230	569	501
Volume-to-Capacity Ratio (*X*)	0.524	0.741		0.181		0.206	0.331	0.713	0.713	0.049	0.465	0.478
Back of Queue (*Q*), ft/ln (95 th percentile)	66	96		4		4	40	158	158	3	93	85
Back of Queue (*Q*), veh/ln (95 th percentile)	2.6	3.9		0.2		0.2	1.6	6.3	6.3	0.1	3.7	3.4
Queue Storage Ratio (*RQ*) (95 th percentile)	0.13	0.19		0.09		0.09	0.21	0.32	0.32	0.05	0.19	0.17
Uniform Delay (d_1), s/veh	19.4	20.1		24.0		24.0	10.3	13.4	13.4	12.8	14.3	14.4
Incremental Delay (d_2), s/veh	0.6	1.5		0.7		1.0	0.1	0.3	0.3	0.0	0.2	0.2
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	19.9	21.6		24.7		25.0	10.4	13.7	13.7	12.9	14.5	14.6
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	20.9	C		24.8	C		13.2	B		14.5	B	
Intersection Delay, s/veh / LOS	15.0						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.08	A	0.50	A	0.99	A	1.02	A

Table 79. Wacker Dr and JFK Rd Tuesday 4-5PM HCS 5 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 4-5PM	File Name	TUESDAY Intersection (Wacker-JFK)_5YEARproj...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	365	2	66	5	9	6	100	616	5	21	482	224

Signal Information			
Cycle, s	51.6	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	0.6	3.2	15.0	9.8	1.5	0.0	
Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
Red	1.5	0.0	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		15.3		7.0	8.8	23.7	5.6	20.5
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		9.0		2.3	3.9	8.5	2.2	5.4
Green Extension Time (*g e*), s		0.9		0.0	0.1	1.7	0.0	1.7
Phase Call Probability		1.00		0.25	0.76	1.00	0.12	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.00

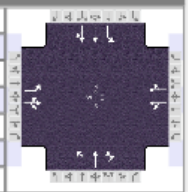
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	183	251		10		10	100	311	310	9	154	145
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1757		1856		1706	1810	1900	1895	1810	1900	1700
Queue Service Time (*g s*), s	4.7	7.0		0.3		0.3	1.9	6.5	6.5	0.2	3.2	3.4
Cycle Queue Clearance Time (*g c*), s	4.7	7.0		0.3		0.3	1.9	6.5	6.5	0.2	3.2	3.4
Green Ratio (*g/C*)	0.19	0.19		0.03		0.03	0.37	0.35	0.35	0.30	0.29	0.29
Capacity (*c*), veh/h	344	334		54		50	519	670	668	313	552	494
Volume-to-Capacity Ratio (*X*)	0.530	0.750		0.194		0.192	0.193	0.464	0.464	0.028	0.279	0.294
Back of Queue (*Q*), ft/ln (95 th percentile)	80	118		6		5	29	105	105	3	54	51
Back of Queue (*Q*), veh/ln (95 th percentile)	3.2	4.7		0.2		0.2	1.1	4.2	4.2	0.1	2.2	2.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.23		0.12		0.11	0.15	0.21	0.21	0.05	0.11	0.10
Uniform Delay (*d 1*), s/veh	18.8	19.7		24.5		24.5	11.0	12.9	12.9	12.9	14.1	14.2
Incremental Delay (*d 2*), s/veh	0.5	1.3		0.6		0.7	0.1	0.2	0.2	0.0	0.1	0.1
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	19.3	21.0		25.1		25.2	11.1	13.1	13.1	12.9	14.2	14.3
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	20.3	C		25.1	C		12.8	B		14.2	B	
Intersection Delay, s/veh / LOS	15.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.20	A	0.50	A	1.08	A	1.09	A

Table 80. Wacker Dr and JFK Rd Tuesday 4-5PM HCS 5 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 4-5PM	File Name	TUESDAY Intersection (Wacker-JFK)_5YEARproj…		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	365	2	66	5	9	6	100	616	5	21	482	224

Signal Information			
Cycle, s	51.5	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	0.6	3.2	15.0	9.7	1.5	0.0	
Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
Red	1.5	0.0	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		15.2		7.0	8.8	23.7	5.6	20.5
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		9.0		2.3	3.9	8.5	2.2	5.4
Green Extension Time (g_e), s		0.7		0.0	0.0	1.7	0.0	1.7
Phase Call Probability		1.00		0.25	0.76	1.00	0.12	1.00
Max Out Probability		0.01		0.00	1.00	0.00	0.00	0.00

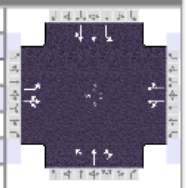
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	183	251		10		10	100	311	310	9	154	145
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1757		1856		1706	1810	1900	1895	1810	1900	1700
Queue Service Time (g_s), s	4.7	7.0		0.3		0.3	1.9	6.5	6.5	0.2	3.2	3.4
Cycle Queue Clearance Time (g_c), s	4.7	7.0		0.3		0.3	1.9	6.5	6.5	0.2	3.2	3.4
Green Ratio (*g/C*)	0.19	0.19		0.03		0.03	0.37	0.35	0.35	0.30	0.29	0.29
Capacity (*c*), veh/h	341	332		55		50	520	671	669	314	553	495
Volume-to-Capacity Ratio (*X*)	0.534	0.755		0.192		0.189	0.192	0.463	0.463	0.028	0.278	0.293
Back of Queue (*Q*), ft/ln (95 th percentile)	80	118		6		5	28	104	104	3	54	51
Back of Queue (*Q*), veh/ln (95 th percentile)	3.2	4.7		0.2		0.2	1.1	4.2	4.2	0.1	2.1	2.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.24		0.12		0.11	0.15	0.21	0.21	0.05	0.11	0.10
Uniform Delay (d_1), s/veh	18.9	19.8		24.4		24.4	11.0	12.9	12.9	12.9	14.1	14.2
Incremental Delay (d_2), s/veh	0.5	1.3		0.6		0.7	0.1	0.2	0.2	0.0	0.1	0.1
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	19.4	21.1		25.1		25.1	11.1	13.1	13.1	12.9	14.2	14.3
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	20.4	C		25.1	C		12.8	B		14.2	B	
Intersection Delay, s/veh / LOS	15.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.20	A	0.50	A	1.08	A	1.09	A

Table 81. Wacker Dr and JFK Rd Tuesday 5-6PM HCS 5 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 5-6PM	File Name	TUESDAY Intersection (Wacker-JFK)_5YEARproj…		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	394	2	55	9	8	11	115	634	5	8	410	224

Signal Information											
Cycle, s	53.2	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On	Green	0.3	4.1	15.0	10.1	2.0	0.0	
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
				Red	1.5	0.0	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		15.6		7.5	9.5	24.7	5.3	20.5
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		9.2		2.4	4.9	11.4	2.1	6.6
Green Extension Time (*g e*), s		0.9		0.0	0.2	2.3	0.0	2.3
Phase Call Probability		1.00		0.34	0.89	1.00	0.07	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.00

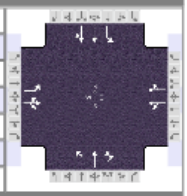
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	197	254		15		13	147	410	409	5	196	181
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1767		1844		1654	1810	1900	1895	1810	1900	1678
Queue Service Time (*g s*), s	5.3	7.2		0.4		0.4	2.9	9.4	9.4	0.1	4.4	4.6
Cycle Queue Clearance Time (*g c*), s	5.3	7.2		0.4		0.4	2.9	9.4	9.4	0.1	4.4	4.6
Green Ratio (*g/C*)	0.19	0.19		0.04		0.04	0.39	0.36	0.36	0.29	0.28	0.28
Capacity (*c*), veh/h	345	337		71		63	488	684	683	246	536	473
Volume-to-Capacity Ratio (*X*)	0.571	0.754		0.208		0.209	0.302	0.599	0.599	0.019	0.366	0.382
Back of Queue (*Q*), ft/ln (95 th percentile)	90	124		8		7	43	146	146	2	75	69
Back of Queue (*Q*), veh/ln (95 th percentile)	3.6	4.9		0.3		0.3	1.7	5.8	5.8	0.1	3.0	2.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.18	0.25		0.18		0.16	0.22	0.29	0.29	0.03	0.15	0.14
Uniform Delay (*d 1*), s/veh	19.5	20.3		24.8		24.8	11.2	13.9	13.9	14.0	15.3	15.4
Incremental Delay (*d 2*), s/veh	0.6	1.3		0.5		0.6	0.1	0.2	0.2	0.0	0.1	0.2
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	20.1	21.6		25.3		25.4	11.3	14.1	14.1	14.0	15.4	15.5
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.0	C		25.4	C		13.7	B		15.5	B	
Intersection Delay, s/veh / LOS	16.0						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.23	A	0.51	A	1.11	A	1.02	A

Table 82. Wacker Dr and JFK Rd Tuesday 5-6PM HCS 5 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 5-6PM	File Name	TUESDAY Intersection (Wacker-JFK)_5YEARproj…		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	394	2	55	9	8	11	115	634	5	8	410	224

Signal Information										
Cycle, s	53.1	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	Yes	Simult. Gap E/W	On	Green	0.3	4.1	15.0	10.1	2.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.0	3.0	3.0	0.0
				Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		15.6		7.5	9.4	24.6	5.3	20.5
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		9.2		2.4	4.9	11.3	2.1	6.6
Green Extension Time (*g e*), s		0.9		0.0	0.1	2.3	0.0	2.3
Phase Call Probability		1.00		0.34	0.89	1.00	0.07	1.00
Max Out Probability		0.00		0.00	1.00	0.00	0.00	0.00

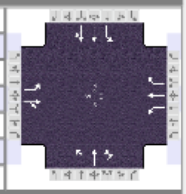
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	197	254		15		13	147	409	408	5	196	181
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1767		1844		1654	1810	1900	1895	1810	1900	1678
Queue Service Time (*g s*), s	5.3	7.2		0.4		0.4	2.9	9.3	9.3	0.1	4.4	4.6
Cycle Queue Clearance Time (*g c*), s	5.3	7.2		0.4		0.4	2.9	9.3	9.3	0.1	4.4	4.6
Green Ratio (*g/C*)	0.19	0.19		0.04		0.04	0.39	0.36	0.36	0.29	0.28	0.28
Capacity (*c*), veh/h	344	336		71		64	487	684	682	246	537	474
Volume-to-Capacity Ratio (*X*)	0.572	0.755		0.208		0.209	0.302	0.599	0.599	0.019	0.365	0.382
Back of Queue (*Q*), ft/ln (95 th percentile)	90	123		8		7	43	145	144	2	75	69
Back of Queue (*Q*), veh/ln (95 th percentile)	3.6	4.9		0.3		0.3	1.7	5.8	5.8	0.1	3.0	2.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.18	0.25		0.17		0.16	0.22	0.29	0.29	0.03	0.15	0.14
Uniform Delay (*d 1*), s/veh	19.5	20.3		24.8		24.8	11.2	13.9	13.9	14.0	15.2	15.3
Incremental Delay (*d 2*), s/veh	0.6	1.3		0.5		0.6	0.1	0.2	0.2	0.0	0.1	0.2
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	20.1	21.6		25.3		25.4	11.3	14.1	14.1	14.0	15.4	15.5
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.0	C		25.3	C		13.7	B		15.4	B	
Intersection Delay, s/veh / LOS	16.0						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.23	A	0.51	A	1.11	A	1.02	A

Table 83. Pennsylvania Ave and JFK Rd Tuesday 11AM-Noon HCS 10 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_10YEARproje...		
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	181	208	120	93	169	107	131	669	77	89	637	162

Signal Information			
Cycle, s	72.7	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	5.9	0.9	23.0	5.9	2.1	14.2						
Yellow	4.0	0.0	4.0	4.0	0.0	4.0						
Red	1.2	0.0	1.1	1.2	0.0	1.2						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.2	21.5	11.1	19.4	12.0	29.0	11.1	28.1
Change Period, (*Y+Rc*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s	7.8	15.1	4.9	7.9	6.4	20.0	4.2	16.3
Green Extension Time (*ge*), s	0.3	1.1	0.1	1.2	0.3	3.9	0.1	2.9
Phase Call Probability	1.00	1.00	0.85	1.00	0.97	1.00	0.83	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.38

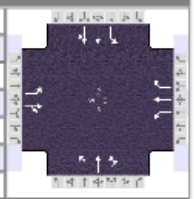
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	181	328		93	169	107	172	500	481	89	414	385
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1741		1767	1856	1572	1838	1856	1788	1838	1856	1725
Queue Service Time (*gs*), s	5.8	13.1		2.9	5.9	4.3	4.4	18.0	18.0	2.2	14.3	14.3
Cycle Queue Clearance Time (*gc*), s	5.8	13.1		2.9	5.9	4.3	4.4	18.0	18.0	2.2	14.3	14.3
Green Ratio (*g/C*)	0.31	0.22		0.28	0.20	0.20	0.41	0.33	0.33	0.40	0.32	0.32
Capacity (*c*), veh/h	434	390		261	362	307	355	611	589	279	587	546
Volume-to-Capacity Ratio (*X*)	0.417	0.840		0.356	0.467	0.349	0.485	0.818	0.818	0.319	0.704	0.706
Back of Queue (*Q*), ft/ln (95 th percentile)	102	232		53	114	70	78	272	257	40	260	242
Back of Queue (*Q*), veh/ln (95 th percentile)	4.0	9.1		2.1	4.5	2.8	3.0	10.6	10.3	1.6	10.2	9.7
Queue Storage Ratio (*RQ*) (95 th percentile)	0.56	0.00		0.46	0.00	0.61	0.78	0.00	0.00	0.33	0.00	0.00
Uniform Delay (*d1*), s/veh	19.8	27.0		21.4	25.9	25.3	15.9	22.4	22.4	16.8	21.9	21.9
Incremental Delay (*d2*), s/veh	0.2	1.9		0.3	0.3	0.3	0.2	0.6	0.6	0.2	2.6	2.8
Initial Queue Delay (*d3*), 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	20.1	28.9		21.7	26.3	25.6	16.1	23.0	23.1	17.1	24.5	24.7
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	25.8	C		24.9	C		22.0	C		23.8	C	
Intersection Delay, s/veh / LOS	23.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.33	A	1.10	A	1.21	A	1.22	A

Table 84. Pennsylvania Ave and JFK Rd Tuesday 11AM-Noon HCS 10 Year Projected Conditions Optimized

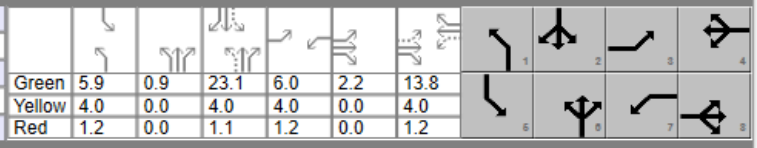
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_10YEARproje...		
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	181	208	120	93	169	107	131	669	77	89	637	162

Signal Information			
Cycle, s	72.4	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	5.9	0.9	23.1	6.0	2.2	13.8	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.3	21.1	11.2	19.0	12.0	29.1	11.1	28.2
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	7.8	15.2	4.9	7.9	6.4	19.9	4.2	16.3
Green Extension Time (g_e), s	0.3	0.6	0.1	0.6	0.3	3.9	0.1	3.7
Phase Call Probability	1.00	1.00	0.85	1.00	0.97	1.00	0.83	1.00
Max Out Probability	0.00	0.00	0.00	0.61	0.00	0.00	0.00	0.10

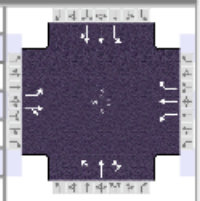
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	181	328		93	169	107	172	500	481	89	414	385
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1741		1767	1856	1572	1838	1856	1788	1838	1856	1725
Queue Service Time (g_s), s	5.8	13.2		2.9	5.9	4.3	4.4	17.9	17.9	2.2	14.2	14.3
Cycle Queue Clearance Time (g_c), s	5.8	13.2		2.9	5.9	4.3	4.4	17.9	17.9	2.2	14.2	14.3
Green Ratio (*g/C*)	0.30	0.22		0.27	0.19	0.19	0.41	0.33	0.33	0.40	0.32	0.32
Capacity (*c*), veh/h	430	384		257	353	299	358	616	594	283	592	551
Volume-to-Capacity Ratio (*X*)	0.421	0.855		0.361	0.478	0.357	0.481	0.811	0.811	0.314	0.698	0.700
Back of Queue (*Q*), ft/ln (95 th percentile)	103	234		53	115	71	77	274	260	40	248	230
Back of Queue (*Q*), veh/ln (95 th percentile)	4.0	9.1		2.1	4.5	2.8	3.0	10.7	10.4	1.5	9.7	9.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.57	0.00		0.46	0.00	0.62	0.77	0.00	0.00	0.33	0.00	0.00
Uniform Delay (d_1), s/veh	20.0	27.2		21.6	26.2	25.6	15.7	22.2	22.2	16.6	21.7	21.7
Incremental Delay (d_2), s/veh	0.2	2.2		0.3	0.4	0.3	0.2	0.6	0.7	0.2	0.6	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	20.2	29.4		21.9	26.6	25.9	15.9	22.8	22.9	16.9	22.3	22.3
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	26.2	C		25.2	C		21.8	C		21.7	C	
Intersection Delay, s/veh / LOS	23.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.33	A	1.10	A	1.21	A	1.22	A

Table 85. Pennsylvania Ave and JFK Rd Tuesday 4-5PM HCS 10 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_10YEARproje...		
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	190	325	106	84	258	82	130	712	64	89	669	156

Signal Information			
Cycle, s	76.6	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	5.6	1.2		22.1	5.8	2.3	18.9					
Yellow	4.0	0.0		4.0	4.0	0.0	4.0					
Red	1.2	0.0		1.1	1.2	0.0	1.2					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.3	26.4	11.0	24.1	12.0	28.3	10.8	27.2
Change Period, (*Y+Rc*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s	8.0	19.8	4.6	11.3	6.6	21.3	4.1	15.3
Green Extension Time (*ge*), s	0.3	1.4	0.1	1.5	0.3	1.9	0.1	0.0
Phase Call Probability	0.98	1.00	0.83	1.00	0.97	1.00	0.80	1.00
Max Out Probability	0.00	0.01	0.00	0.00	0.00	0.16	0.00	1.00

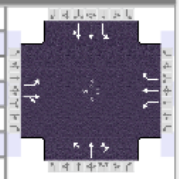
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	190	431		84	258	82	163	493	478	76	362	340
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1777		1767	1856	1572	1838	1856	1801	1838	1856	1734
Queue Service Time (*gs*), s	6.0	17.8		2.6	9.3	3.2	4.6	19.3	19.3	2.1	13.2	13.3
Cycle Queue Clearance Time (*gc*), s	6.0	17.8		2.6	9.3	3.2	4.6	19.3	19.3	2.1	13.2	13.3
Green Ratio (*g/C*)	0.35	0.28		0.32	0.25	0.25	0.38	0.30	0.30	0.36	0.29	0.29
Capacity (*c*), veh/h	422	492		247	458	388	345	564	547	244	535	500
Volume-to-Capacity Ratio (*X*)	0.451	0.875		0.340	0.563	0.211	0.471	0.875	0.875	0.310	0.676	0.680
Back of Queue (*Q*), ft/ln (95 th percentile)	106	313		47	181	52	84	308	294	39	230	214
Back of Queue (*Q*), veh/ln (95 th percentile)	4.1	12.2		1.8	7.1	2.0	3.3	12.0	11.7	1.5	9.0	8.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.58	0.00		0.41	0.00	0.45	0.84	0.00	0.00	0.32	0.00	0.00
Uniform Delay (*d1*), s/veh	18.7	26.5		20.6	25.3	23.0	17.8	25.3	25.3	19.3	24.1	24.2
Incremental Delay (*d2*), s/veh	0.3	5.0		0.3	0.4	0.1	0.2	3.4	3.5	0.2	1.9	2.1
Initial Queue Delay (*d3*), 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	31.5		20.9	25.7	23.1	18.0	28.7	28.8	19.5	26.1	26.3
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	27.6	C		24.2	C		27.2	C		25.5	C	
Intersection Delay, s/veh / LOS	26.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.51	B	1.19	A	1.24	A	1.24	A

Table 86. Pennsylvania Ave and JFK Rd Tuesday 4-5PM HCS 10 Year Projected Conditions Optimized

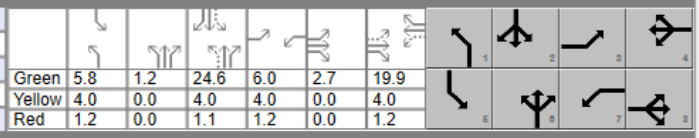
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_10YEARproje...		
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	190	325	106	84	258	82	130	712	64	89	669	156

Signal Information			
Cycle, s	80.8	Reference Phase	2
Offset, s	19	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	5.8	1.2		24.6	6.0	2.7	19.9					
Yellow	4.0	0.0		4.0	4.0	0.0	4.0					
Red	1.2	0.0		1.1	1.2	0.0	1.2					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.8	27.7	11.2	25.1	12.2	30.9	11.0	29.7
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	8.3	20.8	4.8	11.9	6.8	22.0	4.2	15.8
Green Extension Time (g_e), s	0.3	1.5	0.1	1.5	0.3	3.5	0.1	3.6
Phase Call Probability	0.99	1.00	0.85	1.00	0.97	1.00	0.82	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00

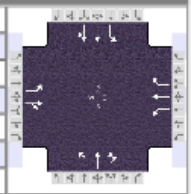
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	190	431		84	258	82	163	493	478	76	362	340
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1777		1767	1856	1572	1838	1856	1801	1838	1856	1734
Queue Service Time (g_s), s	6.3	18.8		2.8	9.9	3.4	4.8	20.0	20.0	2.2	13.7	13.8
Cycle Queue Clearance Time (g_c), s	6.3	18.8		2.8	9.9	3.4	4.8	20.0	20.0	2.2	13.7	13.8
Green Ratio (*g/C*)	0.36	0.28		0.32	0.25	0.25	0.39	0.32	0.32	0.38	0.30	0.30
Capacity (*c*), veh/h	419	497		244	457	388	353	595	577	250	567	529
Volume-to-Capacity Ratio (*X*)	0.454	0.866		0.345	0.564	0.212	0.461	0.829	0.829	0.303	0.639	0.642
Back of Queue (*Q*), ft/ln (95 th percentile)	114	316		50	195	56	88	311	296	40	232	215
Back of Queue (*Q*), veh/ln (95 th percentile)	4.4	12.3		2.0	7.6	2.2	3.4	12.1	11.8	1.6	9.1	8.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.63	0.00		0.44	0.00	0.49	0.88	0.00	0.00	0.34	0.00	0.00
Uniform Delay (d_1), s/veh	19.7	27.9		21.9	26.8	24.4	18.0	25.6	25.6	19.5	24.4	24.4
Incremental Delay (d_2), s/veh	0.3	1.9		0.3	0.4	0.1	0.2	0.7	0.8	0.2	0.3	0.4
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	20.0	29.7		22.2	27.2	24.5	18.2	26.3	26.4	19.7	24.7	24.8
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	26.8	C		25.7	C		25.2	C		24.3	C	
Intersection Delay, s/veh / LOS	25.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.51	B	1.19	A	1.24	A	1.24	A

Table 87. Pennsylvania Ave and JFK Rd Tuesday 5-6PM HCS 10 Year Projected Conditions

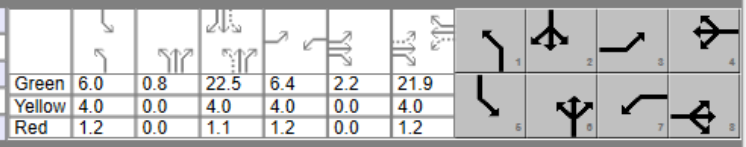
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_10YEARproje...		
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	199	351	123	109	276	95	147	840	86	114	717	192

Signal Information			
Cycle, s	80.3	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	0.8		22.5	6.4	2.2		21.9				
Yellow	4.0	0.0		4.0	4.0	0.0		4.0				
Red	1.2	0.0		1.1	1.2	0.0		1.2				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.7	29.3	11.6	27.1	11.9	28.3	11.2	27.6
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	8.3	22.6	5.4	12.2	6.5	21.4	4.5	15.5
Green Extension Time (g_e), s	0.3	1.4	0.1	1.7	0.3	1.7	0.1	0.0
Phase Call Probability	0.99	1.00	0.91	1.00	0.96	1.00	0.85	1.00
Max Out Probability	0.00	0.05	0.00	0.00	0.00	0.15	0.00	1.00

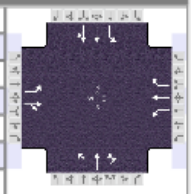
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	199	474		109	276	95	147	471	455	85	349	326
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1773		1767	1856	1572	1838	1856	1795	1838	1856	1720
Queue Service Time (g_s), s	6.3	20.6		3.4	10.2	3.8	4.5	19.4	19.4	2.5	13.4	13.5
Cycle Queue Clearance Time (g_c), s	6.3	20.6		3.4	10.2	3.8	4.5	19.4	19.4	2.5	13.4	13.5
Green Ratio (*g/C*)	0.38	0.30		0.35	0.27	0.27	0.36	0.29	0.29	0.35	0.28	0.28
Capacity (*c*), veh/h	438	531		248	506	429	332	537	520	240	519	481
Volume-to-Capacity Ratio (*X*)	0.455	0.892		0.440	0.545	0.221	0.443	0.876	0.876	0.352	0.672	0.677
Back of Queue (*Q*), ft/ln (95 th percentile)	113	374		62	198	62	83	355	339	47	235	218
Back of Queue (*Q*), veh/ln (95 th percentile)	4.4	14.6		2.4	7.7	2.4	3.2	13.9	13.5	1.8	9.2	8.7
Queue Storage Ratio (*RQ*) (95 th percentile)	0.62	0.00		0.54	0.00	0.54	0.83	0.00	0.00	0.39	0.00	0.00
Uniform Delay (d_1), s/veh	18.3	26.9		20.9	25.0	22.6	19.1	27.2	27.2	20.6	25.7	25.8
Incremental Delay (d_2), s/veh	0.3	9.6		0.5	0.3	0.1	0.3	6.1	6.3	0.2	1.9	2.2
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	18.5	36.5		21.3	25.3	22.7	19.5	33.3	33.5	20.8	27.7	27.9
Level of Service (LOS)	B	D		C	C	C	B	C	C	C	C	C
Approach Delay, s/veh / LOS	31.2	C		23.9	C		31.5	C		27.0	C	
Intersection Delay, s/veh / LOS	29.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.60	B	1.28	A	1.37	A	1.33	A

Table 88. Pennsylvania Ave and JFK Rd Tuesday 5-6PM HCS 10 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_10YEARproje...		
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	199	351	123	109	276	95	147	840	86	114	717	192

Signal Information			
Cycle, s	84.3	Reference Phase	2
Offset, s	106	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.1	0.7	25.1	6.5	0.5	24.7	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.2	30.4	11.7	29.9	12.0	30.9	11.3	30.2
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	8.7	23.8	5.5	12.5	6.6	22.0	4.6	15.9
Green Extension Time (g_e), s	0.0	1.0	0.2	1.4	0.3	3.4	0.2	3.4
Phase Call Probability	0.99	1.00	0.92	1.00	0.97	1.00	0.86	1.00
Max Out Probability	1.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00

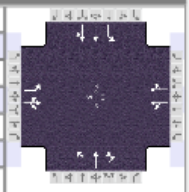
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	199	474		109	276	95	147	471	455	85	349	326
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1773		1767	1856	1572	1838	1856	1795	1838	1856	1720
Queue Service Time (g_s), s	6.7	21.8		3.5	10.5	3.9	4.6	20.0	20.0	2.6	13.8	13.9
Cycle Queue Clearance Time (g_c), s	6.7	21.8		3.5	10.5	3.9	4.6	20.0	20.0	2.6	13.8	13.9
Green Ratio (*g/C*)	0.38	0.30		0.37	0.29	0.29	0.38	0.31	0.31	0.37	0.30	0.30
Capacity (*c*), veh/h	425	532		241	547	463	342	572	553	249	555	514
Volume-to-Capacity Ratio (*X*)	0.469	0.891		0.451	0.505	0.205	0.430	0.823	0.824	0.340	0.629	0.633
Back of Queue (*Q*), ft/ln (95 th percentile)	122	358		64	202	64	86	342	325	49	236	218
Back of Queue (*Q*), veh/ln (95 th percentile)	4.8	14.0		2.5	7.9	2.5	3.4	13.4	13.0	1.9	9.2	8.7
Queue Storage Ratio (*RQ*) (95 th percentile)	0.67	0.00		0.56	0.00	0.55	0.86	0.00	0.00	0.41	0.00	0.00
Uniform Delay (d_1), s/veh	19.3	28.5		21.4	24.9	22.6	19.2	27.3	27.3	20.7	25.8	25.8
Incremental Delay (d_2), s/veh	0.3	2.2		0.5	0.3	0.1	0.3	1.2	1.2	0.2	0.3	0.4
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	19.6	30.7		21.9	25.2	22.6	19.5	28.5	28.5	20.9	26.1	26.2
Level of Service (LOS)	B	C		C	C	C	B	C	C	C	C	C
Approach Delay, s/veh / LOS	27.4	C		23.9	C		27.3	C		25.6	C	
Intersection Delay, s/veh / LOS	26.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.60	B	1.28	A	1.37	A	1.33	A

Table 89. Wacker Dr and JFK Rd Tuesday 11AM-Noon HCS 10 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 11AM-NOON	File Name	TUESDAY Intersection (Wacker-JFK)_10YEARpr...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	286	6	49	6	2	8	75	494	6	14	426	235

Signal Information			
Cycle, s	50.2	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	0.7	3.8	15.0	8.0	1.2	0.0
Yellow	3.5	0.0	4.0	3.0	3.0	0.0
Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		13.5		6.7	9.5	24.3	5.7	20.5
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		7.4		2.2	4.9	14.2	2.2	8.2
Green Extension Time (g_e), s		0.7		0.0	0.2	3.4	0.0	3.4
Phase Call Probability		0.99		0.20	0.89	1.00	0.14	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.00

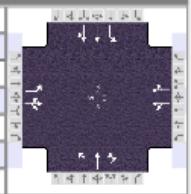
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	143	198		8		8	159	531	529	11	278	251
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1762		1831		1610	1810	1900	1892	1810	1900	1674
Queue Service Time (g_s), s	3.6	5.4		0.2		0.2	2.9	12.2	12.2	0.2	6.0	6.2
Cycle Queue Clearance Time (g_c), s	3.6	5.4		0.2		0.2	2.9	12.2	12.2	0.2	6.0	6.2
Green Ratio (*g/C*)	0.16	0.16		0.02		0.02	0.41	0.37	0.37	0.31	0.30	0.30
Capacity (*c*), veh/h	288	280		44		39	463	712	709	219	568	500
Volume-to-Capacity Ratio (*X*)	0.497	0.707		0.181		0.206	0.344	0.746	0.746	0.051	0.489	0.502
Back of Queue (*Q*), ft/ln (95 th percentile)	62	91		4		4	41	165	164	3	99	90
Back of Queue (*Q*), veh/ln (95 th percentile)	2.5	3.6		0.2		0.2	1.6	6.6	6.6	0.1	4.0	3.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.12	0.18		0.09		0.09	0.21	0.33	0.33	0.05	0.20	0.18
Uniform Delay (d_1), s/veh	19.3	20.0		24.0		24.1	10.3	13.6	13.6	13.0	14.5	14.5
Incremental Delay (d_2), s/veh	0.5	1.2		0.7		1.0	0.1	0.3	0.3	0.0	0.2	0.2
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	19.8	21.3		24.8		25.0	10.4	13.9	13.9	13.1	14.7	14.8
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	20.7	C		24.9	C		13.5	B		14.7	B	
Intersection Delay, s/veh / LOS	15.0						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.05	A	0.50	A	0.96	A	1.04	A

Table 90. Wacker Dr and JFK Rd Tuesday 11AM-Noon HCS 10 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 11AM-NOON	File Name	TUESDAY Intersection (Wacker-JFK)_10YEARpr...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	286	6	49	6	2	8	75	494	6	14	426	235

Signal Information					EB			WB			NB			SB		
Cycle, s	49.8	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	Yes	Simult. Gap E/W	On	Green	0.7	3.7		15.0	7.6	1.2	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0		4.0	3.0	3.0	0.0					
				Red	1.5	0.0		1.5	2.5	2.5	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		13.1		6.7	9.5	24.2	5.7	20.5
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		7.3		2.2	4.8	13.9	2.2	8.1
Green Extension Time (g_e), s		0.3		0.0	0.1	3.4	0.0	3.4
Phase Call Probability		0.99		0.20	0.89	1.00	0.14	1.00
Max Out Probability		0.74		0.00	0.94	0.00	0.00	0.00

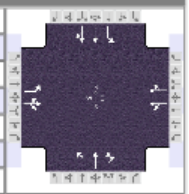
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	143	198		8		8	158	527	525	11	278	251
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1762		1831		1610	1810	1900	1892	1810	1900	1674
Queue Service Time (g_s), s	3.6	5.3		0.2		0.2	2.8	11.9	11.9	0.2	6.0	6.1
Cycle Queue Clearance Time (g_c), s	3.6	5.3		0.2		0.2	2.8	11.9	11.9	0.2	6.0	6.1
Green Ratio (*g/C*)	0.15	0.15		0.02		0.02	0.41	0.38	0.38	0.32	0.30	0.30
Capacity (*c*), veh/h	277	269		45		39	466	716	713	223	573	505
Volume-to-Capacity Ratio (*X*)	0.517	0.735		0.180		0.204	0.338	0.736	0.736	0.050	0.485	0.497
Back of Queue (*Q*), ft/ln (95 th percentile)	62	93		4		4	40	160	160	3	98	89
Back of Queue (*Q*), veh/ln (95 th percentile)	2.5	3.7		0.2		0.2	1.6	6.4	6.4	0.1	3.9	3.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.12	0.19		0.09		0.09	0.20	0.32	0.32	0.05	0.20	0.18
Uniform Delay (d_1), s/veh	19.4	20.1		23.8		23.8	10.2	13.4	13.4	12.8	14.2	14.3
Incremental Delay (d_2), s/veh	0.6	1.8		0.7		0.9	0.1	0.3	0.3	0.0	0.2	0.2
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	20.0	21.9		24.5		24.8	10.3	13.7	13.7	12.8	14.4	14.5
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.1	C		24.7	C		13.2	B		14.4	B	
Intersection Delay, s/veh / LOS	14.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.05	A	0.50	A	0.96	A	1.04	A

Table 91. Wacker Dr and JFK Rd Tuesday 4-5PM HCS 10 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 4-5PM	File Name	TUESDAY Intersection (Wacker-JFK)_10YEARpr...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	383	2	70	6	10	7	105	647	6	22	507	235

Signal Information			
Cycle, s	52.5	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	0.6	3.3	15.0	10.3	1.7	0.0	
Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
Red	1.5	0.0	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		15.8		7.2	8.9	23.8	5.6	20.5
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		9.4		2.3	4.1	9.1	2.2	5.6
Green Extension Time (g_e), s		0.9		0.0	0.1	1.8	0.0	1.8
Phase Call Probability		1.00		0.28	0.78	1.00	0.13	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.00

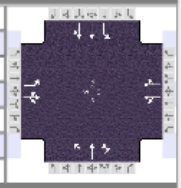
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	192	264		12		11	105	327	326	9	160	151
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1757		1854		1704	1810	1900	1894	1810	1900	1700
Queue Service Time (g_s), s	5.0	7.4		0.3		0.3	2.1	7.1	7.1	0.2	3.4	3.6
Cycle Queue Clearance Time (g_c), s	5.0	7.4		0.3		0.3	2.1	7.1	7.1	0.2	3.4	3.6
Green Ratio (*g/C*)	0.20	0.20		0.03		0.03	0.37	0.35	0.35	0.30	0.29	0.29
Capacity (*c*), veh/h	357	347		61		56	507	662	660	297	543	486
Volume-to-Capacity Ratio (*X*)	0.536	0.760		0.199		0.196	0.207	0.494	0.494	0.031	0.295	0.310
Back of Queue (*Q*), ft/ln (95 th percentile)	85	126		6		6	31	116	116	3	58	55
Back of Queue (*Q*), veh/ln (95 th percentile)	3.4	5.0		0.3		0.2	1.2	4.6	4.6	0.1	2.3	2.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.17	0.25		0.14		0.13	0.16	0.23	0.23	0.05	0.12	0.11
Uniform Delay (d_1), s/veh	18.9	19.9		24.7		24.7	11.4	13.5	13.5	13.3	14.6	14.7
Incremental Delay (d_2), s/veh	0.5	1.3		0.6		0.6	0.1	0.2	0.2	0.0	0.1	0.1
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	19.4	21.2		25.3		25.4	11.4	13.7	13.7	13.4	14.7	14.8
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	20.4	C		25.3	C		13.4	B		14.7	B	
Intersection Delay, s/veh / LOS	15.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.24	A	0.51	A	1.11	A	1.12	A

Table 92. Wacker Dr and JFK Rd Tuesday 4-5PM HCS 10 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 4-5PM	File Name	TUESDAY Intersection (Wacker-JFK)_10YEARpr...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	383	2	70	6	10	7	105	647	6	22	507	235

Signal Information			
Cycle, s	51.1	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	0.6	3.3	14.1	9.9	1.7	0.0
Yellow	3.5	0.0	4.0	3.0	3.0	0.0
Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		15.4		7.2	8.9	22.9	5.6	19.6
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		9.3		2.3	4.0	9.0	2.2	5.6
Green Extension Time (g_e), s		0.7		0.0	0.2	1.4	0.0	0.9
Phase Call Probability		1.00		0.28	0.78	1.00	0.12	1.00
Max Out Probability		0.07		0.00	0.00	0.16	0.00	0.00

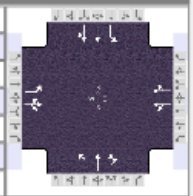
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	192	264		12		11	105	327	326	9	160	151
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1757		1854		1704	1810	1900	1894	1810	1900	1700
Queue Service Time (g_s), s	4.9	7.3		0.3		0.3	2.0	7.0	7.0	0.2	3.4	3.6
Cycle Queue Clearance Time (g_c), s	4.9	7.3		0.3		0.3	2.0	7.0	7.0	0.2	3.4	3.6
Green Ratio (*g/C*)	0.19	0.19		0.03		0.03	0.36	0.34	0.34	0.29	0.28	0.28
Capacity (*c*), veh/h	352	342		61		56	501	646	644	292	525	470
Volume-to-Capacity Ratio (*X*)	0.544	0.771		0.197		0.195	0.209	0.506	0.506	0.032	0.305	0.321
Back of Queue (*Q*), ft/ln (95 th percentile)	83	123		6		6	30	113	113	3	57	54
Back of Queue (*Q*), veh/ln (95 th percentile)	3.3	4.9		0.3		0.2	1.2	4.5	4.5	0.1	2.3	2.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.17	0.25		0.14		0.13	0.16	0.23	0.23	0.05	0.11	0.11
Uniform Delay (d_1), s/veh	18.6	19.5		24.1		24.1	11.4	13.5	13.5	13.4	14.6	14.7
Incremental Delay (d_2), s/veh	0.5	1.4		0.6		0.6	0.1	0.3	0.3	0.0	0.1	0.1
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	19.0	20.9		24.7		24.7	11.5	13.7	13.7	13.4	14.8	14.8
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	20.1	C		24.7	C		13.4	B		14.8	B	
Intersection Delay, s/veh / LOS	15.8						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.24	A	0.51	A	1.11	A	1.12	A

Table 93. Wacker Dr and JFK Rd Tuesday 5-6PM HCS 10 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 5-6PM	File Name	TUESDAY Intersection (Wacker-JFK)_10YEARpr…		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	414	2	57	10	9	12	120	666	6	9	431	235

Signal Information			
Cycle, s	54.1	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	0.4	4.3	15.0	10.7	2.2	0.0	
Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
Red	1.5	0.0	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		16.2		7.7	9.7	24.8	5.4	20.5
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		9.7		2.5	5.1	12.2	2.1	6.9
Green Extension Time (*g e*), s		1.0		0.0	0.2	2.5	0.0	2.5
Phase Call Probability		1.00		0.37	0.90	1.00	0.08	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.00

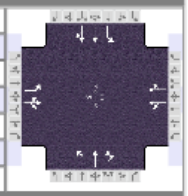
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	207	266		16		15	153	430	428	5	203	187
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1767		1843		1657	1810	1900	1894	1810	1900	1678
Queue Service Time (*g s*), s	5.6	7.7		0.5		0.5	3.1	10.2	10.2	0.1	4.7	4.9
Cycle Queue Clearance Time (*g c*), s	5.6	7.7		0.5		0.5	3.1	10.2	10.2	0.1	4.7	4.9
Green Ratio (*g/C*)	0.20	0.20		0.04		0.04	0.39	0.36	0.36	0.28	0.28	0.28
Capacity (*c*), veh/h	357	348		76		69	479	679	677	232	526	465
Volume-to-Capacity Ratio (*X*)	0.580	0.763		0.213		0.214	0.320	0.633	0.633	0.023	0.386	0.403
Back of Queue (*Q*), ft/ln (95 th percentile)	97	132		9		8	46	156	155	2	80	75
Back of Queue (*Q*), veh/ln (95 th percentile)	3.9	5.3		0.4		0.3	1.8	6.2	6.2	0.1	3.2	3.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.19	0.26		0.20		0.18	0.24	0.31	0.31	0.03	0.16	0.15
Uniform Delay (*d 1*), s/veh	19.7	20.5		25.1		25.1	11.5	14.5	14.5	14.5	15.9	15.9
Incremental Delay (*d 2*), s/veh	0.6	1.3		0.5		0.6	0.1	0.2	0.2	0.0	0.2	0.2
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	20.3	21.9		25.6		25.7	11.6	14.7	14.7	14.5	16.0	16.1
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.2	C		25.6	C		14.2	B		16.0	B	
Intersection Delay, s/veh / LOS	16.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.27	A	0.51	A	1.14	A	1.04	A

Table 94. Wacker Dr and JFK Rd Tuesday 5-6PM HCS 10 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 5-6PM	File Name	TUESDAY Intersection (Wacker-JFK)_10YEARpr...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	414	2	57	10	9	12	120	666	6	9	431	235

Signal Information										
Cycle, s	54.0	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	0.4	4.4	15.0	10.4	2.2	0.0
				Yellow	3.5	0.0	4.0	3.0	3.0	0.0
				Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		15.9		7.7	9.8	24.9	5.4	20.5
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		9.7		2.5	5.0	12.1	2.1	6.9
Green Extension Time (g_e), s		0.7		0.0	0.3	2.5	0.0	2.5
Phase Call Probability		1.00		0.37	0.90	1.00	0.08	1.00
Max Out Probability		0.09		0.00	0.00	0.00	0.00	0.00

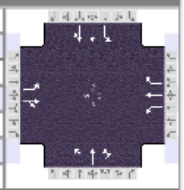
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	207	266		16		15	153	428	426	5	203	187
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1767		1843		1657	1810	1900	1894	1810	1900	1678
Queue Service Time (g_s), s	5.6	7.7		0.5		0.5	3.0	10.1	10.1	0.1	4.7	4.9
Cycle Queue Clearance Time (g_c), s	5.6	7.7		0.5		0.5	3.0	10.1	10.1	0.1	4.7	4.9
Green Ratio (*g/C*)	0.19	0.19		0.04		0.04	0.39	0.36	0.36	0.29	0.28	0.28
Capacity (*c*), veh/h	350	342		77		69	483	683	681	236	528	466
Volume-to-Capacity Ratio (*X*)	0.591	0.778		0.212		0.213	0.316	0.626	0.626	0.022	0.385	0.402
Back of Queue (*Q*), ft/ln (95 th percentile)	97	133		9		8	45	153	152	2	80	75
Back of Queue (*Q*), veh/ln (95 th percentile)	3.9	5.3		0.4		0.3	1.8	6.1	6.1	0.1	3.2	3.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.19	0.27		0.20		0.18	0.23	0.31	0.31	0.03	0.16	0.15
Uniform Delay (d_1), s/veh	19.8	20.7		25.0		25.0	11.3	14.3	14.3	14.4	15.8	15.9
Incremental Delay (d_2), s/veh	0.6	1.5		0.5		0.6	0.1	0.2	0.2	0.0	0.2	0.2
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	20.4	22.2		25.5		25.6	11.4	14.5	14.5	14.4	15.9	16.1
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.4	C		25.6	C		14.0	B		16.0	B	
Intersection Delay, s/veh / LOS	16.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.27	A	0.51	A	1.14	A	1.04	A

Table 95. Pennsylvania Ave and JFK Rd Tuesday 11AM-Noon HCS 20 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_20YEARproje...		
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	200	229	133	102	187	118	145	739	85	99	704	179

Signal Information			
Cycle, s	80.1	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	6.2	1.4		26.3	6.3	3.0		16.3				
Yellow	4.0	0.0		4.0	4.0	0.0		4.0				
Red	1.2	0.0		1.1	1.2	0.0		1.2				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	14.5	24.5	11.5	21.5	12.8	32.7	11.4	31.4
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	9.0	18.0	5.5	9.2	7.4	24.2	4.7	19.7
Green Extension Time (g_e), s	0.3	1.2	0.1	1.3	0.3	3.4	0.1	2.5
Phase Call Probability	1.00	1.00	0.90	1.00	0.99	1.00	0.89	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.72

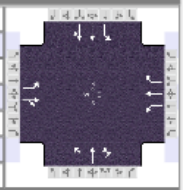
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	200	362		102	187	118	191	551	532	99	457	426
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1740		1767	1856	1572	1838	1856	1788	1838	1856	1725
Queue Service Time (g_s), s	7.0	16.0		3.5	7.2	5.2	5.4	22.2	22.2	2.7	17.6	17.7
Cycle Queue Clearance Time (g_c), s	7.0	16.0		3.5	7.2	5.2	5.4	22.2	22.2	2.7	17.6	17.7
Green Ratio (*g/C*)	0.32	0.24		0.28	0.20	0.20	0.42	0.34	0.34	0.41	0.33	0.33
Capacity (*c*), veh/h	430	419		245	377	320	334	640	617	256	608	566
Volume-to-Capacity Ratio (*X*)	0.465	0.864		0.416	0.496	0.369	0.571	0.861	0.862	0.387	0.752	0.752
Back of Queue (*Q*), ft/ln (95 th percentile)	127	277		66	142	87	96	330	312	50	325	301
Back of Queue (*Q*), veh/ln (95 th percentile)	5.0	10.8		2.6	5.6	3.4	3.8	12.9	12.5	1.9	12.7	12.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.70	0.00		0.57	0.00	0.76	0.96	0.00	0.00	0.42	0.00	0.00
Uniform Delay (d_1), s/veh	21.3	29.2		23.5	28.3	27.5	17.7	24.5	24.5	18.9	24.0	24.0
Incremental Delay (d_2), s/veh	0.3	2.5		0.4	0.4	0.3	0.3	1.2	1.3	0.4	4.8	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	0.0	0.0	0.0
Control Delay (*d*), s/veh	21.6	31.6		23.9	28.7	27.8	18.0	25.7	25.8	19.2	28.9	29.3
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	28.1	C		27.2	C		24.6	C		28.1	C	
Intersection Delay, s/veh / LOS	26.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.41	A	1.16	A	1.29	A	1.30	A

Table 96. Pennsylvania Ave and JFK Rd Tuesday 11AM-Noon HCS 20 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_20YEARproje...		
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	200	229	133	102	187	118	145	739	85	99	704	179

Signal Information													
Cycle, s	82.5	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.3	1.5	28.0	6.4	3.3	16.3			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0			
				Red	1.2	0.0	1.1	1.2	0.0	1.2			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	14.9	24.8	11.6	21.5	13.0	34.6	11.5	33.1
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	9.2	18.6	5.7	9.5	7.4	24.6	4.8	20.0
Green Extension Time (g_e), s	0.4	0.7	0.2	0.8	0.4	4.6	0.2	4.6
Phase Call Probability	1.00	1.00	0.91	1.00	0.99	1.00	0.90	1.00
Max Out Probability	0.00	0.00	0.00	0.32	0.00	0.01	0.00	0.00

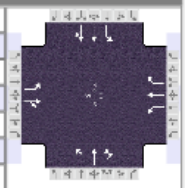
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	200	362		102	187	118	191	551	532	99	457	426
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1740		1767	1856	1572	1838	1856	1788	1838	1856	1725
Queue Service Time (g_s), s	7.2	16.6		3.7	7.5	5.4	5.4	22.6	22.6	2.8	18.0	18.0
Cycle Queue Clearance Time (g_c), s	7.2	16.6		3.7	7.5	5.4	5.4	22.6	22.6	2.8	18.0	18.0
Green Ratio (*g/C*)	0.32	0.24		0.28	0.20	0.20	0.44	0.36	0.36	0.42	0.34	0.34
Capacity (*c*), veh/h	426	416		240	368	312	342	666	641	262	632	587
Volume-to-Capacity Ratio (*X*)	0.470	0.869		0.426	0.509	0.379	0.558	0.828	0.829	0.378	0.724	0.725
Back of Queue (*Q*), ft/ln (95 th percentile)	132	287		69	150	92	98	337	319	51	307	283
Back of Queue (*Q*), veh/ln (95 th percentile)	5.2	11.2		2.7	5.9	3.6	3.8	13.2	12.8	2.0	12.0	11.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.73	0.00		0.60	0.00	0.80	0.98	0.00	0.00	0.42	0.00	0.00
Uniform Delay (d_1), s/veh	22.2	30.4		24.7	29.8	28.9	17.6	24.3	24.4	18.8	24.0	24.0
Incremental Delay (d_2), s/veh	0.3	2.3		0.4	0.5	0.3	0.3	0.6	0.6	0.3	0.6	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	22.5	32.7		25.2	30.3	29.2	17.9	25.0	25.0	19.2	24.6	24.7
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	29.1	C		28.7	C		23.9	C		24.1	C	
Intersection Delay, s/veh / LOS	25.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.41	A	1.16	A	1.29	A	1.30	A

Table 97. Pennsylvania Ave and JFK Rd Tuesday 4-5PM HCS 20 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_20YEARproje...		
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	210	359	117	93	286	90	144	787	71	99	739	172

Signal Information			
Cycle, s	87.1	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	6.1	1.9	26.3	6.3	3.4	22.4	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	14.9	31.0	11.5	27.6	13.2	33.3	11.3	31.4
Change Period, (*Y+Rc*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s	9.4	24.4	5.2	13.8	7.7	26.5	4.6	18.8
Green Extension Time (*ge*), s	0.3	1.3	0.1	1.7	0.3	1.7	0.1	0.0
Phase Call Probability	0.99	1.00	0.89	1.00	0.99	1.00	0.87	1.00
Max Out Probability	0.00	0.12	0.00	0.00	0.00	0.48	0.00	1.00

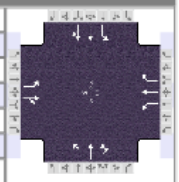
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	210	476		93	286	90	180	544	528	84	400	375
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1777		1767	1856	1572	1838	1856	1801	1838	1856	1734
Queue Service Time (*gs*), s	7.4	22.4		3.2	11.8	3.9	5.7	24.4	24.5	2.6	16.7	16.8
Cycle Queue Clearance Time (*gc*), s	7.4	22.4		3.2	11.8	3.9	5.7	24.4	24.5	2.6	16.7	16.8
Green Ratio (*g/C*)	0.37	0.30		0.33	0.26	0.26	0.39	0.32	0.32	0.37	0.30	0.30
Capacity (*c*), veh/h	412	527		225	478	405	330	601	583	222	561	524
Volume-to-Capacity Ratio (*X*)	0.510	0.903		0.414	0.598	0.222	0.546	0.905	0.905	0.379	0.714	0.716
Back of Queue (*Q*), ft/ln (95 th percentile)	135	422		61	225	66	106	399	381	50	281	262
Back of Queue (*Q*), veh/ln (95 th percentile)	5.3	16.5		2.4	8.8	2.6	4.2	15.6	15.2	1.9	11.0	10.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.74	0.00		0.53	0.00	0.57	1.06	0.00	0.00	0.41	0.00	0.00
Uniform Delay (*d1*), s/veh	20.6	29.4		23.5	28.4	25.5	19.9	28.2	28.2	21.9	27.1	27.1
Incremental Delay (*d2*), s/veh	0.4	13.6		0.5	0.4	0.1	0.3	7.9	8.1	0.3	2.4	2.6
Initial Queue Delay (*d3*), 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	21.0	43.0		23.9	28.8	25.6	20.2	36.1	36.3	22.1	29.5	29.7
Level of Service (LOS)	C	D		C	C	C	C	D	D	C	C	C
Approach Delay, s/veh / LOS	36.3	D		27.2	C		33.9	C		28.9	C	
Intersection Delay, s/veh / LOS	32.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.62	B	1.26	A	1.31	A	1.32	A

Table 98. Pennsylvania Ave and JFK Rd Tuesday 4-5PM HCS 20 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_20YEARproje...		
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	210	359	117	93	286	90	144	787	71	99	739	172

Signal Information			
Cycle, s	95.1	Reference Phase	2
Offset, s	111	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.3	0.7	32.2	6.5	4.1	24.7	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	15.8	34.0	11.7	29.9	12.2	37.9	11.5	37.3
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	10.0	26.5	5.6	15.0	8.1	28.1	4.8	19.6
Green Extension Time (g_e), s	0.4	1.7	0.2	1.7	0.0	4.1	0.2	4.2
Phase Call Probability	1.00	1.00	0.92	1.00	0.99	1.00	0.90	1.00
Max Out Probability	0.00	0.00	0.00	0.00	1.00	0.02	0.00	0.00

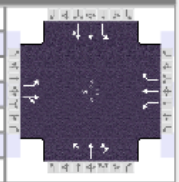
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	210	476		93	286	90	180	544	528	84	400	375
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1777		1767	1856	1572	1838	1856	1801	1838	1856	1734
Queue Service Time (g_s), s	8.0	24.5		3.6	13.0	4.3	6.1	26.1	26.1	2.8	17.5	17.6
Cycle Queue Clearance Time (g_c), s	8.0	24.5		3.6	13.0	4.3	6.1	26.1	26.1	2.8	17.5	17.6
Green Ratio (*g/C*)	0.39	0.30		0.33	0.26	0.26	0.42	0.35	0.35	0.41	0.34	0.34
Capacity (*c*), veh/h	412	542		222	484	411	326	644	625	226	632	590
Volume-to-Capacity Ratio (*X*)	0.509	0.879		0.418	0.590	0.219	0.553	0.845	0.845	0.372	0.634	0.636
Back of Queue (*Q*), ft/ln (95 th percentile)	149	401		68	246	74	118	394	375	53	287	266
Back of Queue (*Q*), veh/ln (95 th percentile)	5.8	15.7		2.7	9.6	2.9	4.6	15.4	15.0	2.1	11.2	10.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.82	0.00		0.60	0.00	0.64	1.18	0.00	0.00	0.44	0.00	0.00
Uniform Delay (d_1), s/veh	22.0	31.8		25.8	31.1	27.9	20.4	29.1	29.1	22.4	26.7	26.8
Incremental Delay (d_2), s/veh	0.4	1.9		0.5	0.4	0.1	0.7	0.7	0.7	0.3	0.3	0.3
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	22.4	33.7		26.2	31.6	28.0	21.1	29.8	29.8	22.7	27.0	27.1
Level of Service (LOS)	C	C		C	C	C	C	C	C	C	C	C
Approach Delay, s/veh / LOS	30.3	C		29.8	C		28.6	C		26.6	C	
Intersection Delay, s/veh / LOS	28.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.62	B	1.26	A	1.31	A	1.32	A

Table 99. Pennsylvania Ave and JFK Rd Tuesday 5-6PM HCS 20 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_20YEARproje...		
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	220	388	135	121	305	105	162	927	95	126	792	212

Signal Information											
Cycle, s	90.9	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.3	1.3	26.8	6.7	3.4	25.6	
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
				Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	15.3	34.3	11.9	30.8	12.8	33.2	11.5	31.9
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	9.8	27.9	6.3	14.8	7.5	26.4	5.1	18.9
Green Extension Time (g_e), s	0.3	1.2	0.2	1.8	0.3	1.6	0.1	0.0
Phase Call Probability	1.00	1.00	0.95	1.00	0.98	1.00	0.91	1.00
Max Out Probability	0.00	0.48	0.00	0.00	0.00	0.46	0.00	1.00

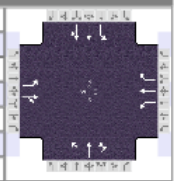
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	220	523		121	305	105	162	520	502	94	386	359
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1773		1767	1856	1572	1838	1856	1794	1838	1856	1720
Queue Service Time (g_s), s	7.8	25.9		4.3	12.8	4.7	5.5	24.4	24.4	3.1	16.9	16.9
Cycle Queue Clearance Time (g_c), s	7.8	25.9		4.3	12.8	4.7	5.5	24.4	24.4	3.1	16.9	16.9
Green Ratio (*g/C*)	0.40	0.32		0.36	0.28	0.28	0.38	0.31	0.31	0.37	0.29	0.29
Capacity (*c*), veh/h	426	567		221	524	444	314	574	555	218	547	507
Volume-to-Capacity Ratio (*X*)	0.516	0.922		0.548	0.582	0.237	0.516	0.906	0.906	0.429	0.706	0.708
Back of Queue (*Q*), ft/ln (95 th percentile)	142	509		81	241	78	105	476	454	59	285	263
Back of Queue (*Q*), veh/ln (95 th percentile)	5.5	19.9		3.2	9.4	3.1	4.1	18.6	18.2	2.3	11.1	10.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.78	0.00		0.70	0.00	0.68	1.05	0.00	0.00	0.49	0.00	0.00
Uniform Delay (d_1), s/veh	20.1	29.8		23.8	28.0	25.1	21.3	30.1	30.1	23.2	28.5	28.6
Incremental Delay (d_2), s/veh	0.4	21.3		0.8	0.4	0.1	0.5	14.9	15.4	0.3	2.3	2.5
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	20.5	51.1		24.6	28.4	25.2	21.7	45.1	45.5	23.5	30.8	31.1
Level of Service (LOS)	C	D		C	C	C	C	D	D	C	C	C
Approach Delay, s/veh / LOS	42.0	D		26.9	C		42.1	D		30.1	C	
Intersection Delay, s/veh / LOS	36.6						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.71	B	1.36	A	1.46	A	1.42	A

Table 100. Pennsylvania Ave and JFK Rd Tuesday 5-6PM HCS 20 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Penn/JFK	File Name	TUESDAY Intersection (Penn-JFK)_20YEARproje...		
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	220	388	135	121	305	105	162	927	95	126	792	212

Signal Information			
Cycle, s	97.9	Reference Phase	2
Offset, s	106	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.5	1.6		30.4	6.8	4.0	27.9					
Yellow	4.0	0.0		4.0	4.0	0.0	4.0					
Red	1.2	0.0		1.1	1.2	0.0	1.2					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	16.0	37.2	12.0	33.1	13.3	37.1	11.7	35.5
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	10.3	29.7	6.7	15.8	7.8	27.8	5.3	19.9
Green Extension Time (g_e), s	0.4	1.9	0.2	1.9	0.3	3.9	0.1	3.8
Phase Call Probability	1.00	1.00	0.96	1.00	0.99	1.00	0.92	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03

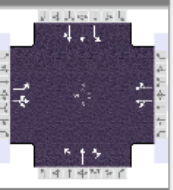
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	220	523		121	305	105	162	520	502	94	386	359
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1773		1767	1856	1572	1838	1856	1794	1838	1856	1720
Queue Service Time (g_s), s	8.3	27.7		4.7	13.8	5.0	5.8	25.8	25.8	3.3	17.8	17.9
Cycle Queue Clearance Time (g_c), s	8.3	27.7		4.7	13.8	5.0	5.8	25.8	25.8	3.3	17.8	17.9
Green Ratio (*g/C*)	0.41	0.33		0.36	0.29	0.29	0.40	0.33	0.33	0.38	0.31	0.31
Capacity (*c*), veh/h	426	581		218	531	450	320	608	588	220	577	535
Volume-to-Capacity Ratio (*X*)	0.517	0.901		0.556	0.575	0.233	0.506	0.855	0.855	0.425	0.669	0.672
Back of Queue (*Q*), ft/ln (95 th percentile)	154	443		89	258	86	112	430	408	64	298	274
Back of Queue (*Q*), veh/ln (95 th percentile)	6.0	17.3		3.5	10.1	3.4	4.4	16.8	16.3	2.5	11.6	11.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.85	0.00		0.78	0.00	0.75	1.12	0.00	0.00	0.53	0.00	0.00
Uniform Delay (d_1), s/veh	21.2	31.6		25.8	30.1	26.9	22.0	30.9	30.9	24.3	29.5	29.6
Incremental Delay (d_2), s/veh	0.4	2.2		0.8	0.4	0.1	0.5	1.4	1.4	0.3	0.4	0.4
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	21.6	33.8		26.6	30.4	27.0	22.4	32.3	32.4	24.6	29.9	30.0
Level of Service (LOS)	C	C		C	C	C	C	C	C	C	C	C
Approach Delay, s/veh / LOS	30.2	C		28.9	C		31.0	C		29.3	C	
Intersection Delay, s/veh / LOS	30.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.71	B	1.36	A	1.46	A	1.42	A

Table 101. Wacker Dr and JFK Rd Tuesday 11AM-Noon HCS 20 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 11AM-NOON	File Name	TUESDAY Intersection (Wacker-JFK)_20YEARpr...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	349	7	60	7	2	7	94	602	6	16	471	260

Signal Information			
Cycle, s	54.3	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	0.9	4.4	16.3	9.9	1.3	0.0	
Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
Red	1.5	0.0	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		15.4		6.8	10.3	26.2	5.9	21.8
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		9.1		2.2	5.4	16.7	2.3	9.6
Green Extension Time (g_e), s		0.8		0.0	0.2	3.8	0.0	3.9
Phase Call Probability		1.00		0.22	0.93	1.00	0.18	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.00

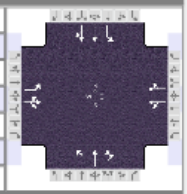
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	175	242		8		8	178	576	574	13	308	277
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1761		1824		1630	1810	1900	1893	1810	1900	1674
Queue Service Time (g_s), s	4.8	7.1		0.2		0.2	3.4	14.7	14.7	0.3	7.4	7.6
Cycle Queue Clearance Time (g_c), s	4.8	7.1		0.2		0.2	3.4	14.7	14.7	0.3	7.4	7.6
Green Ratio (*g/C*)	0.18	0.18		0.02		0.02	0.43	0.38	0.38	0.32	0.30	0.30
Capacity (*c*), veh/h	332	323		44		39	448	725	723	200	571	503
Volume-to-Capacity Ratio (*X*)	0.526	0.747		0.191		0.194	0.397	0.795	0.795	0.064	0.540	0.550
Back of Queue (*Q*), ft/ln (95 th percentile)	82	122		5		4	50	191	190	4	126	114
Back of Queue (*Q*), veh/ln (95 th percentile)	3.3	4.9		0.2		0.2	2.0	7.6	7.6	0.2	5.0	4.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.24		0.11		0.10	0.26	0.38	0.38	0.07	0.25	0.23
Uniform Delay (d_1), s/veh	20.1	21.1		26.1		26.1	10.9	15.0	15.0	14.2	15.9	16.0
Incremental Delay (d_2), s/veh	0.5	1.3		0.8		0.9	0.1	0.3	0.3	0.0	0.2	0.3
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	20.6	22.4		26.9		27.0	11.0	15.3	15.3	14.2	16.1	16.3
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.6	C		26.9	C		14.7	B		16.2	B	
Intersection Delay, s/veh / LOS	16.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.17	A	0.50	A	1.07	A	1.10	A

Table 102. Wacker Dr and JFK Rd Tuesday 11AM-Noon HCS 20 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 11AM-NOON	File Name	TUESDAY Intersection (Wacker-JFK)_20YEARpr...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	349	7	60	7	2	7	94	602	6	16	471	260

Signal Information			
Cycle, s	54.2	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	0.9	4.5	16.0	10.0	1.3	0.0	
Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
Red	1.5	0.0	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		15.5		6.8	10.4	26.0	5.9	21.5
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		9.1		2.2	5.4	16.7	2.3	9.6
Green Extension Time (g_e), s		0.9		0.0	0.3	3.6	0.0	3.0
Phase Call Probability		1.00		0.22	0.93	1.00	0.18	1.00
Max Out Probability		0.00		0.00	0.00	0.08	0.00	0.32

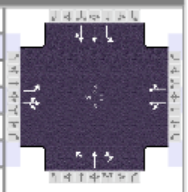
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	175	242		8		8	178	575	573	13	308	277
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1761		1824		1630	1810	1900	1893	1810	1900	1674
Queue Service Time (g_s), s	4.7	7.1		0.2		0.2	3.4	14.7	14.7	0.3	7.4	7.6
Cycle Queue Clearance Time (g_c), s	4.7	7.1		0.2		0.2	3.4	14.7	14.7	0.3	7.4	7.6
Green Ratio (*g/C*)	0.18	0.18		0.02		0.02	0.43	0.38	0.38	0.32	0.30	0.30
Capacity (*c*), veh/h	334	325		44		40	449	722	720	199	564	497
Volume-to-Capacity Ratio (*X*)	0.522	0.742		0.190		0.192	0.396	0.797	0.797	0.064	0.547	0.558
Back of Queue (*Q*), ft/ln (95 th percentile)	82	121		5		4	50	190	189	4	127	114
Back of Queue (*Q*), veh/ln (95 th percentile)	3.3	4.9		0.2		0.2	2.0	7.6	7.6	0.2	5.1	4.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.24		0.11		0.10	0.25	0.38	0.38	0.07	0.25	0.23
Uniform Delay (d_1), s/veh	20.1	21.0		26.1		26.1	10.9	15.0	15.0	14.3	16.1	16.2
Incremental Delay (d_2), s/veh	0.5	1.3		0.8		0.9	0.1	0.3	0.3	0.0	0.3	0.3
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	20.5	22.3		26.8		27.0	11.0	15.3	15.3	14.4	16.4	16.5
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.5	C		26.9	C		14.7	B		16.4	B	
Intersection Delay, s/veh / LOS	16.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	2.09	B
Bicycle LOS Score / LOS	1.17	A	0.50	A	1.07	A	1.10	A

Table 103. Wacker Dr and JFK Rd Tuesday 4-5PM HCS 20 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 4-5PM	File Name	TUESDAY Intersection (Wacker-JFK)_20YEARpr...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	423	2	77	6	11	7	116	715	6	24	560	260

Signal Information										
Cycle, s	53.9	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	Yes	Simult. Gap E/W	On	Green	0.7	3.4	15.0	11.4	1.8	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.0	3.0	3.0	0.0
				Red	1.5	0.0	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		16.9		7.3	9.1	23.9	5.7	20.5
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		10.4		2.4	4.4	10.3	2.2	6.3
Green Extension Time (g_e), s		1.0		0.0	0.1	2.0	0.0	2.0
Phase Call Probability		1.00		0.30	0.82	1.00	0.14	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.00

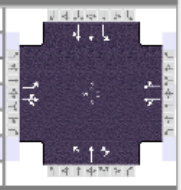
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	212	291		13		11	116	361	360	10	179	168
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1757		1856		1711	1810	1900	1894	1810	1900	1699
Queue Service Time (g_s), s	5.6	8.4		0.4		0.3	2.4	8.3	8.3	0.2	4.1	4.3
Cycle Queue Clearance Time (g_c), s	5.6	8.4		0.4		0.3	2.4	8.3	8.3	0.2	4.1	4.3
Green Ratio (*g/C*)	0.21	0.21		0.03		0.03	0.36	0.34	0.34	0.29	0.28	0.28
Capacity (*c*), veh/h	384	373		63		58	481	649	648	269	529	473
Volume-to-Capacity Ratio (*X*)	0.550	0.779		0.201		0.198	0.241	0.556	0.556	0.038	0.339	0.355
Back of Queue (*Q*), ft/ln (95 th percentile)	96	142		7		6	36	138	137	4	69	65
Back of Queue (*Q*), veh/ln (95 th percentile)	3.8	5.7		0.3		0.3	1.4	5.5	5.5	0.1	2.8	2.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.19	0.29		0.15		0.14	0.19	0.28	0.27	0.06	0.14	0.13
Uniform Delay (d_1), s/veh	18.9	20.0		25.3		25.3	11.9	14.4	14.4	14.0	15.5	15.6
Incremental Delay (d_2), s/veh	0.5	1.4		0.6		0.6	0.1	0.3	0.3	0.0	0.1	0.2
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	19.4	21.4		25.9		25.9	12.0	14.7	14.7	14.1	15.6	15.7
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	20.5	C		25.9	C		14.3	B		15.6	B	
Intersection Delay, s/veh / LOS	16.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.90	B	2.09	B
Bicycle LOS Score / LOS	1.32	A	0.51	A	1.18	A	1.18	A

Table 104. Wacker Dr and JFK Rd Tuesday 4-5PM HCS 20 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 4-5PM	File Name	TUESDAY Intersection (Wacker-JFK)_20YEARpr…		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	423	2	77	6	11	7	116	715	6	24	560	260

Signal Information			
Cycle, s	54.0	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	0.7	3.4	15.0	11.5	1.8	0.0						
Yellow	3.5	0.0	4.0	3.0	3.0	0.0						
Red	1.5	0.0	1.5	2.5	2.5	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		17.0		7.3	9.1	23.9	5.7	20.5
Change Period, (*Y+Rc*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s		10.4		2.4	4.4	10.4	2.2	6.3
Green Extension Time (*ge*), s		1.1		0.0	0.2	2.0	0.0	2.0
Phase Call Probability		1.00		0.30	0.83	1.00	0.14	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.00

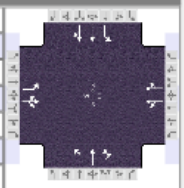
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	212	291		13		11	116	361	360	10	179	168
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1757		1856		1711	1810	1900	1894	1810	1900	1699
Queue Service Time (*gs*), s	5.6	8.4		0.4		0.4	2.4	8.4	8.4	0.2	4.1	4.3
Cycle Queue Clearance Time (*gc*), s	5.6	8.4		0.4		0.4	2.4	8.4	8.4	0.2	4.1	4.3
Green Ratio (*g/C*)	0.21	0.21		0.03		0.03	0.36	0.34	0.34	0.29	0.28	0.28
Capacity (*c*), veh/h	387	376		63		58	480	648	646	268	527	472
Volume-to-Capacity Ratio (*X*)	0.546	0.772		0.199		0.196	0.242	0.557	0.557	0.038	0.340	0.356
Back of Queue (*Q*), ft/ln (95 th percentile)	96	143		7		6	36	138	138	4	70	66
Back of Queue (*Q*), veh/ln (95 th percentile)	3.8	5.7		0.3		0.3	1.5	5.5	5.5	0.1	2.8	2.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.19	0.29		0.15		0.14	0.19	0.28	0.28	0.06	0.14	0.13
Uniform Delay (*d1*), s/veh	18.9	20.0		25.4		25.4	12.0	14.5	14.5	14.1	15.6	15.7
Incremental Delay (*d2*), s/veh	0.4	1.3		0.6		0.6	0.1	0.3	0.3	0.0	0.1	0.2
Initial Queue Delay (*d3*), 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	19.4	21.3		26.0		26.0	12.1	14.8	14.8	14.2	15.7	15.8
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	20.5	C		26.0	C		14.4	B		15.7	B	
Intersection Delay, s/veh / LOS	16.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.90	B	2.09	B
Bicycle LOS Score / LOS	1.32	A	0.51	A	1.18	A	1.18	A

Table 105. Wacker Dr and JFK Rd Tuesday 5-6PM HCS 20 Year Projected Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 5-6PM	File Name	TUESDAY Intersection (Wacker-JFK)_20YEARpr...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	458	2	63	11	10	13	133	736	6	10	476	260

Signal Information					EB			WB			NB			SB		
Cycle, s	56.2	Reference Phase	2													
Offset, s	0	Reference Point	End	Green	0.4	4.8		15.0	11.9	2.5	0.0					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	0.0		4.0	3.0	3.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.5	0.0		1.5	2.5	2.5	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		17.4		8.0	10.3	25.3	5.4	20.5
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		10.8		2.5	5.5	13.9	2.1	7.9
Green Extension Time (*g e*), s		1.1		0.0	0.2	2.8	0.0	2.8
Phase Call Probability		1.00		0.41	0.93	1.00	0.09	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.00

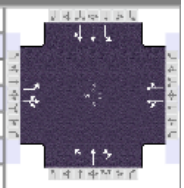
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	229	294		18		16	168	470	469	6	229	209
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1767		1843		1659	1810	1900	1894	1810	1900	1677
Queue Service Time (*g s*), s	6.4	8.8		0.5		0.5	3.5	11.9	11.9	0.1	5.6	5.9
Cycle Queue Clearance Time (*g c*), s	6.4	8.8		0.5		0.5	3.5	11.9	11.9	0.1	5.6	5.9
Green Ratio (*g/C*)	0.21	0.21		0.04		0.04	0.39	0.35	0.35	0.27	0.27	0.27
Capacity (*c*), veh/h	384	375		81		73	455	671	669	206	507	447
Volume-to-Capacity Ratio (*X*)	0.596	0.784		0.219		0.220	0.370	0.700	0.700	0.029	0.451	0.468
Back of Queue (*Q*), ft/ln (95 th percentile)	111	152		10		9	53	175	175	2	99	91
Back of Queue (*Q*), veh/ln (95 th percentile)	4.4	6.1		0.4		0.4	2.1	7.0	7.0	0.1	4.0	3.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.22	0.30		0.22		0.20	0.27	0.35	0.35	0.04	0.20	0.18
Uniform Delay (*d 1*), s/veh	20.0	20.9		25.9		25.9	12.0	15.6	15.6	15.6	17.2	17.3
Incremental Delay (*d 2*), s/veh	0.6	1.4		0.5		0.6	0.1	0.3	0.3	0.0	0.2	0.2
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	20.5	22.3		26.4		26.5	12.1	15.9	15.9	15.6	17.4	17.5
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.5	C		26.5	C		15.3	B		17.4	B	
Intersection Delay, s/veh / LOS	17.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.90	B	2.10	B
Bicycle LOS Score / LOS	1.35	A	0.52	A	1.21	A	1.10	A

Table 106. Wacker Dr and JFK Rd Tuesday 5-6PM HCS 20 Year Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	Wacker/JFK	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Wacker/JFK 5-6PM	File Name	TUESDAY Intersection (Wacker-JFK)_20YEARpr...		
Project Description	Wacker/JFK TUESDAY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	458	2	63	11	10	13	133	736	6	10	476	260

Signal Information			
Cycle, s	55.6	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	0.4	4.6	15.0	11.6	2.5	0.0	
Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
Red	1.5	0.0	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		17.1		8.0	10.0	25.1	5.4	20.5
Change Period, (*Y+Rc*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*gs*), s		10.8		2.5	5.5	13.9	2.1	7.8
Green Extension Time (*ge*), s		0.8		0.0	0.0	2.8	0.0	2.8
Phase Call Probability		1.00		0.41	0.93	1.00	0.09	1.00
Max Out Probability		0.07		0.00	1.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	229	294		18		16	169	472	470	6	229	209
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1767		1843		1659	1810	1900	1894	1810	1900	1677
Queue Service Time (*gs*), s	6.4	8.8		0.5		0.5	3.5	11.9	11.9	0.1	5.6	5.8
Cycle Queue Clearance Time (*gc*), s	6.4	8.8		0.5		0.5	3.5	11.9	11.9	0.1	5.6	5.8
Green Ratio (*g/C*)	0.21	0.21		0.04		0.04	0.39	0.35	0.35	0.28	0.27	0.27
Capacity (*c*), veh/h	378	369		82		74	453	669	667	204	513	453
Volume-to-Capacity Ratio (*X*)	0.605	0.796		0.219		0.219	0.373	0.705	0.705	0.029	0.446	0.462
Back of Queue (*Q*), ft/ln (95 th percentile)	110	151		10		9	53	175	175	2	97	89
Back of Queue (*Q*), veh/ln (95 th percentile)	4.4	6.1		0.4		0.4	2.1	7.0	7.0	0.1	3.9	3.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.22	0.30		0.22		0.20	0.27	0.35	0.35	0.04	0.19	0.18
Uniform Delay (*d1*), s/veh	19.9	20.9		25.6		25.6	12.1	15.5	15.5	15.4	16.8	16.9
Incremental Delay (*d2*), s/veh	0.6	1.5		0.5		0.6	0.1	0.3	0.3	0.0	0.2	0.2
Initial Queue Delay (*d3*), 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	20.5	22.4		26.1		26.2	12.2	15.8	15.8	15.4	17.0	17.2
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.6	C		26.2	C		15.3	B		17.1	B	
Intersection Delay, s/veh / LOS	17.4						B					

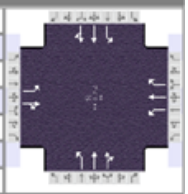
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.90	B	2.10	B
Bicycle LOS Score / LOS	1.35	A	0.52	A	1.21	A	1.10	A

Saturday, February 10th, 2024, Highway Capacity Software Tables:

Table 5. Pennsylvania Ave and JFK Rd Saturday Noon-1PM HCS Existing Conditions

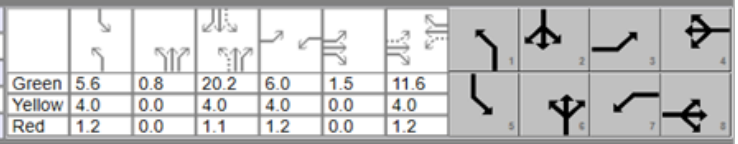
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection		File Name	Wacker_Penn Existing Update 12-1.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	174	148	126	103	130	72	140	717	87	88	760	150

Signal Information			
Cycle, s	66.5	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	5.6	0.8		20.2	6.0	1.5		11.6				
Yellow	4.0	0.0		4.0	4.0	0.0		4.0				
Red	1.2	0.0		1.1	1.2	0.0		1.2				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.6	18.3	11.2	16.8	11.7	26.2	10.8	25.3
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	7.2	12.2	5.0	6.1	5.4	14.8	4.1	17.6
Green Extension Time (g_e), s	0.3	0.9	0.1	0.9	0.2	3.7	0.1	2.6
Phase Call Probability	1.00	1.00	0.85	1.00	0.92	1.00	0.80	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.45

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	174	274		103	130	72	139	407	392	88	468	442
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1714		1767	1856	1572	1767	1856	1785	1767	1856	1749
Queue Service Time (g_s), s	5.2	10.2		3.0	4.1	2.6	3.4	12.8	12.8	2.1	15.6	15.6
Cycle Queue Clearance Time (g_c), s	5.2	10.2		3.0	4.1	2.6	3.4	12.8	12.8	2.1	15.6	15.6
Green Ratio (*g/C*)	0.29	0.20		0.26	0.17	0.17	0.40	0.32	0.32	0.39	0.30	0.30
Capacity (*c*), veh/h	448	338		283	324	275	323	589	566	322	565	533
Volume-to-Capacity Ratio (*X*)	0.389	0.811		0.364	0.401	0.262	0.431	0.692	0.693	0.273	0.828	0.829
Back of Queue (*Q*), ft/ln (95 th percentile)	90	184		54	80	43	56	217	205	36	292	273
Back of Queue (*Q*), veh/ln (95 th percentile)	3.5	7.2		2.1	3.1	1.7	2.2	8.5	8.2	1.4	11.4	10.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.50	0.00		0.47	0.00	0.37	0.56	0.00	0.00	0.30	0.00	0.00
Uniform Delay (d_1), s/veh	18.9	25.5		20.1	24.4	23.7	15.3	19.9	19.9	14.7	21.5	21.5
Incremental Delay (d_2), s/veh	0.2	1.8		0.3	0.3	0.2	0.3	0.5	0.5	0.2	6.0	6.4
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	19.1	27.4		20.3	24.7	23.9	15.6	20.3	20.4	14.9	27.5	27.9
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	24.2	C		23.0	C		19.6	B		26.6	C	
Intersection Delay, s/veh / LOS	23.3						C					

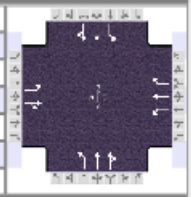
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.23	A	0.99	A	1.27	A	1.31	A

 HCS™ Streets Version 2024 Generated: 5/6/2024 9:42:54 AM

Table 6. Pennsylvania Ave and JFK Rd Saturday Noon-1PM HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection		File Name	Wacker_Penn Existing Update 12-1 (Overall Dela...		
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	174	148	126	103	130	72	140	717	87	88	760	150

Signal Information			
Cycle, s	68.4	Reference Phase	2
Offset, s	76	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.7	0.8		21.7	6.0	1.0		12.5				
Yellow	4.0	0.0		4.0	4.0	0.0		4.0				
Red	1.2	0.0		1.1	1.2	0.0		1.2				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.2	18.6	11.2	17.7	11.7	27.6	10.9	26.8
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	7.4	12.5	5.1	6.2	5.4	15.0	4.2	17.8
Green Extension Time (*g e*), s	0.0	0.8	0.2	0.9	0.3	3.7	0.2	3.7
Phase Call Probability	1.00	1.00	0.86	1.00	0.93	1.00	0.81	1.00
Max Out Probability	1.00	0.01	0.00	0.00	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	174	274		103	130	72	139	407	392	88	468	442
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1714		1767	1856	1572	1767	1856	1785	1767	1856	1749
Queue Service Time (*g s*), s	5.4	10.5		3.1	4.2	2.7	3.4	13.0	13.0	2.2	15.8	15.8
Cycle Queue Clearance Time (*g c*), s	5.4	10.5		3.1	4.2	2.7	3.4	13.0	13.0	2.2	15.8	15.8
Green Ratio (*g/C*)	0.29	0.20		0.27	0.18	0.18	0.42	0.33	0.33	0.40	0.32	0.32
Capacity (*c*), veh/h	443	337		279	340	289	328	612	589	330	591	557
Volume-to-Capacity Ratio (*X*)	0.393	0.812		0.370	0.382	0.250	0.425	0.666	0.667	0.267	0.793	0.793
Back of Queue (*Q*), ft/ln (95 th percentile)	94	192		55	82	44	57	219	208	36	269	251
Back of Queue (*Q*), veh/ln (95 th percentile)	3.7	7.5		2.2	3.2	1.7	2.2	8.6	8.3	1.4	10.5	10.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.52	0.00		0.48	0.00	0.38	0.57	0.00	0.00	0.30	0.00	0.00
Uniform Delay (*d 1*), s/veh	19.6	26.4		20.4	24.6	24.0	15.2	19.8	19.8	14.6	21.4	21.4
Incremental Delay (*d 2*), s/veh	0.2	1.8		0.3	0.3	0.2	0.3	0.4	0.4	0.2	0.9	1.0
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	19.8	28.2		20.7	24.9	24.2	15.4	20.2	20.2	14.7	22.3	22.4
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	25.0	C		23.3	C		19.5	B		21.7	C	
Intersection Delay, s/veh / LOS	21.6						C					

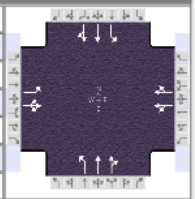
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.23	A	0.99	A	1.27	A	1.31	A

 HCS™ Streets Version 2024 Generated: 5/1/2024 5:41:53 PM

Table 7. Wacker Dr and JFK Rd Saturday Noon-1PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	JFK/Wacker	File Name	Wacker_Penn Existing Update 12-1.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	389	16	71	12	4	14	116	536	4	13	498	355

Signal Information					EB			WB			NB			SB		
Cycle, s	74.4	Reference Phase	2		L	T	R	L	T	R	L	T	R	L	T	R
Offset, s	0	Reference Point	End	Green	1.9	4.5		24.1	17.8	4.6	0.0					
Uncoordinated	Yes	Simult. Gap E/W	Off	Yellow	3.5	0.0		4.0	3.0	3.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	Off	Red	1.5	0.0		1.5	2.5	2.5	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		23.3		10.1	11.4	34.1	6.9	29.6
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.0	3.1	3.2
Queue Clearance Time (g_s), s		16.9		2.6	6.8	9.8	2.6	21.8
Green Extension Time (g_e), s		0.9		0.0	0.1	1.0	0.0	2.1
Phase Call Probability		1.00		0.46	0.91	1.00	0.26	1.00
Max Out Probability		0.00		0.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	117	359		16		14	116	270	270	15	524	451
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1731		1788		1576	1767	1856	1851	1767	1856	1597
Queue Service Time (g_s), s	4.0	14.9		0.6		0.6	4.8	7.8	7.8	0.6	19.8	19.8
Cycle Queue Clearance Time (g_c), s	4.0	14.9		0.6		0.6	4.8	7.8	7.8	0.6	19.8	19.8
Green Ratio (*g/C*)	0.24	0.24		0.06		0.06	0.09	0.38	0.38	0.03	0.32	0.32
Capacity (*c*), veh/h	424	415		112		99	151	713	711	44	601	517
Volume-to-Capacity Ratio (*X*)	0.275	0.866		0.141		0.144	0.766	0.379	0.379	0.335	0.871	0.871
Back of Queue (*Q*), ft/ln (95 th percentile)	74	260		12		11	97	142	138	12	295	254
Back of Queue (*Q*), veh/ln (95 th percentile)	2.9	10.1		0.5		0.4	3.8	5.5	5.5	0.5	11.5	10.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.15	0.52		0.27		0.25	0.19	0.28	0.28	0.02	0.59	0.52
Uniform Delay (d_1), s/veh	23.1	27.2		33.1		33.1	33.4	16.5	16.5	35.8	23.8	23.8
Incremental Delay (d_2), s/veh	0.1	3.0		0.2		0.2	3.1	0.1	0.1	0.9	0.9	1.0
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	23.2	30.2		33.3		33.3	36.5	16.7	16.7	36.6	24.6	24.8
Level of Service (LOS)	C	C		C		C	D	B	B	D	C	C
Approach Delay, s/veh / LOS	28.5	C		33.3	C		20.2	C		24.9	C	
Intersection Delay, s/veh / LOS	24.4						C					

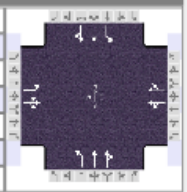
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.30	B	1.90	B	2.10	B
Bicycle LOS Score / LOS	1.27	A	0.51	A	1.03	A	1.20	A

 HCS™ Streets Version 2024 Generated: 5/6/2024 9:42:54 AM

Table 8.Wacker Dr and JFK Rd Saturday Noon-1PM HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

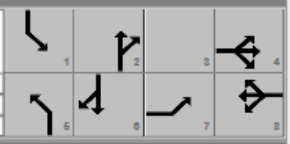
General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	JFK/Wacker	File Name	Wacker_Penn Existing Update 12-1 (Overall Dela...		
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	389	16	71	12	4	14	116	536	4	13	498	355

Signal Information			
Cycle, s	74.4	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	1.9	4.5	24.0	17.8	4.6	0.0	
Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
Red	1.5	0.0	1.5	2.5	2.5	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		23.3		10.1	11.4	34.0	6.9	29.5
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.0	3.1	3.2
Queue Clearance Time (g_s), s		16.8		2.6	6.8	9.8	2.6	21.8
Green Extension Time (g_e), s		0.9		0.0	0.1	0.7	0.0	2.1
Phase Call Probability		1.00		0.46	0.91	1.00	0.26	1.00
Max Out Probability		0.00		0.00	0.01	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	117	359		16		14	116	270	270	15	524	451
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1731		1788		1576	1767	1856	1851	1767	1856	1597
Queue Service Time (g_s), s	4.0	14.8		0.6		0.6	4.8	7.8	7.8	0.6	19.8	19.8
Cycle Queue Clearance Time (g_c), s	4.0	14.8		0.6		0.6	4.8	7.8	7.8	0.6	19.8	19.8
Green Ratio (*g/C*)	0.24	0.24		0.06		0.06	0.09	0.38	0.38	0.03	0.32	0.32
Capacity (*c*), veh/h	424	415		112		99	151	713	711	44	600	516
Volume-to-Capacity Ratio (*X*)	0.275	0.865		0.141		0.144	0.766	0.379	0.380	0.335	0.873	0.872
Back of Queue (*Q*), ft/ln (95 th percentile)	73	256		12		11	97	142	138	12	298	258
Back of Queue (*Q*), veh/ln (95 th percentile)	2.9	10.0		0.5		0.4	3.8	5.5	5.5	0.5	11.7	10.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.15	0.51		0.27		0.25	0.19	0.28	0.28	0.02	0.60	0.53
Uniform Delay (d_1), s/veh	23.0	27.2		33.0		33.0	33.3	16.6	16.6	35.7	23.8	23.8
Incremental Delay (d_2), s/veh	0.1	2.2		0.2		0.2	3.1	0.1	0.1	0.9	0.9	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
Control Delay (*d*), s/veh	23.2	29.4		33.3		33.3	36.4	16.7	16.7	36.7	24.7	24.9
Level of Service (LOS)	C	C		C		C	D	B	B	D	C	C
Approach Delay, s/veh / LOS	27.9	C		33.3	C		20.2	C		25.0	C	
Intersection Delay, s/veh / LOS	24.3						C					

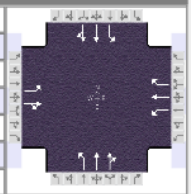
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.30	B	1.90	B	2.10	B
Bicycle LOS Score / LOS	1.27	A	0.51	A	1.03	A	1.20	A

 HCS™ Streets Version 2024 Generated: 5/1/2024 5:41:53 PM

Table 107.Pennsylvania Ave and JFK Rd Saturday Noon-1PM HCS 5 Year Projection Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection		File Name	Wacker_Penn 5yr Update 12-1.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	193	181	176	105	141	86	147	776	82	107	721	147

Signal Information			
Cycle, s	71.5	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	6.2	0.4	20.6	6.1	2.0	15.4	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.4	22.7	11.3	20.6	11.7	26.1	11.4	25.7
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	7.9	16.3	5.2	6.6	5.7	16.1	4.9	18.2
Green Extension Time (g_e), s	0.3	1.1	0.1	1.2	0.2	3.5	0.1	2.4
Phase Call Probability	1.00	1.00	0.88	1.00	0.93	1.00	0.88	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.49

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	193	357		105	141	86	137	405	392	107	447	421
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1704		1767	1856	1572	1767	1856	1793	1767	1856	1746
Queue Service Time (g_s), s	5.9	14.3		3.2	4.6	3.2	3.7	14.1	14.1	2.9	16.2	16.2
Cycle Queue Clearance Time (g_c), s	5.9	14.3		3.2	4.6	3.2	3.7	14.1	14.1	2.9	16.2	16.2
Green Ratio (*g/C*)	0.33	0.24		0.30	0.22	0.22	0.38	0.29	0.29	0.38	0.29	0.29
Capacity (*c*), veh/h	492	417		270	401	340	302	545	527	299	536	504
Volume-to-Capacity Ratio (*X*)	0.393	0.856		0.389	0.352	0.253	0.452	0.743	0.744	0.357	0.835	0.835
Back of Queue (*Q*), ft/ln (95 th percentile)	102	243		56	89	53	64	241	230	50	309	290
Back of Queue (*Q*), veh/ln (95 th percentile)	4.0	9.5		2.2	3.5	2.1	2.5	9.4	9.2	1.9	12.1	11.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.56	0.00		0.49	0.00	0.46	0.64	0.00	0.00	0.41	0.00	0.00
Uniform Delay (d_1), s/veh	18.2	25.8		20.1	23.8	23.3	17.2	22.8	22.8	16.9	23.9	23.9
Incremental Delay (d_2), s/veh	0.2	2.0		0.3	0.2	0.1	0.3	0.7	0.7	0.3	7.1	7.6
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	18.4	27.9		20.4	24.0	23.4	17.6	23.5	23.5	17.2	31.0	31.5
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	24.5	C		22.7	C		22.6	C		29.7	C	
Intersection Delay, s/veh / LOS	25.5						C					

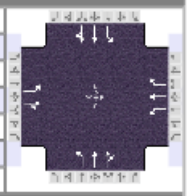
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.40	A	1.04	A	1.32	A	1.29	A

 HCS™ Streets Version 2024 Generated: 5/6/2024 9:58:08 AM

Table 108.Pennsylvania Ave and JFK Rd Saturday Noon-1PM HCS 5 Year Projection Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection		File Name	Wacker_Penn 5yr Update 12-1(Overall Delay).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	193	181	176	105	141	86	147	776	82	107	721	147

Signal Information										
Cycle, s	73.5	Reference Phase	2							
Offset, s	112	Reference Point	End							
Uncoordinated	Yes	Simult. Gap E/W	On							
Force Mode	Fixed	Simult. Gap N/S	On							
				Green	6.2	0.4	22.0	6.2	0.8	17.3
				Yellow	4.0	0.0	4.0	4.0	0.0	4.0
				Red	1.2	0.0	1.1	1.2	0.0	1.2

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.2	23.3	11.4	22.5	11.8	27.4	11.4	27.1
Change Period, (*Y+R*$_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	8.1	16.8	5.2	6.6	5.8	16.4	4.9	18.4
Green Extension Time (g_e), s	0.0	1.2	0.2	1.2	0.2	3.6	0.0	3.4
Phase Call Probability	1.00	1.00	0.88	1.00	0.94	1.00	0.89	1.00
Max Out Probability	1.00	0.00	0.00	0.00	0.00	0.00	1.00	0.05

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	193	357		105	141	86	136	405	391	107	447	421
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1704		1767	1856	1572	1767	1856	1793	1767	1856	1746
Queue Service Time (g_s), s	6.1	14.8		3.2	4.6	3.3	3.8	14.3	14.4	2.9	16.4	16.4
Cycle Queue Clearance Time (g_c), s	6.1	14.8		3.2	4.6	3.3	3.8	14.3	14.4	2.9	16.4	16.4
Green Ratio (*g/C*)	0.33	0.25		0.32	0.23	0.23	0.39	0.30	0.30	0.39	0.30	0.30
Capacity (*c*), veh/h	484	420		268	438	371	305	565	546	305	556	523
Volume-to-Capacity Ratio (*X*)	0.399	0.850		0.392	0.322	0.232	0.447	0.716	0.717	0.351	0.804	0.805
Back of Queue (*Q*), ft/ln (95 th percentile)	107	250		57	89	53	65	244	232	51	283	264
Back of Queue (*Q*), veh/ln (95 th percentile)	4.2	9.7		2.2	3.5	2.1	2.5	9.5	9.3	2.0	11.1	10.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.59	0.00		0.49	0.00	0.46	0.65	0.00	0.00	0.42	0.00	0.00
Uniform Delay (d_1), s/veh	18.7	26.5		20.0	23.3	22.8	17.2	22.9	22.9	16.9	23.9	23.9
Incremental Delay (d_2), s/veh	0.2	1.9		0.3	0.2	0.1	0.3	0.6	0.6	0.3	1.1	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	28.5		20.4	23.5	22.9	17.6	23.4	23.4	17.2	24.9	25.0
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	25.1	C		22.4	C		22.6	C		24.1	C	
Intersection Delay, s/veh / LOS	23.6						C					

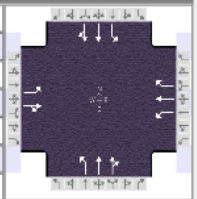
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.40	A	1.04	A	1.32	A	1.29	A

 HCS™ Streets Version 2024 Generated: 5/1/2024 5:54:27 PM

Table 109.Pennsylvania Ave and JFK Rd Saturday Noon-1PM HCS 10 Year Projection Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection		File Name	Wacker_Penn 10yr Update 12-1.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	203	190	184	110	148	91	155	815	86	113	758	155

Signal Information													
Cycle, s	74.5	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.3	0.3	22.0	6.3	2.4	16.4			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0			
				Red	1.2	0.0	1.1	1.2	0.0	1.2			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.9	24.1	11.5	21.6	11.8	27.4	11.5	27.1
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	8.4	17.7	5.4	7.0	6.1	17.5	5.2	19.8
Green Extension Time (g_e), s	0.3	1.2	0.1	1.2	0.3	3.8	0.1	2.1
Phase Call Probability	1.00	1.00	0.90	1.00	0.95	1.00	0.90	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.69

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	203	374		110	148	91	143	424	410	113	470	443
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1705		1767	1856	1572	1767	1856	1793	1767	1856	1746
Queue Service Time (g_s), s	6.4	15.7		3.4	5.0	3.6	4.1	15.5	15.5	3.2	17.8	17.8
Cycle Queue Clearance Time (g_c), s	6.4	15.7		3.4	5.0	3.6	4.1	15.5	15.5	3.2	17.8	17.8
Green Ratio (*g/C*)	0.34	0.25		0.31	0.22	0.22	0.39	0.30	0.30	0.38	0.30	0.30
Capacity (*c*), veh/h	493	432		263	409	347	288	557	538	290	549	516
Volume-to-Capacity Ratio (*X*)	0.412	0.866		0.419	0.362	0.263	0.497	0.761	0.762	0.390	0.857	0.857
Back of Queue (*Q*), ft/ln (95 th percentile)	113	263		62	98	58	71	261	248	55	351	329
Back of Queue (*Q*), veh/ln (95 th percentile)	4.4	10.3		2.4	3.8	2.3	2.8	10.2	9.9	2.1	13.7	13.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.62	0.00		0.54	0.00	0.51	0.71	0.00	0.00	0.46	0.00	0.00
Uniform Delay (d_1), s/veh	18.7	26.6		20.9	24.6	24.1	18.1	23.7	23.7	17.7	24.8	24.8
Incremental Delay (d_2), s/veh	0.2	2.1		0.4	0.2	0.1	0.4	0.7	0.7	0.3	10.4	11.1
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	28.8		21.3	24.8	24.2	18.5	24.4	24.4	18.0	35.2	35.9
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	D	D
Approach Delay, s/veh / LOS	25.3	C		23.6	C		23.6	C		33.6	C	
Intersection Delay, s/veh / LOS	27.4						C					

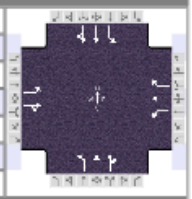
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.44	A	1.06	A	1.36	A	1.33	A

 HCS™ Streets Version 2024 Generated: 5/6/2024 10:03:19 AM

Table 110.Pennsylvania Ave and JFK Rd Saturday Noon-1PM HCS 10 Year Projection Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection		File Name	Wacker_Penn 10yr Update 12-1(Overall Delay).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	203	190	184	110	148	91	155	815	86	113	758	155

Signal Information			
Cycle, s	78.1	Reference Phase	2
Offset, s	111	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.4	0.3	24.4	6.4	2.8	17.1						
Yellow	4.0	0.0	4.0	4.0	0.0	4.0						
Red	1.2	0.0	1.1	1.2	0.0	1.2						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	14.4	25.1	11.6	22.3	11.9	29.8	11.6	29.5
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	8.8	18.4	5.6	7.3	6.2	18.0	5.2	20.3
Green Extension Time (*g e*), s	0.4	1.2	0.2	1.2	0.2	3.8	0.1	3.8
Phase Call Probability	1.00	1.00	0.91	1.00	0.96	1.00	0.92	1.00
Max Out Probability	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.02

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	203	374		110	148	91	144	426	412	113	470	443
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1705		1767	1856	1572	1767	1856	1793	1767	1856	1746
Queue Service Time (*g s*), s	6.8	16.4		3.6	5.3	3.8	4.2	16.0	16.0	3.2	18.3	18.3
Cycle Queue Clearance Time (*g c*), s	6.8	16.4		3.6	5.3	3.8	4.2	16.0	16.0	3.2	18.3	18.3
Green Ratio (*g/C*)	0.34	0.25		0.30	0.22	0.22	0.40	0.32	0.32	0.40	0.31	0.31
Capacity (*c*), veh/h	492	437		259	407	345	292	588	568	295	581	547
Volume-to-Capacity Ratio (*X*)	0.413	0.857		0.424	0.364	0.264	0.493	0.724	0.725	0.383	0.810	0.810
Back of Queue (*Q*), ft/ln (95 th percentile)	121	274		67	104	62	74	270	257	57	313	291
Back of Queue (*Q*), veh/ln (95 th percentile)	4.7	10.7		2.6	4.1	2.4	2.9	10.5	10.3	2.2	12.2	11.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.66	0.00		0.58	0.00	0.54	0.73	0.00	0.00	0.47	0.00	0.00
Uniform Delay (*d 1*), s/veh	19.7	27.9		22.2	26.0	25.4	18.2	23.8	23.8	17.7	24.8	24.9
Incremental Delay (*d 2*), s/veh	0.2	2.0		0.4	0.2	0.2	0.4	0.6	0.6	0.3	1.1	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	19.9	29.8		22.6	26.2	25.6	18.7	24.4	24.4	18.0	25.9	26.0
Level of Service (LOS)	B	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	26.3	C		24.9	C		23.5	C		25.1	C	
Intersection Delay, s/veh / LOS	24.8						C					

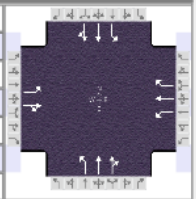
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.44	A	1.06	A	1.36	A	1.33	A

 HCS™ Streets Version 2024 Generated: 5/1/2024 6:07:30 PM

Table 111.Pennsylvania Ave and JFK Rd Saturday Noon-1PM HCS 20 Year Projection Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection		File Name	Wacker_Penn 20yr Update 12-1.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	225	210	204	122	164	100	171	901	95	124	837	171

Signal Information			
Cycle, s	80.8	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	6.6	0.3	24.6	6.6	3.4	18.7	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	15.1	27.3	11.8	23.9	12.1	30.0	11.8	29.7
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	9.6	20.9	6.1	8.0	6.8	20.5	5.8	23.9
Green Extension Time (g_e), s	0.3	1.2	0.2	1.4	0.3	4.3	0.2	0.7
Phase Call Probability	1.00	1.00	0.94	1.00	0.97	1.00	0.94	1.00
Max Out Probability	0.00	0.02	0.00	0.00	0.00	0.04	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	225	414		122	164	100	156	461	446	124	519	489
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1704		1767	1856	1572	1767	1856	1793	1767	1856	1746
Queue Service Time (g_s), s	7.6	18.9		4.1	6.0	4.2	4.8	18.5	18.5	3.8	21.9	21.9
Cycle Queue Clearance Time (g_c), s	7.6	18.9		4.1	6.0	4.2	4.8	18.5	18.5	3.8	21.9	21.9
Green Ratio (*g/C*)	0.36	0.27		0.31	0.23	0.23	0.39	0.31	0.31	0.39	0.30	0.30
Capacity (*c*), veh/h	498	467		248	431	365	257	571	552	266	565	531
Volume-to-Capacity Ratio (*X*)	0.452	0.887		0.491	0.381	0.274	0.605	0.807	0.807	0.467	0.920	0.920
Back of Queue (*Q*), ft/ln (95 th percentile)	136	330		76	118	70	86	308	293	67	487	458
Back of Queue (*Q*), veh/ln (95 th percentile)	5.3	12.9		3.0	4.6	2.7	3.3	12.0	11.7	2.6	19.0	18.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.75	0.00		0.66	0.00	0.61	0.86	0.00	0.00	0.56	0.00	0.00
Uniform Delay (d_1), s/veh	19.4	28.2		22.6	26.2	25.5	20.1	25.8	25.8	19.6	27.2	27.2
Incremental Delay (d_2), s/veh	0.2	7.5		0.6	0.2	0.1	0.7	0.9	0.9	0.5	25.7	27.1
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	19.7	35.6		23.2	26.4	25.6	20.9	26.7	26.7	20.1	52.9	54.3
Level of Service (LOS)	B	D		C	C	C	C	C	C	C	D	D
Approach Delay, s/veh / LOS	30.0	C		25.2	C		25.9	C		49.9	D	
Intersection Delay, s/veh / LOS	35.1						D					

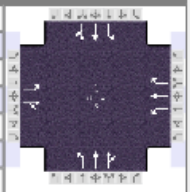
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.54	B	1.12	A	1.45	A	1.42	A

 HCS™ Streets Version 2024 Generated: 5/6/2024 10:04:35 AM

Table 112.Pennsylvania Ave and JFK Rd Saturday Noon-1PM HCS 20 Year Projection Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection		File Name	Wacker_Penn 20yr Update 12-1(Overall Delay).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	225	210	204	122	164	100	171	901	95	124	837	171

Signal Information			
Cycle, s	89.8	Reference Phase	2
Offset, s	92	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.7	0.7	30.3	6.7	4.3	20.3	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.2	0.0	1.1	1.2	0.0	1.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	16.3	29.8	11.9	25.5	12.6	36.1	11.9	35.4
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	10.5	23.2	6.7	8.8	7.1	21.8	6.0	25.4
Green Extension Time (g_e), s	0.4	0.9	0.0	1.2	0.3	4.3	0.2	4.3
Phase Call Probability	1.00	1.00	0.95	1.00	0.98	1.00	0.96	1.00
Max Out Probability	0.00	0.00	1.00	0.04	0.00	0.04	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	225	414		122	164	100	156	463	448	124	519	489
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1704		1767	1856	1572	1767	1856	1793	1767	1856	1746
Queue Service Time (g_s), s	8.5	21.2		4.7	6.8	4.8	5.1	19.8	19.8	4.0	23.4	23.4
Cycle Queue Clearance Time (g_c), s	8.5	21.2		4.7	6.8	4.8	5.1	19.8	19.8	4.0	23.4	23.4
Green Ratio (*g*/*C*)	0.37	0.27		0.31	0.23	0.23	0.43	0.35	0.35	0.42	0.34	0.34
Capacity (*c*), veh/h	488	470		231	421	357	270	645	624	278	630	592
Volume-to-Capacity Ratio (*X*)	0.462	0.881		0.528	0.389	0.280	0.579	0.718	0.718	0.446	0.825	0.825
Back of Queue (*Q*), ft/ln (95 th percentile)	155	344		90	138	82	93	327	310	73	389	362
Back of Queue (*Q*), veh/ln (95 th percentile)	6.1	13.4		3.5	5.4	3.2	3.6	12.8	12.4	2.9	15.2	14.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.85	0.00		0.78	0.00	0.71	0.93	0.00	0.00	0.61	0.00	0.00
Uniform Delay (d_1), s/veh	21.5	31.6		26.1	29.9	29.1	20.9	25.8	25.8	19.8	27.6	27.6
Incremental Delay (d_2), s/veh	0.3	2.2		0.7	0.2	0.2	0.6	0.5	0.5	0.4	1.1	1.2
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	21.7	33.8		26.8	30.1	29.2	21.5	26.3	26.3	20.2	28.7	28.8
Level of Service (LOS)	C	C		C	C	C	C	C	C	C	C	C
Approach Delay, s/veh / LOS	29.6	C		28.8	C		25.6	C		27.8	C	
Intersection Delay, s/veh / LOS	27.6						C					

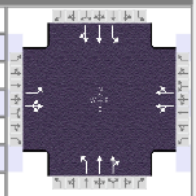
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.54	B	1.12	A	1.45	A	1.42	A

 HCS™ Streets Version 2024 Generated: 5/1/2024 6:13:34 PM

Table 113.Wacker Dr and JFK Rd Saturday Noon-1PM HCS 5 Year Projection Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	JFK/Wacker	File Name	Wacker_Penn 5yr Update 12-1.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	446	12	69	20	12	24	165	542	5	14	474	387

Signal Information			
Cycle, s	81.4	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	2.1	2.2	26.5	16.9	7.2	0.0	
Yellow	3.5	3.5	4.0	3.0	3.0	0.0	
Red	1.5	1.5	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		22.4		12.7	14.4	39.2	7.1	32.0
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.0	3.1	3.2
Queue Clearance Time (*g s*), s		15.8		3.3	9.4	10.3	2.7	24.2
Green Extension Time (*g e*), s		1.0		0.0	0.1	1.0	0.0	2.2
Phase Call Probability		1.00		1.00	0.98	1.00	0.30	1.00
Max Out Probability		0.00		0.00	0.07	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	223	304		30		26	165	274	273	16	533	453
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1725		1795		1595	1767	1856	1849	1767	1856	1578
Queue Service Time (*g s*), s	9.3	13.8		1.2		1.3	7.4	8.3	8.3	0.7	22.2	22.2
Cycle Queue Clearance Time (*g c*), s	9.3	13.8		1.2		1.3	7.4	8.3	8.3	0.7	22.2	22.2
Green Ratio (*g/C*)	0.21	0.21		0.09		0.09	0.12	0.41	0.41	0.03	0.33	0.33
Capacity (*c*), veh/h	367	358		159		141	204	769	766	47	604	513
Volume-to-Capacity Ratio (*X*)	0.608	0.849		0.186		0.188	0.810	0.356	0.357	0.344	0.883	0.883
Back of Queue (*Q*), ft/ln (95 th percentile)	178	246		24		22	151	152	148	15	328	280
Back of Queue (*Q*), veh/ln (95 th percentile)	6.9	9.6		1.0		0.9	5.9	5.9	5.9	0.6	12.8	11.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.36	0.49		0.55		0.49	0.30	0.30	0.30	0.03	0.66	0.57
Uniform Delay (*d 1*), s/veh	29.3	31.1		34.5		34.5	35.2	16.4	16.4	39.0	26.1	26.1
Incremental Delay (*d 2*), s/veh	0.6	2.3		0.2		0.2	3.5	0.1	0.1	0.8	0.9	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
Control Delay (*d*), s/veh	29.9	33.4		34.7		34.7	38.8	16.5	16.5	39.9	27.0	27.1
Level of Service (LOS)	C	C		C		C	D	B	B	D	C	C
Approach Delay, s/veh / LOS	31.9	C		34.7	C		21.7	C		27.3	C	
Intersection Delay, s/veh / LOS	26.8						C					

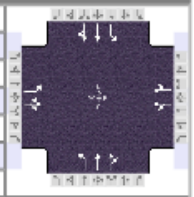
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.31	B	1.90	B	2.11	B
Bicycle LOS Score / LOS	1.36	A	0.53	A	1.08	A	1.21	A

 HCS™ Streets Version 2024 Generated: 5/6/2024 9:58:08 AM

Table 114.Wacker Dr and JFK Rd Saturday Noon-1PM HCS 5 Year Projection Conditions Optimized

HCS Signalized Intersection Results Summary

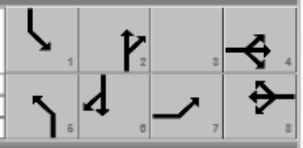
General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	JFK/Wacker	File Name	Wacker_Penn 5yr Update 12-1(Overall Delay).xus		
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	446	12	69	20	12	24	165	542	5	14	474	387

Signal Information			
Cycle, s	81.3	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	2.1	2.2	26.4	16.8	7.2	0.0	
Yellow	3.5	3.5	4.0	3.0	3.0	0.0	
Red	1.5	1.5	1.5	2.5	2.5	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		22.3		12.7	14.4	39.1	7.1	31.9
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.0	3.1	3.2
Queue Clearance Time (g_s), s		15.8		3.3	9.4	10.3	2.7	24.1
Green Extension Time (g_e), s		1.0		0.0	0.1	0.7	0.0	2.2
Phase Call Probability		1.00		1.00	0.98	1.00	0.30	1.00
Max Out Probability		0.00		0.00	0.02	0.06	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	223	304		30		26	165	274	273	16	533	453
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1725		1795		1595	1767	1856	1849	1767	1856	1578
Queue Service Time (g_s), s	9.3	13.8		1.2		1.3	7.4	8.3	8.3	0.7	22.1	22.1
Cycle Queue Clearance Time (g_c), s	9.3	13.8		1.2		1.3	7.4	8.3	8.3	0.7	22.1	22.1
Green Ratio (*g/C*)	0.21	0.21		0.09		0.09	0.12	0.41	0.41	0.03	0.32	0.32
Capacity (*c*), veh/h	366	357		159		141	204	768	766	47	603	513
Volume-to-Capacity Ratio (*X*)	0.609	0.851		0.186		0.188	0.810	0.357	0.357	0.345	0.884	0.884
Back of Queue (*Q*), ft/ln (95 th percentile)	177	246		24		22	150	151	148	15	332	283
Back of Queue (*Q*), veh/ln (95 th percentile)	6.9	9.6		1.0		0.9	5.8	5.9	5.9	0.6	13.0	11.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.35	0.49		0.55		0.49	0.30	0.30	0.30	0.03	0.66	0.58
Uniform Delay (d_1), s/veh	29.3	31.1		34.4		34.4	35.1	16.4	16.4	39.0	26.0	26.0
Incremental Delay (d_2), s/veh	0.6	2.3		0.2		0.2	3.0	0.1	0.1	0.9	1.0	1.2
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	29.9	33.3		34.6		34.6	38.1	16.5	16.5	39.8	27.0	27.2
Level of Service (LOS)	C	C		C		C	D	B	B	D	C	C
Approach Delay, s/veh / LOS	31.9	C		34.6	C		21.5	C		27.3	C	
Intersection Delay, s/veh / LOS	26.7						C					

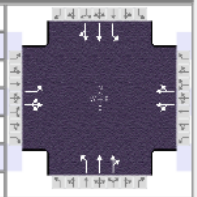
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.31	B	1.90	B	2.11	B
Bicycle LOS Score / LOS	1.36	A	0.53	A	1.08	A	1.21	A

 HCS™ Streets Version 2024 Generated: 5/1/2024 5:54:27 PM

Table 115.Wacker Dr and JFK Rd Saturday Noon-1PM HCS 10 Year Projection Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	JFK/Wacker	File Name	Wacker_Penn 10yr Update 12-1.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	468	13	76	21	12	25	173	570	6	14	498	407

Signal Information			
Cycle, s	88.5	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	2.3	3.2	29.8	19.1	7.6	0.0	1	2	3	4	
Yellow	3.5	3.5	4.0	3.0	3.0	0.0	5	6	7	8	
Red	1.5	1.5	1.5	2.5	2.5	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		24.6		13.1	15.5	43.5	7.3	35.3
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.0	3.1	3.2
Queue Clearance Time (g_s), s		18.0		3.4	10.5	11.3	2.8	27.4
Green Extension Time (g_e), s		1.0		0.0	0.1	1.0	0.0	2.3
Phase Call Probability		1.00		1.00	0.99	1.00	0.33	1.00
Max Out Probability		0.01		0.00	0.22	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	234	323		31		27	173	288	288	16	560	476
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1723		1794		1594	1767	1856	1849	1767	1856	1578
Queue Service Time (g_s), s	10.6	16.0		1.4		1.4	8.5	9.3	9.3	0.8	25.4	25.4
Cycle Queue Clearance Time (g_c), s	10.6	16.0		1.4		1.4	8.5	9.3	9.3	0.8	25.4	25.4
Green Ratio (*g/C*)	0.22	0.22		0.09		0.09	0.12	0.43	0.43	0.03	0.34	0.34
Capacity (*c*), veh/h	382	372		154		137	209	798	795	46	626	532
Volume-to-Capacity Ratio (*X*)	0.613	0.868		0.198		0.200	0.826	0.362	0.362	0.350	0.895	0.895
Back of Queue (*Q*), ft/ln (95 th percentile)	202	291		28		25	188	173	168	16	370	315
Back of Queue (*Q*), veh/ln (95 th percentile)	7.9	11.4		1.1		1.0	7.4	6.8	6.7	0.6	14.5	12.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.40	0.58		0.63		0.56	0.38	0.35	0.35	0.03	0.74	0.65
Uniform Delay (d_1), s/veh	31.4	33.6		37.7		37.7	38.2	17.1	17.1	42.5	27.9	27.9
Incremental Delay (d_2), s/veh	0.6	5.6		0.2		0.3	8.9	0.1	0.1	0.8	0.9	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
Control Delay (*d*), s/veh	32.0	39.1		37.9		38.0	47.1	17.2	17.2	43.3	28.8	29.0
Level of Service (LOS)	C	D		D		D	D	B	B	D	C	C
Approach Delay, s/veh / LOS	36.2	D		37.9	D		24.1	C		29.1	C	
Intersection Delay, s/veh / LOS	29.4						C					

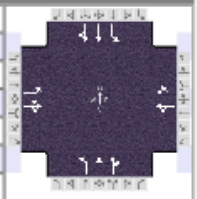
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.31	B	1.90	B	2.11	B
Bicycle LOS Score / LOS	1.41	A	0.54	A	1.11	A	1.25	A

 HCS™ Streets Version 2024 Generated: 5/6/2024 10:03:19 AM

Table 116.Wacker Dr and JFK Rd Saturday Noon-1PM HCS 10 Year Projection Conditions Optimized

HCS Signalized Intersection Results Summary

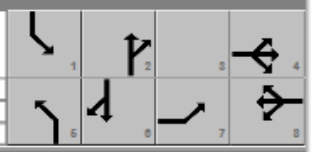
General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	JFK/Wacker	File Name	Wacker_Penn 10yr Update 12-1(Overall Delay).xus		
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	468	13	76	21	12	25	173	570	6	14	498	407

Signal Information			
Cycle, s	89.9	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	2.3	3.4	30.4	19.6	7.7	0.0
Yellow	3.5	3.5	4.0	3.0	3.0	0.0
Red	1.5	1.5	1.5	2.5	2.5	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		25.1		13.2	15.7	44.3	7.3	35.9
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.0	3.1	3.2
Queue Clearance Time (*g s*), s		18.3		3.4	10.6	11.5	2.8	27.8
Green Extension Time (*g e*), s		1.2		0.0	0.2	0.6	0.0	2.3
Phase Call Probability		1.00		1.00	0.99	1.00	0.33	1.00
Max Out Probability		0.00		0.01	0.01	0.24	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	234	323		31		27	173	288	288	16	560	476
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1723		1794		1594	1767	1856	1849	1767	1856	1578
Queue Service Time (*g s*), s	10.8	16.3		1.4		1.4	8.6	9.4	9.5	0.8	25.8	25.8
Cycle Queue Clearance Time (*g c*), s	10.8	16.3		1.4		1.4	8.6	9.4	9.5	0.8	25.8	25.8
Green Ratio (*g/C*)	0.22	0.22		0.09		0.09	0.12	0.43	0.43	0.03	0.34	0.34
Capacity (*c*), veh/h	386	376		153		136	212	802	799	46	628	534
Volume-to-Capacity Ratio (*X*)	0.607	0.859		0.199		0.201	0.818	0.360	0.360	0.347	0.891	0.892
Back of Queue (*Q*), ft/ln (95 th percentile)	205	284		28		25	176	176	172	16	383	327
Back of Queue (*Q*), veh/ln (95 th percentile)	8.0	11.1		1.1		1.0	6.9	6.9	6.9	0.6	15.0	13.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.41	0.57		0.64		0.58	0.35	0.35	0.35	0.03	0.77	0.67
Uniform Delay (*d 1*), s/veh	31.8	34.0		38.4		38.4	38.8	17.3	17.3	43.2	28.3	28.3
Incremental Delay (*d 2*), s/veh	0.6	2.3		0.2		0.3	3.0	0.1	0.1	0.9	1.0	1.2
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	32.4	36.3		38.7		38.7	41.8	17.4	17.4	44.1	29.3	29.5
Level of Service (LOS)	C	D		D		D	D	B	B	D	C	C
Approach Delay, s/veh / LOS	34.7	C		38.7	D		23.0	C		29.6	C	
Intersection Delay, s/veh / LOS	29.0						C					

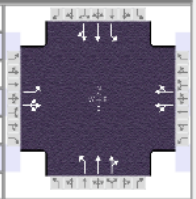
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.31	B	1.90	B	2.11	B
Bicycle LOS Score / LOS	1.41	A	0.54	A	1.11	A	1.25	A

 HCS™ Streets Version 2024 Generated: 5/1/2024 6:07:30 PM

Table 117.Wacker Dr and JFK Rd Saturday Noon-1PM HCS 20 Year Projection Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	JFK/Wacker	File Name	Wacker_Penn 20yr Update 12-1.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	517	15	84	23	13	28	192	630	6	16	550	449

Signal Information			
Cycle, s	106.3	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	2.9	5.4	38.6	24.3	8.5	0.0
Yellow	3.5	3.5	4.0	3.0	3.0	0.0
Red	1.5	1.5	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		29.8		14.0	18.4	54.6	7.9	44.1
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.0	3.1	3.2
Queue Clearance Time (g_s), s		23.5		3.9	13.3	13.9	3.1	36.0
Green Extension Time (g_e), s		0.9		0.1	0.1	1.1	0.0	2.6
Phase Call Probability		1.00		1.00	1.00	1.00	0.42	1.00
Max Out Probability		0.20		0.00	1.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	259	358		34		30	192	318	318	18	617	527
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1724		1794		1590	1767	1856	1849	1767	1856	1578
Queue Service Time (g_s), s	14.1	21.5		1.9		1.9	11.3	11.9	11.9	1.1	33.7	34.0
Cycle Queue Clearance Time (g_c), s	14.1	21.5		1.9		1.9	11.3	11.9	11.9	1.1	33.7	34.0
Green Ratio (*g/C*)	0.23	0.23		0.08		0.08	0.13	0.46	0.46	0.03	0.36	0.36
Capacity (*c*), veh/h	405	395		143		127	222	856	853	49	674	574
Volume-to-Capacity Ratio (*X*)	0.639	0.906		0.236		0.238	0.865	0.372	0.372	0.377	0.915	0.920
Back of Queue (*Q*), ft/ln (95 th percentile)	258	424		38		34	276	220	214	22	484	415
Back of Queue (*Q*), veh/ln (95 th percentile)	10.1	16.5		1.5		1.4	10.8	8.6	8.6	0.9	18.9	16.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.52	0.85		0.86		0.77	0.55	0.44	0.44	0.04	0.97	0.85
Uniform Delay (d_1), s/veh	37.0	39.9		45.9		45.9	45.6	18.6	18.6	50.8	32.3	32.4
Incremental Delay (d_2), s/veh	0.9	20.1		0.3		0.4	27.0	0.1	0.1	0.7	2.6	3.3
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	37.9	60.0		46.2		46.3	72.6	18.7	18.7	51.5	34.9	35.7
Level of Service (LOS)	D	E		D		D	E	B	B	D	C	D
Approach Delay, s/veh / LOS	50.7	D		46.2	D		31.2	C		35.5	D	
Intersection Delay, s/veh / LOS	37.9						D					

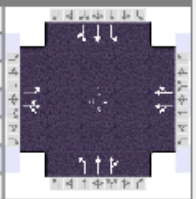
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.31	B	2.32	B	1.91	B	2.11	B
Bicycle LOS Score / LOS	1.50	B	0.54	A	1.17	A	1.32	A

 HCS™ Streets Version 2024 Generated: 5/6/2024 10:04:35 AM

Table 118.Wacker Dr and JFK Rd Saturday Noon-1PM HCS 20 Year Projection Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	5/1/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	JFK Rd	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	JFK/Wacker	File Name	Wacker_Penn 20yr Update 12-1(Overall Delay).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	517	15	84	23	13	28	192	630	6	16	550	449

Signal Information											
Cycle, s	108.2	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	Off	Green	3.0	5.8	39.3	25.1	8.5	0.0	
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	3.5	3.5	4.0	3.0	3.0	0.0	
				Red	1.5	1.5	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		30.6		14.0	18.8	55.6	8.0	44.8
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.0	3.1	3.2
Queue Clearance Time (g_s), s		23.8		3.9	13.5	14.0	3.1	36.6
Green Extension Time (g_e), s		1.3		0.1	0.3	1.1	0.0	2.7
Phase Call Probability		1.00		1.00	1.00	1.00	0.42	1.00
Max Out Probability		0.00		0.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	259	358		34		30	192	318	318	18	617	527
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1724		1794		1590	1767	1856	1849	1767	1856	1578
Queue Service Time (g_s), s	14.3	21.8		1.9		1.9	11.5	12.0	12.0	1.1	34.4	34.6
Cycle Queue Clearance Time (g_c), s	14.3	21.8		1.9		1.9	11.5	12.0	12.0	1.1	34.4	34.6
Green Ratio (*g/C*)	0.23	0.23		0.08		0.08	0.13	0.46	0.46	0.03	0.36	0.36
Capacity (*c*), veh/h	410	400		142		126	225	859	857	48	674	573
Volume-to-Capacity Ratio (*X*)	0.631	0.895		0.238		0.241	0.853	0.371	0.371	0.378	0.916	0.920
Back of Queue (*Q*), ft/ln (95 th percentile)	261	368		39		35	229	223	218	23	500	427
Back of Queue (*Q*), veh/ln (95 th percentile)	10.2	14.4		1.5		1.4	9.0	8.7	8.7	0.9	19.5	17.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.52	0.74		0.88		0.79	0.46	0.45	0.45	0.05	1.00	0.87
Uniform Delay (d_1), s/veh	37.4	40.3		46.8		46.8	46.2	18.8	18.8	51.7	32.9	33.0
Incremental Delay (d_2), s/veh	0.6	3.0		0.3		0.4	3.7	0.1	0.1	0.9	1.1	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	38.0	43.3		47.1		47.2	49.9	18.9	18.9	52.6	34.0	34.4
Level of Service (LOS)	D	D		D		D	D	B	B	D	C	C
Approach Delay, s/veh / LOS	41.1	D		47.2	D		26.1	C		34.5	C	
Intersection Delay, s/veh / LOS	33.7						C					

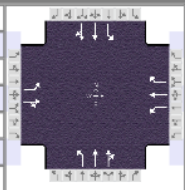
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.31	B	2.32	B	1.91	B	2.11	B
Bicycle LOS Score / LOS	1.50	B	0.54	A	1.17	A	1.32	A

 HCS™ Streets Version 2024 Generated: 5/1/2024 6:13:34 PM

Table 119. Pennsylvania Ave and JFK Rd Saturday 11-12PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Penn/JFK	File Name	Intersection (Penn-JFK).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	174	148	126	103	130	72	140	717	87	88	760	150

Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	6.6	0.3	62.2	8.7	3.2	18.3		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0		
				Red	1.2	0.0	1.1	1.2	0.0	1.2		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	2.0	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	17.1	26.8	13.9	23.5	12.1	67.5	11.8	67.3
Change Period, ($Y+R_c$), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s	11.8	20.7	8.9	9.7	5.6		4.6	
Green Extension Time (g_e), s	0.1	0.8	0.1	0.9	0.2	0.0	0.1	0.0
Phase Call Probability	1.00	1.00	0.97	1.00	0.98		0.95	
Max Out Probability	0.13	0.00	0.00	0.00	0.00		0.00	

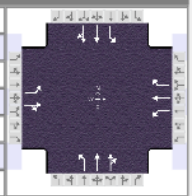
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	174	274		103	130	72	122	356	343	88	468	442
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1714		1767	1856	1572	1838	1856	1785	1838	1856	1749
Queue Service Time (g_s), s	9.8	18.7		6.9	7.7	4.9	3.6	13.4	13.3	2.6	19.5	19.5
Cycle Queue Clearance Time (g_c), s	9.8	18.7		6.9	7.7	4.9	3.6	13.4	13.3	2.6	19.5	19.5
Green Ratio (*g/C*)	0.25	0.18		0.07	0.15	0.15	0.58	0.52	0.52	0.57	0.52	0.52
Capacity (*c*), veh/h	347	308		128	284	240	390	965	928	463	961	906
Volume-to-Capacity Ratio (*X*)	0.502	0.889		0.805	0.458	0.300	0.312	0.368	0.370	0.190	0.487	0.488
Back of Queue (*Q*), ft/ln (95 th percentile)	195	339		148	164	88	70	247	229	48	343	320
Back of Queue (*Q*), veh/ln (95 th percentile)	7.6	13.2		5.8	6.4	3.4	2.7	9.6	9.2	1.9	13.4	12.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.78	0.00		0.59	0.00	0.35	0.30	0.00	0.00	0.30	0.00	0.00
Uniform Delay (d_1), s/veh	37.5	48.0		54.8	46.3	45.1	14.2	16.7	16.3	12.6	18.6	18.7
Incremental Delay (d_2), s/veh	0.4	6.5		4.6	0.4	0.3	0.2	1.0	1.1	0.1	1.8	1.9
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	0.0	0.0
Control Delay (*d*), s/veh	37.9	54.5		59.4	46.7	45.4	14.3	17.7	17.4	12.6	20.4	20.5
Level of Service (LOS)	D	D		E	D	D	B	B	B	B	C	C
Approach Delay, s/veh / LOS	48.1	D		50.7	D		17.1	B		19.8	B	
Intersection Delay, s/veh / LOS	27.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.31	B	2.31	B	2.09	B	1.90	B
Bicycle LOS Score / LOS	1.23	A	0.99	A	1.27	A	1.31	A

Table 120. Pennsylvania Ave and JFK Rd Saturday 11-12PM HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Penn/JFK	File Name	Intersection (Penn-JFK)_Overall_Delay.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	174	148	126	103	130	72	140	717	87	88	760	150

Signal Information			
Cycle, s	74.2	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	5.9	0.6	22.9	10.0	14.3	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	1.2	0.0	1.1	1.2	1.1	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4	1	6	5	2
Case Number		10.0		9.0	1.1	4.0	1.1	4.0
Phase Duration, s		19.4		15.2	11.6	28.5	11.1	28.0
Change Period, (*Y+R c*), s		5.1		5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s		3.2		3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		13.4		6.8	5.2	14.1	4.3	19.4
Green Extension Time (*g e*), s		0.8		0.4	0.1	3.4	0.1	3.4
Phase Call Probability		1.00		1.00	0.92	1.00	0.84	1.00
Max Out Probability		0.00		0.00	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	174	274		103	130	72	122	356	343	88	468	442
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1714		1767	1856	1572	1838	1856	1785	1838	1856	1749
Queue Service Time (*g s*), s	6.5	11.4		4.0	4.8	3.1	3.2	12.0	12.1	2.3	17.4	17.4
Cycle Queue Clearance Time (*g c*), s	6.5	11.4		4.0	4.8	3.1	3.2	12.0	12.1	2.3	17.4	17.4
Green Ratio (*g/C*)	0.19	0.19		0.13	0.13	0.13	0.40	0.32	0.32	0.39	0.31	0.31
Capacity (*c*), veh/h	341	331		237	249	211	305	587	564	341	572	540
Volume-to-Capacity Ratio (*X*)	0.510	0.828		0.434	0.521	0.341	0.399	0.606	0.608	0.258	0.818	0.818
Back of Queue (*Q*), ft/ln (95 th percentile)	122	208		76	97	52	57	209	199	41	296	276
Back of Queue (*Q*), veh/ln (95 th percentile)	4.8	8.1		3.0	3.8	2.0	2.2	8.2	8.0	1.6	11.6	11.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.67	0.00		0.66	0.00	0.45	0.57	0.00	0.00	0.34	0.00	0.00
Uniform Delay (*d 1*), s/veh	26.8	28.8		29.6	29.9	29.2	17.0	21.5	21.5	16.0	23.8	23.8
Incremental Delay (*d 2*), s/veh	0.4	2.1		0.5	0.6	0.4	0.3	0.3	0.3	0.1	1.1	1.2
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	27.3	30.9		30.0	30.6	29.5	17.3	21.8	21.8	16.1	24.9	25.0
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	29.5	C		30.1	C		21.2	C		24.2	C	
Intersection Delay, s/veh / LOS	24.8						C					

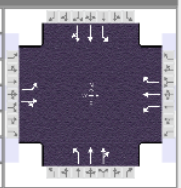
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.29	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.23	A	0.99	A	1.27	A	1.31	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:13:09 PM

Table 121. Pennsylvania Ave and JFK Rd Saturday 11-12PM HCS 5-yr Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Penn/JFK	File Name	Intersection (Penn-JFK)_Overall_Delay_5yr.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	183	156	132	108	137	76	147	756	91	92	799	158

Signal Information												
Cycle, s	77.7	Reference Phase	2									
Offset, s	0	Reference Point	End	Green	6.1	0.5	24.9	10.0	15.7	0.0		
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	0.0	4.0	4.0	4.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.2	0.0	1.1	1.2	1.1	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4	1	6	5	2
Case Number		10.0		9.0	1.1	4.0	1.1	4.0
Phase Duration, s		20.8		15.2	11.7	30.5	11.3	30.0
Change Period, ($Y+R_c$), s		5.1		5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s		3.2		3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		14.6		7.4	5.4	14.9	4.5	21.1
Green Extension Time (g_e), s		0.9		0.4	0.2	3.6	0.0	3.6
Phase Call Probability		1.00		1.00	0.93	1.00	0.86	1.00
Max Out Probability		0.00		0.07	0.00	0.00	0.14	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	183	288		108	137	76	125	366	353	92	493	464
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1708		1767	1856	1554	1838	1856	1785	1838	1856	1748
Queue Service Time (g_s), s	7.2	12.6		4.4	5.4	3.5	3.4	12.9	12.9	2.5	19.1	19.1
Cycle Queue Clearance Time (g_c), s	7.2	12.6		4.4	5.4	3.5	3.4	12.9	12.9	2.5	19.1	19.1
Green Ratio (*g/C*)	0.20	0.20		0.13	0.13	0.13	0.41	0.33	0.33	0.40	0.32	0.32
Capacity (*c*), veh/h	357	345		226	238	199	294	608	585	341	596	562
Volume-to-Capacity Ratio (*X*)	0.512	0.834		0.477	0.576	0.382	0.424	0.601	0.603	0.269	0.826	0.826
Back of Queue (*Q*), ft/ln (95 th percentile)	136	226		86	110	59	61	223	212	45	323	301
Back of Queue (*Q*), veh/ln (95 th percentile)	5.3	8.8		3.3	4.3	2.3	2.4	8.7	8.5	1.7	12.6	12.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.74	0.00		0.74	0.00	0.51	0.61	0.00	0.00	0.37	0.00	0.00
Uniform Delay (d_1), s/veh	27.7	29.9		31.6	32.0	31.2	17.7	22.0	22.0	16.3	24.5	24.5
Incremental Delay (d_2), s/veh	0.4	2.1		0.6	0.8	0.4	0.3	0.3	0.3	0.2	1.1	1.2
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	28.1	31.9		32.2	32.8	31.6	18.0	22.3	22.3	16.4	25.6	25.7
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	30.5	C		32.3	C		21.7	C		24.8	C	
Intersection Delay, s/veh / LOS	25.7						C					

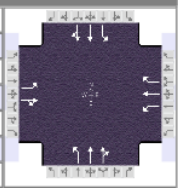
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.29	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.26	A	1.02	A	1.31	A	1.35	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:17:13 PM

Table 122. Pennsylvania Ave and JFK Rd Saturday 11-12PM HCS 10-yr Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Penn/JFK	File Name	Intersection (Penn-JFK)_Overall_Delay_10yr.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	192	163	139	114	144	80	155	794	96	97	840	166

Signal Information			
Cycle, s	81.6	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	6.3	0.4	27.2	10.0	17.0	0.0	1	2	3	4		
Yellow	4.0	0.0	4.0	4.0	4.0	0.0	5	6	7	8		
Red	1.2	0.0	1.1	1.2	1.1	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4	1	6	5	2
Case Number		10.0		9.0	1.1	4.0	1.1	4.0
Phase Duration, s		22.1		15.2	11.9	32.8	11.5	32.3
Change Period, ($Y+R_c$), s		5.1		5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s		3.2		3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		16.0		8.1	5.8	16.6	4.7	23.1
Green Extension Time (g_e), s		0.9		0.6	0.2	3.9	0.1	3.8
Phase Call Probability		1.00		1.00	0.95	1.00	0.89	1.00
Max Out Probability		0.00		0.00	0.00	0.00	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	192	302		114	144	80	135	394	380	97	518	488
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1705		1767	1856	1545	1838	1856	1785	1838	1856	1748
Queue Service Time (g_s), s	7.9	14.0		5.0	6.1	3.9	3.8	14.6	14.6	2.7	21.1	21.1
Cycle Queue Clearance Time (g_c), s	7.9	14.0		5.0	6.1	3.9	3.8	14.6	14.6	2.7	21.1	21.1
Green Ratio (*g/C*)	0.21	0.21		0.12	0.12	0.12	0.42	0.34	0.34	0.41	0.33	0.33
Capacity (*c*), veh/h	371	358		216	227	189	284	631	607	330	621	586
Volume-to-Capacity Ratio (*X*)	0.518	0.844		0.528	0.635	0.424	0.475	0.625	0.626	0.294	0.833	0.833
Back of Queue (*Q*), ft/ln (95 th percentile)	150	246		97	125	67	69	248	235	49	352	328
Back of Queue (*Q*), veh/ln (95 th percentile)	5.9	9.6		3.8	4.9	2.6	2.7	9.7	9.4	1.9	13.7	13.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.82	0.00		0.84	0.00	0.58	0.69	0.00	0.00	0.41	0.00	0.00
Uniform Delay (d_1), s/veh	28.7	31.1		33.8	34.3	33.3	18.6	22.7	22.7	16.8	25.2	25.2
Incremental Delay (d_2), s/veh	0.4	2.2		0.7	1.1	0.6	0.4	0.3	0.3	0.2	1.2	1.2
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	29.1	33.3		34.5	35.4	33.9	18.9	23.0	23.0	16.9	26.3	26.4
Level of Service (LOS)	C	C		C	D	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	31.7	C		34.7	C		22.4	C		25.5	C	
Intersection Delay, s/veh / LOS	26.7						C					

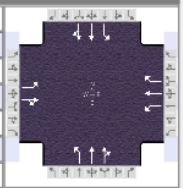
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.31	B	2.29	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.30	A	1.05	A	1.35	A	1.40	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:19:08 PM

Table 123. Pennsylvania Ave and JFK Rd Saturday 11-12PM HCS 20-yr Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Penn/JFK	File Name	Intersection (Penn-JFK)_Overall_Delay_20yr.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	212	181	154	126	159	88	171	877	106	107	927	183

Signal Information												
Cycle, s	90.9	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.6	0.3	32.8	10.1	20.6	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	4.0	0.0		
				Red	1.2	0.0	1.1	1.2	1.1	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4	1	6	5	2
Case Number		10.0		9.0	1.1	4.0	1.1	4.0
Phase Duration, s		25.7		15.3	12.1	38.2	11.8	37.9
Change Period, (*Y+R c*), s		5.1		5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		19.3		9.6	6.5	19.9	5.2	28.0
Green Extension Time (*g e*), s		1.1		0.3	0.2	4.5	0.2	4.5
Phase Call Probability		1.00		1.00	0.98	1.00	0.93	1.00
Max Out Probability		0.00		0.41	0.00	0.02	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	212	335		126	159	88	149	437	420	107	571	539
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1702		1767	1856	1530	1838	1856	1785	1838	1856	1749
Queue Service Time (*g s*), s	9.6	17.3		6.2	7.6	5.0	4.5	17.9	17.9	3.2	26.0	26.0
Cycle Queue Clearance Time (*g c*), s	9.6	17.3		6.2	7.6	5.0	4.5	17.9	17.9	3.2	26.0	26.0
Green Ratio (*g/C*)	0.23	0.23		0.11	0.11	0.11	0.44	0.36	0.36	0.44	0.36	0.36
Capacity (*c*), veh/h	402	387		196	206	170	257	677	651	310	671	632
Volume-to-Capacity Ratio (*X*)	0.528	0.865		0.643	0.773	0.519	0.580	0.645	0.645	0.345	0.851	0.852
Back of Queue (*Q*), ft/ln (95 th percentile)	186	295		125	171	86	86	294	279	60	423	394
Back of Queue (*Q*), veh/ln (95 th percentile)	7.2	11.5		4.9	6.7	3.3	3.3	11.5	11.1	2.3	16.5	15.8
Queue Storage Ratio (*RQ*) (95 th percentile)	1.02	0.00		1.09	0.00	0.75	0.86	0.00	0.00	0.50	0.00	0.00
Uniform Delay (*d 1*), s/veh	31.0	34.0		38.9	39.6	38.4	20.8	24.1	24.1	18.0	26.9	27.0
Incremental Delay (*d 2*), s/veh	0.4	2.4		1.3	5.6	0.9	0.6	0.3	0.3	0.2	1.3	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	0.0
Control Delay (*d*), s/veh	31.4	36.4		40.3	45.2	39.3	21.4	24.4	24.5	18.3	28.3	28.4
Level of Service (LOS)	C	D		D	D	D	C	C	C	B	C	C
Approach Delay, s/veh / LOS	34.5	C		42.1	D		24.0	C		27.4	C	
Intersection Delay, s/veh / LOS	29.3						C					

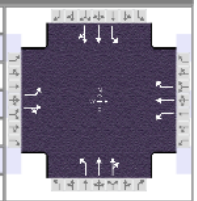
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.31	B	2.29	B	2.11	B	1.91	B
Bicycle LOS Score / LOS	1.39	A	1.10	A	1.44	A	1.49	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:20:28 PM

Table 124. Pennsylvania Ave and JFK Rd Saturday 4-5PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Penn/JFK	File Name	Intersection (Penn-JFK).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	104	140	97	56	105	57	115	579	65	90	486	85

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.8	67.7	5.9	1.9	16.9	0.0	
Yellow	4.0	4.0	4.0	0.0	4.0	0.0	
Red	1.2	1.1	1.2	0.0	1.2	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	2.0	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	13.0	24.0	11.1	22.1	12.0	72.7	12.1	72.8
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	0.0	3.1	0.0
Queue Clearance Time (*g s*), s	8.0	18.1	5.7	8.2	4.9		5.6	
Green Extension Time (*g e*), s	0.1	0.7	0.0	0.8	0.2	0.0	0.2	0.0
Phase Call Probability	0.97	1.00	0.85	1.00	0.97		0.99	
Max Out Probability	0.00	0.00	0.00	0.00	0.00		0.00	

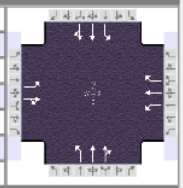
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	104	237		56	105	57	111	315	305	136	442	420
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1728		1767	1856	1572	1838	1856	1789	1838	1856	1759
Queue Service Time (*g s*), s	6.0	16.1		3.7	6.2	3.9	2.9	8.9	8.4	3.6	14.5	13.6
Cycle Queue Clearance Time (*g c*), s	6.0	16.1		3.7	6.2	3.9	2.9	8.9	8.4	3.6	14.5	13.6
Green Ratio (*g/C*)	0.21	0.16		0.05	0.14	0.14	0.62	0.56	0.56	0.62	0.56	0.56
Capacity (*c*), veh/h	289	271		87	262	222	447	1046	1009	572	1048	993
Volume-to-Capacity Ratio (*X*)	0.359	0.875		0.643	0.401	0.257	0.247	0.301	0.302	0.237	0.422	0.423
Back of Queue (*Q*), ft/ln (95 th percentile)	120	295		79	132	70	54	163	144	67	234	203
Back of Queue (*Q*), veh/ln (95 th percentile)	4.7	11.5		3.1	5.2	2.7	2.1	6.4	5.8	2.6	9.1	8.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.48	0.00		0.32	0.00	0.28	0.24	0.00	0.00	0.42	0.00	0.00
Uniform Delay (*d 1*), s/veh	40.4	49.4		56.0	46.9	45.9	11.0	10.7	10.0	10.0	12.4	11.3
Incremental Delay (*d 2*), s/veh	0.3	3.7		3.0	0.4	0.2	0.1	0.7	0.7	0.1	1.0	1.0
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	40.6	53.1		59.0	47.3	46.2	11.1	11.4	10.7	10.0	13.4	12.3
Level of Service (LOS)	D	D		E	D	D	B	B	B	B	B	B
Approach Delay, s/veh / LOS	49.3	D		50.0	D		11.1	B		12.5	B	
Intersection Delay, s/veh / LOS	21.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.31	B	2.31	B	2.09	B	1.90	B
Bicycle LOS Score / LOS	1.05	A	0.85	A	1.11	A	1.03	A

Table 125. Pennsylvania Ave and JFK Rd Saturday 4-5PM HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Penn/JFK	File Name	Intersection (Penn-JFK)_Overall_Delay.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	104	140	97	56	105	57	115	579	65	90	486	85

Signal Information												
Cycle, s	66.3	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.1	0.3	18.1	9.8	11.4	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	4.0	0.0		
				Red	1.2	0.0	1.1	1.2	1.1	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4	1	6	5	2
Case Number		10.0		9.0	1.1	4.0	1.1	4.0
Phase Duration, s		16.5		15.0	11.3	23.2	11.6	23.5
Change Period, (*Y+R c*), s		5.1		5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s		3.2		3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		10.7		5.4	4.7	11.9	5.3	17.0
Green Extension Time (*g e*), s		0.6		0.4	0.2	1.3	0.2	1.3
Phase Call Probability		1.00		0.98	0.87	1.00	0.92	1.00
Max Out Probability		0.00		0.00	0.00	0.99	0.00	0.33

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	104	237		56	105	57	111	315	305	136	442	420
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1728		1767	1856	1572	1838	1856	1789	1838	1856	1759
Queue Service Time (*g s*), s	3.4	8.7		1.8	3.4	2.1	2.7	9.8	9.9	3.3	15.0	15.0
Cycle Queue Clearance Time (*g c*), s	3.4	8.7		1.8	3.4	2.1	2.7	9.8	9.9	3.3	15.0	15.0
Green Ratio (*g/C*)	0.17	0.17		0.15	0.15	0.15	0.36	0.27	0.27	0.37	0.28	0.28
Capacity (*c*), veh/h	303	297		262	275	233	292	506	488	390	515	489
Volume-to-Capacity Ratio (*X*)	0.343	0.799		0.214	0.382	0.245	0.379	0.622	0.625	0.349	0.858	0.859
Back of Queue (*Q*), ft/ln (95 th percentile)	63	161		34	66	35	47	180	172	58	233	219
Back of Queue (*Q*), veh/ln (95 th percentile)	2.5	6.3		1.3	2.6	1.4	1.8	7.0	6.9	2.3	9.1	8.7
Queue Storage Ratio (*RQ*) (95 th percentile)	0.25	0.00		0.14	0.00	0.14	0.21	0.00	0.00	0.36	0.00	0.00
Uniform Delay (*d 1*), s/veh	24.2	26.4		24.9	25.5	25.0	16.6	21.1	21.1	15.1	22.7	22.7
Incremental Delay (*d 2*), s/veh	0.2	1.9		0.2	0.3	0.2	0.2	1.4	1.5	0.1	3.0	3.2
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	24.4	28.3		25.0	25.8	25.2	16.9	22.5	22.6	15.2	25.7	25.9
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	27.1	C		25.5	C		21.7	C		24.4	C	
Intersection Delay, s/veh / LOS	24.0						C					

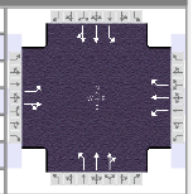
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.28	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.05	A	0.85	A	1.11	A	1.03	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:25:10 PM

Table 126. Pennsylvania Ave and JFK Rd Saturday 4-5PM HCS 5-yr projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Penn/JFK	File Name	Intersection (Penn-JFK)_Overall_Delay_5yr.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	110	148	102	60	116	63	121	609	68	95	513	100

Signal Information										
Cycle, s	71.6	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.2	0.3	21.7	9.9	12.8	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	4.0	0.0
				Red	1.2	0.0	1.1	1.2	1.1	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4	1	6	5	2
Case Number		10.0		9.0	1.1	4.0	1.1	4.0
Phase Duration, s		17.9		15.1	11.4	26.8	11.8	27.2
Change Period, (*Y+R c*), s		5.1		5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s		3.2		3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		12.0		6.1	4.8	12.3	5.6	18.7
Green Extension Time (*g e*), s		0.7		0.3	0.2	3.1	0.3	3.2
Phase Call Probability		1.00		0.99	0.89	1.00	0.94	1.00
Max Out Probability		0.00		0.01	0.00	0.01	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	110	250		60	116	63	111	315	305	141	468	441
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1722		1767	1856	1556	1838	1856	1790	1838	1856	1750
Queue Service Time (*g s*), s	3.9	10.0		2.2	4.1	2.6	2.8	10.2	10.3	3.6	16.7	16.7
Cycle Queue Clearance Time (*g c*), s	3.9	10.0		2.2	4.1	2.6	2.8	10.2	10.3	3.6	16.7	16.7
Green Ratio (*g/C*)	0.18	0.18		0.14	0.14	0.14	0.39	0.30	0.30	0.40	0.31	0.31
Capacity (*c*), veh/h	317	308		244	256	215	292	564	544	405	573	540
Volume-to-Capacity Ratio (*X*)	0.347	0.810		0.246	0.453	0.293	0.379	0.558	0.560	0.348	0.816	0.816
Back of Queue (*Q*), ft/ln (95 th percentile)	73	187		41	82	43	50	183	174	63	249	232
Back of Queue (*Q*), veh/ln (95 th percentile)	2.8	7.3		1.6	3.2	1.7	1.9	7.1	7.0	2.5	9.7	9.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.40	0.00		0.36	0.00	0.38	0.50	0.00	0.00	0.53	0.00	0.00
Uniform Delay (*d 1*), s/veh	25.8	28.3		27.6	28.5	27.8	17.0	21.0	21.0	15.1	22.9	22.9
Incremental Delay (*d 2*), s/veh	0.2	2.0		0.2	0.5	0.3	0.2	0.3	0.3	0.1	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	26.1	30.3		27.8	28.9	28.1	17.2	21.2	21.3	15.1	23.5	23.5
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	29.0	C		28.4	C		20.6	C		22.4	C	
Intersection Delay, s/veh / LOS	23.5						C					

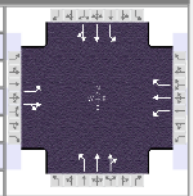
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.29	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.08	A	0.88	A	1.15	A	1.07	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:26:21 PM

Table 127. Pennsylvania Ave and JFK Rd Saturday 4-5PM HCS 10-yr projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Penn/JFK	File Name	Intersection (Penn-JFK)_Overall_Delay_10yr.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	116	156	107	63	122	66	127	642	72	99	539	105

Signal Information			
Cycle, s	74.6	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	6.5	0.2	23.6	10.0	13.8	0.0	
Yellow	4.0	0.0	4.0	4.0	4.0	0.0	
Red	1.2	0.0	1.1	1.2	1.1	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4	1	6	5	2
Case Number		10.0		9.0	1.1	4.0	1.1	4.0
Phase Duration, s		18.9		15.2	11.7	28.7	11.9	29.0
Change Period, (*Y+R c*), s		5.1		5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s		3.2		3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		13.0		6.6	5.2	13.8	5.9	20.3
Green Extension Time (*g e*), s		0.7		0.5	0.1	3.2	0.3	3.5
Phase Call Probability		1.00		0.99	0.92	1.00	0.95	1.00
Max Out Probability		0.00		0.00	0.00	0.09	0.00	0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	116	263		63	122	66	122	348	336	147	491	463
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1720		1767	1856	1548	1838	1856	1789	1838	1856	1750
Queue Service Time (*g s*), s	4.3	11.0		2.4	4.6	2.9	3.2	11.8	11.8	3.9	18.3	18.3
Cycle Queue Clearance Time (*g c*), s	4.3	11.0		2.4	4.6	2.9	3.2	11.8	11.8	3.9	18.3	18.3
Green Ratio (*g/C*)	0.18	0.18		0.13	0.13	0.13	0.40	0.32	0.32	0.41	0.32	0.32
Capacity (*c*), veh/h	327	318		235	247	206	285	589	568	386	594	560
Volume-to-Capacity Ratio (*X*)	0.355	0.826		0.268	0.494	0.320	0.427	0.591	0.593	0.380	0.827	0.827
Back of Queue (*Q*), ft/ln (95 th percentile)	80	204		46	91	48	56	203	193	68	269	250
Back of Queue (*Q*), veh/ln (95 th percentile)	3.1	7.9		1.8	3.6	1.9	2.2	7.9	7.7	2.7	10.5	10.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.44	0.00		0.40	0.00	0.42	0.57	0.00	0.00	0.57	0.00	0.00
Uniform Delay (*d 1*), s/veh	26.6	29.3		29.1	30.1	29.4	17.6	21.5	21.5	15.4	23.5	23.5
Incremental Delay (*d 2*), s/veh	0.2	2.1		0.2	0.6	0.3	0.3	0.3	0.3	0.1	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	26.8	31.5		29.4	30.7	29.7	17.8	21.7	21.8	15.6	24.1	24.1
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	30.1	C		30.1	C		21.2	C		22.9	C	
Intersection Delay, s/veh / LOS	24.1						C					

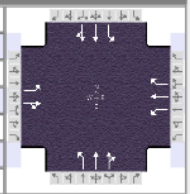
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.29	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.11	A	0.90	A	1.18	A	1.10	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:26:48 PM

Table 128. Pennsylvania Ave and JFK Rd Saturday 4-5PM HCS 20-yr projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Penn/JFK	File Name	Intersection (Penn-JFK)_Overall_Delay_20yr.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	128	172	118	70	134	73	140	709	79	110	595	116

Signal Information												
Cycle, s	83.1	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.7	0.2	28.9	10.0	16.7	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	4.0	0.0		
				Red	1.2	0.0	1.1	1.2	1.1	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4	1	6	5	2
Case Number		10.0		9.0	1.1	4.0	1.1	4.0
Phase Duration, s		21.8		15.2	11.9	34.0	12.1	34.1
Change Period, (*Y+R c*), s		5.1		5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		15.6		7.8	5.8	16.3	6.6	24.5
Green Extension Time (g_e), s		0.8		0.5	0.2	4.1	0.3	4.0
Phase Call Probability		1.00		1.00	0.96	1.00	0.98	1.00
Max Out Probability		0.00		0.00	0.00	0.00	0.00	0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	128	290		70	134	73	134	385	372	163	543	512
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1717		1767	1856	1533	1838	1856	1790	1838	1856	1750
Queue Service Time (g_s), s	5.2	13.6		3.1	5.8	3.7	3.8	14.3	14.3	4.6	22.5	22.5
Cycle Queue Clearance Time (g_c), s	5.2	13.6		3.1	5.8	3.7	3.8	14.3	14.3	4.6	22.5	22.5
Green Ratio (*g/C*)	0.20	0.20		0.12	0.12	0.12	0.43	0.35	0.35	0.44	0.35	0.35
Capacity (*c*), veh/h	359	349		211	222	183	268	647	624	373	652	615
Volume-to-Capacity Ratio (*X*)	0.357	0.831		0.332	0.605	0.399	0.502	0.595	0.596	0.438	0.832	0.833
Back of Queue (*Q*), ft/ln (95 th percentile)	100	243		59	119	63	69	240	228	82	318	296
Back of Queue (*Q*), veh/ln (95 th percentile)	3.9	9.5		2.3	4.6	2.4	2.7	9.4	9.1	3.2	12.4	11.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.55	0.00		0.52	0.00	0.55	0.69	0.00	0.00	0.68	0.00	0.00
Uniform Delay (d_1), s/veh	28.8	32.1		33.9	35.1	34.2	19.2	22.5	22.5	16.3	25.0	25.0
Incremental Delay (d_2), s/veh	0.2	2.0		0.3	1.0	0.5	0.4	0.2	0.3	0.1	0.4	0.5
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	29.0	34.1		34.2	36.1	34.7	19.6	22.7	22.7	16.5	25.4	25.4
Level of Service (LOS)	C	C		C	D	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	32.5	C		35.3	D		22.3	C		24.2	C	
Intersection Delay, s/veh / LOS	25.9						C					

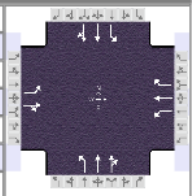
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.31	B	2.29	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.18	A	0.94	A	1.25	A	1.16	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:27:14 PM

Table 129. Pennsylvania Ave and JFK Rd Saturday 5-6PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Penn/JFK	File Name	Intersection (Penn-JFK).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	105	183	159	89	114	62	125	563	93	77	511	91

Signal Information					EB			WB			NB			SB		
Cycle, s	120.0	Reference Phase	2	Green	6.8	0.1		58.5	7.3	0.3	26.4					
Offset, s	0	Reference Point	End	Yellow	4.0	0.0		4.0	4.0	0.0	4.0					
Uncoordinated	No	Simult. Gap E/W	On	Red	1.2	0.0		1.1	1.2	0.0	1.1					
Force Mode	Fixed	Simult. Gap N/S	On													

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	1.1	4.0	2.0	3.0	1.1	4.0	1.1	4.0
Phase Duration, s	12.5	31.5	12.8	31.8	12.1	63.8	12.0	63.6
Change Period, (*Y+R c*), s	5.2	5.2	5.2	5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	0.0	3.1	0.0
Queue Clearance Time (*g s*), s	7.5	25.4	8.0	8.1	6.0		5.2	
Green Extension Time (*g e*), s	0.1	0.9	0.1	1.0	0.2	0.0	0.1	0.0
Phase Call Probability	0.97	1.00	0.95	1.00	0.98		0.96	
Max Out Probability	0.00	0.01	0.00	0.00	0.00		0.00	

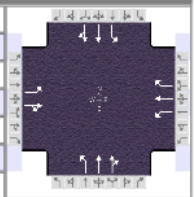
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	105	342		89	114	62	125	335	321	101	403	383
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1712		1767	1856	1572	1838	1856	1763	1838	1856	1757
Queue Service Time (*g s*), s	5.5	23.4		6.0	6.1	3.8	4.0	13.5	13.6	3.2	12.9	11.9
Cycle Queue Clearance Time (*g c*), s	5.5	23.4		6.0	6.1	3.8	4.0	13.5	13.6	3.2	12.9	11.9
Green Ratio (*g/C*)	0.28	0.22		0.06	0.22	0.22	0.55	0.49	0.49	0.54	0.49	0.49
Capacity (*c*), veh/h	363	375		112	411	348	435	907	862	451	905	857
Volume-to-Capacity Ratio (*X*)	0.289	0.912		0.793	0.278	0.178	0.287	0.370	0.372	0.223	0.446	0.447
Back of Queue (*Q*), ft/ln (95 th percentile)	108	436		128	128	68	75	256	242	62	212	182
Back of Queue (*Q*), veh/ln (95 th percentile)	4.2	17.0		5.0	5.0	2.7	2.9	10.0	9.7	2.4	8.3	7.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.43	0.00		0.51	0.00	0.27	0.33	0.00	0.00	0.39	0.00	0.00
Uniform Delay (*d 1*), s/veh	33.3	45.7		55.4	38.8	37.9	14.2	19.1	19.2	15.0	13.1	11.6
Incremental Delay (*d 2*), s/veh	0.2	16.0		4.9	0.1	0.1	0.1	1.2	1.2	0.1	1.4	1.5
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	33.5	61.7		60.3	38.9	38.0	14.3	20.3	20.4	15.1	14.5	13.1
Level of Service (LOS)	C	E		E	D	D	B	C	C	B	B	B
Approach Delay, s/veh / LOS	55.1	E		45.9	D		19.4	B		13.9	B	
Intersection Delay, s/veh / LOS	27.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.30	B	2.10	B	1.91	B
Bicycle LOS Score / LOS	1.23	A	0.92	A	1.13	A	1.05	A

Table 130. Pennsylvania Ave and JFK Rd Saturday 5-6PM HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Penn/JFK	File Name	Intersection (Penn-JFK)_Overall_Delay.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	105	183	159	89	114	62	125	563	93	77	511	91

Signal Information													
Cycle, s	72.3	Reference Phase	2										
Offset, s	0	Reference Point	End	Green	6.1	0.4	18.6	10.0	16.7	0.0			
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	0.0	4.0	4.0	4.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.2	0.0	1.1	1.2	1.1	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4	1	6	5	2
Case Number		10.0		9.0	1.1	4.0	1.1	4.0
Phase Duration, s		21.8		15.2	11.6	24.1	11.3	23.7
Change Period, ($Y+R_c$), s		5.1		5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s		3.2		3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		15.9		6.1	5.5	13.9	4.8	17.0
Green Extension Time (g_e), s		0.8		0.5	0.1	0.5	0.2	1.6
Phase Call Probability		1.00		1.00	0.92	1.00	0.87	1.00
Max Out Probability		0.00		0.00	0.00	1.00	0.00	0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	105	342		89	114	62	125	335	321	101	403	383
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1712		1767	1856	1572	1838	1856	1763	1838	1856	1757
Queue Service Time (g_s), s	3.5	13.9		3.3	4.1	2.6	3.5	11.8	11.9	2.8	14.9	15.0
Cycle Queue Clearance Time (g_c), s	3.5	13.9		3.3	4.1	2.6	3.5	11.8	11.9	2.8	14.9	15.0
Green Ratio (*g/C*)	0.23	0.23		0.14	0.14	0.14	0.35	0.26	0.26	0.34	0.26	0.26
Capacity (*c*), veh/h	409	396		243	255	216	299	487	463	311	478	453
Volume-to-Capacity Ratio (*X*)	0.257	0.863		0.366	0.447	0.287	0.418	0.689	0.693	0.323	0.844	0.846
Back of Queue (Q), ft/ln (95 th percentile)	64	240		63	81	43	63	231	219	50	231	216
Back of Queue (Q), veh/ln (95 th percentile)	2.5	9.4		2.4	3.2	1.7	2.5	9.0	8.8	2.0	9.0	8.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.26	0.00		0.25	0.00	0.17	0.27	0.00	0.00	0.31	0.00	0.00
Uniform Delay (d_1), s/veh	22.7	26.7		28.4	28.7	28.0	18.5	24.0	24.1	18.0	25.5	25.5
Incremental Delay (d_2), s/veh	0.1	2.3		0.3	0.5	0.3	0.3	3.5	3.8	0.1	0.8	0.8
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	22.9	29.0		28.7	29.1	28.3	18.8	27.5	27.8	18.1	26.3	26.4
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	27.6	C		28.8	C		26.3	C		25.4	C	
Intersection Delay, s/veh / LOS	26.5						C					

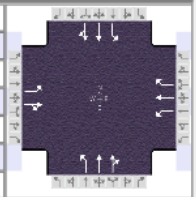
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.28	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.23	A	0.92	A	1.13	A	1.05	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:25:10 PM

Table 131. Pennsylvania Ave and JFK Rd Saturday 5-6PM HCS 5-yr projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Penn/JFK	File Name	Intersection (Penn-JFK)_Overall_Delay_5yr.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	105	183	159	89	114	62	125	563	93	77	511	91

Signal Information													
Cycle, s	75.9	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.3	0.3	21.2	10.0	17.6	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	4.0	0.0			
				Red	1.2	0.0	1.1	1.2	1.1	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4	1	6	5	2
Case Number		10.0		9.0	1.1	4.0	1.1	4.0
Phase Duration, s		22.7		15.2	11.7	26.6	11.5	26.3
Change Period, (*Y+R c*), s		5.1		5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s		3.2		3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		16.6		6.3	5.5	14.1	4.9	18.0
Green Extension Time (*g e*), s		0.8		0.4	0.2	3.0	0.2	3.0
Phase Call Probability		1.00		1.00	0.93	1.00	0.89	1.00
Max Out Probability		0.00		0.00	0.00	0.01	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	105	342		89	114	62	125	335	321	105	420	398
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1712		1767	1856	1572	1838	1856	1763	1838	1856	1757
Queue Service Time (*g s*), s	3.7	14.6		3.5	4.3	2.7	3.5	12.0	12.1	2.9	16.0	16.0
Cycle Queue Clearance Time (*g c*), s	3.7	14.6		3.5	4.3	2.7	3.5	12.0	12.1	2.9	16.0	16.0
Green Ratio (*g/C*)	0.23	0.23		0.13	0.13	0.13	0.37	0.28	0.28	0.36	0.28	0.28
Capacity (*c*), veh/h	410	398		231	243	206	301	527	501	328	521	493
Volume-to-Capacity Ratio (*X*)	0.256	0.860		0.385	0.469	0.301	0.415	0.637	0.640	0.319	0.806	0.807
Back of Queue (*Q*), ft/ln (95 th percentile)	68	252		67	87	46	65	222	210	53	250	233
Back of Queue (*Q*), veh/ln (95 th percentile)	2.7	9.8		2.6	3.4	1.8	2.5	8.7	8.4	2.1	9.7	9.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.37	0.00		0.58	0.00	0.40	0.65	0.00	0.00	0.44	0.00	0.00
Uniform Delay (*d 1*), s/veh	23.9	28.1		30.3	30.6	29.9	18.4	23.8	23.9	17.8	25.5	25.5
Incremental Delay (*d 2*), s/veh	0.1	2.2		0.4	0.5	0.3	0.3	0.5	0.5	0.1	0.6	0.7
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	0.0
Control Delay (*d*), s/veh	24.0	30.3		30.7	31.2	30.2	18.8	24.3	24.4	17.9	26.1	26.1
Level of Service (LOS)	C	C		C	C	C	B	C	C	B	C	C
Approach Delay, s/veh / LOS	28.8	C		30.8	C		23.5	C		25.2	C	
Intersection Delay, s/veh / LOS	25.9						C					

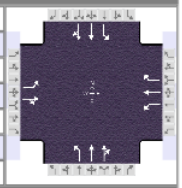
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.28	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.23	A	0.92	A	1.13	A	1.05	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:34:34 PM

Table 132. Pennsylvania Ave and JFK Rd Saturday 5-6PM HCS 10-yr projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Penn/JFK	File Name	Intersection (Penn-JFK)_Overall_Delay_10yr.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	116	202	176	98	126	68	138	622	103	85	564	101

Signal Information			
Cycle, s	80.8	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	6.4	0.3	23.3	10.0	20.3	0.0					
Yellow	4.0	0.0	4.0	4.0	4.0	0.0					
Red	1.2	0.0	1.1	1.2	1.1	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4	1	6	5	2
Case Number		10.0		9.0	1.1	4.0	1.1	4.0
Phase Duration, s		25.4		15.2	11.9	28.7	11.6	28.4
Change Period, (*Y+R c*), s		5.1		5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s		3.2		3.1	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		19.3		7.2	6.1	16.4	5.3	20.0
Green Extension Time (*g e*), s		0.9		0.3	0.2	3.3	0.2	3.2
Phase Call Probability		1.00		1.00	0.96	1.00	0.92	1.00
Max Out Probability		0.00		0.05	0.00	0.00	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	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	116	378		98	126	68	138	371	354	110	441	418
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1705		1767	1856	1546	1838	1856	1763	1838	1856	1757
Queue Service Time (*g s*), s	4.3	17.3		4.2	5.2	3.3	4.1	14.3	14.4	3.3	18.0	18.0
Cycle Queue Clearance Time (*g c*), s	4.3	17.3		4.2	5.2	3.3	4.1	14.3	14.4	3.3	18.0	18.0
Green Ratio (*g/C*)	0.25	0.25		0.12	0.12	0.12	0.37	0.29	0.29	0.37	0.29	0.29
Capacity (*c*), veh/h	444	428		218	229	191	285	542	515	303	535	507
Volume-to-Capacity Ratio (*X*)	0.261	0.883		0.450	0.550	0.357	0.484	0.685	0.688	0.363	0.824	0.825
Back of Queue (*Q*), ft/ln (95 th percentile)	79	290		81	106	55	77	258	242	60	277	258
Back of Queue (*Q*), veh/ln (95 th percentile)	3.1	11.3		3.2	4.1	2.2	3.0	10.1	9.7	2.3	10.8	10.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.44	0.00		0.70	0.00	0.48	0.77	0.00	0.00	0.50	0.00	0.00
Uniform Delay (*d 1*), s/veh	24.3	29.2		32.9	33.4	32.5	19.8	25.4	25.4	19.1	26.9	26.9
Incremental Delay (*d 2*), s/veh	0.1	2.5		0.5	0.8	0.4	0.5	0.6	0.6	0.1	0.7	0.7
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	0.0
Control Delay (*d*), s/veh	24.4	31.7		33.5	34.1	33.0	20.3	26.0	26.0	19.2	27.5	27.6
Level of Service (LOS)	C	C		C	C	C	C	C	C	B	C	C
Approach Delay, s/veh / LOS	30.0	C		33.6	C		25.1	C		26.6	C	
Intersection Delay, s/veh / LOS	27.5						C					

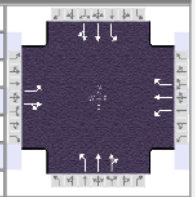
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.31	B	2.28	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.30	A	0.97	A	1.20	A	1.11	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:26:48 PM

Table 133. Pennsylvania Ave and JFK Rd Saturday 5-6PM HCS 20-yr projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/15/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street	John F Kennedy	Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Penn/JFK	File Name	Intersection (Penn-JFK)_Overall_Delay_20yr.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	128	223	194	109	139	76	153	687	113	94	624	111

Signal Information			
Cycle, s	91.2	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	6.7	0.5	28.5	10.0	24.9	0.0	
Yellow	4.0	0.0	4.0	4.0	4.0	0.0	
Red	1.2	0.0	1.1	1.2	1.1	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4	1	6	5	2
Case Number		10.0		9.0	1.1	4.0	1.1	4.0
Phase Duration, s		30.0		15.2	12.4	34.1	11.9	33.6
Change Period, ($Y+R_c$), s		5.1		5.2	5.2	5.1	5.2	5.1
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		23.6		8.6	7.1	19.7	6.0	24.5
Green Extension Time (g_e), s		1.1		0.6	0.3	3.7	0.2	3.8
Phase Call Probability		1.00		1.00	0.98	1.00	0.95	1.00
Max Out Probability		0.00		0.00	0.00	0.03	0.00	0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	128	417		109	139	76	153	410	390	121	488	462
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1703		1767	1856	1529	1838	1856	1764	1838	1856	1757
Queue Service Time (g_s), s	5.2	21.6		5.4	6.6	4.3	5.1	17.7	17.7	4.0	22.5	22.5
Cycle Queue Clearance Time (g_c), s	5.2	21.6		5.4	6.6	4.3	5.1	17.7	17.7	4.0	22.5	22.5
Green Ratio (*g/C*)	0.27	0.27		0.11	0.11	0.11	0.39	0.32	0.32	0.39	0.31	0.31
Capacity (*c*), veh/h	484	466		193	203	167	266	592	563	287	581	550
Volume-to-Capacity Ratio (*X*)	0.264	0.894		0.565	0.686	0.455	0.576	0.692	0.694	0.423	0.840	0.840
Back of Queue (*Q*), ft/ln (95 th percentile)	98	351		107	140	74	97	310	291	75	338	315
Back of Queue (*Q*), veh/ln (95 th percentile)	3.8	13.7		4.2	5.5	2.9	3.8	12.1	11.6	2.9	13.2	12.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.54	0.00		0.93	0.00	0.64	0.97	0.00	0.00	0.63	0.00	0.00
Uniform Delay (d_1), s/veh	26.1	32.0		38.8	39.3	38.3	22.1	27.3	27.3	20.9	29.4	29.4
Incremental Delay (d_2), s/veh	0.1	2.6		1.0	1.6	0.7	0.7	0.5	0.6	0.2	0.7	0.7
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	0.0
Control Delay (*d*), s/veh	26.2	34.6		39.7	40.9	39.0	22.9	27.8	27.9	21.1	30.0	30.0
Level of Service (LOS)	C	C		D	D	D	C	C	C	C	C	C
Approach Delay, s/veh / LOS	32.6	C		40.0	D		27.0	C		29.0	C	
Intersection Delay, s/veh / LOS	30.3						C					

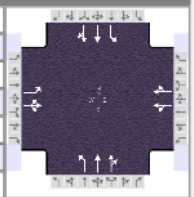
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.31	B	2.28	B	2.11	B	1.92	B
Bicycle LOS Score / LOS	1.39	A	1.02	A	1.27	A	1.17	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:43:30 PM

Table 134. Wacker Dr and JFK Rd Saturday 11-12PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street		Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Wacker/JFK	File Name	Intersection (Wacker-JFK)-Optimization.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	389	16	71	12	4	14	116	536	5	13	498	355

Signal Information			
Cycle, s	57.4	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	0.3	3.9	14.0	11.7	6.0	0.0	
Yellow	3.5	0.0	4.0	3.0	3.0	0.0	
Red	1.5	0.0	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		17.2		11.5	9.2	23.4	5.3	19.5
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		10.9		2.5	4.7	8.8	2.1	5.7
Green Extension Time (g_e), s		0.8		0.0	0.1	1.0	0.0	0.5
Phase Call Probability		1.00		1.00	0.84	1.00	0.06	1.00
Max Out Probability		0.03		0.00	0.00	0.25	0.01	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	195	282		16		14	116	271	270	4	136	127
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1721		1788		1576	1767	1856	1849	1767	1856	1606
Queue Service Time (g_s), s	5.7	8.9		0.5		0.5	2.7	6.8	6.8	0.1	3.4	3.7
Cycle Queue Clearance Time (g_c), s	5.7	8.9		0.5		0.5	2.7	6.8	6.8	0.1	3.4	3.7
Green Ratio (*g/C*)	0.20	0.20		0.10		0.10	0.33	0.31	0.31	0.25	0.24	0.24
Capacity (*c*), veh/h	360	351		187		165	453	578	577	271	452	391
Volume-to-Capacity Ratio (*X*)	0.540	0.802		0.084		0.086	0.256	0.468	0.469	0.015	0.301	0.324
Back of Queue (*Q*), ft/ln (95 th percentile)	99	156		8		7	43	117	114	2	61	56
Back of Queue (*Q*), veh/ln (95 th percentile)	3.9	6.1		0.3		0.3	1.7	4.6	4.5	0.1	2.4	2.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.20	0.31		0.19		0.17	0.09	0.23	0.23	0.00	0.12	0.12
Uniform Delay (d_1), s/veh	20.5	21.8		23.2		23.2	13.9	15.9	15.9	16.4	17.7	17.8
Incremental Delay (d_2), s/veh	0.5	1.7		0.1		0.1	0.1	0.2	0.2	0.0	0.1	0.2
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	20.9	23.4		23.3		23.3	14.0	16.1	16.1	16.4	17.9	18.0
Level of Service (LOS)	C	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	22.4	C		23.3	C		15.8	B		17.9	B	
Intersection Delay, s/veh / LOS	18.5						B					

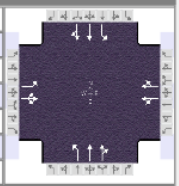
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.29	B	1.90	B	2.10	B
Bicycle LOS Score / LOS	1.27	A	0.51	A	1.03	A	1.20	A

 HCS™ Streets Version 2024 Generated: 4/16/2024 7:09:56 PM

Table 135. Wacker Dr and JFK Rd Saturday 11-12PM HCS Existing Conditions Optimized

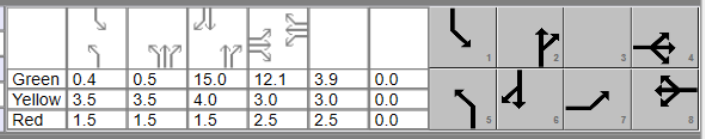
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street		Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Wacker/JFK	File Name	Intersection (Wacker-JFK)_Overall_Delay_Existin…		
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	389	16	71	12	4	14	116	536	4	13	498	355

Signal Information			
Cycle, s	58.4	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	0.4	0.5	15.0	12.1	3.9	0.0	
Yellow	3.5	3.5	4.0	3.0	3.0	0.0	
Red	1.5	1.5	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		17.6		9.4	11.0	26.0	5.4	20.5
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		11.1		2.5	5.7	8.5	2.1	5.7
Green Extension Time (g_e), s		1.0		0.1	0.2	1.5	0.0	1.5
Phase Call Probability		1.00		0.39	0.85	1.00	0.06	1.00
Max Out Probability		0.00		0.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	195	282		16		14	116	270	270	4	136	127
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1721		1788		1576	1767	1856	1851	1767	1856	1606
Queue Service Time (g_s), s	5.7	9.1		0.5		0.5	3.7	6.5	6.5	0.1	3.4	3.7
Cycle Queue Clearance Time (g_c), s	5.7	9.1		0.5		0.5	3.7	6.5	6.5	0.1	3.4	3.7
Green Ratio (*g/C*)	0.21	0.21		0.07		0.07	0.10	0.35	0.35	0.01	0.26	0.26
Capacity (*c*), veh/h	367	357		119		105	180	651	649	14	476	412
Volume-to-Capacity Ratio (*X*)	0.530	0.788		0.132		0.135	0.643	0.415	0.416	0.293	0.286	0.308
Back of Queue (*Q*), ft/ln (95 th percentile)	100	158		9		8	69	110	107	3	62	56
Back of Queue (*Q*), veh/ln (95 th percentile)	3.9	6.2		0.4		0.3	2.7	4.3	4.3	0.1	2.4	2.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.20	0.32		0.20		0.18	0.14	0.22	0.22	0.01	0.12	0.12
Uniform Delay (d_1), s/veh	20.7	22.0		25.7		25.7	25.3	14.4	14.4	28.9	17.5	17.6
Incremental Delay (d_2), s/veh	0.4	1.5		0.2		0.2	1.4	0.2	0.2	4.3	0.1	0.2
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	21.1	23.5		25.9		25.9	26.7	14.6	14.6	33.2	17.6	17.7
Level of Service (LOS)	C	C		C		C	C	B	B	C	B	B
Approach Delay, s/veh / LOS	22.5	C		25.9	C		16.7	B		17.9	B	
Intersection Delay, s/veh / LOS	19.1						B					

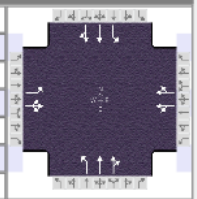
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.90	B	2.10	B
Bicycle LOS Score / LOS	1.27	A	0.51	A	1.03	A	1.20	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:37:45 PM

Table 136. Wacker Dr and JFK Rd Saturday 11-12PM HCS 5-yr Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street		Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Wacker/JFK	File Name	Intersection (Wacker-JFK)_Overall_Delay_5yr.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	409	1	75	13	4	15	122	563	4	14	523	373

Signal Information			
Cycle, s	58.8	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	0.5	0.6	15.0	12.1	4.1	0.0
Yellow	3.5	3.5	4.0	3.0	3.0	0.0
Red	1.5	1.5	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		17.6		9.6	11.1	26.1	5.5	20.5
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		11.2		2.5	5.9	8.9	2.1	6.0
Green Extension Time (g_e), s		0.9		0.1	0.2	1.6	0.0	1.6
Phase Call Probability		1.00		0.41	0.86	1.00	0.07	1.00
Max Out Probability		0.00		0.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	205	281		17		15	122	284	283	4	144	133
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1712		1787		1561	1767	1856	1851	1767	1856	1597
Queue Service Time (g_s), s	6.1	9.2		0.5		0.5	3.9	6.9	6.9	0.1	3.7	4.0
Cycle Queue Clearance Time (g_c), s	6.1	9.2		0.5		0.5	3.9	6.9	6.9	0.1	3.7	4.0
Green Ratio (*g/C*)	0.21	0.21		0.07		0.07	0.10	0.35	0.35	0.01	0.26	0.26
Capacity (*c*), veh/h	366	354		125		110	183	649	647	15	473	407
Volume-to-Capacity Ratio (*X*)	0.559	0.792		0.134		0.138	0.667	0.438	0.438	0.290	0.304	0.328
Back of Queue (*Q*), ft/ln (95 th percentile)	108	160		10		9	74	118	115	3	66	60
Back of Queue (*Q*), veh/ln (95 th percentile)	4.2	6.2		0.4		0.3	2.9	4.6	4.6	0.1	2.6	2.4
Queue Storage Ratio (*RQ*) (95 th percentile)	0.22	0.32		0.22		0.20	0.15	0.24	0.24	0.01	0.13	0.12
Uniform Delay (d_1), s/veh	21.0	22.2		25.7		25.7	25.5	14.7	14.7	29.1	17.7	17.9
Incremental Delay (d_2), s/veh	0.5	1.5		0.2		0.2	1.6	0.2	0.2	3.7	0.1	0.2
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	21.5	23.7		25.9		25.9	27.0	14.9	14.9	32.8	17.9	18.0
Level of Service (LOS)	C	C		C		C	C	B	B	C	B	B
Approach Delay, s/veh / LOS	22.8	C		25.9	C		17.0	B		18.2	B	
Intersection Delay, s/veh / LOS	19.3						B					

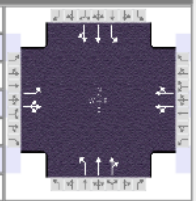
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.90	B	2.10	B
Bicycle LOS Score / LOS	1.29	A	0.51	A	1.06	A	1.24	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:37:55 PM

Table 137. Wacker Dr and JFK Rd Saturday 11-12PM HCS 10-yr Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street		Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Wacker/JFK	File Name	Intersection (Wacker-JFK)_Overall_Delay_10yr.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	430	18	78	13	4	16	128	592	4	14	550	392

Signal Information												
Cycle, s	57.2	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	0.4	0.1	15.0	12.8	2.5	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	3.5	4.0	3.0	3.0	0.0		
				Red	1.5	1.5	1.5	2.5	2.5	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	2.0	4.0	2.0	4.0
Phase Duration, s		18.3		8.0	10.5	25.7	5.4	20.5
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.3	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		11.8		2.6	6.0	9.1	2.1	6.3
Green Extension Time (*g e*), s		0.9		0.0	0.2	1.7	0.0	1.7
Phase Call Probability		1.00		0.41	0.87	1.00	0.07	1.00
Max Out Probability		0.04		0.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	215	311		17		16	128	298	298	5	160	147
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1717		1787		1541	1767	1856	1851	1767	1856	1593
Queue Service Time (*g s*), s	6.2	9.8		0.5		0.6	4.0	7.1	7.1	0.1	4.0	4.3
Cycle Queue Clearance Time (*g c*), s	6.2	9.8		0.5		0.6	4.0	7.1	7.1	0.1	4.0	4.3
Green Ratio (*g/C*)	0.22	0.22		0.04		0.04	0.10	0.35	0.35	0.01	0.26	0.26
Capacity (*c*), veh/h	395	384		77		67	171	653	652	11	485	417
Volume-to-Capacity Ratio (*X*)	0.544	0.810		0.220		0.240	0.750	0.457	0.457	0.414	0.329	0.353
Back of Queue (*Q*), ft/ln (95 th percentile)	107	170		10		9	77	120	116	4	71	64
Back of Queue (*Q*), veh/ln (95 th percentile)	4.2	6.6		0.4		0.4	3.0	4.7	4.7	0.2	2.8	2.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.21	0.34		0.22		0.21	0.15	0.24	0.24	0.01	0.14	0.13
Uniform Delay (*d 1*), s/veh	19.7	21.1		26.5		26.5	25.2	14.3	14.3	28.4	17.1	17.2
Incremental Delay (*d 2*), s/veh	0.4	1.6		0.5		0.7	2.5	0.2	0.2	8.4	0.1	0.2
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	20.1	22.7		27.0		27.2	27.8	14.5	14.5	36.8	17.2	17.4
Level of Service (LOS)	C	C		C		C	C	B	B	D	B	B
Approach Delay, s/veh / LOS	21.7	C		27.1	C		16.9	B		17.6	B	
Intersection Delay, s/veh / LOS	18.8						B					

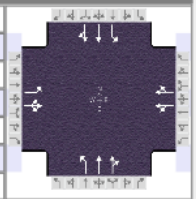
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.90	B	2.10	B
Bicycle LOS Score / LOS	1.36	A	0.51	A	1.08	A	1.28	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:38:01 PM

Table 138. Wacker Dr and JFK Rd Saturday 11-12PM HCS 20-yr Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street		Analysis Year	2024	Analysis Period	1> 12:00
Intersection	11am-12pm Wacker/JFK	File Name	Intersection (Wacker-JFK)_Overall_Delay_20yr.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	475	20	87	15	5	18	142	654	5	16	608	433

Signal Information					EB			WB			NB			SB		
Cycle, s	58.4	Reference Phase	2													
Offset, s	0	Reference Point	End	Green	0.4	4.4		15.0	14.3	2.8	0.0					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	0.0		4.0	3.0	3.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.5	0.0		1.5	2.5	2.5	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		12.0	1.1	4.0	1.1	4.0
Phase Duration, s		19.8		8.3	9.8	24.9	5.4	20.5
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.3	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		13.1		2.7	5.3	10.5	2.1	6.7
Green Extension Time (*g e*), s		1.1		0.1	0.0	1.8	0.0	1.9
Phase Call Probability		1.00		0.46	0.90	1.00	0.08	1.00
Max Out Probability		0.00		0.00	1.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	238	345		20		18	142	330	329	5	168	153
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1716		1788		1526	1767	1856	1850	1767	1856	1587
Queue Service Time (*g s*), s	6.9	11.1		0.6		0.7	3.3	8.5	8.5	0.1	4.3	4.7
Cycle Queue Clearance Time (*g c*), s	6.9	11.1		0.6		0.7	3.3	8.5	8.5	0.1	4.3	4.7
Green Ratio (*g/C*)	0.24	0.24		0.05		0.05	0.36	0.33	0.33	0.26	0.26	0.26
Capacity (*c*), veh/h	434	422		86		73	454	616	615	252	476	407
Volume-to-Capacity Ratio (*X*)	0.547	0.817		0.232		0.245	0.313	0.535	0.535	0.020	0.352	0.377
Back of Queue (*Q*), ft/ln (95 th percentile)	118	190		12		11	52	146	142	2	77	70
Back of Queue (*Q*), veh/ln (95 th percentile)	4.6	7.4		0.5		0.4	2.0	5.7	5.7	0.1	3.0	2.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.24	0.38		0.27		0.24	0.10	0.29	0.29	0.00	0.15	0.14
Uniform Delay (*d 1*), s/veh	19.2	20.8		26.8		26.8	13.3	15.9	15.9	16.3	17.8	17.9
Incremental Delay (*d 2*), s/veh	0.4	1.5		0.5		0.6	0.1	0.3	0.3	0.0	0.2	0.2
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	19.6	22.4		27.3		27.5	13.4	16.2	16.2	16.3	18.0	18.1
Level of Service (LOS)	B	C		C		C	B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.3	C		27.4	C		15.7	B		18.0	B	
Intersection Delay, s/veh / LOS	18.2						B					

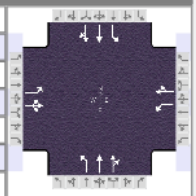
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.90	B	2.10	B
Bicycle LOS Score / LOS	1.45	A	0.52	A	1.15	A	1.36	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:38:08 PM

Table 139. Wacker Dr and JFK Rd Saturday 4-5PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street		Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Wacker/JFK	File Name	Intersection (Wacker-JFK)-Optimization.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	329	26	57	10	9	12	104	364	5	20	332	237

Signal Information					EB			WB			NB			SB		
Cycle, s	55.6	Reference Phase	2													
Offset, s	0	Reference Point	End	Green	1.1	1.1		14.3	10.4	2.3	0.0					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	3.5		4.0	3.0	3.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.5	1.5		1.5	2.5	2.5	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		10.0	1.1	4.0	1.1	4.0
Phase Duration, s		15.9		7.8	12.2	25.9	6.1	19.8
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		9.6		2.7	7.1	12.6	2.4	8.4
Green Extension Time (*g e*), s		0.8		0.0	0.3	1.9	0.0	1.8
Phase Call Probability		1.00		0.38	0.98	1.00	0.22	1.00
Max Out Probability		0.00		0.00	0.00	0.32	0.00	0.02

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	165	248		10	21		240	428	426	16	238	214
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1728		1810	1682		1767	1856	1847	1767	1856	1602
Queue Service Time (*g s*), s	4.6	7.6		0.3	0.7		5.1	10.6	10.6	0.4	6.1	6.4
Cycle Queue Clearance Time (*g c*), s	4.6	7.6		0.3	0.7		5.1	10.6	10.6	0.4	6.1	6.4
Green Ratio (*g/C*)	0.19	0.19		0.04	0.04		0.42	0.37	0.37	0.28	0.26	0.26
Capacity (*c*), veh/h	330	323		75	69		489	679	676	253	475	410
Volume-to-Capacity Ratio (*X*)	0.498	0.767		0.134	0.303		0.491	0.629	0.629	0.063	0.501	0.521
Back of Queue (*Q*), ft/ln (95 th percentile)	81	132		6	12		75	150	146	6	107	94
Back of Queue (*Q*), veh/ln (95 th percentile)	3.2	5.1		0.2	0.5		2.9	5.9	5.8	0.2	4.2	3.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.26		0.00	0.27		0.15	0.30	0.30	0.01	0.00	0.00
Uniform Delay (*d 1*), s/veh	20.3	21.5		25.7	25.9		11.6	14.5	14.5	15.1	17.7	17.8
Incremental Delay (*d 2*), s/veh	0.4	1.5		0.3	0.9		0.1	0.6	0.6	0.0	0.2	0.3
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	20.7	23.0		26.0	26.8		11.8	15.1	15.1	15.2	17.9	18.1
Level of Service (LOS)	C	C		C	C		B	B	B	B	B	B
Approach Delay, s/veh / LOS	22.1	C		26.6	C		14.4	B		17.9	B	
Intersection Delay, s/veh / LOS	17.0						B					

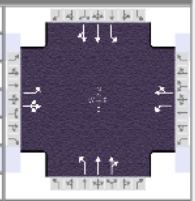
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	1.91	B
Bicycle LOS Score / LOS	1.17	A	0.54	A	0.88	A	0.97	A

 HCS™ Streets Version 2024 Generated: 4/16/2024 7:09:56 PM

Table 140. Wacker Dr and JFK Rd Saturday 4-5PM HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street		Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Wacker/JFK	File Name	Intersection (Wacker-JFK)_Overall_Delay_Existin...		
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	329	26	57	10	9	12	104	364	0	20	332	237

Signal Information			
Cycle, s	62.3	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	1.7	3.6	15.0	11.3	4.2	0.0	
Yellow	3.5	3.5	4.0	3.0	3.0	0.0	
Red	1.5	1.5	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		10.0	2.0	4.0	2.0	4.0
Phase Duration, s		16.8		9.7	15.3	29.1	6.7	20.5
Change Period, (*Y+R* $_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		10.5		2.7	10.2	13.4	2.5	9.3
Green Extension Time (g_e), s		0.7		0.0	0.2	2.6	0.0	3.2
Phase Call Probability		1.00		0.42	0.98	1.00	0.24	1.00
Max Out Probability		0.00		0.00	0.22	0.12	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	165	248		10	21		241	843	0	16	238	214
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1728		1810	1682		1767	1856	0	1767	1856	1602
Queue Service Time (g_s), s	5.2	8.5		0.3	0.7		8.2	11.4	0.0	0.5	7.0	7.3
Cycle Queue Clearance Time (g_c), s	5.2	8.5		0.3	0.7		8.2	11.4	0.0	0.5	7.0	7.3
Green Ratio (*g/C*)	0.18	0.18		0.07	0.07		0.17	0.38		0.03	0.24	0.24
Capacity (*c*), veh/h	321	314		122	113		294	1408		48	446	385
Volume-to-Capacity Ratio (*X*)	0.512	0.788		0.082	0.186		0.818	0.599	0.000	0.329	0.533	0.555
Back of Queue (*Q*), ft/ln (95 th percentile)	94	154		6	13		132	161	0	11	128	113
Back of Queue (*Q*), veh/ln (95 th percentile)	3.7	6.0		0.2	0.5		5.2	6.3	0.0	0.4	5.0	4.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.19	0.31		0.00	0.29		0.27	0.32	0.00	0.02	0.00	0.00
Uniform Delay (d_1), s/veh	23.1	24.4		27.3	27.5		25.1	15.6		29.8	20.7	20.8
Incremental Delay (d_2), s/veh	0.5	1.7		0.1	0.3		2.1	0.2	0.0	1.1	0.3	0.3
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	23.5	26.1		27.4	27.8		27.2	15.7		30.9	20.9	21.1
Level of Service (LOS)	C	C		C	C		C	B		C	C	C
Approach Delay, s/veh / LOS	25.1	C		27.7	C		18.3	B		21.4	C	
Intersection Delay, s/veh / LOS	20.6						C					

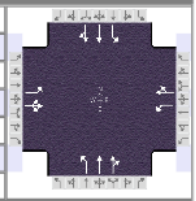
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.30	B	1.90	B	1.91	B
Bicycle LOS Score / LOS	1.17	A	0.54	A	0.87	A	0.97	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:37:45 PM

Table 141. Wacker Dr and JFK Rd Saturday 4-5PM HCS 5-yr Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street		Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Wacker/JFK	File Name	Intersection (Wacker-JFK)_Overall_Delay_5yr.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	346	27	60	11	9	13	109	383	1	21	350	250

Signal Information													
Cycle, s	63.6	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	1.8	4.0	15.0	11.9	4.4	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	3.5	4.0	3.0	3.0	0.0			
				Red	1.5	1.5	1.5	2.5	2.5	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		10.0	2.0	4.0	2.0	4.0
Phase Duration, s		17.4		9.9	15.8	29.5	6.8	20.5
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		11.2		2.8	10.7	14.3	2.6	10.0
Green Extension Time (*g e*), s		0.7		0.0	0.2	2.7	0.0	2.8
Phase Call Probability		1.00		0.44	0.99	1.00	0.25	1.00
Max Out Probability		0.03		0.00	0.34	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	173	260		11	22		249	438	438	17	251	223
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1725		1810	1667		1767	1856	1854	1767	1856	1585
Queue Service Time (*g s*), s	5.6	9.2		0.4	0.8		8.7	12.3	12.3	0.6	7.6	8.0
Cycle Queue Clearance Time (*g c*), s	5.6	9.2		0.4	0.8		8.7	12.3	12.3	0.6	7.6	8.0
Green Ratio (*g/C*)	0.19	0.19		0.07	0.07		0.17	0.38	0.38	0.03	0.24	0.24
Capacity (*c*), veh/h	330	322		126	116		302	701	701	50	437	373
Volume-to-Capacity Ratio (*X*)	0.524	0.806		0.087	0.189		0.824	0.625	0.625	0.333	0.576	0.598
Back of Queue (*Q*), ft/ln (95 th percentile)	102	167		7	14		154	184	180	12	140	124
Back of Queue (*Q*), veh/ln (95 th percentile)	4.0	6.5		0.3	0.6		6.0	7.2	7.2	0.4	5.4	4.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.20	0.33		0.00	0.31		0.31	0.37	0.37	0.02	0.00	0.00
Uniform Delay (*d 1*), s/veh	23.4	24.8		27.8	28.0		25.5	16.2	16.2	30.4	21.6	21.7
Incremental Delay (*d 2*), s/veh	0.5	1.9		0.1	0.3		4.0	0.2	0.2	1.0	0.3	0.4
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	23.9	26.7		27.9	28.2		29.5	16.4	16.4	31.4	21.9	22.1
Level of Service (LOS)	C	C		C	C		C	B	B	C	C	C
Approach Delay, s/veh / LOS	25.5	C		28.1	C		19.3	B		22.3	C	
Intersection Delay, s/veh / LOS	21.4						C					

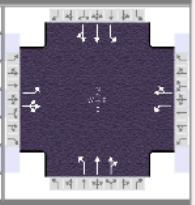
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.30	B	1.90	B	1.91	B
Bicycle LOS Score / LOS	1.20	A	0.54	A	0.89	A	1.00	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:37:55 PM

Table 142. Wacker Dr and JFK Rd Saturday 4-5PM HCS 10-yr Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street		Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Wacker/JFK	File Name	Intersection (Wacker-JFK)_Overall_Delay_10yr.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	363	29	63	11	10	13	115	402	9	22	368	263

Signal Information												
Cycle, s	56.6	Reference Phase	2									
Offset, s	0	Reference Point	End	Green	1.3	4.7	15.1	11.5	2.5	0.0		
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	0.0	4.0	3.0	3.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.5	0.0	1.5	2.5	2.5	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		10.0	1.1	4.0	1.1	4.0
Phase Duration, s		17.0		8.0	11.0	25.2	6.3	20.6
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		10.5		2.8	7.9	14.5	2.4	10.1
Green Extension Time (*g e*), s		0.9		0.1	0.0	3.1	0.0	3.1
Phase Call Probability		1.00		0.42	0.98	1.00	0.26	1.00
Max Out Probability		0.00		0.00	1.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	182	274		11	23		261	468	464	19	294	258
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1724		1810	1664		1767	1856	1840	1767	1856	1580
Queue Service Time (*g s*), s	5.2	8.5		0.3	0.8		5.9	12.5	12.5	0.4	7.9	8.1
Cycle Queue Clearance Time (*g c*), s	5.2	8.5		0.3	0.8		5.9	12.5	12.5	0.4	7.9	8.1
Green Ratio (*g/C*)	0.20	0.20		0.04	0.04		0.40	0.35	0.35	0.29	0.27	0.27
Capacity (*c*), veh/h	362	353		81	75		421	646	641	222	494	421
Volume-to-Capacity Ratio (*X*)	0.502	0.775		0.136	0.308		0.619	0.724	0.724	0.087	0.596	0.613
Back of Queue (*Q*), ft/ln (95 th percentile)	90	148		6	14		94	181	175	7	136	119
Back of Queue (*Q*), veh/ln (95 th percentile)	3.5	5.8		0.2	0.5		3.7	7.1	7.0	0.3	5.3	4.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.18	0.30		0.00	0.30		0.19	0.36	0.36	0.01	0.00	0.00
Uniform Delay (*d 1*), s/veh	20.0	21.3		26.1	26.3		13.1	16.1	16.1	15.4	18.2	18.3
Incremental Delay (*d 2*), s/veh	0.4	1.4		0.3	0.9		1.1	0.3	0.3	0.0	0.3	0.4
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	20.4	22.7		26.3	27.1		14.2	16.4	16.4	15.4	18.5	18.6
Level of Service (LOS)	C	C		C	C		B	B	B	B	B	B
Approach Delay, s/veh / LOS	21.8	C		26.9	C		15.9	B		18.4	B	
Intersection Delay, s/veh / LOS	17.9						B					

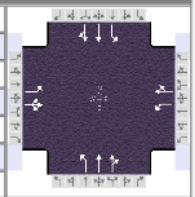
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.90	B	1.91	B
Bicycle LOS Score / LOS	1.24	A	0.54	A	0.92	A	1.03	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:38:01 PM

Table 143. Wacker Dr and JFK Rd Saturday 4-5PM HCS 20-yr Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street		Analysis Year	2024	Analysis Period	1> 12:00
Intersection	4-5pm Wacker/JFK	File Name	Intersection (Wacker-JFK)_Overall_Delay_20yr.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	401	32	70	12	11	15	127	444	5	24	406	290

Signal Information												
Cycle, s	59.7	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	1.4	4.6	16.1	13.2	2.9	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.0	3.0	3.0	0.0		
				Red	1.5	0.0	1.5	2.5	2.5	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		10.0	1.1	4.0	1.1	4.0
Phase Duration, s		18.7		8.4	11.0	26.2	6.4	21.6
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		12.0		2.9	8.0	17.0	2.5	10.6
Green Extension Time (*g e*), s		1.0		0.0	0.0	3.4	0.0	3.4
Phase Call Probability		1.00		0.47	0.99	1.00	0.27	1.00
Max Out Probability		0.00		0.01	1.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	201	303		12	26		290	514	512	19	295	257
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1723		1810	1649		1767	1856	1847	1767	1856	1572
Queue Service Time (*g s*), s	6.0	10.0		0.4	0.9		6.0	15.0	15.0	0.5	8.3	8.6
Cycle Queue Clearance Time (*g c*), s	6.0	10.0		0.4	0.9		6.0	15.0	15.0	0.5	8.3	8.6
Green Ratio (*g/C*)	0.22	0.22		0.05	0.05		0.40	0.35	0.35	0.30	0.27	0.27
Capacity (*c*), veh/h	392	382		87	79		415	649	646	198	508	430
Volume-to-Capacity Ratio (*X*)	0.512	0.792		0.138	0.328		0.700	0.792	0.792	0.096	0.581	0.598
Back of Queue (*Q*), ft/ln (95 th percentile)	105	175		7	16		107	203	197	8	142	126
Back of Queue (*Q*), veh/ln (95 th percentile)	4.1	6.8		0.3	0.6		4.2	7.9	7.9	0.3	5.6	5.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.21	0.35		0.00	0.37		0.21	0.41	0.40	0.02	0.00	0.00
Uniform Delay (*d 1*), s/veh	20.6	22.1		27.5	27.7		15.6	17.6	17.6	16.4	18.9	19.0
Incremental Delay (*d 2*), s/veh	0.4	1.4		0.3	0.9		1.6	0.3	0.3	0.1	0.3	0.3
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	21.0	23.6		27.7	28.6		17.2	17.9	17.9	16.4	19.1	19.3
Level of Service (LOS)	C	C		C	C		B	B	B	B	B	B
Approach Delay, s/veh / LOS	22.5	C		28.3	C		17.8	B		19.1	B	
Intersection Delay, s/veh / LOS	19.2						B					

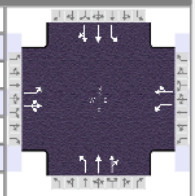
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.90	B	1.91	B
Bicycle LOS Score / LOS	1.32	A	0.55	A	0.96	A	1.08	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:38:08 PM

Table 144. Wacker Dr and JFK Rd Saturday 5-6PM HCS Existing Conditions

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street		Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Wacker/JFK	File Name	Intersection (Wacker-JFK)-Optimization.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	319	23	65	5	5	6	110	354	5	8	397	280

Signal Information			
Cycle, s	56.7	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	0.6	2.7	15.0	10.6	1.3	0.0
Yellow	3.5	3.5	4.0	3.0	3.0	0.0
Red	1.5	1.5	1.5	2.5	2.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		10.0	1.1	4.0	1.1	4.0
Phase Duration, s		16.1		6.8	13.3	28.2	5.6	20.5
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s		9.8		2.4	7.9	13.0	2.2	12.3
Green Extension Time (*g e*), s		0.8		0.0	0.5	3.1	0.0	2.5
Phase Call Probability		1.00		0.22	0.99	1.00	0.12	1.00
Max Out Probability		0.00		0.00	0.00	0.07	0.00	0.39

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	160	248		5	11		277	454	451	8	361	316
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1721		1810	1690		1767	1856	1846	1767	1856	1600
Queue Service Time (*g s*), s	4.6	7.8		0.2	0.4		5.9	11.0	11.0	0.2	10.1	10.3
Cycle Queue Clearance Time (*g c*), s	4.6	7.8		0.2	0.4		5.9	11.0	11.0	0.2	10.1	10.3
Green Ratio (*g/C*)	0.19	0.19		0.02	0.02		0.45	0.40	0.40	0.28	0.26	0.26
Capacity (*c*), veh/h	330	322		43	40		448	743	739	250	491	423
Volume-to-Capacity Ratio (*X*)	0.483	0.769		0.116	0.274		0.619	0.611	0.611	0.032	0.737	0.746
Back of Queue (*Q*), ft/ln (95 th percentile)	80	135		3	7		86	163	159	3	187	163
Back of Queue (*Q*), veh/ln (95 th percentile)	3.1	5.3		0.1	0.3		3.4	6.4	6.4	0.1	7.3	6.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.27		0.00	0.15		0.17	0.33	0.33	0.01	0.37	0.33
Uniform Delay (*d 1*), s/veh	20.6	21.9		27.1	27.2		12.4	13.5	13.5	15.3	19.1	19.1
Incremental Delay (*d 2*), s/veh	0.4	1.5		0.4	1.4		0.3	0.2	0.2	0.0	1.8	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
Control Delay (*d*), s/veh	21.0	23.4		27.6	28.6		12.7	13.7	13.7	15.3	20.9	21.5
Level of Service (LOS)	C	C		C	C		B	B	B	B	C	C
Approach Delay, s/veh / LOS	22.5	C		28.3	C		13.5	B		21.1	C	
Intersection Delay, s/veh / LOS	17.5						B					

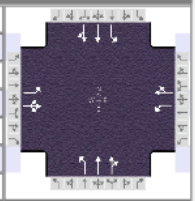
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	1.89	B	1.91	B
Bicycle LOS Score / LOS	1.16	A	0.51	A	0.87	A	1.05	A

 HCS™ Streets Version 2024 Generated: 4/16/2024 7:09:56 PM

Table 145. Wacker Dr and JFK Rd Saturday 5-6PM HCS Existing Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street		Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Wacker/JFK	File Name	Intersection (Wacker-JFK)_Overall_Delay_Existin...		
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	319	23	65	5	5	6	110	354	0	8	397	280

Signal Information												
Cycle, s	67.1	Reference Phase	2									
Offset, s	0	Reference Point	End	Green	1.0	6.6	18.3	12.2	2.6	0.0		
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	3.5	4.0	3.0	3.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.5	1.5	1.5	2.5	2.5	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		10.0	2.0	4.0	2.0	4.0
Phase Duration, s		17.7		8.1	17.6	35.3	6.0	23.8
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		11.3		2.4	12.3	14.0	2.3	14.1
Green Extension Time (g_e), s		0.7		0.0	0.2	4.0	0.0	4.0
Phase Call Probability		1.00		0.26	0.99	1.00	0.14	1.00
Max Out Probability		0.00		0.00	1.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	160	248		5	11		279	898	0	8	361	316
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1721		1810	1690		1767	1856	0	1767	1856	1600
Queue Service Time (g_s), s	5.5	9.3		0.2	0.4		10.3	12.0	0.0	0.3	11.9	12.1
Cycle Queue Clearance Time (g_c), s	5.5	9.3		0.2	0.4		10.3	12.0	0.0	0.3	11.9	12.1
Green Ratio (*g/C*)	0.18	0.18		0.04	0.04		0.19	0.44		0.01	0.27	0.27
Capacity (*c*), veh/h	321	312		71	67		333	1656		26	506	437
Volume-to-Capacity Ratio (*X*)	0.497	0.792		0.070	0.165		0.838	0.542	0.000	0.304	0.714	0.723
Back of Queue (*Q*), ft/ln (95 th percentile)	101	170		4	8		195	180	0	6	216	191
Back of Queue (*Q*), veh/ln (95 th percentile)	3.9	6.7		0.1	0.3		7.6	7.0	0.0	0.3	8.4	7.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.20	0.34		0.00	0.18		0.39	0.36	0.00	0.01	0.43	0.39
Uniform Delay (d_1), s/veh	24.9	26.5		31.3	31.4		26.5	13.7		33.0	22.2	22.3
Incremental Delay (d_2), s/veh	0.4	1.8		0.2	0.4		8.1	0.1	0.0	2.4	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	0.0	0.0
Control Delay (*d*), s/veh	25.3	28.2		31.4	31.8		34.6	13.7		35.4	22.9	23.1
Level of Service (LOS)	C	C		C	C		C	B		D	C	C
Approach Delay, s/veh / LOS	27.1	C		31.7	C		18.7	B		23.2	C	
Intersection Delay, s/veh / LOS	21.6						C					

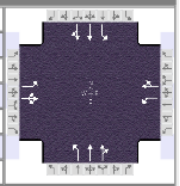
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.30	B	1.89	B	1.91	B
Bicycle LOS Score / LOS	1.16	A	0.51	A	0.87	A	1.05	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:37:45 PM

Table 146. Wacker Dr and JFK Rd Saturday 5-6PM HCS 5-yr Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street		Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Wacker/JFK	File Name	Intersection (Wacker-JFK)_Overall_Delay_5yr.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	338	24	68	5	5	6	116	373	1	8	418	294

Signal Information			
Cycle, s	69.8	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	1.0	7.3	19.1	13.1	2.7	0.0	
Yellow	3.5	3.5	4.0	3.0	3.0	0.0	
Red	1.5	1.5	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		10.0	2.0	4.0	2.0	4.0
Phase Duration, s		18.6		8.2	18.3	36.9	6.0	24.6
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		12.2		2.4	13.1	14.9	2.3	15.4
Green Extension Time (g_e), s		0.8		0.0	0.1	3.6	0.0	3.6
Phase Call Probability		1.00		0.27	1.00	1.00	0.14	1.00
Max Out Probability		0.00		0.00	1.00	0.00	0.00	0.00

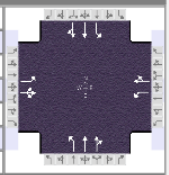
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	169	261		5	11		288	465	465	8	382	330
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1718		1810	1679		1767	1856	1854	1767	1856	1586
Queue Service Time (g_s), s	6.0	10.2		0.2	0.4		11.1	12.9	12.9	0.3	13.2	13.4
Cycle Queue Clearance Time (g_c), s	6.0	10.2		0.2	0.4		11.1	12.9	12.9	0.3	13.2	13.4
Green Ratio (*g/C*)	0.19	0.19		0.04	0.04		0.19	0.45	0.45	0.01	0.27	0.27
Capacity (*c*), veh/h	333	323		71	66		339	839	838	26	510	436
Volume-to-Capacity Ratio (*X*)	0.508	0.807		0.071	0.167		0.849	0.555	0.555	0.304	0.749	0.757
Back of Queue (*Q*), ft/ln (95 th percentile)	112	188		4	8		210	192	187	7	237	207
Back of Queue (*Q*), veh/ln (95 th percentile)	4.4	7.4		0.1	0.3		8.2	7.5	7.5	0.3	9.3	8.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.22	0.38		0.00	0.19		0.42	0.38	0.38	0.01	0.47	0.42
Uniform Delay (d_1), s/veh	25.6	27.3		32.5	32.7		27.4	14.1	14.1	34.3	23.3	23.3
Incremental Delay (d_2), s/veh	0.4	1.9		0.2	0.4		9.7	0.1	0.1	2.4	0.8	1.0
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	26.1	29.2		32.7	33.1		37.2	14.2	14.2	36.7	24.1	24.4
Level of Service (LOS)	C	C		C	C		D	B	B	D	C	C
Approach Delay, s/veh / LOS	28.0	C		33.0	C		19.7	B		24.4	C	
Intersection Delay, s/veh / LOS	22.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.30	B	1.89	B	1.91	B
Bicycle LOS Score / LOS	1.20	A	0.51	A	0.89	A	1.08	A

Table 147. Wacker Dr and JFK Rd Saturday 5-6PM HCS 10-yr Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street		Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Wacker/JFK	File Name	Intersection (Wacker-JFK)_Overall_Delay_10yr.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	393	28	79	6	6	7	134	433	9	10	486	342

Signal Information			
Cycle, s	64.7	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	0.8	1.2	20.4	14.0	1.8	0.0	
Yellow	3.5	3.5	4.0	3.0	3.0	0.0	
Red	1.5	1.5	1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		10.0	1.1	4.0	1.1	4.0
Phase Duration, s		19.5		7.3	12.0	32.1	5.8	25.9
Change Period, ($Y+R_c$), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		12.9		2.5	9.0	15.9	2.2	16.1
Green Extension Time (g_e), s		1.0		0.0	0.0	4.1	0.0	4.1
Phase Call Probability		1.00		0.29	1.00	1.00	0.17	1.00
Max Out Probability		0.00		0.00	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	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	197	304		6	13		299	496	492	10	446	382
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1717		1810	1669		1767	1856	1841	1767	1856	1582
Queue Service Time (g_s), s	6.4	10.9		0.2	0.5		7.0	13.9	13.9	0.2	14.1	14.1
Cycle Queue Clearance Time (g_c), s	6.4	10.9		0.2	0.5		7.0	13.9	13.9	0.2	14.1	14.1
Green Ratio (*g/C*)	0.22	0.22		0.03	0.03		0.46	0.41	0.41	0.33	0.32	0.32
Capacity (*c*), veh/h	385	374		49	46		368	762	757	226	586	500
Volume-to-Capacity Ratio (*X*)	0.511	0.812		0.121	0.285		0.814	0.650	0.650	0.044	0.761	0.763
Back of Queue (*Q*), ft/ln (95 th percentile)	114	195		4	10		132	198	192	4	241	209
Back of Queue (*Q*), veh/ln (95 th percentile)	4.4	7.6		0.2	0.4		5.2	7.7	7.7	0.2	9.4	8.4
Queue Storage Ratio (*RQ*) (95 th percentile)	0.23	0.39		0.00	0.21		0.27	0.40	0.39	0.01	0.48	0.43
Uniform Delay (d_1), s/veh	22.4	24.1		30.8	31.0		15.2	15.4	15.4	15.5	20.0	20.0
Incremental Delay (d_2), s/veh	0.4	1.7		0.4	1.3		7.0	0.2	0.2	0.0	0.8	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	0.0	0.0
Control Delay (*d*), s/veh	22.8	25.8		31.2	32.2		22.1	15.5	15.6	15.5	20.8	20.9
Level of Service (LOS)	C	C		C	C		C	B	B	B	C	C
Approach Delay, s/veh / LOS	24.6	C		31.9	C		17.1	B		20.8	C	
Intersection Delay, s/veh / LOS	19.8						B					

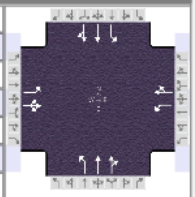
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.30	B	1.89	B	1.91	B
Bicycle LOS Score / LOS	1.31	A	0.52	A	0.96	A	1.18	A

 HCS™ Streets Version 2024 Generated: 5/7/2024 2:38:01 PM

Table 148. Wacker Dr and JFK Rd Saturday 5-6PM HCS 20-yr Projected Conditions Optimized

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	1.000
Analyst		Analysis Date	2/20/2024	Area Type	Other
Jurisdiction		Time Period		PHF	1.00
Urban Street		Analysis Year	2024	Analysis Period	1> 12:00
Intersection	5-6pm Wacker/JFK	File Name	Intersection (Wacker-JFK)_Overall_Delay_20yr.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	393	28	79	6	6	67	134	433	5	10	486	342

Signal Information					EB			WB				
Cycle, s	80.1	Reference Phase	2									
Offset, s	0	Reference Point	End	Green	1.0	6.4		24.5	16.7	5.0	0.0	
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	3.5		4.0	3.0	3.0	0.0	
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.5	1.5		1.5	2.5	2.5	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		10.0		10.0	1.1	4.0	1.1	4.0
Phase Duration, s		22.2		10.5	17.4	41.3	6.0	30.0
Change Period, (*Y+R c*), s		5.5		5.5	5.0	5.5	5.0	5.5
Max Allow Headway (*MAH*), s		3.2		3.4	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		15.7		5.8	11.6	20.5	2.3	19.8
Green Extension Time (g_e), s		0.9		0.0	0.6	4.5	0.0	4.5
Phase Call Probability		1.00		0.83	1.00	1.00	0.20	1.00
Max Out Probability		0.00		1.00	0.00	0.00	0.00	0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	197	304		6	73		333	546	544	10	447	381
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1715		1810	1533		1767	1856	1847	1767	1856	1573
Queue Service Time (g_s), s	8.0	13.7		0.3	3.8		9.6	18.5	18.5	0.3	17.7	17.8
Cycle Queue Clearance Time (g_c), s	8.0	13.7		0.3	3.8		9.6	18.5	18.5	0.3	17.7	17.8
Green Ratio (*g/C*)	0.21	0.21		0.06	0.06		0.49	0.45	0.45	0.32	0.31	0.31
Capacity (*c*), veh/h	370	359		113	95		420	833	829	211	568	482
Volume-to-Capacity Ratio (*X*)	0.532	0.846		0.053	0.765		0.794	0.656	0.656	0.047	0.788	0.790
Back of Queue (*Q*), ft/ln (95 th percentile)	150	242		5	69		139	255	248	6	306	263
Back of Queue (*Q*), veh/ln (95 th percentile)	5.9	9.5		0.2	2.7		5.4	10.0	9.9	0.2	11.9	10.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.30	0.48		0.00	1.53		0.28	0.51	0.51	0.01	0.61	0.54
Uniform Delay (d_1), s/veh	28.3	30.6		35.5	37.2		16.9	17.3	17.3	19.3	25.5	25.6
Incremental Delay (d_2), s/veh	0.4	2.2		0.1	4.9		0.5	0.1	0.1	0.0	0.9	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
Control Delay (*d*), s/veh	28.8	32.8		35.6	42.0		17.5	17.5	17.5	19.3	26.5	26.7
Level of Service (LOS)	C	C		D	D		B	B	B	B	C	C
Approach Delay, s/veh / LOS	31.2	C		41.5	D		17.5	B		26.5	C	
Intersection Delay, s/veh / LOS	23.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.31	B	1.90	B	1.92	B
Bicycle LOS Score / LOS	1.31	A	0.62	A	0.96	A	1.18	A

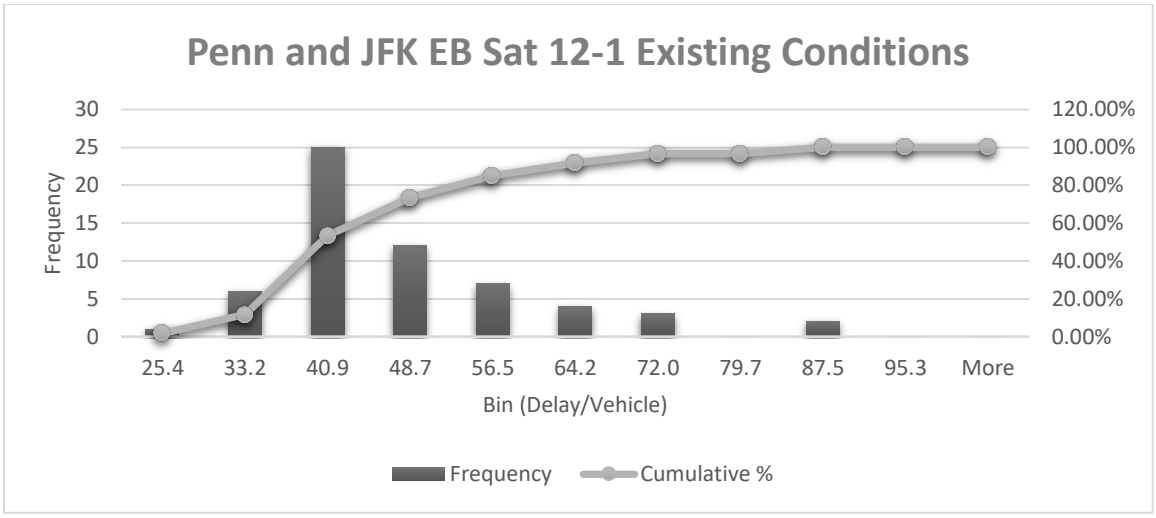


Figure 6. The total delay/vehicle the Penn and JFK intersection going eastbound experienced during the 60 simulation runs from 12-1 on a Saturday.

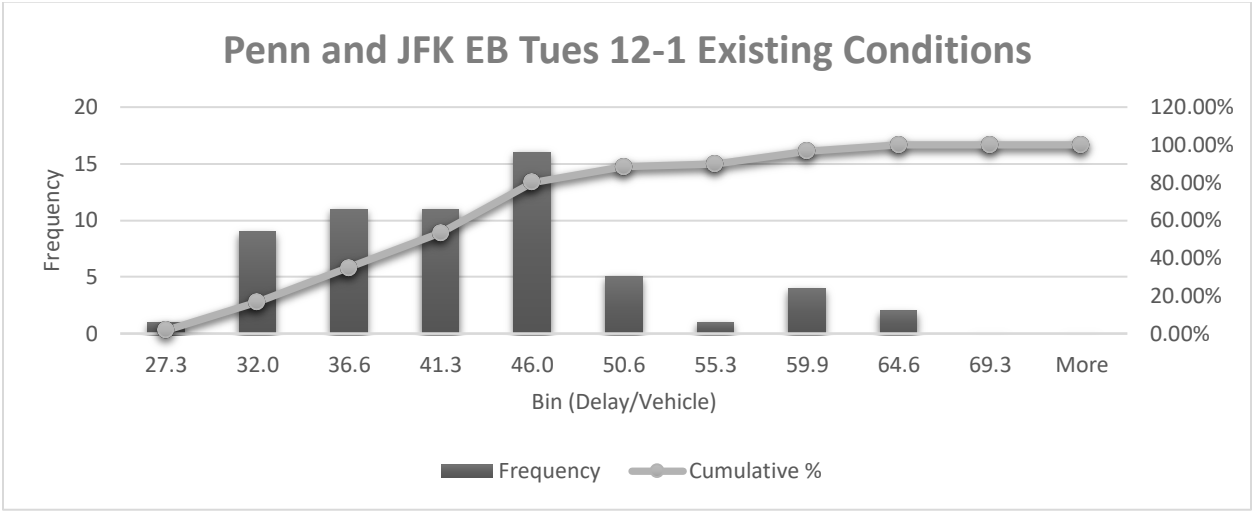


Figure 7. The total delay/vehicle the Penn and JFK intersection going eastbound experienced during the 60 simulation runs from 12-1 on a Tuesday.

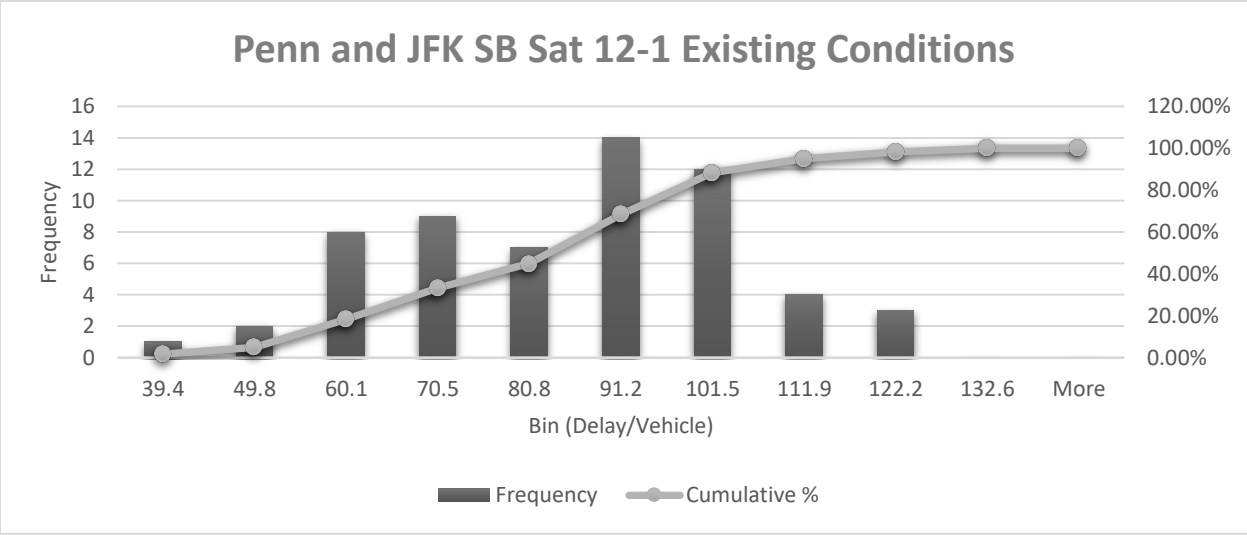


Figure 8. The total delay/vehicle the Penn and JFK intersection going southbound experienced during the 60 simulation runs from 12-1 on a Saturday.

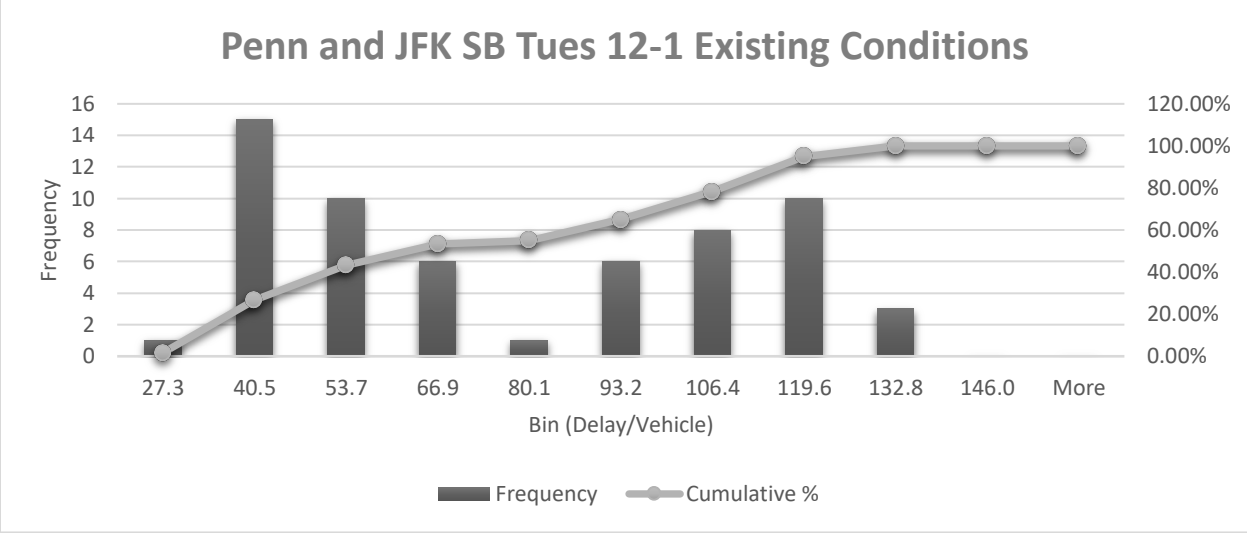


Figure 11. The total delay/vehicle the Penn and JFK intersection going southbound experienced during the 60 simulation runs from 12-1 on a Saturday.

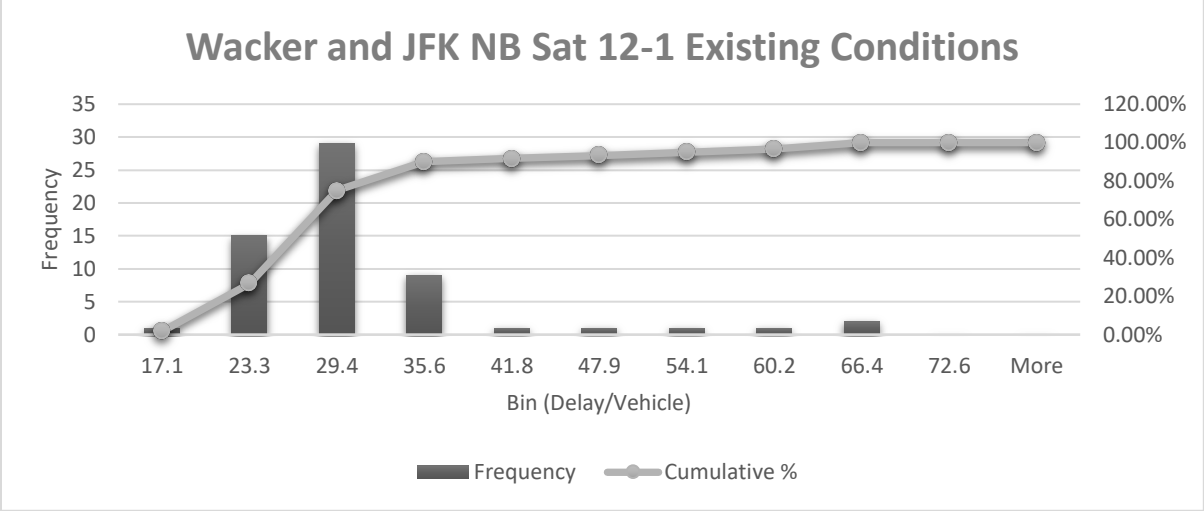


Figure 10. The total delay/vehicle the Wacker and JFK intersection going northbound experienced during the 60 simulation runs from 12-1 on a Saturday.

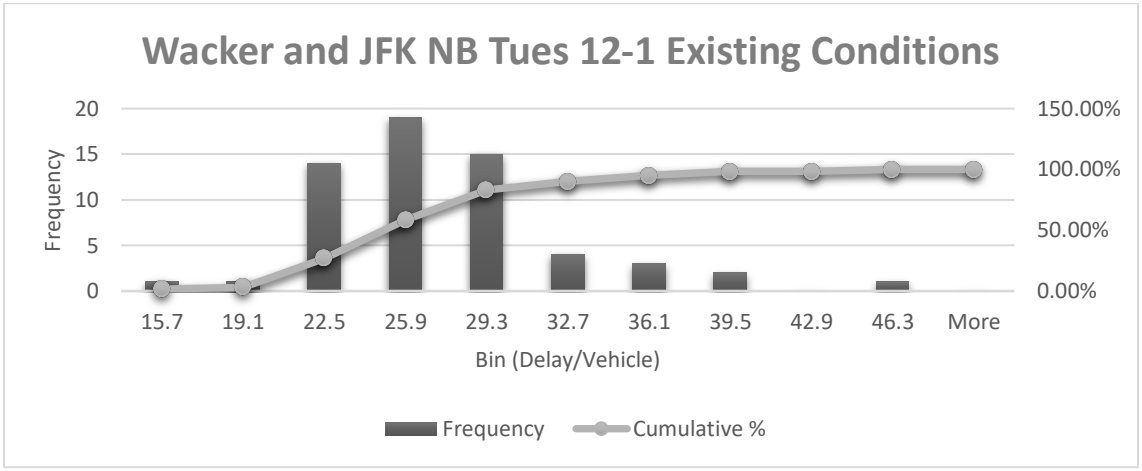


Figure 11. The total delay/vehicle the Wacker and JFK intersection going northbound experienced during the 60 simulation runs from 12-1 on a Tuesday.

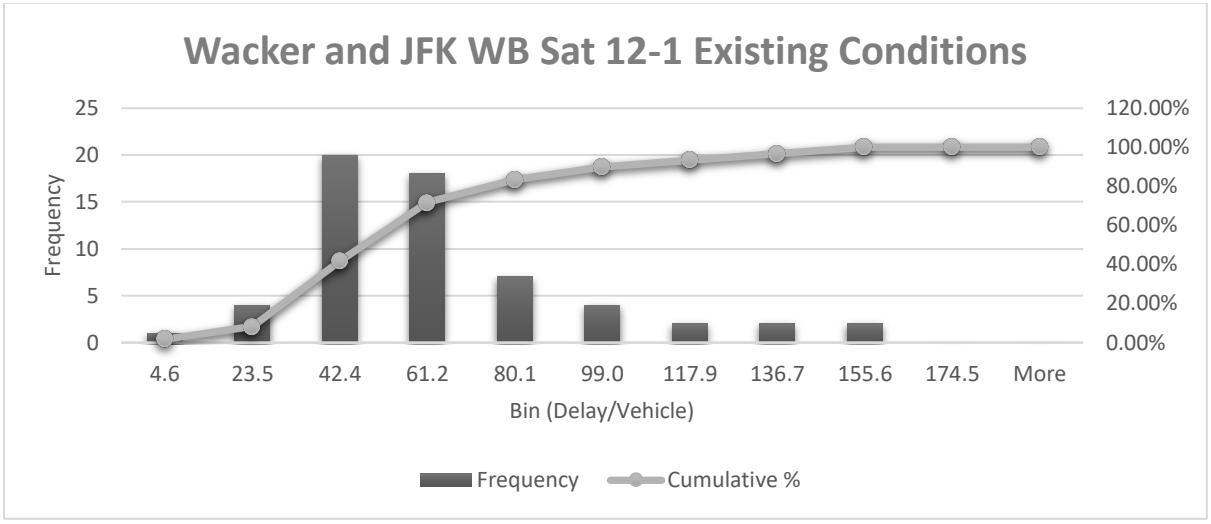


Figure 12. The total delay/vehicle the Wacker and JFK intersection going westbound experienced during the 60 simulation runs from 12-1 on a Saturday.

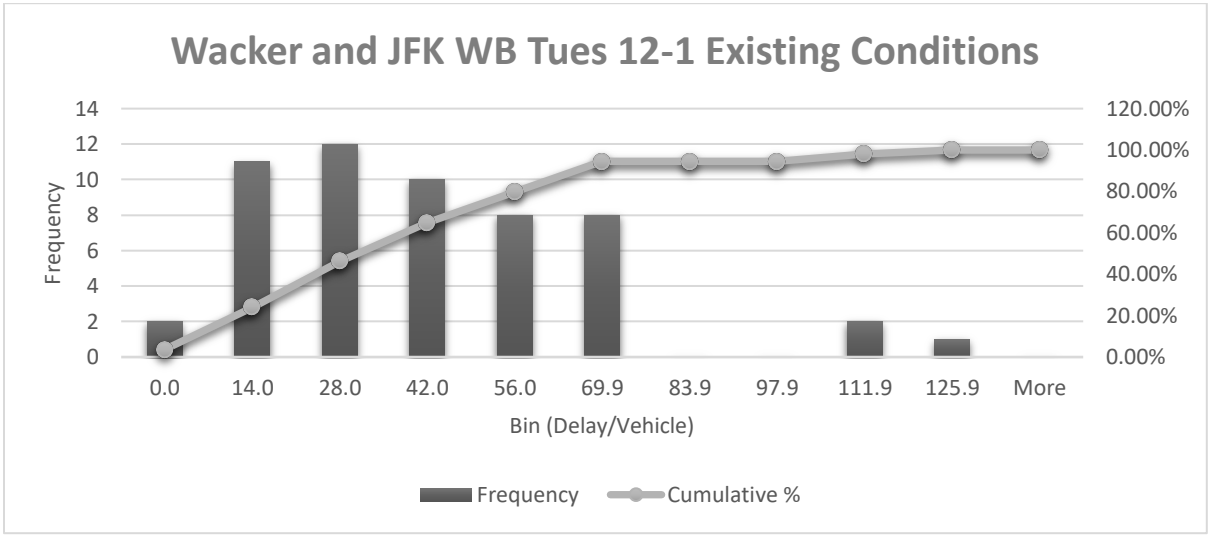


Figure 13. The total delay/vehicle the Wacker and JFK intersection going westbound experienced during the 60 simulation runs from 12-1 on a Tuesday.

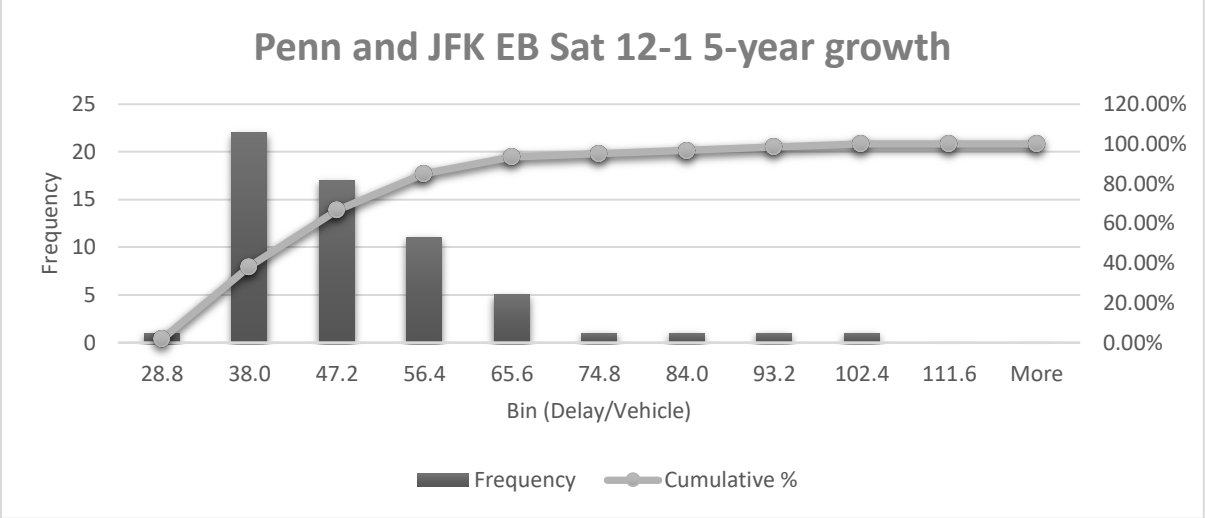


Figure 16. The total delay/vehicle the Penn and JFK intersection going eastbound experienced during the 60 simulation runs from 12-1 on a Saturday with a 5-year population growth.

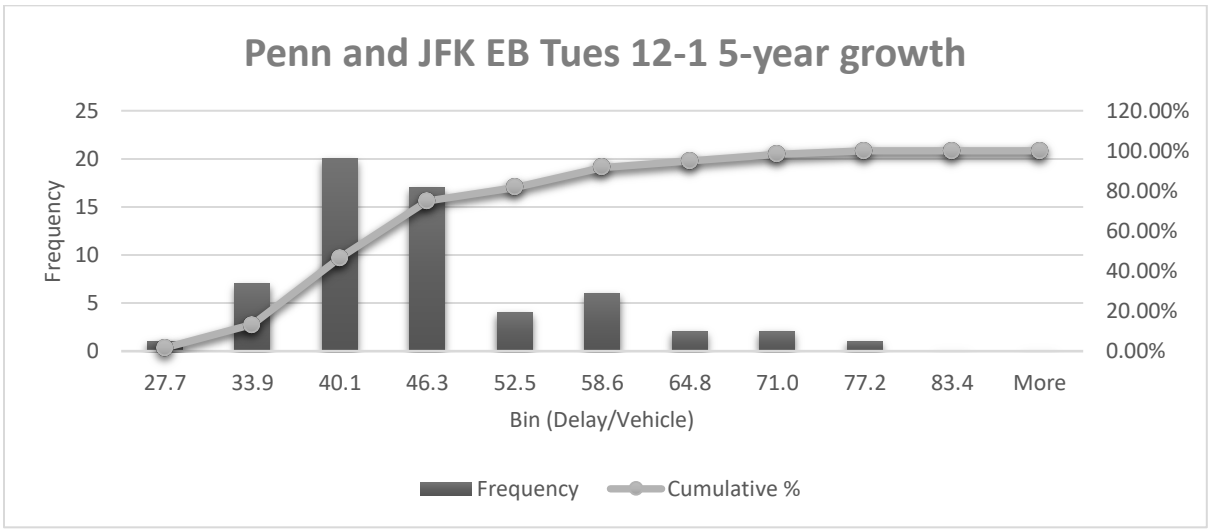


Figure 17. The total delay/vehicle the Penn and JFK intersection going eastbound experienced during the 60 simulation runs from 12-1 on a Tuesday with a 5-year population growth.

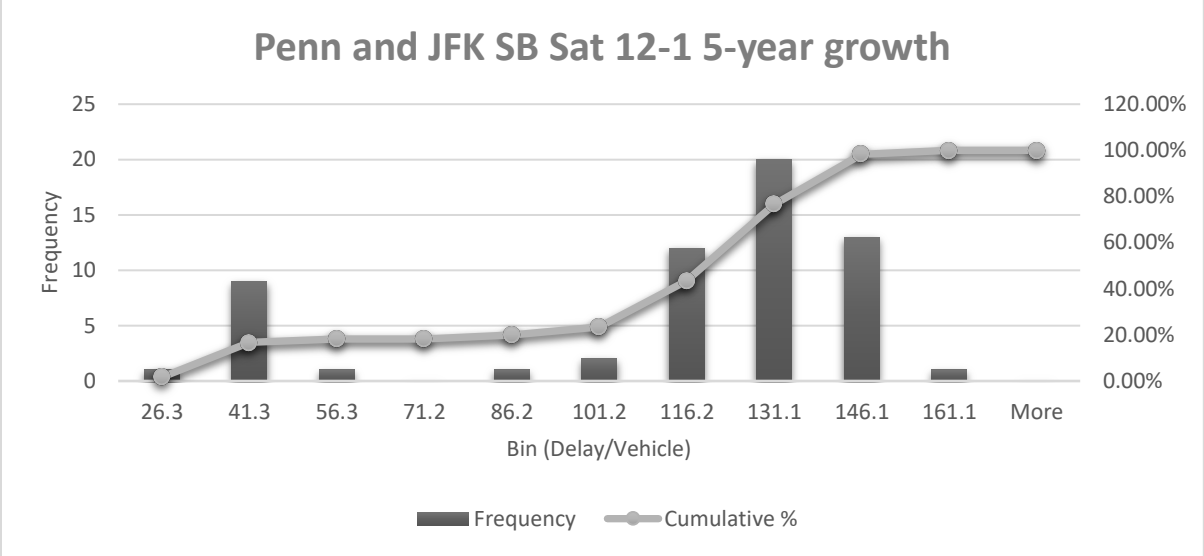


Figure 18. The total delay/vehicle the Penn and JFK intersection going southbound experienced during the 60 simulation runs from 12-1 on a Saturday with a 5-year population growth.

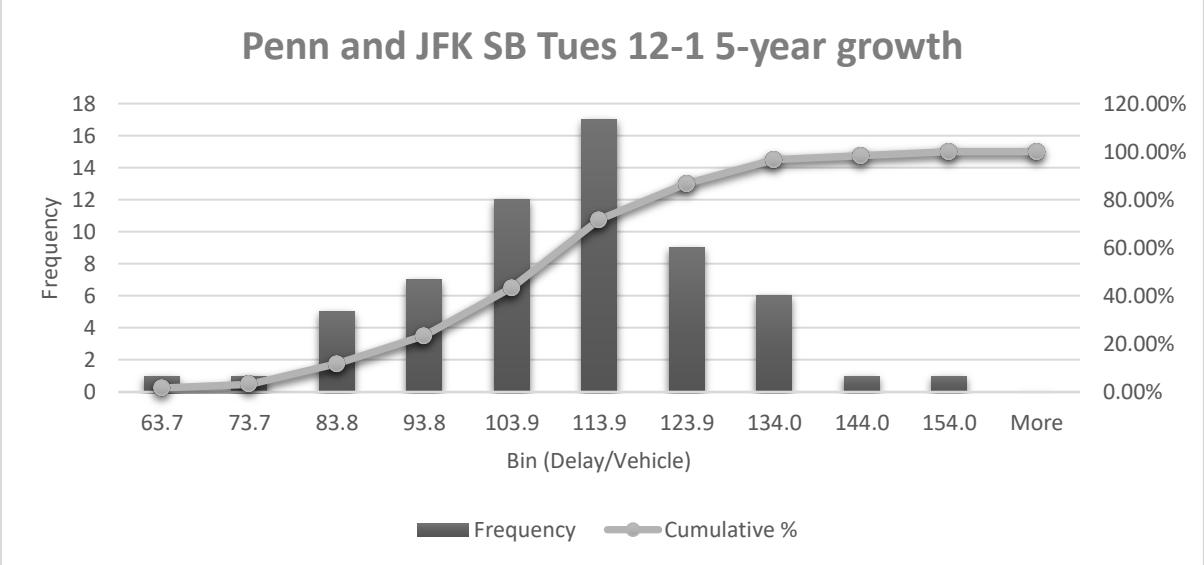


Figure 19. The total delay/vehicle the Penn and JFK intersection going southbound experienced during the 60 simulation runs from 12-1 on a Tuesday with a 5-year population growth.

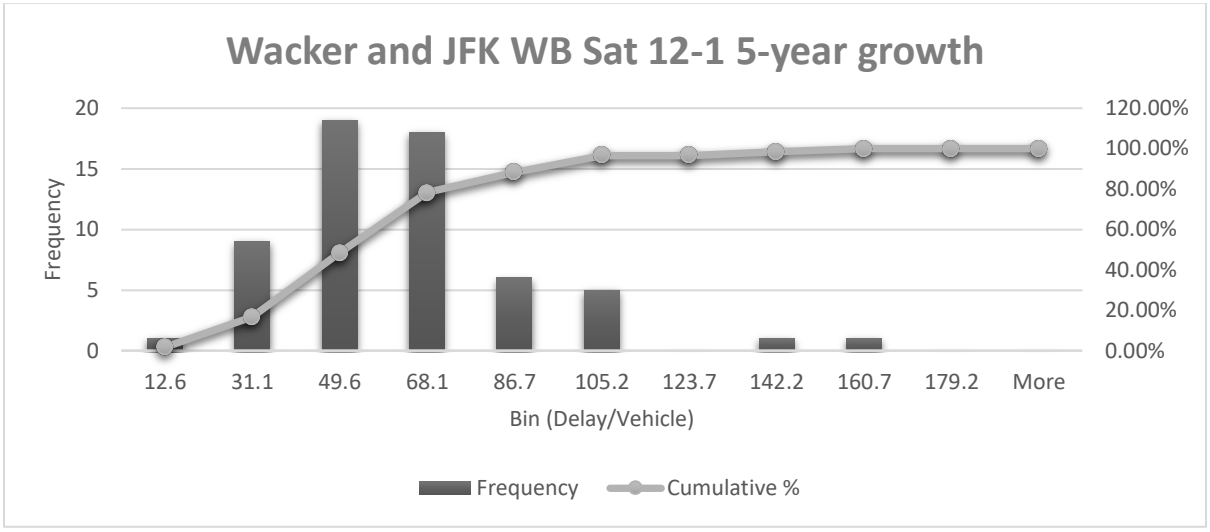


Figure 20. The total delay/vehicle the Wacker and JFK intersection going westbound experienced during the 60 simulation runs from 12-1 on a Saturday with a 5-year population growth.

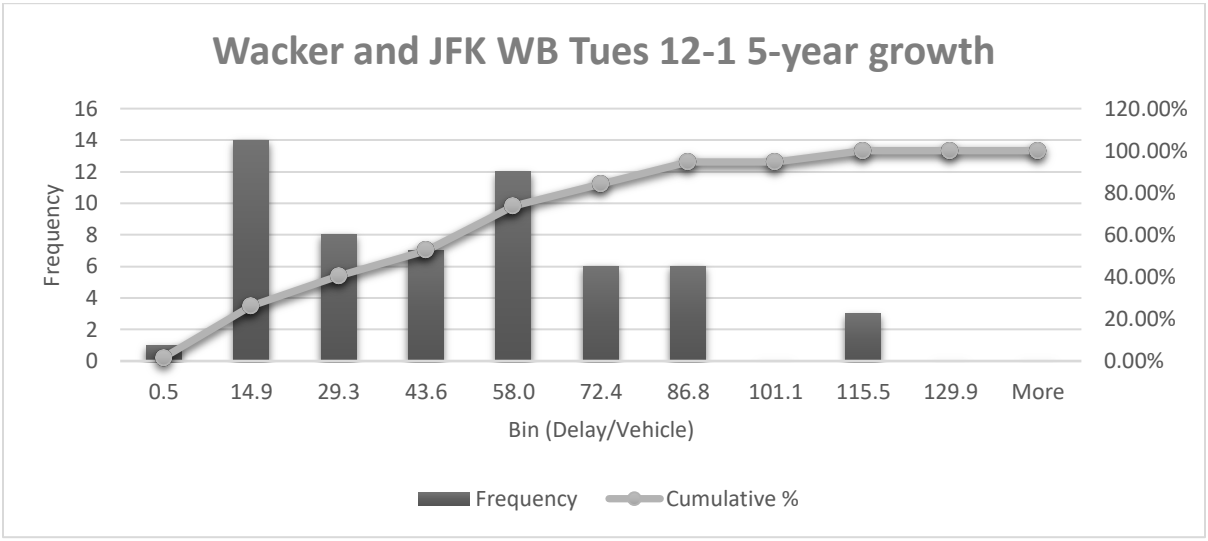


Figure 21. The total delay/vehicle the Wacker and JFK intersection going westbound experienced during the 60 simulation runs from 12-1 on a Tuesday with a 5-year population growth.

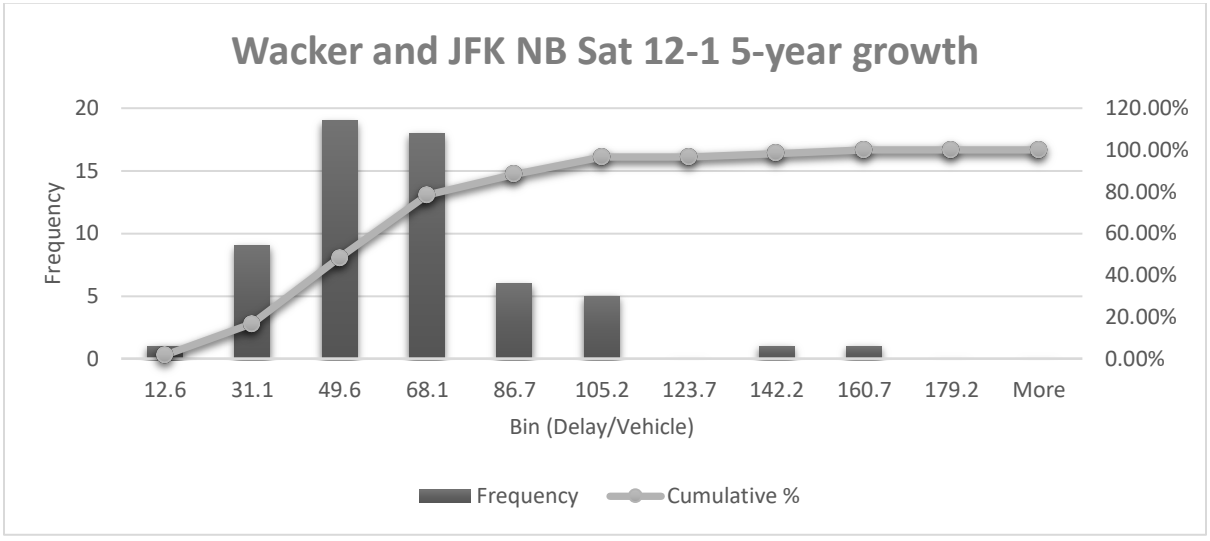


Figure 22. The total delay/vehicle the Wacker and JFK intersection going northbound experienced during the 60 simulation runs from 12-1 on a Saturday with a 5-year population growth.

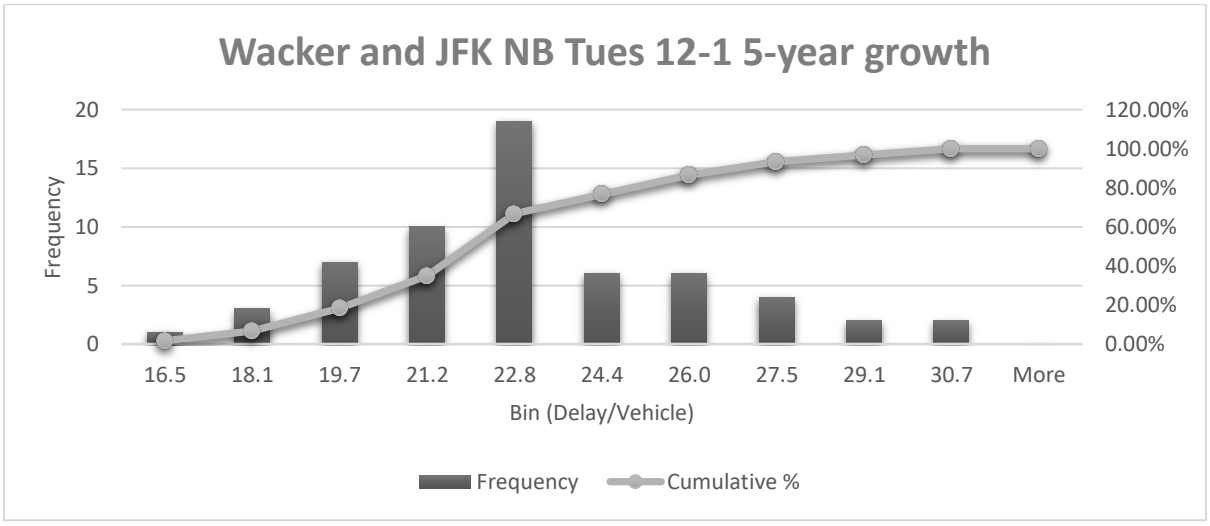


Figure 23. The total delay/vehicle the Wacker and JFK intersection going northbound experienced during the 60 simulation runs from 12-1 on a Tuesday with a 5-year population growth.

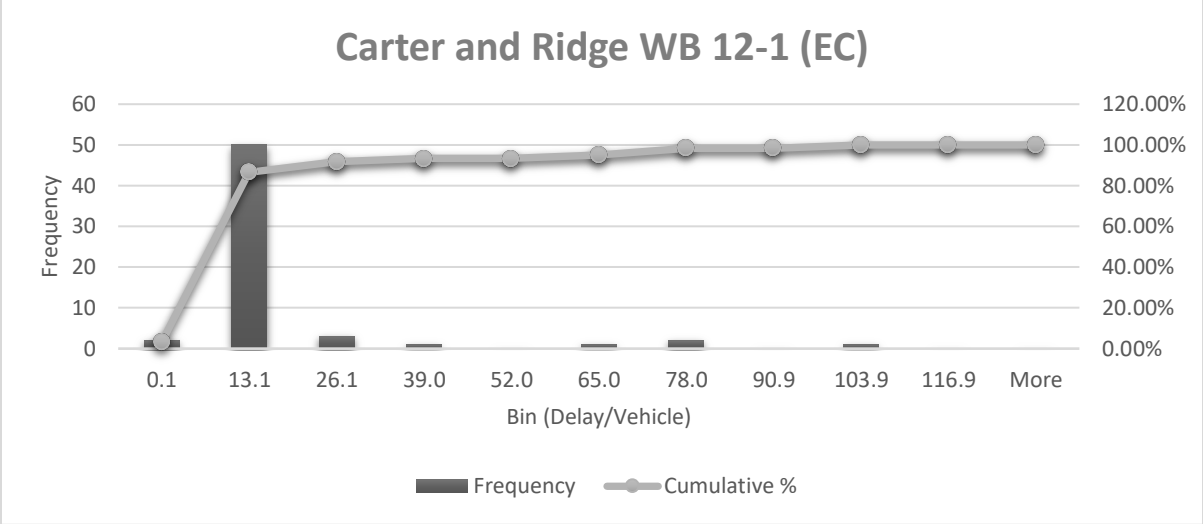


Figure 25. The total delay/vehicle the Carter and Ridge intersection going westbound experienced during the 60 simulation runs from 12-1 on a Saturday.

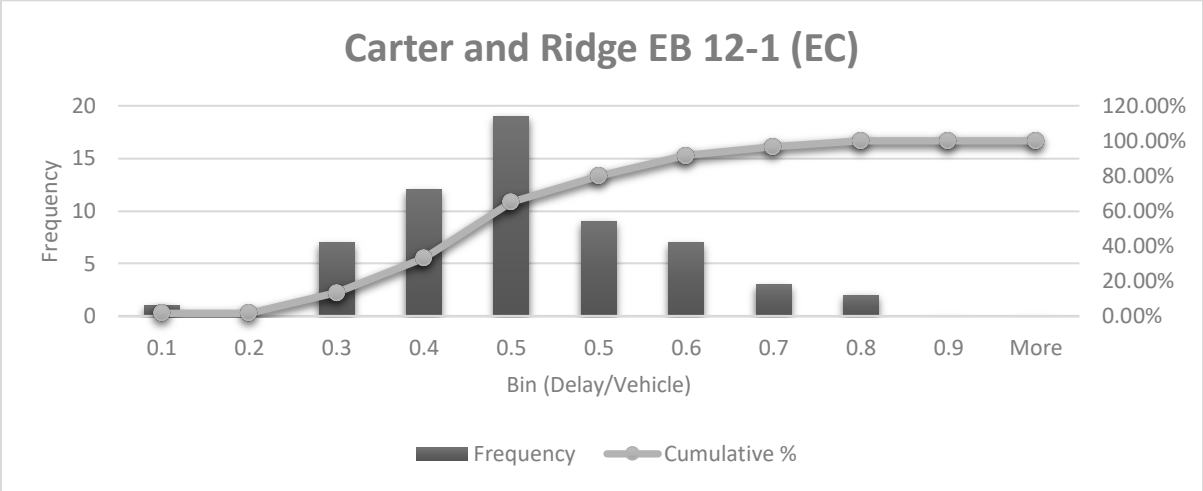


Figure 26. The total delay/vehicle the Carter and Ridge intersection going eastbound experienced during the 60 simulation runs from 12-1 on a Saturday.

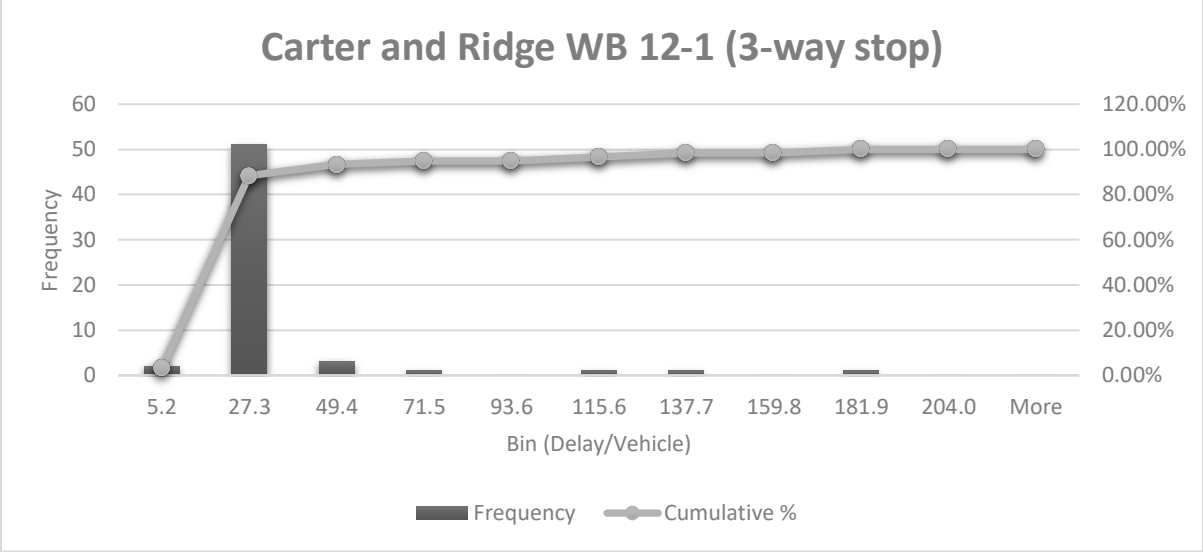


Figure 27. The total delay/vehicle the Carter and Ridge intersection with a 3-way stop going westbound experienced during the 60 simulation runs from 12-1 on a Saturday.

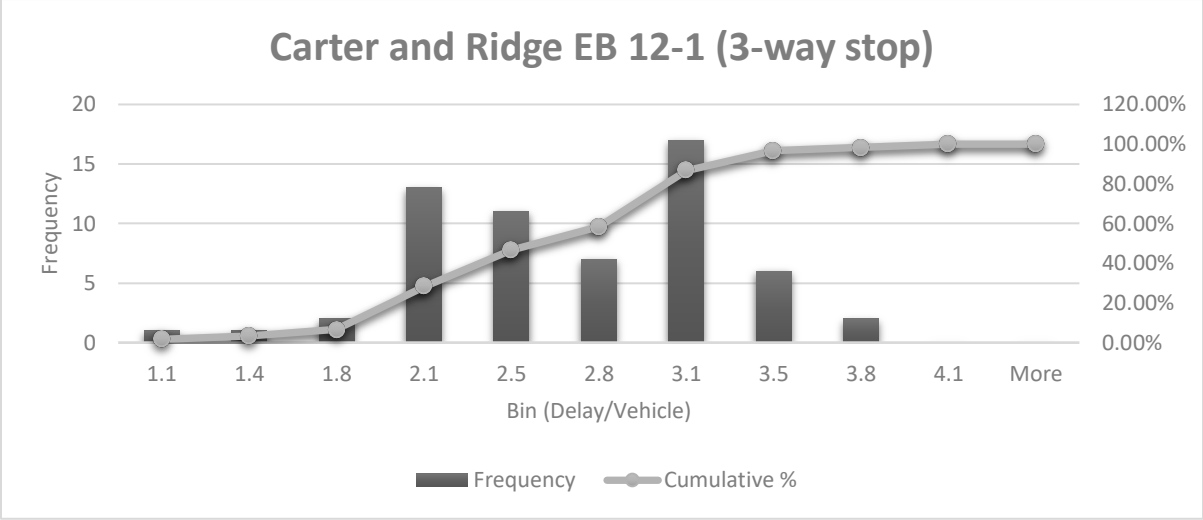


Figure 28. The total delay/vehicle the Carter and Ridge intersection with a 3-way stop going eastbound experienced during the 60 simulation runs from 12-1 on a Saturday.

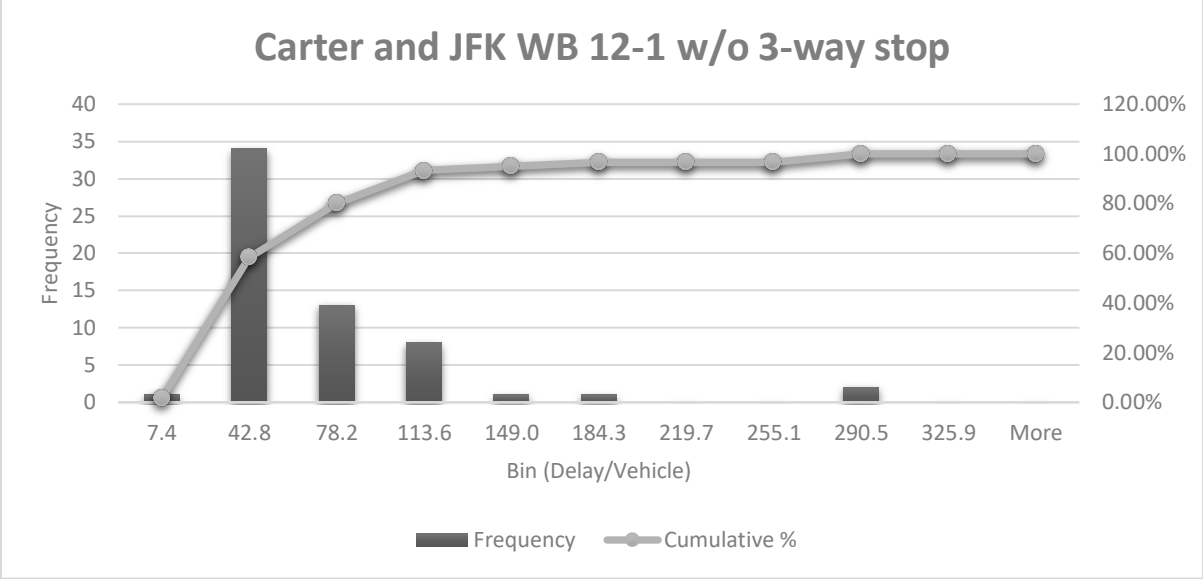


Figure 29. The total delay/vehicle the Carter and JFK intersection without a 3-way stop going westbound experienced during the 60 simulation runs from 12-1 on a Saturday.

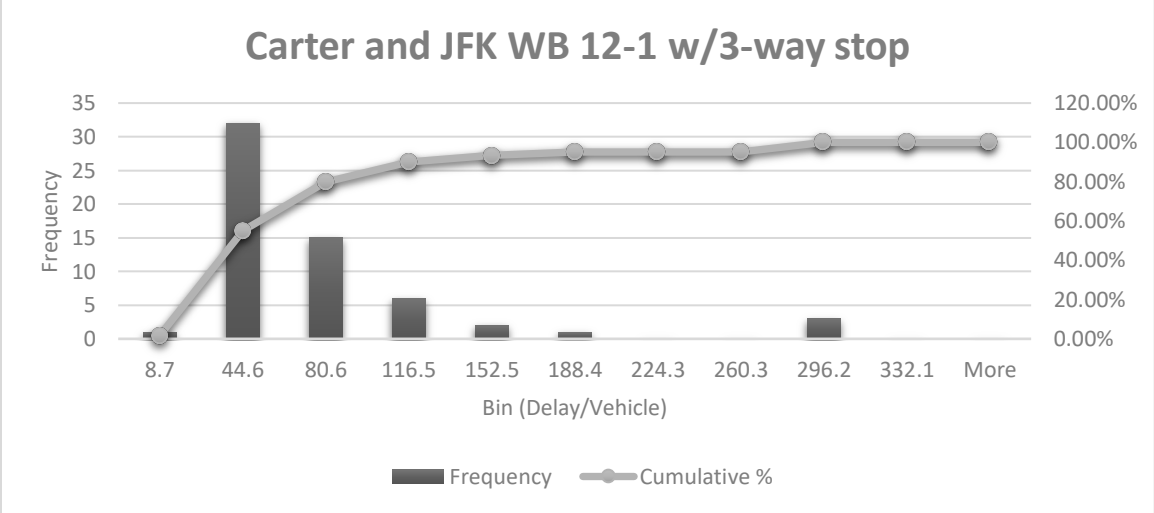


Figure 30. The total delay/vehicle the Carter and JFK intersection with a 3-way stop going westbound experienced during the 60 simulation runs from 12-1 on a Saturday.

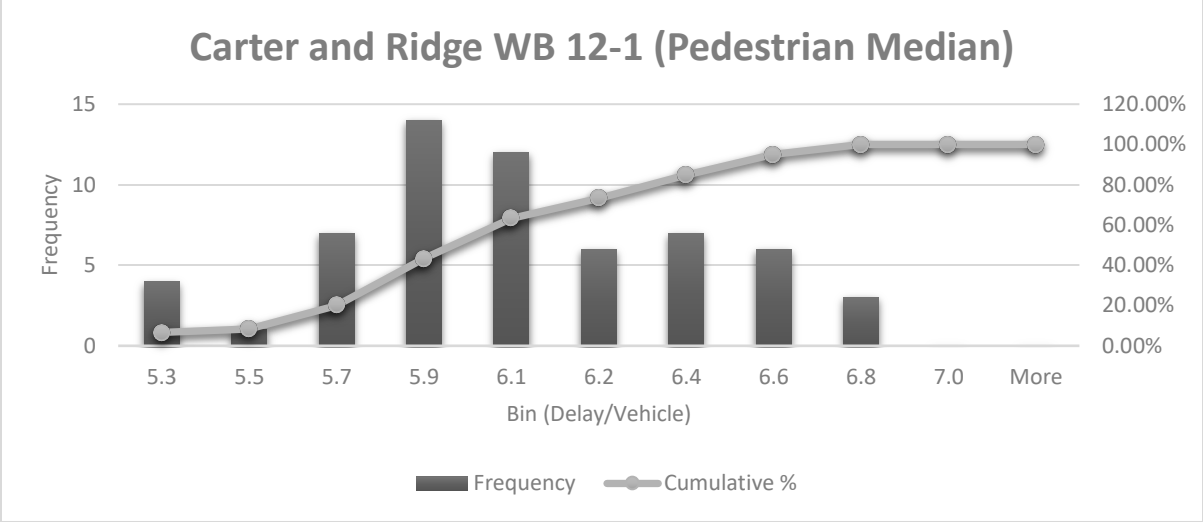


Figure 31. The total delay/vehicle the Carter and Ridge intersection with a pedestrian median going westbound experienced during the 60 simulation runs from 12-1 on a Saturday.

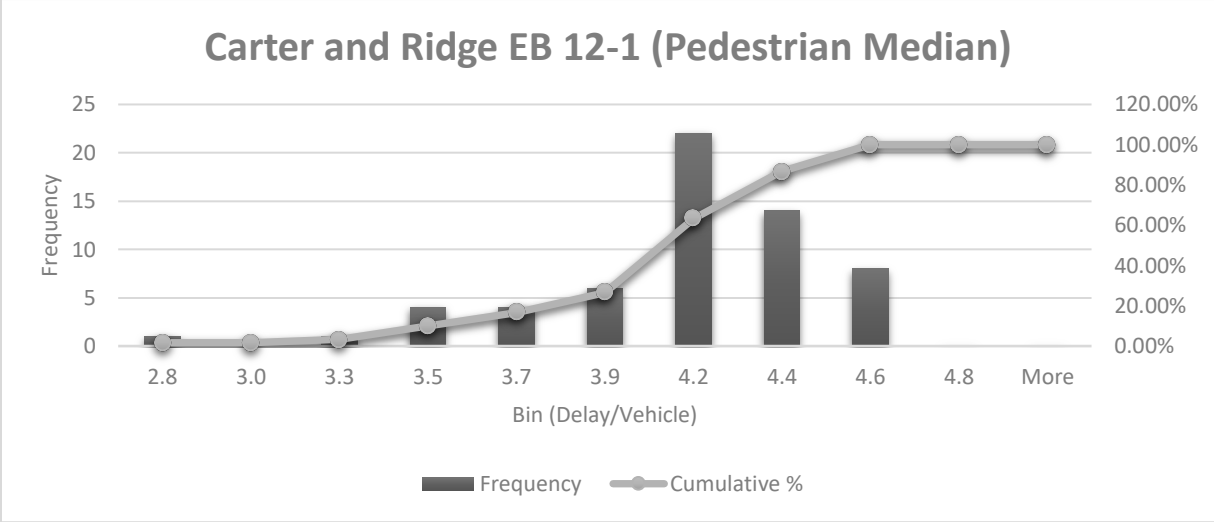


Figure 32. The total delay/vehicle the Carter and Ridge intersection with a pedestrian median going eastbound experienced during the 60 simulation runs from 12-1 on a Saturday.

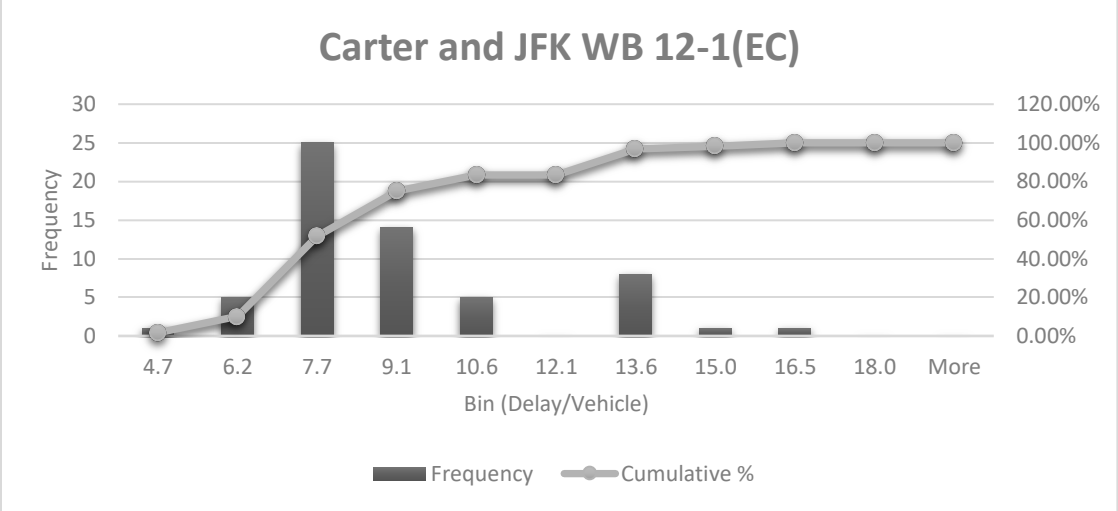


Figure 33. The total delay/vehicle the Carter and JFK intersection with a pedestrian median going westbound experienced during the 60 simulation runs from 12-1 on a Saturday.

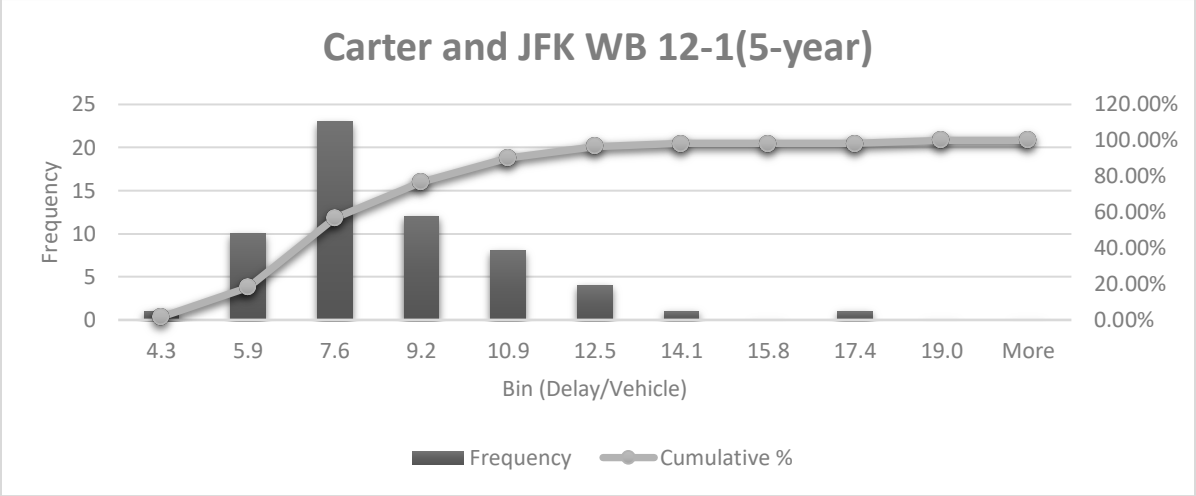


Figure 34. The total delay/vehicle the Carter and JFK intersection with a pedestrian median going westbound experiences 5 years from now during the 60 simulation runs from 12-1 on a Saturday.

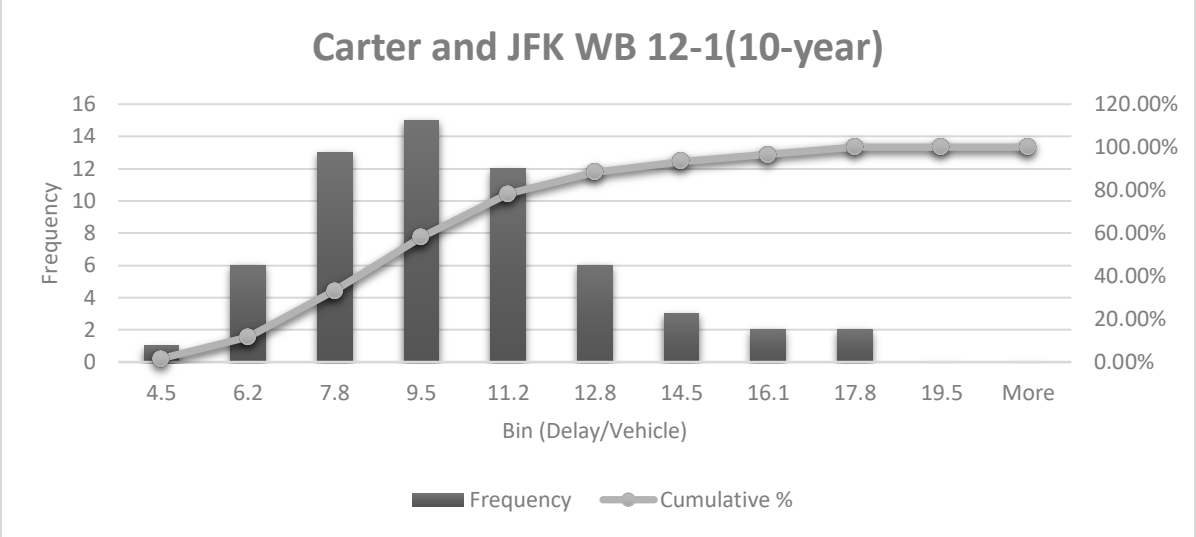


Figure 35. The total delay/vehicle the Carter and JFK intersection with a pedestrian median going westbound experiences 10 years from now during the 60 simulation runs from 12-1 on a Saturday.

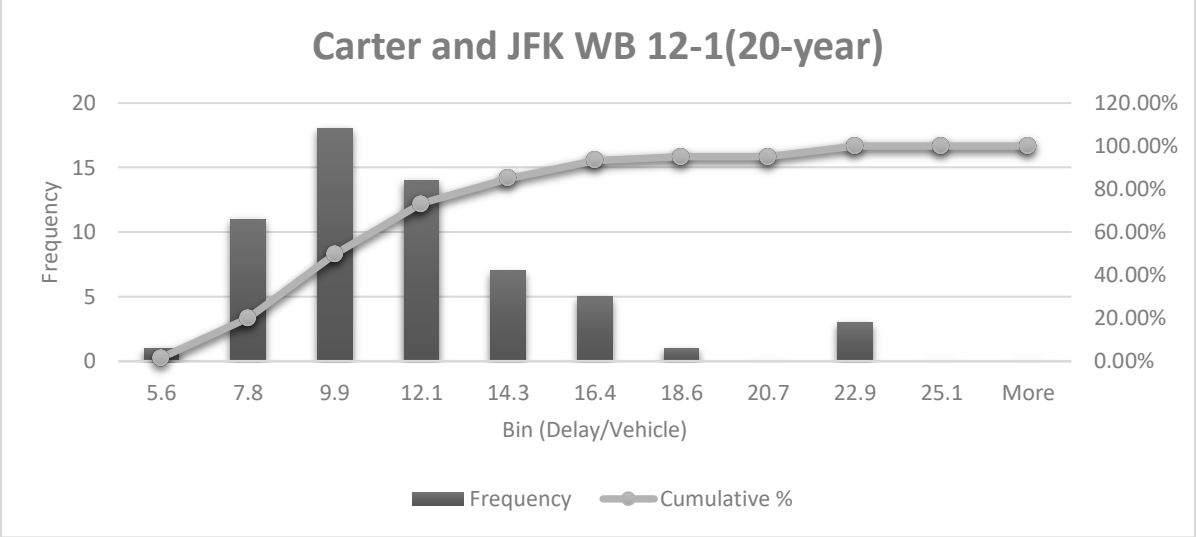


Figure 36. The total delay/vehicle the Carter and JFK intersection with a pedestrian median going westbound experiences 20 years from now during the 60 simulation runs from 12-1 on a Saturday.

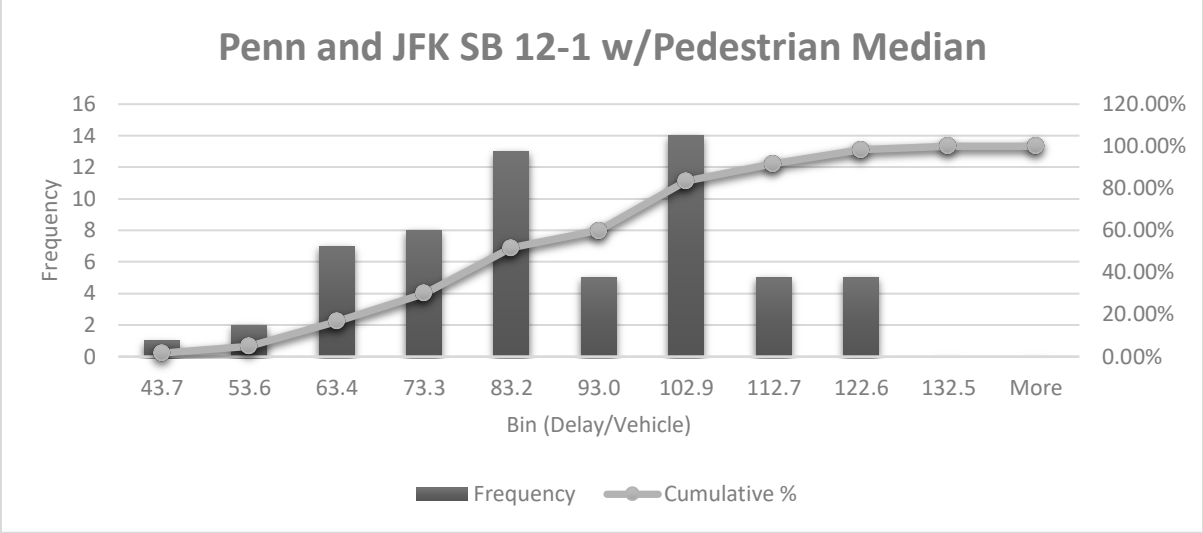


Figure 37. The total delay/vehicle the Pennsylvania and JFK intersection with a pedestrian median going southbound experienced during the 60 simulation runs from 12-1 on a Saturday.

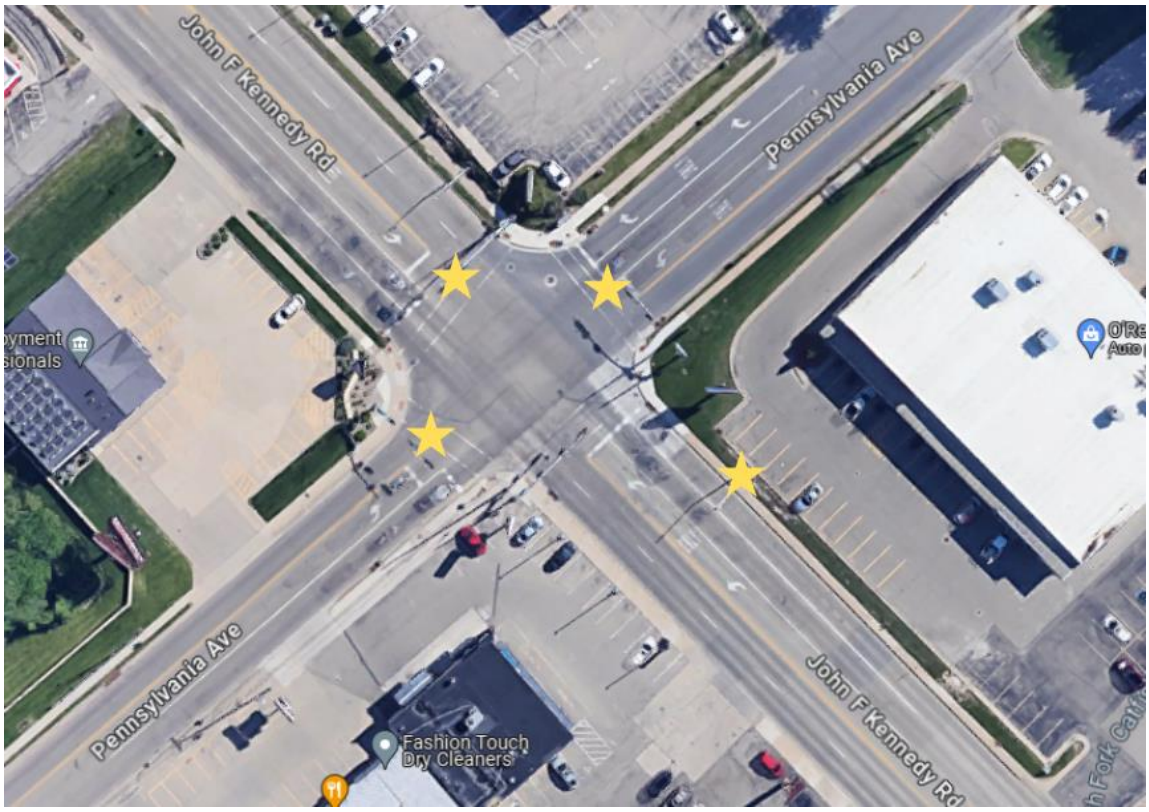


Figure 4. Aerial view displaying the location of cameras used to analyze the JFK Rd. and Pennsylvania Ave. intersection.

Figure 5. Aerial view displaying the location of cameras used to analyze the JFK Rd. and Wacker Dr. intersection.

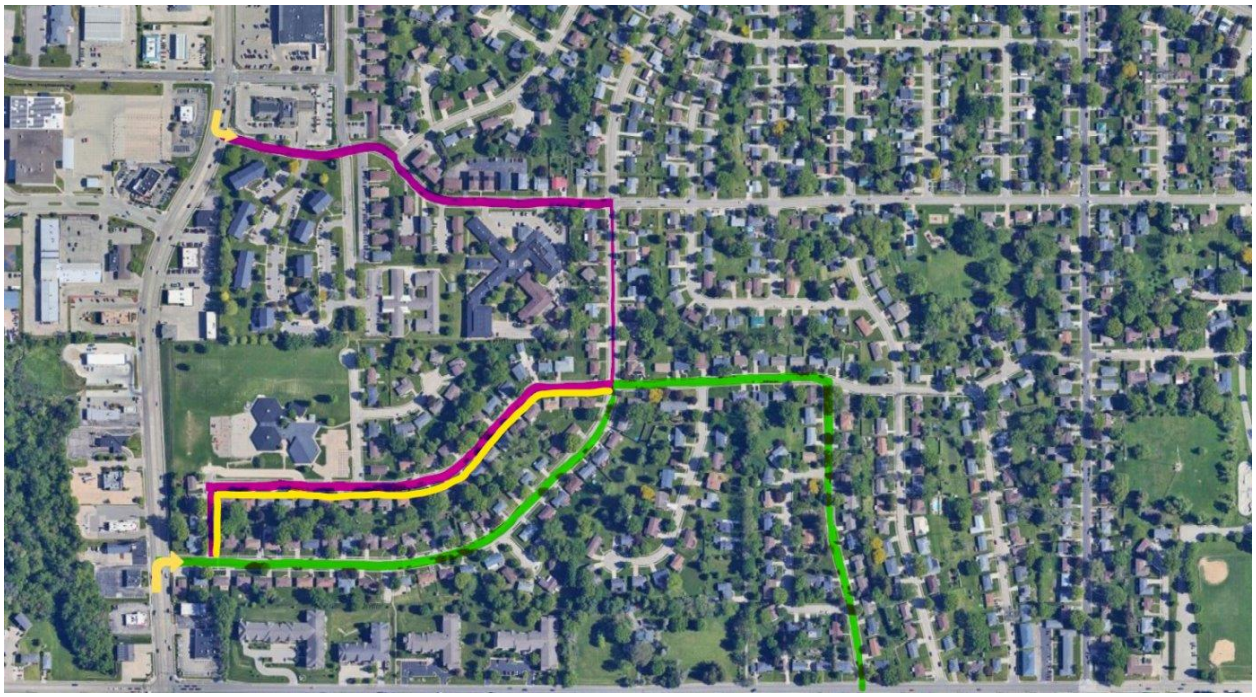


Figure 24. Aerial view of the routes likely to be taken by parents dropping children off at school if the pedestrian median at Carter Rd. and JFK Rd is constructed.

Figure 44. Key points of concern along the John F Kennedy Rd Corridor.