Final Report: West Main Street Study

Waterbury, Connecticut

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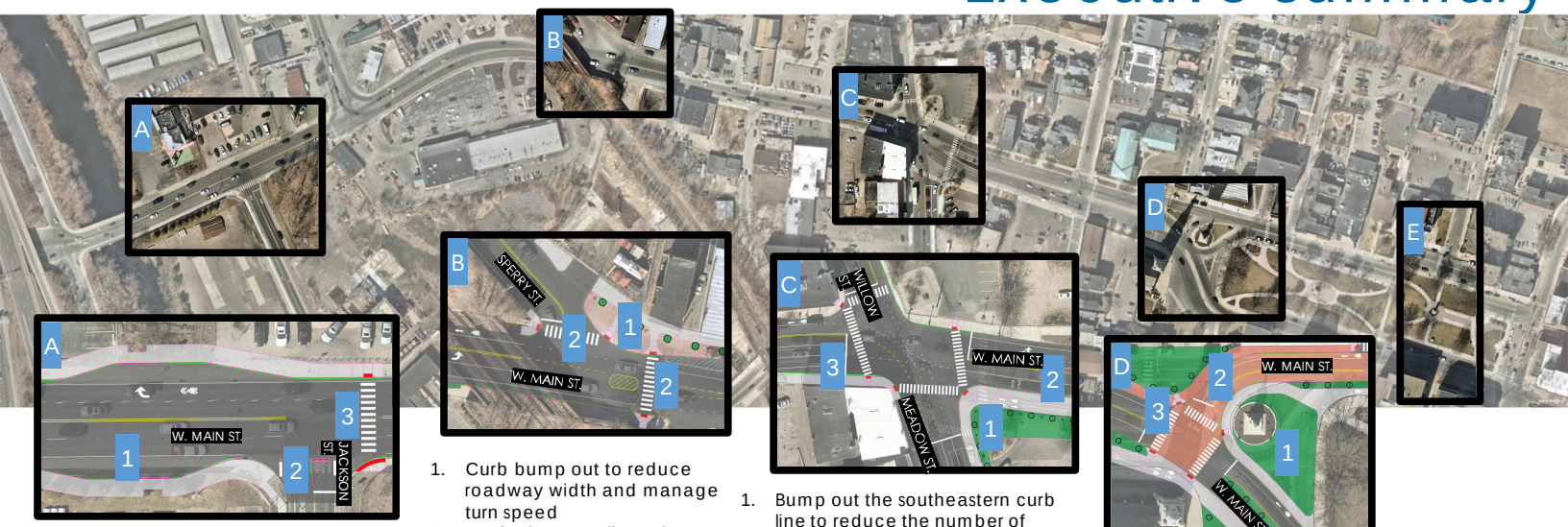

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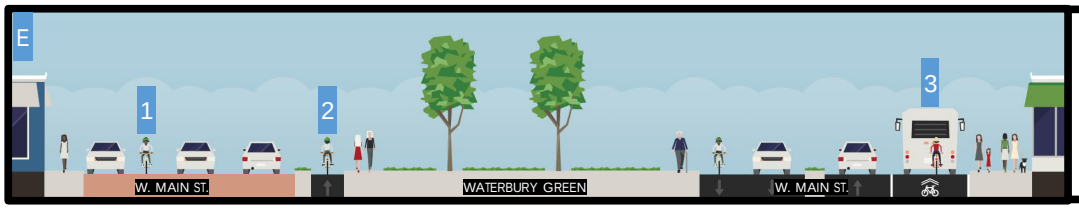


1. Narrow travel lanes; add westbound bicycle lane
2. Remove southern parking lane on the north side; add protected eastbound bike lane
3. Convert one eastbound vehicle travel lane to a shared bus/bike lane

The West Main Street corridor in Waterbury is a key connection between the West Side neighborhoods and the Downtown, as well a retail corridor and main route for vehicular traffic between Route 8 and Downtown Waterbury. The corridor lacks bicycle, pedestrian, and transit accommodations, and vehicle travel lanes are excessive in width and in number. Following our comprehensive analysis of existing conditions along the corridor and a robust public engagement process that involved stakeholder interviews, public workshops, and interactive surveys, a number of potential improvement recommendations were identified to create a safer West Main Street for all users. The recommendations of this study seek to build upon the momentum gained from the TIGER project and the multitude of other past and ongoing projects in the area as the City continues to revitalize and redevelop Downtown Waterbury.

This report will serve to summarize the recommendations and conceptual improvement alternatives that have been developed following completion of the public engagement process. These recommendations include a number of general high-level, corridor wide improvements that should be considered as well as a series of concept plan alternatives specific to each section of the corridor. Capacity and queue analyses were performed for the morning and afternoon peak hours to vet each improvement alternative and ensure the revised lane arrangements will not have a significant detrimental effect on the efficiency of vehicular traffic and transit operations.

Road Diet

West Main Street is an exceedingly wide roadway, with many stretches providing two or more travel lanes in each direction, and each intersection providing dedicated turning lanes. Throughout the public outreach process, congestion on West Main Street was not cited as a major problem by stakeholders. In addition, existing conditions analysis revealed that the majority of the intersections along the corridor are operating efficiently and have reserve capacity. For these reasons, the possibility of reducing the number of vehicle travel lanes on West Main Street and reallocating the space to other roadway users was explored.

The preferred alternative proposes to eliminate one eastbound vehicle travel lane on West Main Street between Thomaston Avenue and railroad overpass with further lane reductions proposed east of Willow and Meadow Street. In addition, the westbound vehicle travel lanes are proposed to be reduced between Willow Street/Meadow Street and Church Street.

This space is proposed to be reallocated for a combination of bicycle lanes, bus lanes and pull-offs, on-street parking, a shared use path, and additional landscaped area.

Example of a Road Diet on Freight Street

Access Management Improvements

The corridor today has a high number of commercial access driveways that service its many businesses. Each of these driveways adds potential vehicle conflict points to the roadway and increases the potential for vehicle conflict with pedestrians on the sidewalk. It is recommended that some of these driveways be closed with access consolidated to one driveway wherever possible. In addition, left turn restrictions through the installation of physical islands are proposed in some instances.

These recommendations may be implemented temporarily in the near term by closing the driveways or restricting access with barricades or planters. If successful, these closures may be implemented with the installation of new curbing in the long term.

Bicycle and Pedestrian Improvements

The concept plans propose the addition of midblock crosswalks on West Main Street at locations that have been identified as common crossing locations even though no designated crosswalks exist today. Additionally, curb extensions at existing crossings, and relocation of existing crosswalks, will allow for shorter pedestrian crossing distances and improve overall pedestrian safety along the corridor.

Pedestrian actuated crossing devices, such as rectangular rapid flashing beacons, are proposed at several midblock crossings. These beacons aid pedestrians in their ability to cross safely by improving crosswalk visibility and notifying vehicles to stop at crossings when a pedestrian is present.

In addition, many of the existing pedestrian curb ramps and sidewalks were found to be ADA non-compliant. It is recommended that the existing curb ramps be replaced with ADA compliant ramps, and existing sidewalks should be widened to at least five feet. Further sidewalk widening is recommended where right-of-way allows. Wider sidewalks will improve the walkability along the corridor and contribute to creating a sense of place for pedestrians.

The implementation of bicycle facilities is strongly recommended, especially considering the nearby shared use path that is planned for construction along the Naugatuck River. Bicycle facilities along West Main Street will also provide connectivity to the recently installed cycle track on Freight Street. Additionally, bicycle parking options should be available at central locations along the corridor, including high quality bike shelters and racks outside of businesses, as well as on The Green.

The concept plans prepared depict a combination of on-street dedicated bike lanes, shared bike/bus lanes, and a protected shared use path along a portion of the corridor, similar to the Freight Street application. The addition of these facilities will aid in creating a multimodal corridor that is safe and accessible for vulnerable roadway users.

Example of Shared Use Path on Freight Street

Parking Improvements

Vehicles utilize on-street parking in the existing condition, but parking lanes and spaces are not clearly marked. As a result, many vehicles park in lanes designated for travel or at bus stops. It is recommended that on-street parking areas are designated with striping and curb extensions to prevent vehicles from parking where parking is prohibited.

In some portions of the corridor between Sperry Street and the Green, on street parking areas were observed to be underutilized and could potentially be eliminated in the interest of reducing the paved road width and providing wider sidewalks.

Additionally, the City currently provides off-street public parking, and has plans to add more on Prospect Street in the future. Wayfinding signage should be installed to direct drivers to available off-street parking.

Example of Striped Parking on Freight Street

Placemaking Improvements

Placemaking Best Practices

Creating a sense of place is critical to fostering economic growth and development along a corridor and benefits all roadway users by encouraging lower vehicle speeds and providing a more inviting pedestrian environment. The recommended streetscape improvements, including textured pavement and hardscape areas, street trees, and landscaped medians will serve as traffic calming measures that increase green space and improve the overall appearance and aesthetics of the corridor.

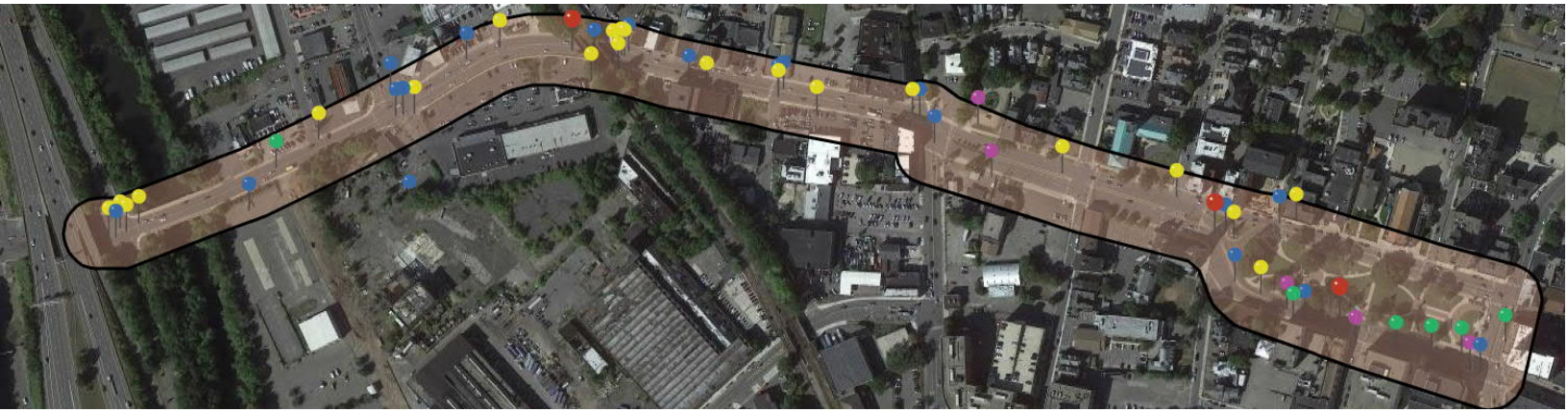
Transit Recommendations

West Main Street functions as a funnel for numerous bus routes to and from the system hub downtown. A dedicated eastbound bus lane leading to and exiting the major bus stops on West Main Street south of the Green will improve transit reliability across the entire system, better organize traffic, and reduce conflicts. Strict enforcement of bus facilities (i.e., no-parking regulations and bus lane protection) is critical.

Advancing service recommendations from the Waterbury Area Transit Study (WATS), including those focused on the hours and span of service, will further expand mobility options for area residents and visitors.

Additionally, Good sidewalk condition, useful route and schedule information, and basic amenities including seating and shelter are encouraged throughout the corridor. Enhanced and up-to-date customer information on bus services will facilitate the significant timed transfer activity taking place at or near the Waterbury Green.

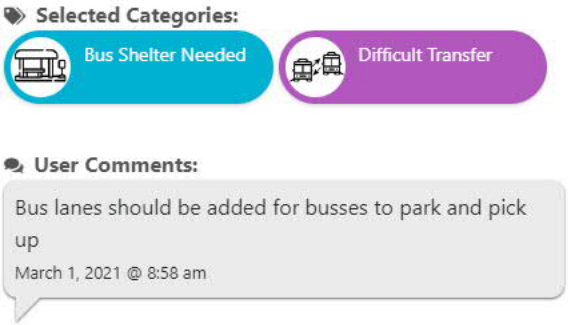
Public Outreach



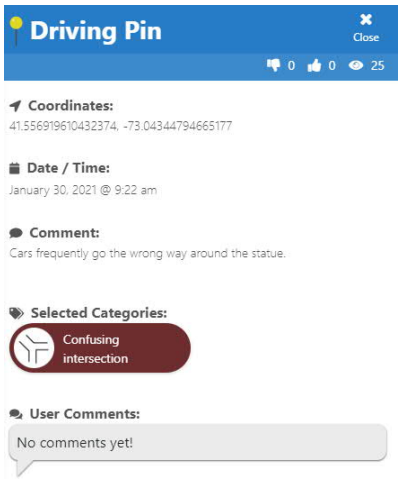
Project Website

As part of the public outreach effort for this project, a website was developed that featured an interactive mapping tool for members of the public to share location specific feedback on existing deficiencies and opportunities for improvement along the corridor. Additionally, an online survey was developed and made available on the website to give members of the public the opportunity to respond to direct questions about the corridor.

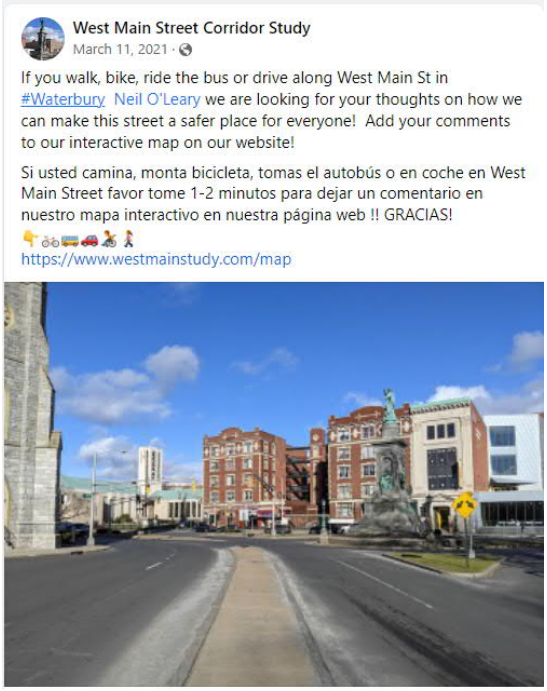
Upcoming public meeting dates were advertised on the website, and recordings of public meetings were made available on the website for those who could not attend. The website was also used to disseminate relevant project documents such as the project schedule, as well as meeting notes, presentations, agendas, and technical reports.



Comment on the Website's Interactive Map



Pin on the Website's Interactive Map



Facebook Post Encouraging Use of the Website

Stakeholder Interviews

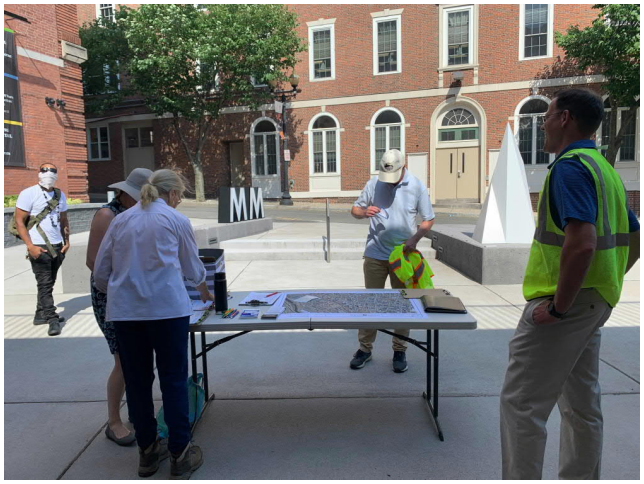
A total of nine stakeholder interviews were conducted throughout the public engagement process in order to engage representatives of the community with in-depth conversations about how the corridor can better serve the City. The following community members were interviewed:

- Mayor Neil M. O'Leary, Mayor of Waterbury
- Steve Dwyer, Bus Driver, NE Transit
- Ken Defloria, Owner, Meadow Street Automotive
- Mark Russo, Owner, Main Street Insurance
- Reverend Michael Carroll, St. John's Church
- Father Jim Sullivan, Basilica of the Immaculate Conception
- Joe Gramando, Managing Partner, Green Hub Development
- Tony D'Elia, Owner, San Marino Ristorante Italiano
- Chief Fernando Spagnolo, Chief of Police, Waterbury Police Department

These individuals were selected with guidance from the project advisory committee and the Mayor's office with the intent of understanding the issues and opportunities along the corridor from a variety of different perspectives.

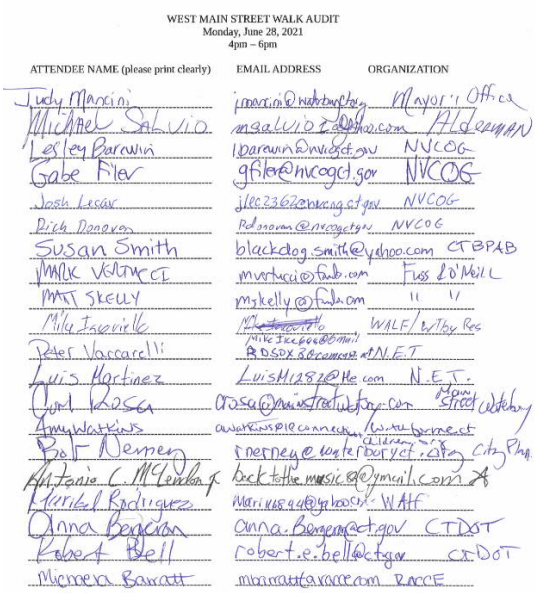
Notes from the stakeholder interviews can be found in Appendix D.

Walk Audit



Walk Audit Check-In

Fuss & O'Neill participated in a walk-audit of the West Main Street corridor. Other attendees of the walk-audit included representatives from Naugatuck Valley Council of Governments (NVCOG), Connecticut Department of Transportation (CTDOT), the City of Waterbury, and Northeast Transportation. The intent of the walk-audit was to identify location specific opportunities to improve pedestrian facilities along the corridor. Findings of the walk-audit were consistent with field observations and feedback received at other public outreach events. Participants cited poorly marked crosswalks, long crossing distances, missing pedestrian signal heads, and discontinuous sidewalks as existing deficiencies that impede travel for pedestrians along the corridor.



WEST MAIN STREET WALK AUDIT
Monday, June 28, 2021
4pm – 6pm

ATTENDEE NAME (please print clearly)	EMAIL ADDRESS	ORGANIZATION
Judy Mancini	jmancini@waterburyct.org	Mayor's Office
Michael Salvio	msalvio2@yahoo.com	Alderman
Lesley Barawin	lbarawin@nvcogct.gov	NVCOG
Gabe Filer	gfiler@nvcogct.gov	NVCOG
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Michaela Barrett	mbarrett@racce.com	RACCE

Walk Audit Sign-Up Sheet

Walking Along the Corridor

Project Advisory Committee

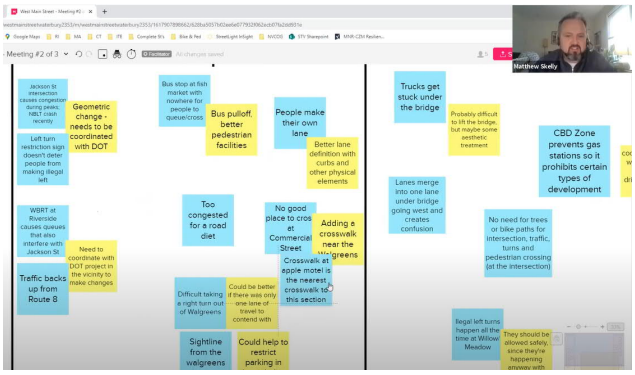
The Project Advisory Committee (PAC) was established to provide oversight, direction for the study, and monitor the planning process. Members of the PAC include representatives from the City of Waterbury, Connecticut Department of Transportation (CTDOT), NVCOG, Northeast Transportation, and Bike/Walk CT, as well as representatives of the Mattatuck Museum and the YMCA, both located on West Main Street.

A total of three meetings were held virtually with the PAC. The first meeting took place on November 16, 2020, with the intent of reviewing the project scope and schedule, and assessing the strengths, weaknesses, opportunities, and design challenges along the corridor. The second meeting took place on March 29, 2021, to review the findings of the existing conditions assessment and discuss the feedback received through public outreach. The meeting concluded with a design brainstorm session to determine appropriate solutions to identified problems. The third and final meeting took place on September 28, 2021, to present preliminary recommendations and concept alternatives that were developed as a result of ongoing analysis and public outreach. The meeting concluded with a workshop activity to obtain feedback on the preliminary concept plans.

Public Meetings

A series of three public workshops were hosted throughout the course of the project. The first meeting was held virtually on January 12, 2021. The intent of the meeting was to introduce the public to the project and obtain input to inform the study. The project team reviewed the study area, scope of work, and schedule, and the meeting concluded with an exercise to identify location specific issues and opportunities along the corridor. The following key concerns about the corridor were noted:

- On and off-street parking availability
- Many sidewalks and ramps are not ADA compliant or accessible
- Curb cuts are frequent and exceedingly wide
- Lack of green space/street trees
- Excessive pavement width
- Vehicle non-compliance with turning restrictions
- Faded pavement markings and crosswalks
- Lighting could be improved, many areas along the corridor are quite dark at night



Identifying Issues Along the Corridor

The second public meeting was hosted virtually on April 14, 2021. The intent of the meeting was to present findings of the existing conditions analysis and conduct an interactive workshop to brainstorm possible improvements and solutions along the corridor using Streetmix. Feedback received at this meeting is summarized below:

- Desire for improved lane definition using pavement markings and curbing
- Desire for additional midblock crosswalks with actuated crossing devices; one desired location is in the vicinity of Commercial Street.
- Road diet east of Willow/Meadow Street seems feasible based on observed volumes and congestion
- Turn restrictions at the intersections surrounding The Green create confusion and worsen congestion.
- Potential of extending The Green west to the monument was discussed. This would simplify the intersection at the monument and provide more space for community events on The Green.

The third and final public meeting was hosted in a hybrid virtual/in-person format on October 21, 2021, with the in-person portion taking place at Veterans Memorial Hall. The intent of the meeting was to present the concept alternatives for the corridor and receive feedback. Feedback received at this meeting is summarized below:

- Stamped concrete would be the preferred material for curb extensions and bump-outs because it is easier to maintain than brick
- Desire to restore on-street parking on the west side of Meadow Street if possible
- Desire to explore adding on-street parking or angled bus bays between Willow Street and Holmes Avenue given the plethora of additional green space shown on the concept plans
- Option 1 of the West Main Street Confluence redesign was preferred by all meeting participants.
- Suggestion to extend The Green a little further east with a curb extension into excess pavement space

Invitation for January 12th Meeting

Comprehensive notes from each of the three public meetings can be found in Appendix D.

Watertown Avenue to Jackson Street

Existing Conditions

Deficient Pedestrian Facilities at West Main Street & Watertown Avenue

The intersection of West Main Street and Watertown Avenue is a four-legged signalized intersection with West Main Street providing the eastbound and westbound approaches, Riverside Street providing the northbound approach and Watertown Avenue providing the southbound approach. West Main Street's eastern leg provides two travel lanes in each direction and is approximately 44 feet wide. The western leg of the intersection provides three travel lanes in each direction, separated by a raised median, and is approximately 110 feet wide. The lane arrangements on the western leg under the Route 8 overpass are poorly defined.

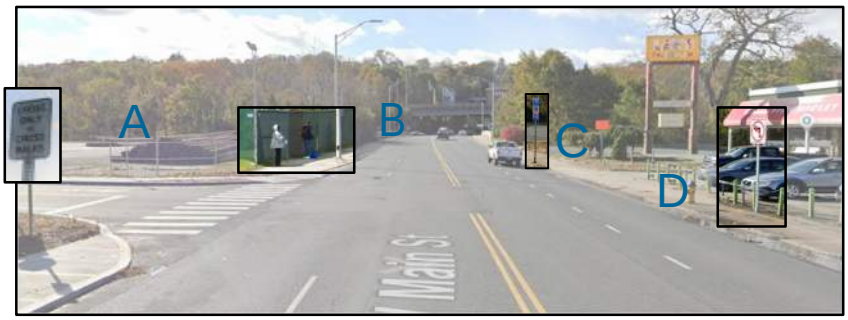
Sidewalks are provided along both sides of West Main Street in the vicinity of the intersection. Sidewalks are approximately 7.5 feet wide east of the intersection and five feet wide west of the intersection. Crosswalks span the north and east legs of the intersection and have blended transition ramps with detectable warning strips.

The existing traffic signal control includes four vehicular phases and no pedestrian phases. Actuated pedestrian push buttons are located at the two eastern corners of the intersections, aligned with the existing crosswalks; however, the southern push button is inoperable and pedestrian signal heads are not provided at either location.

The intersection of West Main Street at Riverside Street and Watertown Avenue experienced an average of approximately four crashes per year. During the five-year span, the intersection experienced nine angled crashes, six front to rear crashes, four sideswipes, one hit fixed object crash, and one crash where the manner of collision is unknown. Of these 21 crashes, 13 involved property damage only, two involved possible injuries, and six involved suspected minor injuries.

West Main Street provides two travel lanes in each direction between Watertown Avenue and Jackson Street. Sidewalks are provided along both sides of the roadway. Two bus stops that service a high number of riders are located just west of Jackson Street, in front of and opposite J's Ocean Fish Market. Through public outreach, the location of these two bus stops has been identified as a common pedestrian crossing location despite the absence of a painted crosswalk.

As a part of the City of Waterbury's TIGER project, Jackson Street was extended from Freight Street north to West Main Street to provide improved connectivity. This project is part of the city's effort to revitalize and redevelop the area. Jackson Street now intersects with West Main Street at an unsignalized 3-way "T" intersection approximately 450 feet east of Watertown Avenue. The Jackson Street leg provides one travel lane in each direction while West Main Street provides two travel lanes in each direction through the intersection. Left turns from Jackson Street onto West Main Street are prohibited by signage, but this restriction is often ignored by drivers and difficult to enforce.



West Main Street and Jackson Street

A: Sign instructing pedestrians to cross only in crosswalks

B: People waiting for the bus

C: J's Ocean Fish Market Bus Stop

D: Sign indicating prohibited left turn from Jackson Street

Sidewalks are provided along both sides of West Main Street and along the west side of Jackson Street. A crosswalk and pedestrian ramps are provided for crossing the Jackson Street approach. Shared lane markings or "sharrows" for bicyclists are also painted along Jackson Street.

Recommended Improvements

West Main Street between Watertown Avenue and Jackson Street

In order to better accommodate buses at the Ocean Fish Market stops, bus pull-offs are recommended on the north and south sides of the roadway. Additionally, it is recommended that bus shelters be added to the existing bus stops in order to improve visibility of the bus stop and create a better experience for riders.

A marked crosswalk with a pedestrian actuated crossing device such as a HAWK signal is also recommended just east of Jackson Street. The addition of a crosswalk at this location will improve visibility for crossing pedestrians.

HAWK Signal in Stamford

Installation of a median island on Jackson Street to restrict left turns onto West Main Street is recommended to ensure drivers comply with the existing left turn prohibition.

Capacity Analysis

During the morning peak hour, the intersection of West Main Street and Watertown Avenue and Riverside Street is improved from LOS E in the background condition to LOS D in the Build condition as a result of signal timing improvements. Vehicles experience a reduction in delay of approximately six seconds per vehicle on average.

During the afternoon peak hour, the intersection is improved from LOS F in the background condition to LOS E in the Build condition. Vehicles experience a reduction in delay of approximately 60 seconds per vehicle on average.

The queue analysis revealed generally insignificant changes in queue length.

Level of Service Summary, West Main Street and Watertown Avenue and Riverside Street

	Weekday AM Peak Hour		Weekday PM Peak Hour	
	Background	Build	Background	Build
Intersection	0.85 / LOS E	0.86 / LOS D	1.14 / LOS F	0.98 / LOS E
EB Approach	LOS D	LOS D	LOS F	LOS F
WB Approach	LOS B	LOS C	LOS E	LOS D
SB Approach (Watertown Ave.)	LOS F	LOS E	LOS D	LOS F
SE Approach (Route 8 Off Ramp)	LOS E	LOS E	LOS F	LOS D

West Main Street and Thomaston Avenue

Existing Conditions

The intersection of West Main Street at Thomaston Avenue and the Walgreens Driveway is a four-legged signalized intersection with West Main Street providing the eastbound and westbound approaches, Thomaston Avenue providing the southbound approach, and the Walgreens driveway providing the northbound approach. West Main Street's eastern leg provides three westbound and two eastbound travel lanes and is approximately 55 feet wide. The western leg of the intersection provides two travel lanes in each direction and is approximately 55 feet wide.

The Walgreens driveway leg is approximately 80 feet wide, and provides one right turn lane, and one shared through/left turn lane. The Thomaston Avenue leg is approximately 80 feet wide and provides one left turn lane, and one shared through/right turn lane.

Long Crosswalk across Thomaston Avenue

Sidewalks are provided along both sides of West Main Street in the vicinity of the intersection. Sidewalks range from approximately four to 4.5 feet wide east of the intersection. West of the intersection, the northern sidewalk is approximately 7.5 feet wide, and the southern sidewalk is approximately 5.5 feet wide. Crosswalks span the north and west legs of the intersection and have blended transition ramps with detectable warning strips.

The existing traffic signal control includes four vehicular phases and an exclusive pedestrian phase. The northeast, northwest, and southwest corners have actuated pedestrian push buttons with corresponding pedestrian signal heads. The northern two pedestrian heads are pole mounted while the southwestern pedestrian head is pedestal mounted.

On the north side of West Main Street, approximately 30 feet west of Thomaston Avenue are three commercial driveways located along a 130-foot stretch of roadway that each provide full access to the same commercial plaza.

The intersection experienced an average of approximately 41 crashes per year. During the five-year span, the intersection experienced 101 angled crashes, 57 front to rear crashes, 22 sideswipes, ten fixed object crashes, three collisions involving pedestrians, and 12 crashes where the manner of collision is unknown. Of these 205 crashes, 150 involved property damage only, 37 involved possible injuries, and 18 involved suspected minor injuries. This intersection has the highest crash rate out of all study intersections and has a high frequency of angled crashes, likely due to vehicles turning onto and off of West Main Street.

Westbound Left Turn Traffic Queue

Recommended Improvements

At the intersection of West Main Street and Thomaston Avenue, one of the two existing eastbound through lanes is proposed to be converted to an exclusive left turn lane onto Thomaston Avenue. This change in lane arrangement will allow for improved operations and reduced queueing for eastbound left turning vehicles. It will also allow for the addition of a landscape buffer strip and an eastbound bicycle lane beginning east of the intersection as the eastbound two to one lane merge will be eliminated. Additionally, the existing westbound right turn lane is proposed to be converted to a shared through/right turn lane.

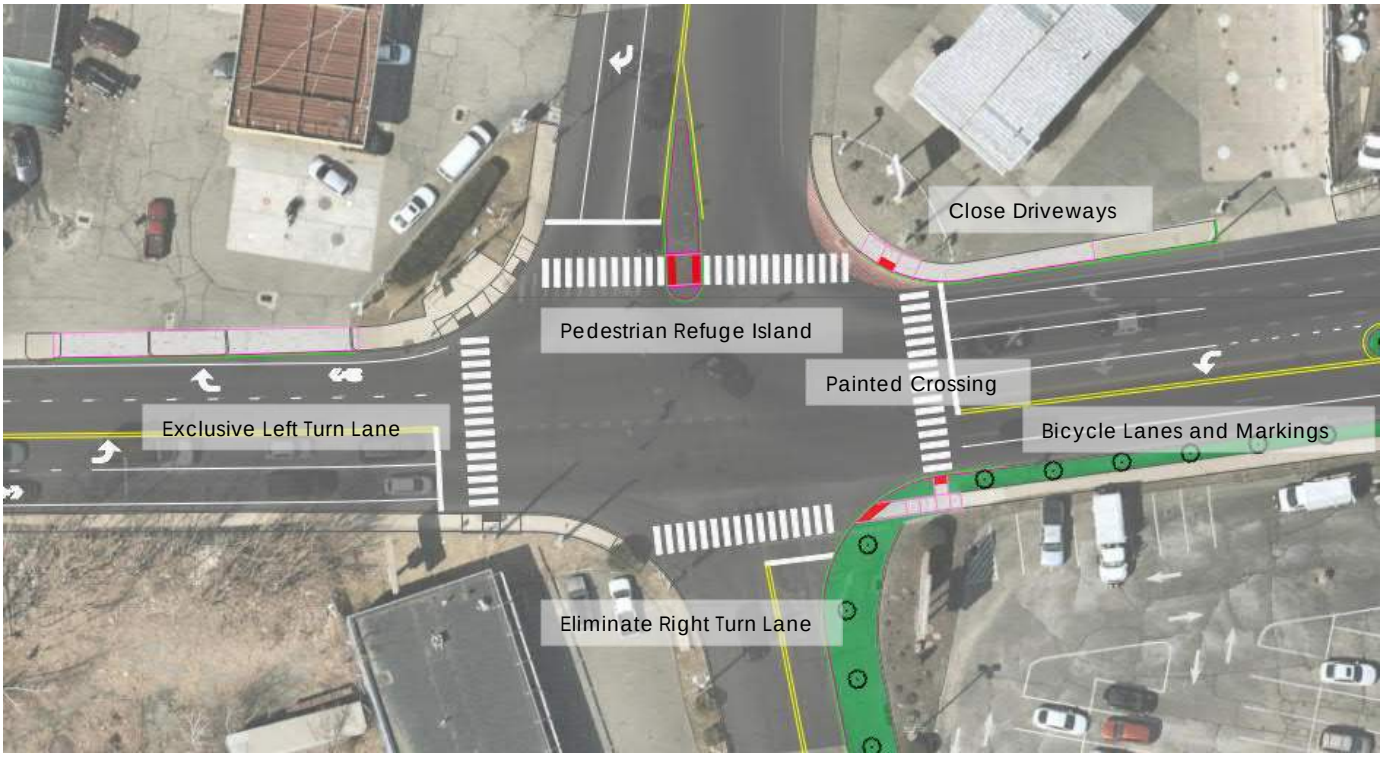
The Walgreens driveway on the southern leg of the intersection currently provides one right turn lane and one shared through/left turn exiting the site which is not necessary for vehicle capacity. The preferred alternative considers extending the eastern curb line approximately 20 feet west to eliminate the exclusive right turn lane and provide one shared lane. This curb extension allows for a shorter crossing distance for pedestrians across the driveway and additional landscaped area.

Pedestrian facilities are improved at this intersection with the proposed addition of a marked crosswalk on the eastern leg, and the extension of the raised island for pedestrian refuge at the crosswalk on the northern leg.

Bicycle lanes are proposed to begin just east of this intersection on both sides of the roadway with sharrows provided to the west.

The closure of three private access driveways on West Main Street in the immediate vicinity of the intersection is also recommended. Closure of these three driveways improves the overall safety of the intersection by eliminating additional vehicle conflict points.

Additionally, changes to the existing signal timing and phasing that allocate more time to left turning vehicles are recommended to mitigate the high number of angle collisions that occur at this intersection.



West Main Street and Thomaston Avenue Improvements

Capacity Analysis

During the morning peak hour, the intersection of West Main Street and Thomaston Avenue improves from an overall LOS D in the background condition to an overall LOS C in the Build condition as a result of the proposed lane configurations and signal timing modifications. Average delay per vehicle is reduced by approximately 25 seconds.

During the afternoon peak hour, the intersection operates at LOS F in the background condition and LOS D in the Build condition. Delay is reduced by approximately 75 seconds per vehicle.

Level of Service Summary, Thomaston Avenue

	Weekday AM Peak Hour		Weekday PM Peak Hour	
	Background	Build	Background	Build
Intersection	1.06 / LOS D	0.80 / LOS C	1.19 / LOS F	1.10 / LOS D
EB Approach	LOS F	LOS B	LOS F	LOS D
WB Approach	LOS B	LOS B	LOS F	LOS C
NB Approach	LOS C	LOS C	LOS B	LOS C
SB Approach	LOS C	LOS C	LOS C	LOS E

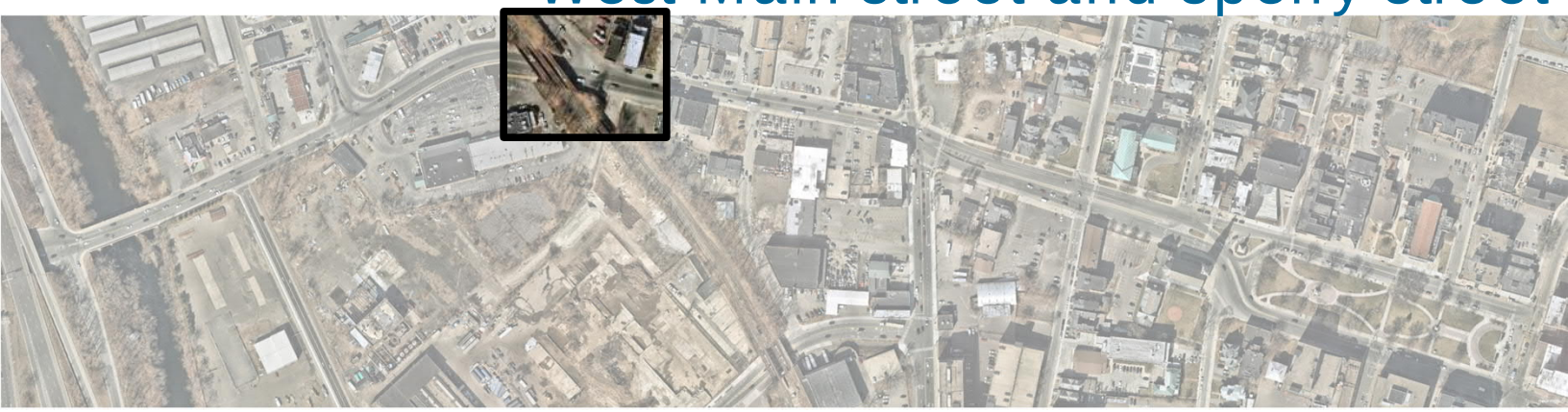
The improvements result in a significant reduction in queueing on the westbound approach and an increase in queueing on the southbound approach where an additional queue length of approximately ten vehicles is experienced during the afternoon peak hour. Queues are contained within the available storage length with the exception of southbound right turn queue which exceeds the length of the right turn lane during the afternoon peak hour but does not cause any blockages at adjacent intersections.

95th Percentile Queue Length Summary, Thomaston Avenue

	AM Peak Hour		PM Peak Hour		
Approach Lane	2035 Background	2035 Build	2035 Background	2035 Build	Available Storage
EB Left Turn	-	135 Feet	-	260 Feet	275 Feet
EB Through	490 Feet	585 Feet	660 Feet	610 Feet	700 Feet
WB Approach	665 Feet	370 Feet	1085 Feet	535 Feet	600 Feet
NB Approach	25 Feet	35 Feet	15 Feet	40 Feet	-
SB Through / Left Turn	180 Feet	265 Feet	315 Feet	555 Feet	-
SB Right Turn	55 Feet	160 Feet	55 Feet	*250 Feet*	185 Feet

* Queue lengths have been rounded to the nearest five feet

West Main Street and Sperry Street

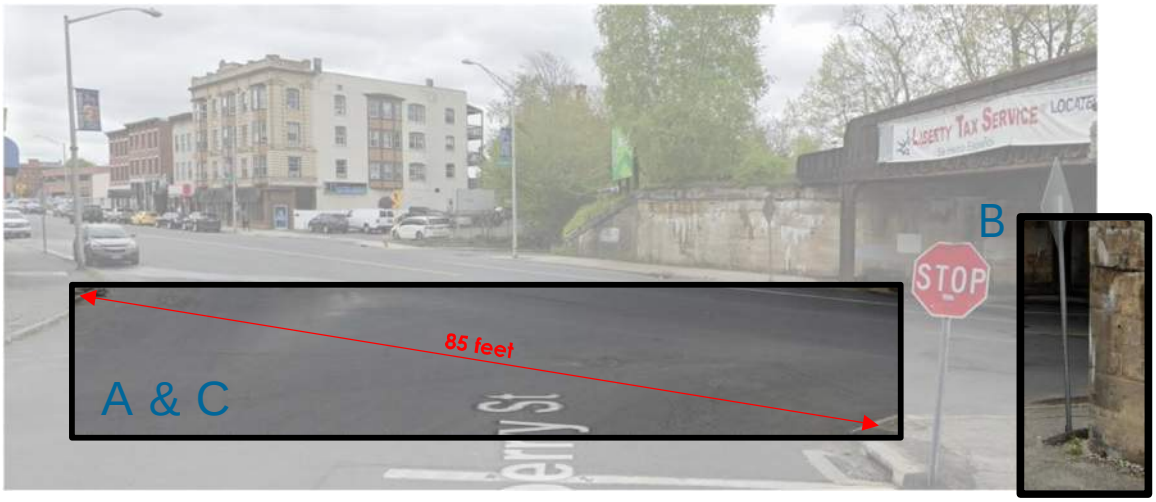


Existing Conditions

A: Excessively wide pavement

B: Limited sight distance looking right

C: No marked crosswalks



West Main Street and Sperry Street

The intersection of West Main Street at Sperry Street is a three-way unsignalized intersection with West Main Street providing the eastbound and westbound approaches and Sperry Street providing the southbound approach. West Main Street's eastern leg provides one travel lane and on-street parking in each direction and is approximately 58 feet wide. The western leg provides one travel lane in each direction, no on-street parking, and is approximately 42 feet wide. The eastbound approach to Sperry Street, while striped for one lane, was observed to be used as two lanes by drivers as through vehicles would often bypass a vehicle waiting to turn left into Sperry Street. The northeast corner of the intersection was noted to have excessive pavement width and a very large corner radius.

Sidewalks are provided along West Main Street in the vicinity of the intersection and are approximately 8.5 feet wide. Crosswalks and pedestrian ramps are not provided on any of the legs at this intersection.

Due to the skewed angle of the Sperry Street approach and the presence of the railroad overpass just west of the intersection, intersection sight distances were measured from Sperry Street in accordance with criteria set forth in the 2003 CTDOT *Highway Design Manual*. Sight distance of 410 feet is provided looking east (left) from Sperry Street, providing safe egress for passenger cars turning right onto West Main Street. The measured sight distance exceeds the 335-foot sight distance required for passenger cars by American Association of State Highway and Transportation Officials (AASHTO) for 30 mile per hour design speeds but falls short of the sight distances required for single unit trucks (420 feet) and semi-trailers (510 feet). Sight distance of only 85 feet is provided looking west (right), which does not provide sufficient intersection sight distance for any vehicles turning left out of Sperry Street.

The intersection experienced an average of approximately nine crashes per year. During the five-year span, the intersection experienced 15 angled crashes, ten front to rear crashes, eight sideswipes, one fixed object crash, one collision involving a pedestrian, and 12 crashes where the manner of collision is unknown. The angled crashes involved vehicles turning onto or off of Sperry Street and it is possible the skewed intersection alignment and limited sight lines were a factor in some of these. Of these 47 crashes, 37 involved property damage only, eight involved possible injuries, and two involved suspected minor injuries.

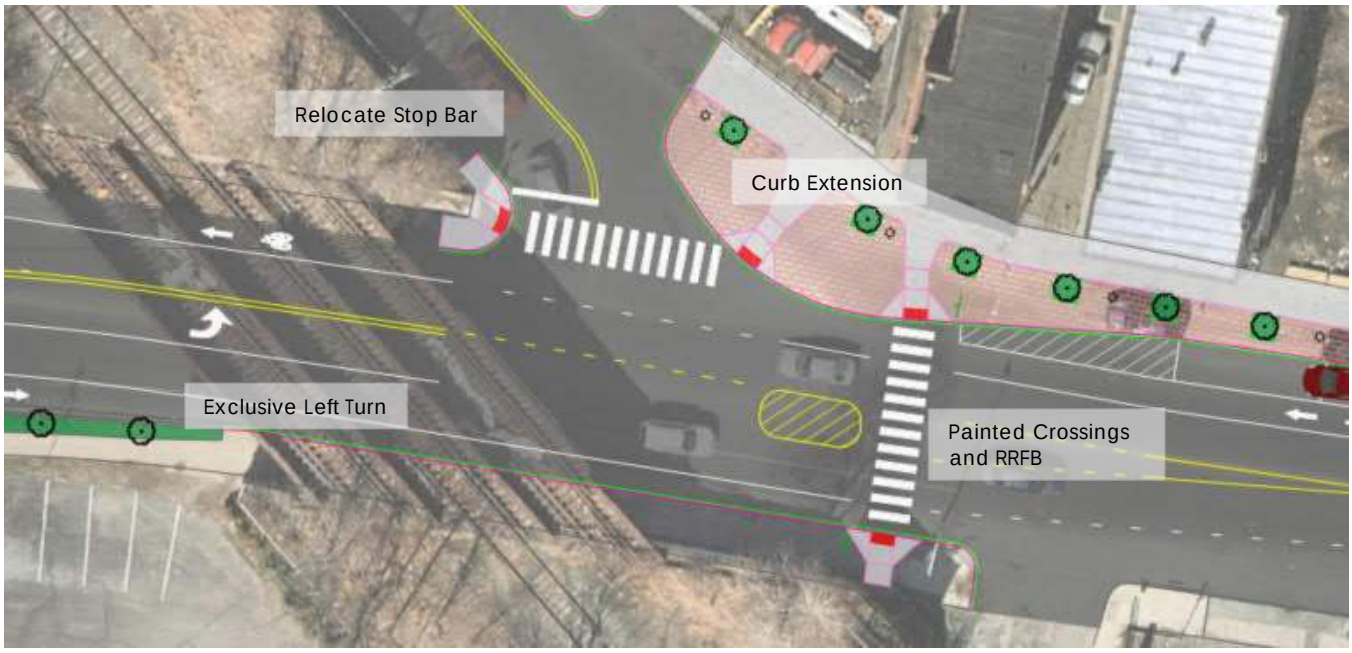
Recommended Improvements

A hardscape curb extension is proposed on the east side of Sperry Street to introduce a significant traffic calming measure for vehicles and shorten the pedestrian crossing distance. Additionally, the stop bar on Sperry Street is proposed to be relocated approximately 12 feet south to improve sight distance for vehicles approaching West Main Street.

Crosswalks are proposed on the north and east legs of the intersection with a rectangular rapid flashing beacon (RRFB) pedestrian actuated crossing device also proposed for the West Main Street crossing. This location is well suited for a midblock crossing given the lengthy distance that exists along the corridor with no crosswalk between Thomaston Avenue and Judd Street. In addition, the crossing will support the bus stop pull offs with curb extensions that are proposed immediately to the east on both sides of the roadway.

Example of RRFB

The eastbound West Main Street approach is also proposed to be restriped to provide an exclusive left turn lane into Sperry Street and provide bypass for through vehicles in a separate eastbound through lane.



West Main Street and Sperry Street Improvements

Capacity Analysis

During the morning peak hour, LOS B is maintained under background and build conditions for eastbound vehicles. Southbound vehicles experience a significant reduction in delay between the background and build conditions as a result of the proposed elimination of left turn restrictions at the Willow/Meadow intersection which in turn is expected to reduce the number of left turns out of Sperry Street.

During the afternoon peak hour, the LOS for eastbound vehicles is improved from LOS D in the background condition to LOS C in the build condition.

Level of Service Summary, Sperry Street

	Weekday AM Peak Hour		Weekday PM Peak Hour	
	Background	Build	Background	Build
EB Left Turn	LOS B	LOS B	LOS D	LOS C
SB Approach	LOS F	LOS F	LOS F	LOS F

Queue lengths at this intersection are reduced on the southbound approach during both peak hours. The eastbound left turn movement also experiences a decrease in queueing with the addition of the dedicated left turn lane.

95th Percentile Queue Summary, Sperry Street

	AM Peak Hour		PM Peak Hour		
Approach Lane	2035 Background	2035 Build	2035 Background	2035 Build	Available Storage
EB Left Turn	30 Feet	30 Feet	95 Feet	65 Feet	250 Feet
EB Through	0 Feet	0 Feet	0 Feet	0 Feet	500 Feet
WB Approach	0 Feet	0 Feet	0 Feet	0 Feet	800 Feet
SB Approach	500'+	105 Feet	500'+	500'+	730 Feet

* Queue lengths have been rounded to the nearest five feet

Sperry Street to Willow Street

Existing Conditions

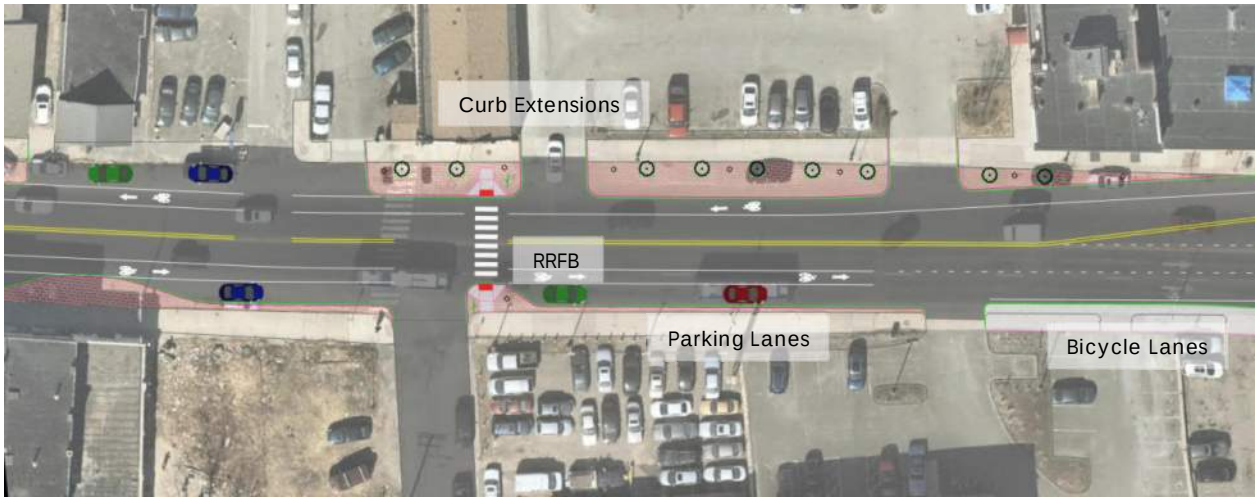
The corridor spanning from the Sperry Street intersection to the Willow and Meadow Street intersection provides wide travel lanes and on-street parking for access to the variety of commercial and retail establishments along this section. The wide lanes invite vehicles to operate at faster speeds, creating unsafe conditions for cyclists and pedestrians.

Sperry Street to Willow Street Corridor

Recommended Improvements

East of Sperry Street, a road diet is proposed to reduce the striped width of the excessively wide travel lanes in each direction and provide striped bicycle lanes in both directions. A combination of parking lanes and bus pull off lanes are proposed on each side of the roadway with curb extensions protecting them.

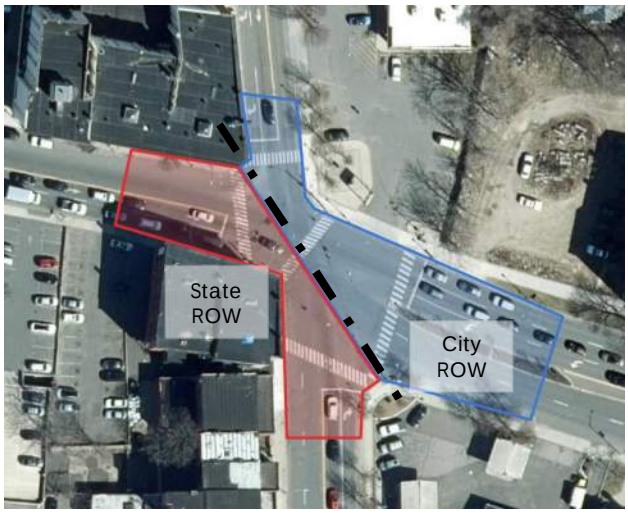
The existing crosswalk west of Judd Street is proposed to be shifted to the east, and the crossing distance is proposed to be shortened with the curb extensions that have been proposed on both sides of the roadway. A pedestrian actuated RRFB device is recommended at this location to aid pedestrians in crossing and to improve vehicle line of sight to the crosswalk.



Sperry Street to Willow Street Improvements

West Main Street and Willow/Meadow Street

Existing Conditions



State and City Right-of-Way

The intersection of West Main Street at Willow Street and Meadow Street is a four-legged signalized intersection with all approaches being offset and poorly aligned. West Main Street provides the eastbound and westbound approaches, Meadow Street provides the south leg and Willow Street provides the north leg. West Main Street's eastern leg provides three westbound travel lanes and two eastbound travel lanes, with a raised planted median between them, totaling an approximate 72 foot roadway width. The western leg is approximately 54 feet wide and provides two westbound travel lanes merging to one and two eastbound travel lanes approaching the intersection. The short westbound two lane to one lane merge results in confusion for some drivers as they cross the intersection. On-street parking is prohibited on both sides of the roadway in the vicinity of the intersection.

Sidewalks are provided along both sides of West Main Street in the area of the intersection. Sidewalks are greater than or equal to nine feet in width on both sides of the intersection. Crosswalks span across all legs of the intersection, and one spans diagonally through the intersection from the northeast to southwest. Accessible sidewalk ramps with detectable warning panels are provided for all five crossings. The existing traffic signal control includes four vehicular phases and an exclusive pedestrian phase. All corners and crossings provide pedestrian push buttons with pedestrian signal heads, three of which are pedestal mounted and seven pole mounted. Left turns are prohibited on the eastbound and southbound approaches to the intersection although these movements were observed to be frequently violated.

It should be noted that this intersection serves as the demarcation point for State owned and maintained roadways versus City owned. West Main Street west of this intersection to Route 8 as well as Meadow Street south of this intersection are State owned and maintained roadways. From its intersection with Watertown Avenue and Riverside Street to Thomaston Avenue, West Main Street is designated as State Route 846. From Thomaston Avenue to its intersection with Willow Street and Meadow Street, West Main Street is designated as State Route 847. Willow Street to the north and West Main Street from this intersection east to the Green are City owned and maintained roadways.

The intersection experienced an average of approximately 16 crashes per year. During the five-year span, the intersection experienced 20 angled crashes, 28 front to rear crashes, 13 sideswipes, seven fixed object crashes, two collisions involving pedestrians, and 11 crashes where the manner of collision is unknown. Of these 81 crashes, 60 involved property damage only, 13 involved possible injuries, and eight involved suspected minor injuries.

This intersection has the second highest crash rate out of all study intersections and has a high frequency of angled and front to rear crashes. Offset intersection alignments in both directions, drivers violating the no left turn restrictions, and private development driveways in proximity to the intersection are contributing factors in some of these crashes.

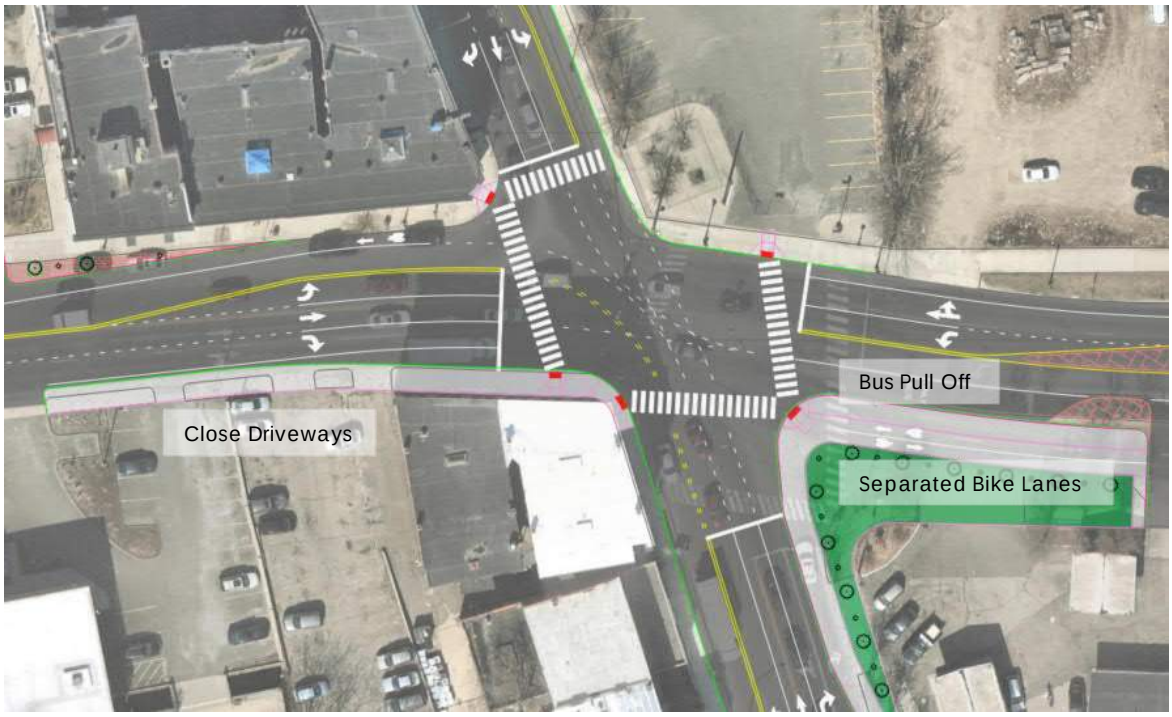
Offset Alignment of Willow/Meadow Street

Recommended Improvements

The recommended improvement alternative proposes a change in lane arrangement that results in one through lane and one receiving lane on each approach. Consequently, it is possible to extend the southeastern curb line so that it is in line with the southwestern curb line. This is recommended, as it better aligns the eastbound through movement, and improves visibility for northbound vehicles. These improvements aid pedestrians as well by shortening the crossing distance across Meadow Street and West Main Street.

The intersection realignment and reduction in the number of through vehicle lanes east of the intersection provide ample additional space on the south side of West Main Street east of the intersection for sidewalks, streetscape, a dedicated bicycle facility, and relocation of the bus stop from the southwest to the southeast corner of the intersection. The additional space also allows for a dedicated bus pull off lane.

Additional improvements at this intersection include the proposed closure of commercial access drives on the northeast and southeast corners of the intersection to consolidate curb cuts and relocation of the turning movements into and out of the parcels farther east, away from the intersection.



West Main Street at Willow and Meadow Street Improvements

Capacity Analysis

During the morning peak hour, the intersection maintains LOS C between the background and build conditions with the proposed revision to the approach lane configurations and the elimination of left turn restrictions at the intersection. During the afternoon peak hour, the intersection LOS is improved from LOS F in the background condition to LOS C in the build condition.

Level of Service Summary, Willow Street and Meadow Street

	Weekday AM Peak Hour		Weekday PM Peak Hour	
	Background	Build	Background	Build
Intersection	0.82 / LOS C	0.64 / LOS C	3.63 / LOS F	0.85 / LOS C
EB Approach	LOS C	LOS B	LOS F	LOS C
WB Approach	LOS B	LOS B	LOS B	LOS C
NB Approach	LOS D	LOS C	LOS F	LOS D
SB Approach	LOS C	LOS C	LOS F	LOS D

Some increase in queueing (up to 7 vehicles lengths) occurs on the westbound approach with the elimination of the second through lane however queues on the other three approaches are significantly reduced during the afternoon peak hour.

95th Percentile Queue Summary, Willow Street and Meadow Street

	AM Peak Hour		PM Peak Hour		
Approach Lane	2035 Background	2035 Build	2035 Background	2035 Build	Available Storage
EB Left Turn	-	25 Feet	-	25 Feet	150 Feet
EB Through	215 Feet	255 Feet	575 Feet	440 Feet	825 Feet
EB Right Turn	-	60 Feet	-	70 Feet	175 Feet
WB Left Turn	45 Feet	35 Feet	70 Feet	60 Feet	135 Feet
WB Through/Right Turn	70 Feet	185 Feet	160 Feet	335 Feet	375 Feet
NB Left Turn	-	115 Feet	-	145 Feet	145 Feet
NB Through	335 Feet	250 Feet	855 Feet	260 Feet	395 Feet
NB Right Turn	30 Feet	50 Feet	45 Feet	55 Feet	395 Feet
SB Left Turn	-	45 Feet	-	185 Feet	75 Feet
SB Through	175 Feet	180 Feet	555 Feet	150 Feet	400 Feet
SB Right Turn	55 Feet	55 Feet	-	55 Feet	150 Feet

* Queue lengths have been rounded to the nearest five feet

Willow Street to Holmes Avenue

Existing Conditions

The intersection of West Main Street at Holmes Avenue and State Street is a four-legged signalized intersection with West Main Street providing the eastbound and westbound approaches, Holmes Avenue providing the north leg and State Street providing the south leg. West Main Street's eastern leg provides three lanes in each direction, separated by a median that is raised for approximately 15 feet at the intersection and striped along the approaches, creating an excessively wide roadway of approximately 92 feet. The western leg provides the same geometry as the eastern leg and is approximately 87 feet wide. An eastbound dedicated left turn lane is provided for vehicles turning onto Holmes Avenue.

Sidewalks are provided along both sides of West Main Street in the vicinity of the intersection. Sidewalks are greater than or equal to 8.5 feet wide on both sides of the intersection. Crosswalks span both side streets and the eastern leg of the intersection. The eastern crossing provides an eight-foot pedestrian refuge area in the median between the eastbound and westbound travel lanes. Blended transition ramps with detectable warning panels are only provided for crossing the southern leg of the intersection.

The existing traffic signal control includes three vehicular phases and an exclusive pedestrian phase however no pedestrian push buttons, or signal heads are provided at this intersection.

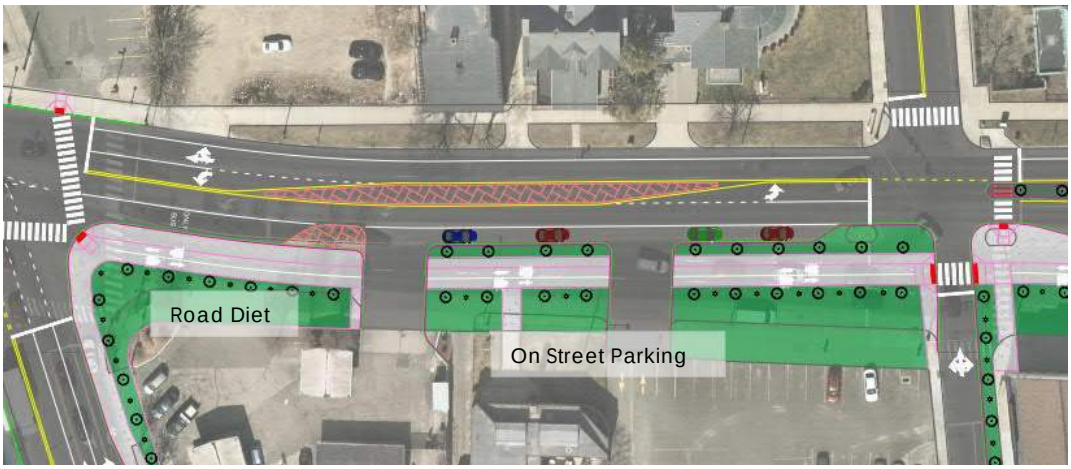
The intersection of West Main Street at Holmes Avenue and State Street experienced an average of approximately 11 crashes per year. During the five-year span, the intersection experienced 35 angled crashes, two front to rear crashes, three sideswipes, nine fixed object crashes, and two crashes where the manner of collision is unknown. Of these 51 crashes, 35 involved property damage only, nine involved possible injuries, six involved suspected minor injuries, and one involved a suspected serious injury. This intersection has the second highest number of angled crashes in the corridor. The street width here is a probable contributing factor to this high crash frequency.

Missing Pedestrian Signal Heads at Holmes Avenue/State Street & West Main Street

Recommended Improvements

Just east of the intersection of West Main Street and Willow/Meadow Street, a two-way cycle track, dedicated sidewalk, and additional landscape/streetscape space is proposed on the south side of West Main Street. In addition to the bus pull-off proposed immediately east of the intersection of West Main Street and Willow/Meadow Street, on street parking can be provided further east.

The substantial road diet proposed through this stretch of the corridor will reduce the roadway to one through lane in each direction with a textured, flush median and eastbound left turn lane provided at Holmes Street. The reduction in paved roadway cross section will greatly reduce the pedestrian crossing width at the crosswalk on the east leg of the Holmes Street intersection.



Willow Street to Holmes Avenue Improvements

Capacity Analysis

The intersection of West Main Street and Holmes Avenue operates efficiently at LOS A under the background condition of both the morning and afternoon peak hours, and the build condition of the morning peak hour. During the afternoon peak hour, the intersection continues to perform efficiently at LOS B under the Build condition, and vehicles experience an increase in average delay of approximately three seconds.

As a result of the elimination of the additional through lanes at this intersection, an increase in queueing occurs during the peak hours on the eastbound and westbound approaches however all queues are contained within the available storage and do not back up to adjacent intersections.

Level of Service Summary, Holmes Avenue

	Weekday AM Peak Hour		Weekday PM Peak Hour	
	Background	Build	Background	Build
Intersection	0.33/LOS A	0.48/LOS A	0.44/LOS A	0.64/LOS B
EB Approach	LOS A	LOS A	LOS A	LOS A
WB Approach	LOS A	LOS A	LOS B	LOS A
NB Approach	LOS B	LOS C	LOS C	LOS D
SB Approach	LOS B	LOS C	LOS C	LOS D

95th Percentile Queue Summary, Holmes Avenue

	AM Peak Hour		PM Peak Hour		
Approach Lane	2035 Background	2035 Build	2035 Background	2035 Build	Available Storage
EB Left Turn	15 Feet	20 Feet	20 Feet	30 Feet	75 Feet
EB Through	60 Feet	160 Feet	85 Feet	280 Feet	375 Feet
WB Through/Right Turn	60 Feet	135 Feet	90 Feet	240 Feet	275 Feet
NB Approach	55 Feet	100 Feet	70 Feet	130 Feet	730 Feet
SB Left/Right Turn	14 Feet	40 Feet	55 Feet	130 Feet	700 Feet

West Main Street Confluence

Existing Conditions

The intersection of West Main Street at Church Street and the West Main Street Confluence is a clustered, multi-legged intersection that is geometrically confusing to drivers in its existing condition. West of this intersection, West Main Street is one roadway with multiple lanes in each direction. To the east and southeast of this intersection, West Main Street splits into two segments to provide circulation to the north and south around the Green. The northern portion of West Main Street provides one travel lane in each direction to the north of the Green while the southern portion of West Main Street provides two travel lanes in each direction along the south side of the Green.

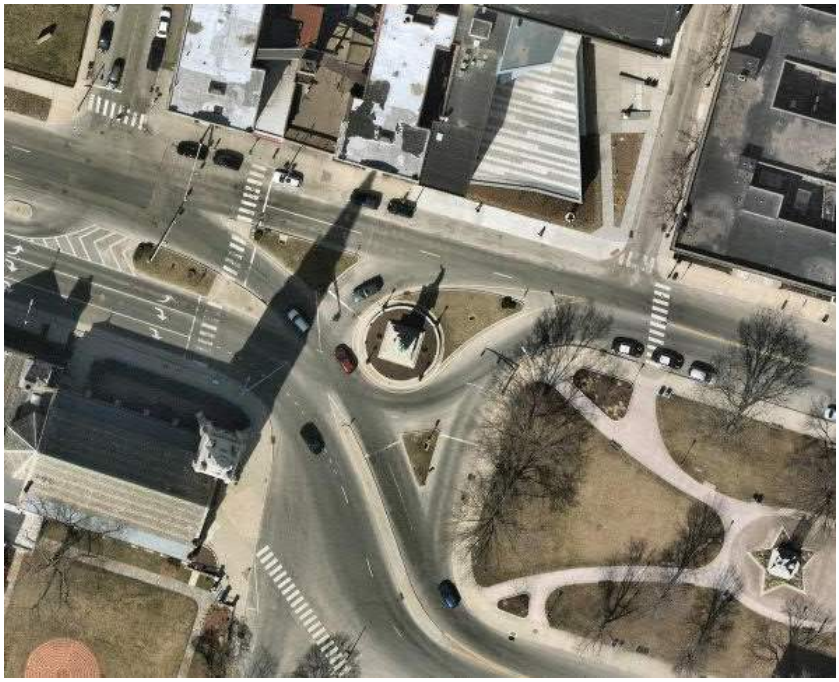
West Main Street's southeastern leg at this intersection provides two through lanes and one channelized right turn lane. The northeastern leg, north of the Green, provides two through lanes and an exclusive, channelized left turn lane. The western leg of West Main Street provides one left and two right turn lanes. Church Street provides one southbound receiving lane.

Sidewalks greater than or equal to 10 feet are provided along all legs of the intersection. Crosswalks spans across the northeastern and western leg, as well as across Church Street. Blended transition ramps without detectable warning panels are provided for all crossings. It should be noted that the monument on the island in the center of the intersection is inaccessible by foot with no crosswalk provided. There is also no crosswalk provided to the southwestern corner of the Green.

West Main Street and Church Street/West Main Street Confluence

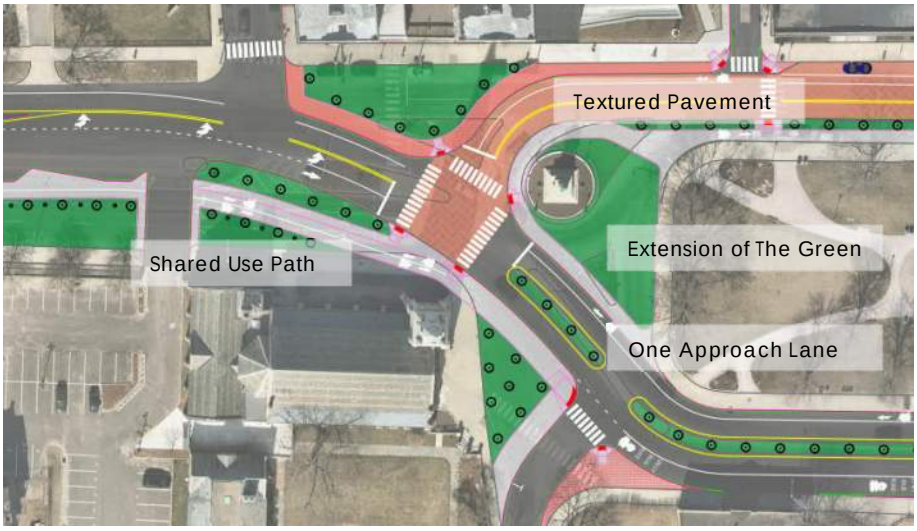
The existing traffic control signal includes four vehicular phases with two concurrent pedestrian phases. Pedestrian push buttons and pedestal mounted pedestrian signal heads are provided for the western crossing

The intersection experienced an average of approximately six crashes per year. During the five-year span, the intersection experienced five front-to-rear crashes, 16 sideswipes, four fixed object crashes, and seven crashes where the manner of collision is unknown. Of these 32 crashes, 27 involved property damage only, three involved possible injuries, and two involved suspected minor injuries. This intersection displays a high pattern of sideswipe crashes likely due to its geometry and multilane, curved approaches.


Aerial View of the Intersection

Recommended Improvements

Three design alternatives were explored at this intersection: two signalized intersection realignment alternatives, and one roundabout alternative.



West Main Street and Church Street/West Main Street Confluence Preferred Alternative

Signalized alternative 1, the preferred alternative, is a T-style intersection that is located just west of the soldiers' monument. West Main Street north of The Green provides the northeast leg, West Main Street south of the Green provides the southeast leg, and West Main Street from the west provides the western leg. One approach lane is proposed on the southbound and westbound approaches, and the eastbound approach provides one through lane and one dedicated left turn lane onto West Main Street north of the Green. A shared use path is proposed on West Main Street on the south side of the intersection, and westbound bicycle lanes are provided north and south of The Green. Marked crossings and pedestrian ramps are provided on each leg of the intersection. Additionally, this alternative allows extension of the Green and sidewalks further west to encompass the soldiers' monument. The reduced width cross section of West Main Street west of the intersection also allows the left turn restriction from Central Avenue to be removed. This alternative is preferred geometrically because the eastbound and westbound through movements are directed to the south of The Green, allowing for the potential to develop the portion of West Main Street to the north of The Green as a shared use space where vehicles are permitted, but not prioritized.

Non-Preferred Alternatives

Signalized alternative 2 is also a T-style intersection located just west of the soldiers' monument however in this alternative, the east/west through movements along the north side of the Green are prioritized. West Main Street north of the Green provides the east leg, West Main Street south of the Green provides the southerly leg, and West Main Street to the west provides the west leg. Eastbound bicycle lanes are provided north and south of the Green, and westbound bicycle lanes are provided on the north side of the Green. Marked crossings and pedestrian ramps are provided on each leg of the intersection. Similar to alternative 1, this alternative proposes to extend the Green to encompass the soldiers' monument.

This alternative was not favored because eastbound through vehicles are directed north of the Green, making it difficult for that space to be shared and maintaining vehicle priority on all approaches. Additionally, directing through traffic to the north side of the Green results in a less-efficient vehicle travel path for vehicles continuing east onto East Main Street.

Alternative 3 that was explored is a three-legged, single lane roundabout centered around the existing soldiers' monument. A shared use path is provided on the south side of the intersection to provide accommodation for cyclists and pedestrians, and eastbound and westbound bike lanes are provided on West Main Street north of the Green. While roundabouts are excellent traffic calming measures that improve overall intersection safety and reduce vehicle speeds, a roundabout is not the preferred alternative at this intersection as it isolates the monument and the presence of a fixed object in the center of a roundabout may limit visibility for vehicles and create a fixed object crash risk.

Capacity Analysis

The West Main Street Confluence operates at LOS A under the background condition of both the morning and afternoon peak hours, and the build condition of the morning peak hour with the proposed intersection reconfiguration. During the afternoon peak hour, the intersection performs at LOS B under the build condition, and vehicles experience an increase in average delay of approximately six seconds.

Level of Service Summary, West Main Street Confluence

	Weekday AM Peak Hour		Weekday PM Peak Hour	
	Background	Build	Background	Build
Intersection	0.25 / LOS A	0.62 / LOS A	0.39 / LOS A	0.74 / LOS B
WB Approach	LOS A	LOS A	LOS B	LOS B
SE Approach	LOS B	LOS A	LOS C	LOS A
NW Approach	LOS A	LOS B	LOS A	LOS C

Queues at this intersection are contained within the available storage, with the exception of the eastbound through movement. The eastbound 95th percentile queues may exceed available storage by up to one vehicle length and back up to the vicinity of the Holmes Avenue intersection during the afternoon peak hour build condition. These queues are anticipated to be infrequent and confined to the afternoon peak hour.

95th Percentile Queue Summary, West Main Street Confluence

	AM Peak Hour		PM Peak Hour		
Approach Lane	2035 Background	2035 Build	2035 Background	2035 Build	Available Storage
EB Left Turn	-	40 Feet	-	95 Feet	250 Feet
EB Through	-	180 Feet	-	*300 Feet*	275 Feet
WB Approach	-	155 Feet	-	245 Feet	450 Feet
WB Left Turn	85 Feet	-	75 Feet	-	-
SB Approach	-	140 Feet	-	195 Feet	770 Feet
SE Left Turn	105 Feet	-	165 Feet	-	-
SE Through	95 Feet	-	145 Feet	-	-
NW Through	115 Feet	-	175 Feet	-	-
NW Right Turn	10 Feet	-	10 Feet	-	-

* Queue lengths have been rounded to the nearest five feet

North Side of The Green

Existing Conditions

On the north side of The Green, West Main Street extends approximately 650 feet east of the monument where it terminates in a T-style, signalized intersection with North Main Street. One travel lane is provided in each direction, and on-street parking is provided on both sides of the roadway. Sidewalks that range between ten and 12 feet in width are provided on both sides of the roadway. A total of four painted crosswalks are provided for pedestrians to cross West Main Street. Dedicated bicycle facilities are not provided.

Immediately east of the West Main Street confluence, West Main Street intersects with Park Place at a T-style, unsignalized intersection. West Main Street provides the eastbound and westbound approaches, and Park Place carries one-way northbound traffic away from the intersection. A painted crosswalk is provided on the eastern leg of the intersection across West Main Street and on the northern leg of the intersection across Park Place. Curb ramps at the intersection are not ADA compliant.

Approximately 450 feet east of Park Place, West Main Street intersects with Prospect Street at a T-style, unsignalized intersection. West Main Street provides the eastbound and westbound approaches, and Prospect Street provides the southbound approach. A painted crosswalk is provided on the north and west leg of the intersection.

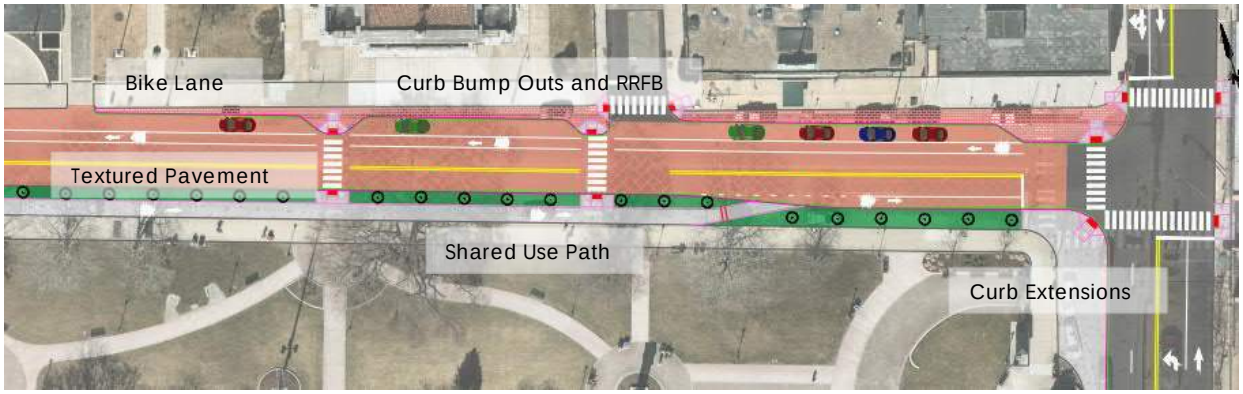
North Side of the Green

Recommended Improvements

The roadway along the north side of the Green is proposed to be paved with textured pavement in an effort to distinguish this portion of the roadway as a secondary vehicle travel route and promote lower vehicle speeds. Additionally, a landscape buffer and shared use path is proposed on the south side of the roadway adjacent to the north side of the Green. Curb bump outs are proposed at existing midblock crossings and an RRFB pedestrian actuated crossing beacon is proposed at the crosswalk in front of the Basilica. In the westbound direction, a striped bike lane is proposed and on street parking is proposed to be retained.

At the intersection with North Main Street, curb extensions are proposed on the northeast and southwest corners to reduce pedestrian crossing distances. The curb extension on the southwest corner is proposed to continue south along the west side of the Green, eliminating the existing paved area and effectively extending the Green further east.

The improvements to West Main along the north side of the Green would make this roadway ideal for temporary vehicle closures, allowing pedestrian space for street festivals, vendors, or outdoor concerts.



North Side of the Green Improvements

Capacity Analysis

The intersection of West Main Street and North Main Street operates at LOS B during both peak hours under the background condition with no overall reduction in LOS under the build condition. No significant changes in queue length are experienced at this intersection during the peak hours.

Level of Service Summary, North Main Street

	Weekday AM Peak Hour		Weekday PM Peak Hour	
	Background	Build	Background	Build
Intersection	0.39 / LOS B	0.41 / LOS B	0.49 / LOS B	0.54 / LOS B
EB Approach	LOS C	LOS C	LOS C	LOS C
NB Approach	LOS A	LOS A	LOS A	LOS B
SB Approach	LOS B	LOS B	LOS B	LOS C

95th Percentile Queue Summary, North Main Street

	AM Peak Hour		PM Peak Hour		
Approach Lane	2035 Background	2035 Build	2035 Background	2035 Build	Available Storage
EB Approach	90 Feet	115 Feet	115 Feet	170 Feet	770 Feet
NB Left Turn	80 Feet	90 Feet	150 Feet	165 Feet	140 Feet
NB Through	50 Feet	60 Feet	90 Feet	115 Feet	140 Feet
SB Approach	125 Feet	130 Feet	140 Feet	155 Feet	375 Feet

* Queue lengths have been rounded to the nearest five feet

South Side of The Green

Existing Conditions

The corridor spanning from the West Main Street at Church Street and West Main Street Confluence intersection to the end of the Green provides access to Waterbury's historic downtown and the "Pulse Point" for Waterbury's transit bus services. This area offers access to multiple bus routes and wide sidewalks. The Green also provides a number of pedestrian amenities, including benches. On the south side of The Green, West Main Street provides two travel lanes in each direction.

Curb Extensions Implemented with Paint at Church Street

Approximately 395 feet east of Church Street, West Main Street intersects with Leavenworth Street at a T-style, signalized intersection with West Main Street providing the eastbound and westbound approaches and Leavenworth Street providing the northbound approach. West Main Street's eastern leg provides three westbound and two eastbound travel lanes and is approximately 53 feet wide. An exclusive westbound left turn lane is provided for vehicles turning onto Leavenworth Street. The western leg provides two lanes in each direction and is approximately 50 feet wide. Two northbound approach lanes, one exclusive left and one exclusive right, are provided on Leavenworth Street.

Sidewalks greater than or equal to 10 feet are provided on both sides of West Main Street in the vicinity of the intersection and crosswalks span across all legs of the intersection. Blended transition ramps without detectable warning panels are provided for all crossings.

The existing traffic signal control includes three vehicular phases and an exclusive pedestrian phase. Pedestrian push buttons and pedestrian signal heads are provided on all corners of the intersection except the northeast. The northwest and southeast pedestrian signal heads are pole mounted while the southwest corner is pedestal mounted.

The intersection of West Main Street at Leavenworth Street experienced an average of approximately five crashes per year. During the five-year span, the intersection experienced three angled crashes, seven rear end crashes, five sideswipes, one fixed object crash, three pedestrian involved collisions, and four crashes where the manner of collision is unknown. Of these 23 crashes, 18 involved property damage only, two involved possible injuries, two involved suspected minor injuries, and one involved a suspected serious injury.

West Main Street South of The Green

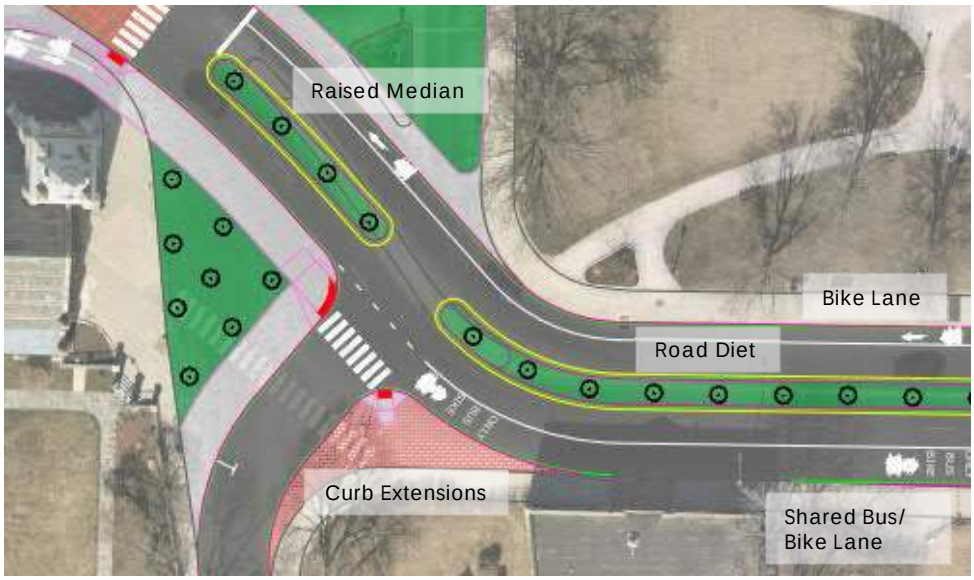
Recommended Improvements

A road diet is proposed along the segment of West Main Street on the south side of the Green to provide one through lane in each direction and a combination of raised and textured medians. Turn lanes will be provided at Leavenworth Street and at the east end of the Green where West Main Street, East Main Street, South Main Street and North Main Street intersect.

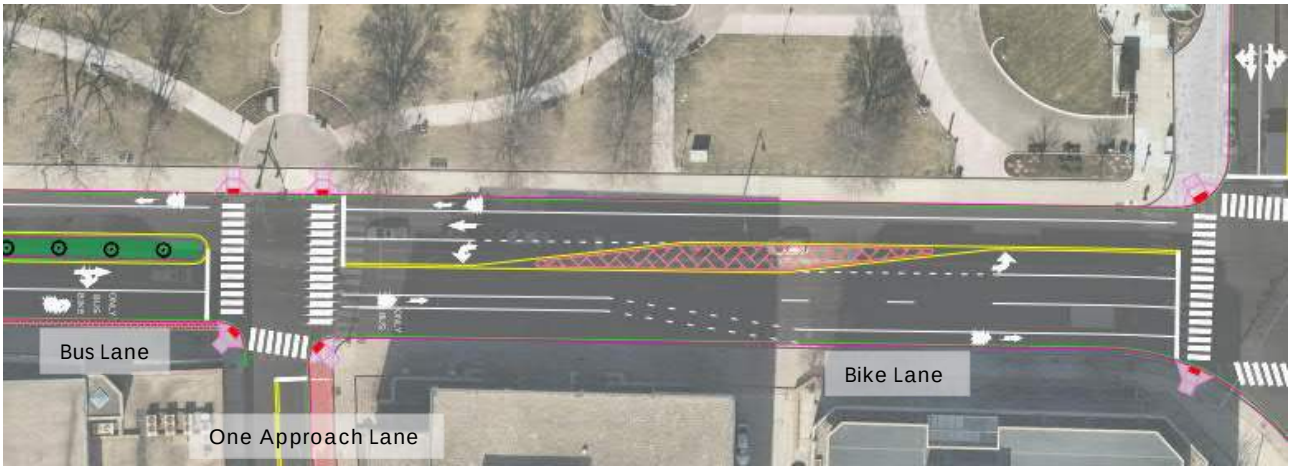
Curb extensions are proposed on the east and west sides of Church Street to reclaim excess pavement south of the Green that results from the intersection improvements at the West Main Confluence. These curb extensions shorten the crossing distance across Church Street and enable the introduction of additional green space.

A shared bus/bike lane is proposed immediately east of Church Street to Leavenworth Street on the south side of West Main Street south of the Green as shown in Figure 16 and 17. The lane terminates at a proposed bus pull off east of Leavenworth Street. An eastbound bike lane is proposed on the north side of the roadway beginning at North Main Street.

Leavenworth Street is also proposed to be narrowed with one shared northbound approach lane provided.



South Side of the Green Improvements at Church Street



South Side of the Green Improvements, Leavenworth Street to North Main Street

Capacity Analysis

During the morning peak hour, the intersection of West Main Street and Leavenworth Street operates at LOS A under the background condition and continues to operate at LOS B under the Build condition with the proposed lane configurations. Vehicles experience an increase in delay of approximately six seconds per vehicle on average.

During the afternoon peak hour, the intersection operates at LOS B under background and build conditions. Vehicles experience an increase in delay of approximately nine seconds per vehicle on average.

Level of Service Summary, Leavenworth Street

	Weekday AM Peak Hour		Weekday PM Peak Hour	
	Background	Build	Background	Build
Intersection	0.47 / LOS A	0.72 / LOS B	0.59 / LOS B	0.88 / LOS B
EB Approach	LOS A	LOS B	LOS B	LOS C
WB Approach	LOS A	LOS A	LOS A	LOS A
NB Approach	LOS B	LOS C	LOS B	LOS E

The most significant increase in queue length at this intersection occurs on the eastbound approach, where queue lengths are expected to increase by up to nine vehicles during the morning peak hour and up to ten vehicles during the afternoon peak hour with the elimination of the second through vehicle lane. Queues are contained within the available storage.

95th Percentile Queue Summary, Leavenworth Street

	AM Peak Hour		PM Peak Hour		
Approach Lane	2035 Background	2035 Build	2035 Background	2035 Build	Available Storage
EB Through / Right Turn	120 Feet	345 Feet	170 Feet	415 Feet	405 Feet
WB Left Turn	15 Feet	15 Feet	25 Feet	20 Feet	50 Feet
WB Through	50 Feet	130 Feet	75 Feet	170 Feet	300 Feet
NB Approach	60 Feet	155 Feet	75 Feet	240 Feet	685 Feet

* Queue lengths have been rounded to the nearest five feet

West Main Street, East Main Street, North Main Street and South Main Street

Existing Conditions

The intersection of West Main Street at Bank Street/South Main Street, East Main Street, and North Main Street is a four-legged signalized intersection. West Main Street provides the eastbound approach, North Main Street provides the southbound approach, East Main Street provides the westbound approach, and South Main Street provide the northbound approach. West Main Street's western leg provides three eastbound and two westbound travel lanes and is approximately 56 feet wide. All approaches to the signal provide two lanes with the exception of the eastbound approach on West Main Street which provides an exclusive right turn lane and two through lanes. Left turns are prohibited on all four approaches and right turns are prohibited on the northbound, southbound and westbound approaches.

Sidewalks greater than or equal to 10 feet are provided along all legs of the intersection. Crosswalks span across all legs of the intersection. Blended transition ramps without detectable warning panels exist on all corners.

The existing traffic signal control includes four vehicular phases with concurrent pedestrian phasing. Pedestrian push buttons and pedestrian signal heads are provided on all corners of the intersection. The northeast and southwest pedestrian signal heads are pole mounted whereas the northwest and southwest corners are pedestal mounted.

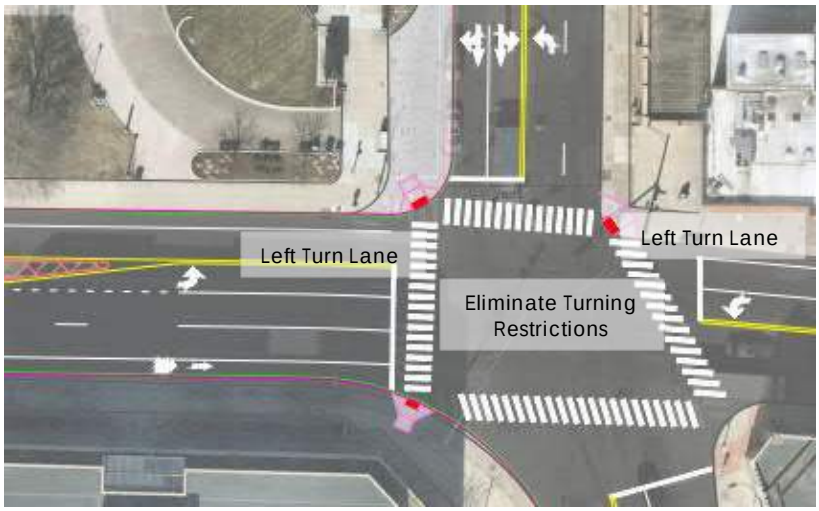
The intersection of West Main Street at South Main Street, East Main Street, and North Main Street experienced an average of approximately eight crashes per year. During the five-year span, the intersection experienced six angled crashes, 12 front to rear crashes, eight sideswipes, two fixed object crashes, and eight crashes where the manner of collision is unknown. Of these 36 crashes, 29 involved property damage only, four involved possible injuries, and three involved suspected minor injuries.

West Main Street, East Main Street, North Main Street and South Main Street

Recommended Improvements

The existing turn restrictions at this intersection are confusing for drivers, greatly limit driver route choice, and result in vehicles needlessly circulating the downtown street network.

Re-assigning the existing lanes on the eastbound and westbound approaches to provide an exclusive left turn lane in each direction allows the intersection to operate sufficiently with the removal of the turn restrictions, therefore it is recommended that all turning restrictions be eliminated.



West Main Street, East Main Street, North Main Street and South Main Street Improvements

Capacity Analysis

The intersection of West Main Street/East Main Street and North Main Street/South Main Street maintains efficient LOS B operations under the background and build condition during both peak hours.

Level of Service Summary, South Main Street/ East Main Street/ North Main Street

	Weekday AM Peak Hour		Weekday PM Peak Hour	
	Background	Build	Background	Build
Intersection	0.42/LOS B	0.56/LOS B	0.55/LOS B	0.71/LOS B
EB Approach	LOS A	LOS A	LOS A	LOS A
WB Approach	LOS A	LOS A	LOS A	LOS B
NB Approach	LOS B	LOS C	LOS C	LOS C
SB Approach	LOS C	LOS C	LOS C	LOS C

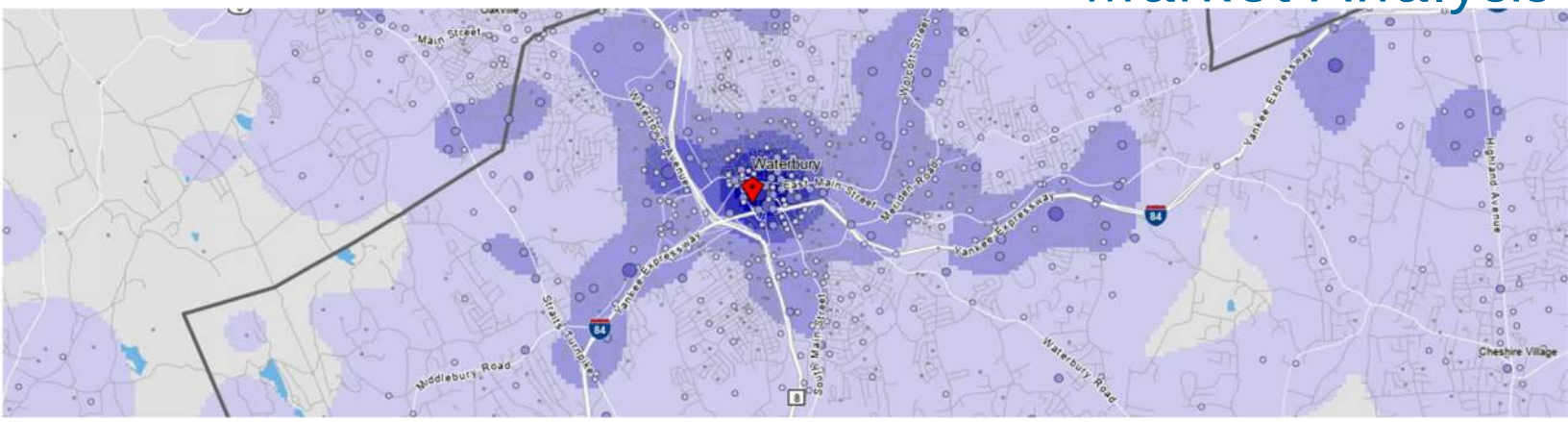
The most significant increase in queue length of 11 vehicles occurs on the westbound approach during the afternoon peak hour. The average queue length remains within available storage, but the 95th percentile queue length exceeds available storage. The increase in queue length is the result of the elimination of the second westbound lane through the intersection.

95th Percentile Queue Summary, South Main Street/ East Main Street/ North Main Street

	AM Peak Hour		PM Peak Hour		
Approach Lane	2035 Background	2035 Build	2035 Background	2035 Build	Available Storage
EB Left Turn	-	25 Feet	-	45 Feet	120 Feet
EB Through/Right Turn	110 Feet	100 Feet	175 Feet	175 Feet	300 Feet
WB Left Turn	-	25 Feet	-	75 Feet	100 Feet
WB Through	100 Feet	*220 Feet*	165 Feet	*455 Feet*	*200 Feet*
NB Approach	80 Feet	80 Feet	140 Feet	145 Feet	170 Feet
SB Approach	110 Feet	110 Feet	130 Feet	130 Feet	135 Feet

* Queue lengths have been rounded to the nearest five feet

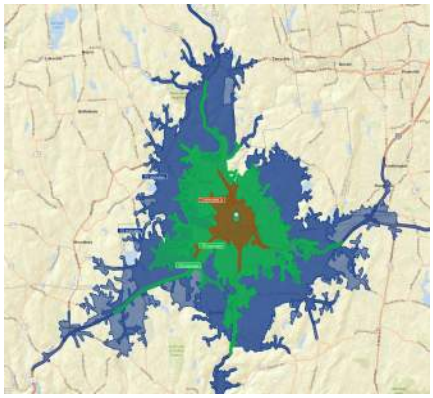
Market Analysis



Market Area

A market analysis was conducted for the study for the purpose of understanding the nature of traffic generated by commercial properties in Downtown Waterbury and the potential for market driven changes to the volume and characteristic of travel in the project area.

The first step in a market analysis is to establish the market capture area. This is the area that the project area is accessible to within specific drive-times. For this analysis 5, 10, and 15-minute drive-time areas where used. The 15-minute market area extends primarily along Routes 8 and I-84 and north to Plymouth, east to Milldale, south to Beacon Falls, and west to Southbury. The five-minute drive-time market area is located almost entirely within Waterbury.

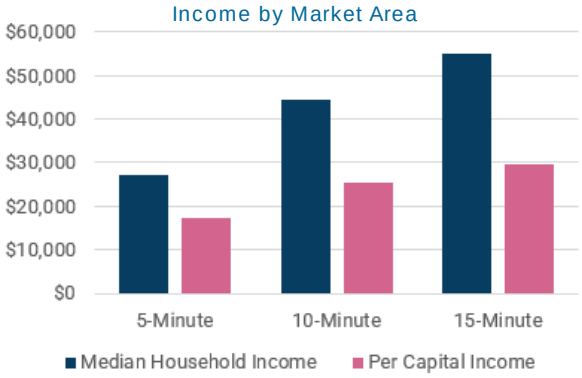


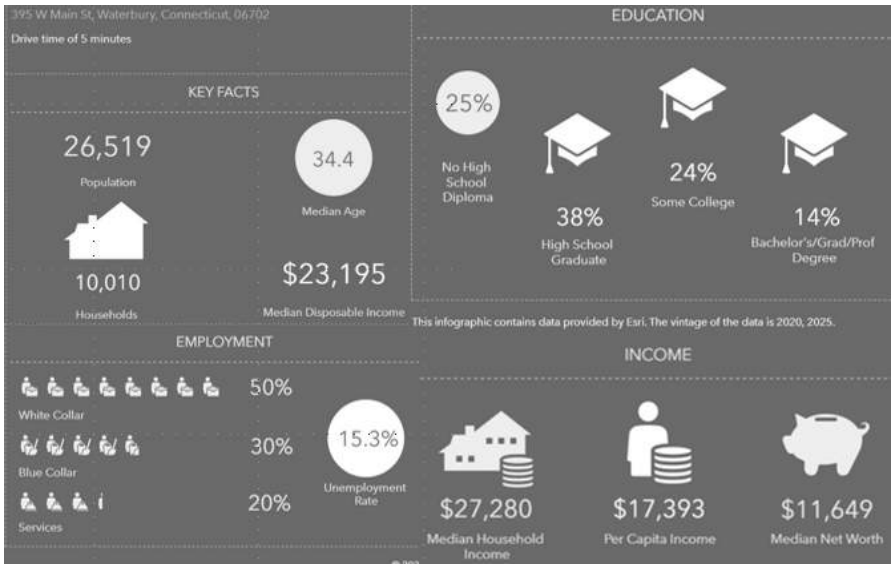
Market Area, Data Source: ESRI

Demographic Profile of Market Areas

The 5-minute market area is comprised of a relatively small population (26,519 persons and 10,010 households). The population is relatively young (34.4 median age) and has a very low median household income ($27,280) and low education levels. Income and educational attainment increase significantly in the 10-minute market area and both increase again in the 15-minute market area. With respect to employment, the greatest share of jobs held by residents in the 5-minute market area are white collar jobs, but the jobs held are not high paying. Additionally, the unemployment rate is high, although this figure is a current Covid-impacted figure.

This analysis reveals that the area immediately surrounding Downtown area has very little spending capacity and plays a small role in driving economic activity, whether retail or service, in the Downtown. The 10 and 15-minute market areas are much greater drivers of economic activity because of larger populations (103,426 people in 10-minute and 176,647 people in 15-minute) and because of income disparities (median household income of $44,399 in 10-minute and $55,171 in 15-minute). See figure below.





Demographic Summary, Data Source: ESRI

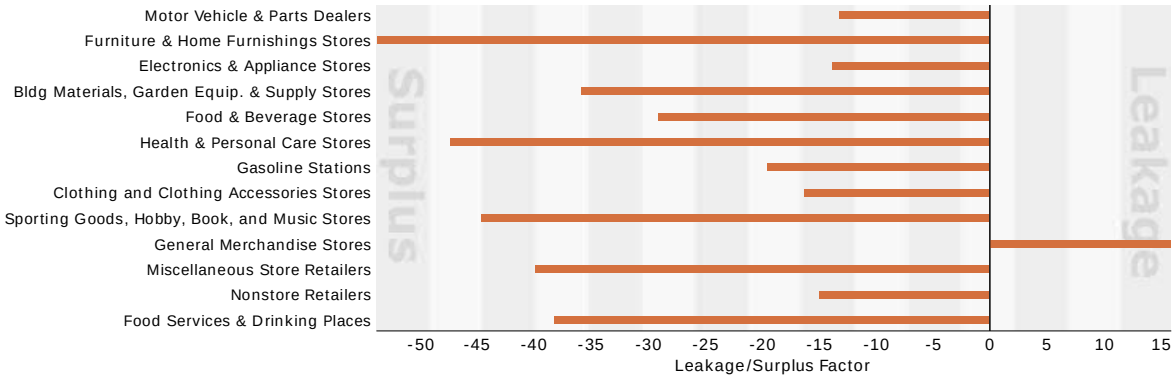
Summary of Demographic Findings

- The Downtown and immediate surrounding area is very low income.
- Spending potential is low due to income and net worth.
- Educational attainment is low.
- Due to these factors, residential areas in proximity of the Downtown are not drivers of economic development in the project area.

Retail Analysis

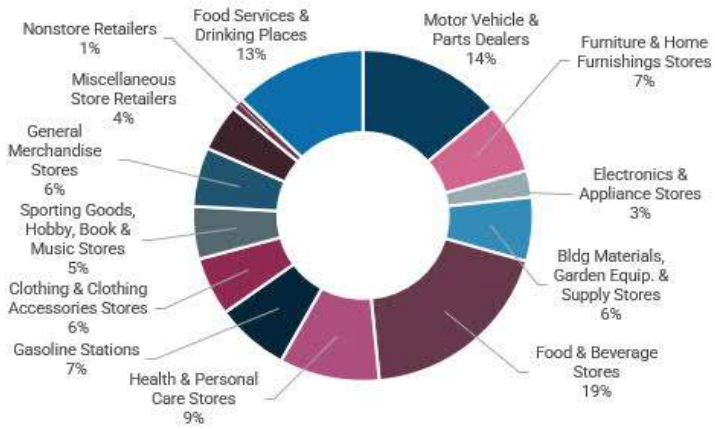
The 5-minute drive-time market area has greater sales than local demand (surplus) in every retail sector with the exception of general merchandise stores (such as Walmart). This means that sales in the local market area are strongly driven by people who live outside the market area.

2017 Leakage/ Surplus Factor by Industry Subsector

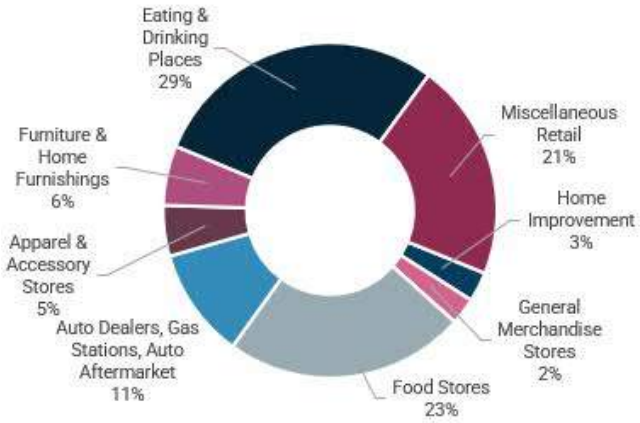


Retail establishments within the 5-minute market area are comprised mostly of "eating and drinking places", "food stores", and "miscellaneous retail". Retail sales within the 5-minute market area are primarily driven by "food and beverage stores", "motor vehicle & parts dealer", and "food services and drinking places".

Retail Sales, Data Source: ESRI



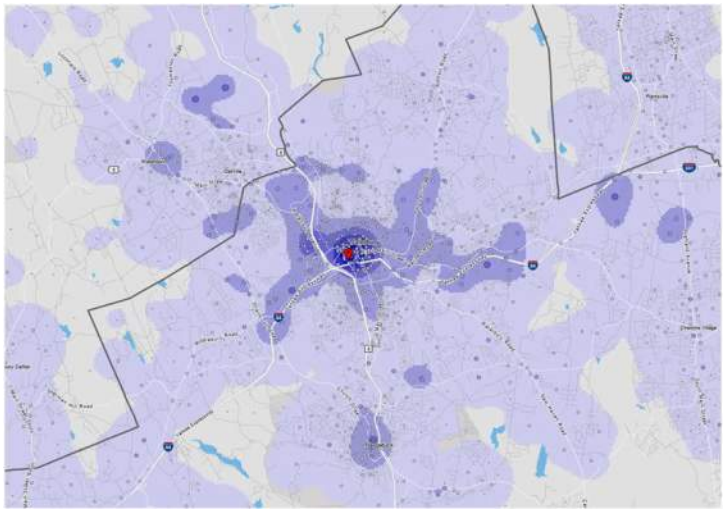
Retail Profile, Data Source: ESRI



Summary of Retail Analysis Findings

- The Downtown retail environment is dependent upon a wide market area, with sales that vastly exceed local spending.
- There is a spectrum of business types located within the 5-minute drive time area with retail trade, health care and social assistance, and "other" services being the most prevalent.
- The largest share of retail, by number of establishments is found in the eating and drinking places, food store, and miscellaneous retailers subsectors.
- The largest share of retail sales is attributed to food and beverage stores, motor vehicle and parts dealers, and food services and drinking places.

Employment



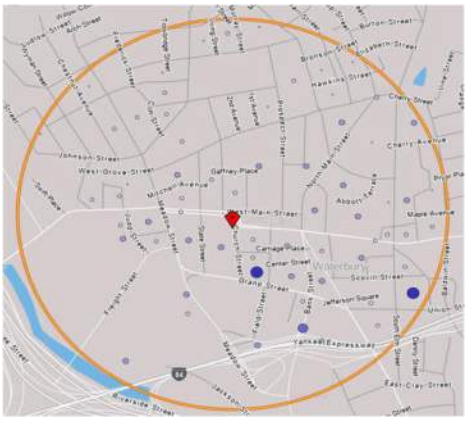
Job Locations in the Waterbury Area, Source: U.S. Census Bureau Longitudinal Employer-Household Dynamics

Jobs in the Waterbury region are primarily concentrated in Downtown Waterbury and in proximity of the project area. The greatest concentration of jobs in the region are within a half-mile radius of Waterbury Green (see map to the left, darker shades indicate higher concentrations).

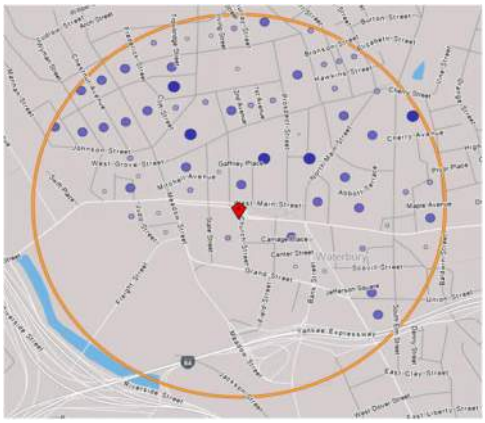
In total, there are 13,814 full and part time jobs located within ½ mile of the West Main Street/Church Street intersection. Of those jobs, only 276 are held by residents of that area. Most residents of the Downtown area commute outside of the area for work; there are 2,359 jobs held by residents of the Downtown area that are located outside of the area.

Inflow/ Outflow of Jobs, Source: U.S. Census Bureau 2018 Longitudinal Employer-Household Dynamics

Job locations within the half-mile radius of Waterbury Green are primarily located to the south of Main Street and West Main Street and east of Meadow Street. By contrast, most jobs are held by workers that reside north of Main Street and West Main Street.



Job Locations, Source: U.S. Census Bureau Longitudinal Employer-Household Dynamics



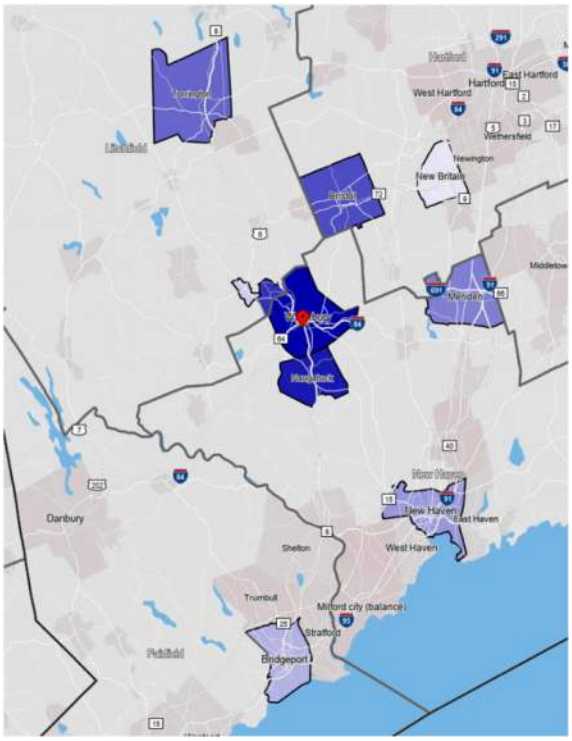
Home Location of Workers, Source: U.S. Census Bureau Longitudinal Employer-Household Dynamics

Employment

The most common place of residence for workers in the Downtown Waterbury area (1/2-mile radius) are:

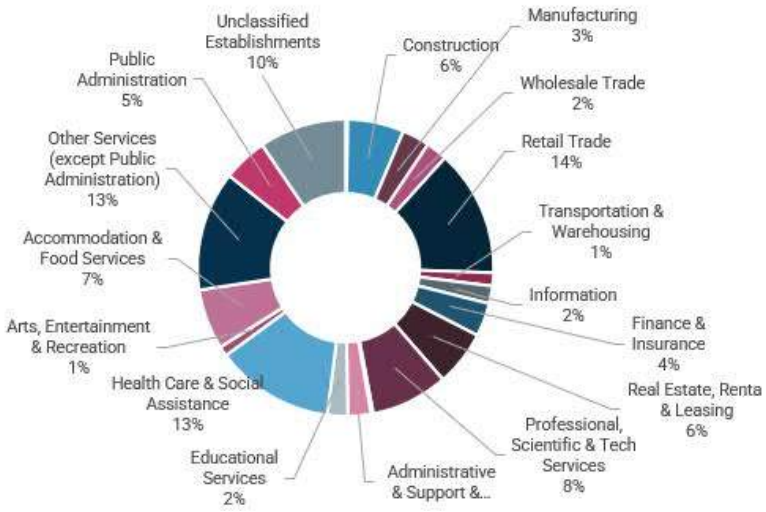
1. Waterbury
2. Naugatuck
3. Oakville
4. Bristol
5. Torrington
6. Meriden
7. New Haven
8. Bridgeport
9. Watertown
10. New Britain

There is a wide diversity of business establishment types that attracts workers to the 5-minute market area. The most common business establishment type is "retail trade" followed by "health care & social assistance" and "other services".



Top Ten Home Locations of Workers Commuting to Downtown Waterbury, Source: U.S. Census Bureau Longitudinal Employer-Household Dynamics

Business Establishments in a 5-Minute Market Area, Data Source: ESRI



Summary of Demographic Findings

- The Downtown has the greatest concentration of jobs in the region.
- There are very few residents in the Downtown who work in the Downtown – few people who walk to work.
- Downtown workers come from many communities across western CT.
- Commuting workers likely play a strong role in supporting local businesses.

Commercial Real Estate Market

The commercial real east market has been impacted by COVID-19 with those impacts being felt in the office, retail, and industrial market sectors. U.S. metro office vacancy rates increased from approximately 12.5% in 2019 to 16.5% in 2021[1], reaching vacancy levels not seen since the Great Recession. Total retail net absorption was positive in 2021 after two negative quarters in 2020[2] suggesting a retail recovery. Total retail space availability nationwide has decreased since 2020 to 6.2%[2], approaching pre-pandemic levels. The industrial real estate market remains strong nationwide. The availability rate remains below its 30-year average, dropping to 6.4% in the second quarter of 2021[2], matching pre-pandemic levels. Nationwide, the vacancy rate for industrial space is relatively low (4.0%); the average vacancy rate of eastern market areas is 4.1%. U.S. industrial space rental prices have continued to increase and are 9.8% higher in 2021 than they were in 2020[3].

Real estate trends suggest a stabilizing commercial space market, but long-term trends are uncertain. The office market sector may be most vulnerable to long-term impacts of the pandemic as remote working becomes standard practice potentially resulting in reduced office space demand. Those impacts may have not yet been revealed due in part to the multi-year nature of most commercial leases.

Office Space

The Waterbury Central Business District (CBD) has approximately 577,000 sf of office space in properties with 50,000 sf or more[4]. Of that space, 80% is Class B space and 20% is Class C space. The CBD has no Class A space in properties with 50,000 sf or more[4].

Approximately 37,000 sf of office space is currently listed as available for lease in the Downtown area on Loopnet (a commercial real estate listing site). Of that, only 4,600 sf of Class A office space is available. Most available space is comprised of Class B and C space (typically found in older buildings). Space listed as available on Loopnet is located in four buildings: The Post Office Building, 207 Bank Street, 228 Meadow Street, and the Grand Street Professional Building. Lease rates are low, ranging from $8-$15 per sf per year. By comparison, Class A office space in Connecticut averages $36 per sf, Class B space averages $24 per sf, and Class C space averages $18 per sf[4]. The average 2020 asking lease rate for office space in the New Haven market (which includes Waterbury) is $30.88. The 2020 office vacancy rate in the New Haven market was 13.81% in 2020.

There is no medical office space listed as available in Downtown Waterbury. Two properties in proximity of West Main Street, west of Route 8 are listed as available. The properties have a combined 13,000 sf of available space.

Post Office Building, Source: Loopnet.com

Commercial Real Estate Market

Retail Space

Approximately 17,000 sf of retail space is currently listed on Loopnet as available in Downtown Waterbury. Space is located in two buildings: 26 North Main Street and 174-196 Grand Street. Lease rates are low, ranging from $5-$15 per sf per year. Retail lease rates in Danbury and New Haven range from $12-$35 per sf per year while the national average is $21 per sf per year.

176-196 Grand Street, Source: Loopnet.com

Industrial Space

There is approximately 33,000 sf of industrial space in proximity of the Downtown currently listed on Loopnet as available for lease. That space is located at 195 Freight Street. The lease rate is relatively low at $6.75 per sf per year (the range in Danbury and New Haven is $5-$15) although this rate is comparable with the current national average ($6.64[5]). There are no industrial properties for sale in the Downtown.

196 Freight Street, Source: Loopnet.com

Summary of Commercial Real Estate Market Findings

- The Downtown lacks Class A office space.
- There is no available medical space in the Downtown.
- Lease rates are low when compared to other cities in CT.
- Approximately 87,000 sf of commercial space is currently listed as available for lease.

Overall Market Findings

- The Downtown economy is dependent upon workers, patrons, and consumers who travel from well outside of the Downtown for its viability.
- Educational levels, household income, and spending potential increase with distance from Downtown Waterbury.
- Ease of access to the Downtown will continue to be an important factor in maintaining access to jobs and encouraging shopping and entertainment trips.
- A lack of Class A and medical office space in the Downtown is a limiting factor for economic development. Office lease rates are too low to incentivize new office development in the Downtown.
- A limited supply and relatively low volume of available commercial spaces suggests that an increase in commercial space occupancy would not be adversely impact to traffic operations in the Downtown.
- Commercial space occupancy has remained relatively stable through the pandemic with exception of the loss of some retailers. National and market area economic trends would suggest that commercial occupancy in Downtown is likely to remain stable in the foreseeable future.

Summary of Economic Development Focus Group Discussion

A virtual focus group meeting was conducted on June 17, 2021 with approximately ten participants representing the City, local businesses, and institutions. The meeting lasted ninety minutes and included a presentation of preliminary market analysis findings and a discussion of the key issues facing economic development in Downtown Waterbury and the project study area.
The discussion was organized in a SWOT (Strengths, Weaknesses, Opportunities, Threats) format. The key issues identified during the discussion include:

Strengths

- UCONN campus presence + Post University offices; East Main Street side of Downtown
- Low real estate cost and availability of space – access to diverse workforce in 10-15 min. radius
- Cultural anchors – Palace Theater and Mattatuck Museum (West Main Street), YMCA (childcare & fitness) – attraction for businesses
- Good parking opportunities and transportation options – city buses and Metro North will hopefully improve connectivity in area
- Development around train station – improved roadways and amenities around the train station
- Police department downtown – gives a sense of safety
- Library Park and the Green – two green spaces downtown, both recently upgraded
- Beautiful architecture remaining although buildings may be vacant
- Location and proximity to highways – Highway ramps get you right to downtown
- Infrastructure is being upgraded with eye towards economic development
- Electrical grid has been updated; fiber optic has been updated in certain locations
- Waterbury has come a long way in terms of safety in the last 10-15 years

Weaknesses

- Recent closure of businesses such as Dunkin and Starbucks
- Students don't have a reason to leave their residences -COVID exacerbated this
- Traffic issues on West Main Street – Kellogg Street, the bridge, Rt 8 to Meadow/Willow Street
- Traffic issues around the Green with the road; pedestrian and traffic problems
- The buses on the Green are a curb appeal drag; Difficult to move the stop with the bus company – the impression of people coming off the bus can be a deterrent to those visiting the area; bus stops close to campus entrances which need extra security now
- Buses do not run late at night
- Perception of a dangerous city even though it is safe
- Inadequate wayfinding signage; good signage around Meadow Street but it is not consistent
- Homeless people tend to congregate Downtown which is a deterrent for visitors
- No attractive retail that would make the area a destination
- Public parking is strict which can be a deterrent for running errands downtown; parking meter kiosks are inconvenient and inefficient
- East Main Street is in poor condition due to utility work in the roadway - the City is preparing to reconstruct the street
- Destination restaurants such as Diorio
- Freight St. Grill – popular place for longtime Waterbury residents and Freight Street has cleaned up and is an attractive place to be.

Summary of Economic Development Focus Group Discussion

Opportunities

- Incentives to invest in downtown have not been strong in the past, things are looking more promising now
- There is a good market for doctors and nurses looking for a safe and convenient residence close to work – need to incentivize developers to create market rate housing
- Support development of restaurants at all different levels that reflect diversity of population
- Churches and religious establishments downtown – opportunity to keep churchgoers downtown – make a day out of going downtown
- Hybrid model of remote work for big companies going forward – they may be giving up their large office spaces
- Conduct research to find out what workers in the area would prefer in the downtown area that would make them go out and spend on their lunchbreaks and after work
- Fiber optic network opportunity – businesses would like to connect
- Improvements to transit – especially rail transit
- UCONN Waterbury campus can help promote the rail connection with extra support such as a shuttle (10-15 minute walk from campus to train station)
- Intermodal connectivity
- Quality of downtown hotel can be improved to attract clientele; at present the hotel captures some families and travelers for sports events in the state; There are not that many hotels nearby that would be competition for the hotel
- Waterbury Hospital – opportunity to expand closer to downtown but it is dependent on the infrastructure and conditions of downtown although hospitals are largely expanding in different ways – to satellite campuses and other locations
- City incentives – not sure if that is enough to spur the downtown growth
- Changing the perception of danger, especially in the downtown area; enhancing the presence of things that would make people feel safe (police, etc.)
- Brown building – downtown dormitories
- The downtown is a food desert for students; a food court for students should be considered – has to be affordable and a good alternative to the take-out options
- Can the University (UCONN Waterbury) be a partner?
- Downtown does not have a BID (Business Improvement District), should be considered

Threats

- Lighting, perception, media coverage, police presence – safety and security and the perception - needs to be a balance because too much police presence also sends a message about the safety of a place
- People's work behavior post-COVID; shrinking footprints

Case Studies

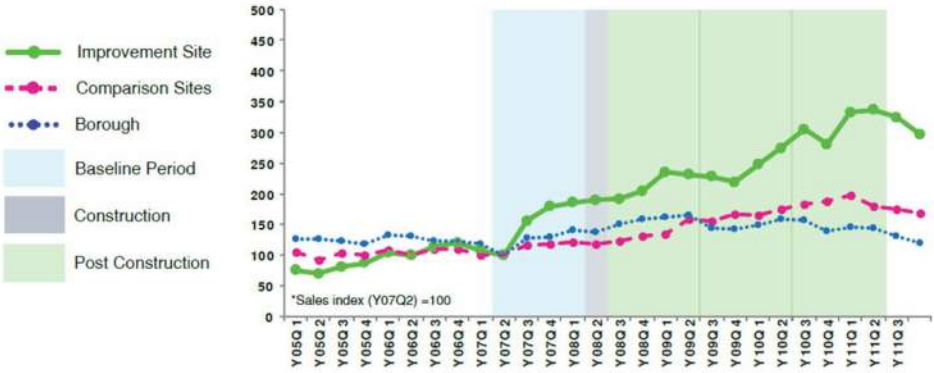
Vanderbilt Avenue (Plaza Street to Dean Street), Brooklyn

The Economic Developments of Sustainable Streets, NYCDOT

Vanderbilt Avenue is in the Prospect Heights neighborhood of Brooklyn, NY and is home to a mix of shops, restaurants and bars. The corridor right-of-way is 60'-62' wide and had two traffic lanes and a parking lane in each direction prior to improvements conducted by NYC DOT. In 2006, NYC DOT implemented a traffic calming road diet by modifying the profile to include one traffic lane, a parking lane in each direction, and a flush center median with left turn bays at intersections. This change resulted in a dramatic reduction in the number of speeding vehicles and helped to increase turning vehicle and pedestrian safety. Additionally, bicycle trips increased along the corridor and pedestrian traffic increased. Real estate prices also increased, and many vacant storefronts were activated.

The project had four goals including: Create dedicated cycling space, Improve pedestrian safety and comfort, further calm traffic, and improve streetscape to support residents and local businesses. To achieve these goals, the project provided the following improvements:

- Cycling Infrastructure – A dedicated bicycle lane was created to clarify a safe space for cyclists.
- Pedestrian Safety/Comfort – Pedestrian safety islands were installed where left turn bays were not required, allowing safer two-phase crossing.
- Traffic Calming – A full-length, tree-lined median was installed on one block to visually narrow the roadway.



Combined Sales: Improvement Sites vs. Comparison Sites – Vanderbilt Avenue

- Streetscape – Simple striping was replaced with raised medians and trees were planted in safety islands and medians to create a more inviting and pedestrian-scale environment that encourages people to stay and stroll.
- Curbside Management – Parking regulations were changed to encourage customer turnover and designate space for deliveries to local business.

Economic data from the Vanderbilt Avenue project revealed a sustained and dramatic trend of increasing economic performance. The faster pace of increases on Vanderbilt compared with comparison sites and Brooklyn as a whole indicates that the project improvements contributed to fast-paced growth in retail activity. The upward trend in combined sales began prior to the construction period and continued at a similar pace afterward.

By the third year following the 2008 project implementation, sales had increased by 102%. Vanderbilt Avenue performed significantly better than two of its similar corridor comparisons and Brooklyn as a whole. While the economy of this neighborhood was already trending in a positive direction, it is reasonable to conclude that the improved safety, shortened crossings, and new landscaping all combined to increase foot and bicycle traffic and enhance the sense of place, creating a positive cycle of retail development that was greater than it otherwise would have been. In addition, the jump in sales seen for the corridor in 2007 (the baseline period) could be partly a result of the earlier traffic calming improvements implemented in 2006.

Vanderbilt Avenue Before and After, NYC DOT

Madison Avenue, Memphis, TN

National Institute for Transportation and Communities, Understanding Economic and Business Impacts of Street Improvements for Bicycle and Pedestrian Mobility: A Multi-City, Multi-Approach Exploration, April 2020

Madison Avenue, located in the Midtown district of Memphis, received a road diet and buffered bike lane in 2011. The project was driven by a desire to expand bicycle infrastructure in the City and support economic development through "complete streets" improvements.
In studying the economic impacts of the improvements, control corridors were identified to provide a basis of comparison, those corridors include Union Avenue and Cooper Street, close to the treatment corridor in Midtown; Highland Street, located to the southeast of the district; and Jackson Avenue on the north side.

Madison Avenue, Google Earth

Economic data indicated a slight increase in retail employment right after the road diet and bike lane installation in 2011 on the Madison Avenue corridor, but this was followed with subsequent decreases in retail employment. This performance was better than one control corridor, Union Avenue, but worse than the other two control corridors, Highland Street and Cooper Street. In addition, city-wide retail employment performed better than the treatment corridor, indicating that the street improvement on Madison might have had a negative impact on retail employment.

However, the food service sector experienced positive impacts. Although a significant employment drop was experienced right after the bike lane installation, a dramatic recovery was experienced after two years. The performance of the food sector on the control corridors was mixed.

MEMPHIS		
MADISON AVENUE (2011)		
	RETAIL	**Positive and statistically significant improvement in retail sales.** A slight increase in retail employment after the 2011 installation was followed by decreases in retail employment. Madison performed worse than two of the three control corridors and worse than city-wide, indicating that the street improvement on Madison may have had a **negative impact on retail employment.**
	FOOD SERVICE	**Significant positive impact on food employment:** After bike lane installation, food employment dropped significantly in level, but dramatically recovered & surpassed previous levels over the next two years.

Compared with its control corridors, the Madison Avenue treatment corridor experienced many more establishments opening after the street improvement. Correspondingly, the indexed retail sales also increased faster than all control corridors except for Cooper Street. However, the number of sales per establishment within the Madison Avenue project area tracked the control corridors closely. Long-term trends suggest that the Madison Avenue improvements had a positive impact on retail sales, mostly due to more establishments opening along the corridor. Analysis of sales tax data shows that the gross sales increased $15,288,908 more every year than pre-installation on Madison Avenue.

Large jumps in retail employment on the corridor were experienced after the Madison Avenue improvements. The retail employment trends on the corresponding control corridors, however, were similar to that of Madison Avenue. In terms of food service industry employment, there were also large jumps on all corridors after construction. While food service employment on the control corridors slightly decreased after 2013, the Madison Avenue steadily maintained its food employment levels.

With respect to retail wages, a large jump in total wages on the treatment corridor was experienced after the street improvement project; however, this trend was similar in the control corridors. Similarly, in the food service industry there were jumps in overall wage levels on all corridors after the construction period. Moreover, unlike other control corridors where wage levels fluctuated after construction, wage levels on Madison Avenue maintained a stable level.

Gainesville Main Street Corridor, Gainesville, Florida

National Center for Transit Research, Capturing the Benefits of Complete Streets, December 2015

Gainesville, Florida reconstructed a one mile stretch of Main Street in downtown Gainesville over a two-year period with completion of the project in 2011. The corridor contains a mix of land uses including retail, entertainment, restaurant, office, government, and manufacturing. The project involved going from a four-lane configuration with a center turn lane to a two-lane configuration with a center turn lane. Additional elements included reconfigured on-street parking, bicycle lanes, wider sidewalks, bus bays, enhanced lighting, streetscaping, additional mid-block crossing locations, and a roundabout at the southern end of the corridor.

Typical Main Street Improvements, Source: Keck & Wood

Complete Streets elements of the project include:

- Reconfigured on-street parking
- Modified signal timing
- Removal of some traffic signals
- Bicycle lanes
- Wider sidewalks with bulb-outs at intersections
- Bus bays
- Enhanced lighting
- Streetscaping
- Additional mid-block crossing locations
- Roundabout at the southern end of the corridor.

The City of Gainesville Public Works Department found that after the improvements were made, traffic volumes decreased 21 percent. However, traffic volumes and daily vehicle miles traveled (VMT) had decreased slightly (approximately 4%) countywide during the same period. In addition, travel speeds declined approximately two miles per hour, resulting in a 29 second increase in average travel time along the entire segment and approximately 105 seconds during peak periods. Bicycle and pedestrian volumes increased since the improvements, and there has been a significant decline in the number of crashes. There were 59 crashes during the period of January 2008 to June 2009, but only 18 crashes during the period from January 2012 to June 2013.

Several properties have made improvements since the project began construction. In 2010, there were 18 permits issues for remodels, and there was also a large increase in annual rate of permits secured for new businesses. The market value of the parcels adjacent to the reconstructed segment of Main Street increased 7% from 2006 to 2014, when accounting for inflation (the unadjusted increase is 24%). Property tax collections, in constant 2014 dollars, have increased similarly during this time, at a rate of approximately 6% (the unadjusted figure is nearly 27%).

Main Street	2006 (2014 $)	2014	Percent Change
Market Value of Parcels	$52,466,710	$55,463,600	6%
Property Taxes Paid by Parcel Owners	$583,650	$624,579	7%

Source: Alachua County Property Appraiser and Bureau of Labor Statistics

Main Street	2008	2013	Percent Change
Total Jobs Adjacent to the Main Street Corridor	1,587	1,924	21%
Total Jobs in City of Gainesville	60,051	70,081	17%

Source: Longitudinal Household Employer Dynamics

A second measure of the economic activity along the Main Street corridor is the number of jobs within the blocks adjacent to the segment. While the total number of jobs in the City of Gainesville grew by 17 percent between 2008 and 2013, the total number of jobs along the Main Street Corridor grew at a faster rate of 21 percent during this time.

While an exact causal relationship cannot be determined, it does appear that improvements made to the Main Street corridor have resulted in increased economic activity in the immediate area. While there were slower travel times along the corridor, the cost of the slower travel times (an average increase of 29 seconds to travel the segment, with a peak period increase of only 105 seconds) seems to be outweighed by improvements in safety as well as the increased pedestrian, bicycling, and economic activity.

Conclusion

Conclusion

The West Main Street corridor is exceedingly wide and has significant pavement area that can be reallocated to other modes of transportation or as streetscape space to help create a safer and more accessible corridor that is pleasant for all roadway users. While the proposed elimination of travel lanes may reduce lane capacity, increase queueing and deteriorate operations on some intersection approaches, the tradeoff is the reduction of vehicle travel speeds, safer accommodations for pedestrians and bicyclists, and a roadway character more consistent with a vibrant, downtown center. While a deterioration in operations is expected, any reduction in level of service is estimated to be minor and the Build LOS remains at an acceptable level. In addition to road dieting, geometric approach reconfigurations and lane restriping at several key intersections can improve the safety and capacity of vehicular operations.

Several improvements outlined in this report are quick hit, low cost alternatives that can be implemented in the near term such as:

- Upgrading existing pedestrian facilities to ensure ADA compliance
- The addition of pedestrian actuated crossing beacons at existing crosswalks
- Installation of additional midblock crosswalks and pedestrian actuated crossing beacons
- Refreshed pavement markings
- Curb extensions at key locations that shorten crossing distances and slow traffic
- Upgrades to existing bus stops including more prominent signage, bus shelters, and benches
- Temporary closure of several access driveways with barricades or planters

Longer term recommendations identified that will require more significant design and construction cost include:

- Road diet on West Main Street between Thomaston Avenue and the Green
- Significant geometric improvements to the intersection of West Main Street and Willow Street/Meadow Street
- Redesign of the West Main Street confluence intersection at the Green
- The addition of a shared use path on the south side of West Main Street
- Redesign of West Main Street north of the Green into a lower speed, lower volume multi-modal street that can be periodically closed to vehicular traffic for events
- Permanent closure of several access driveways with new curbing

Several of the above alternatives could be broken out into separate standalone projects that would make excellent funding applications for a variety of State and Federal grant sources that currently exist.

Implementation of the above recommendations will improve safety along the corridor, and aid in creating a space that is accessible and enjoyable for all roadway users. Such improvements will also promote further economic development along the corridor, which will benefit existing businesses and the City of Waterbury in the long term.

Appendix A

Concept Drawings

File Path: J:\DWG\P2019\1377\A10\Civil\Concept\20191377A10_CON02.dwg Layout: CON-01 Plotted: Thu, December 23, 2021 - 9:26 AM User: asandhu
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CITY OF WATERBURY

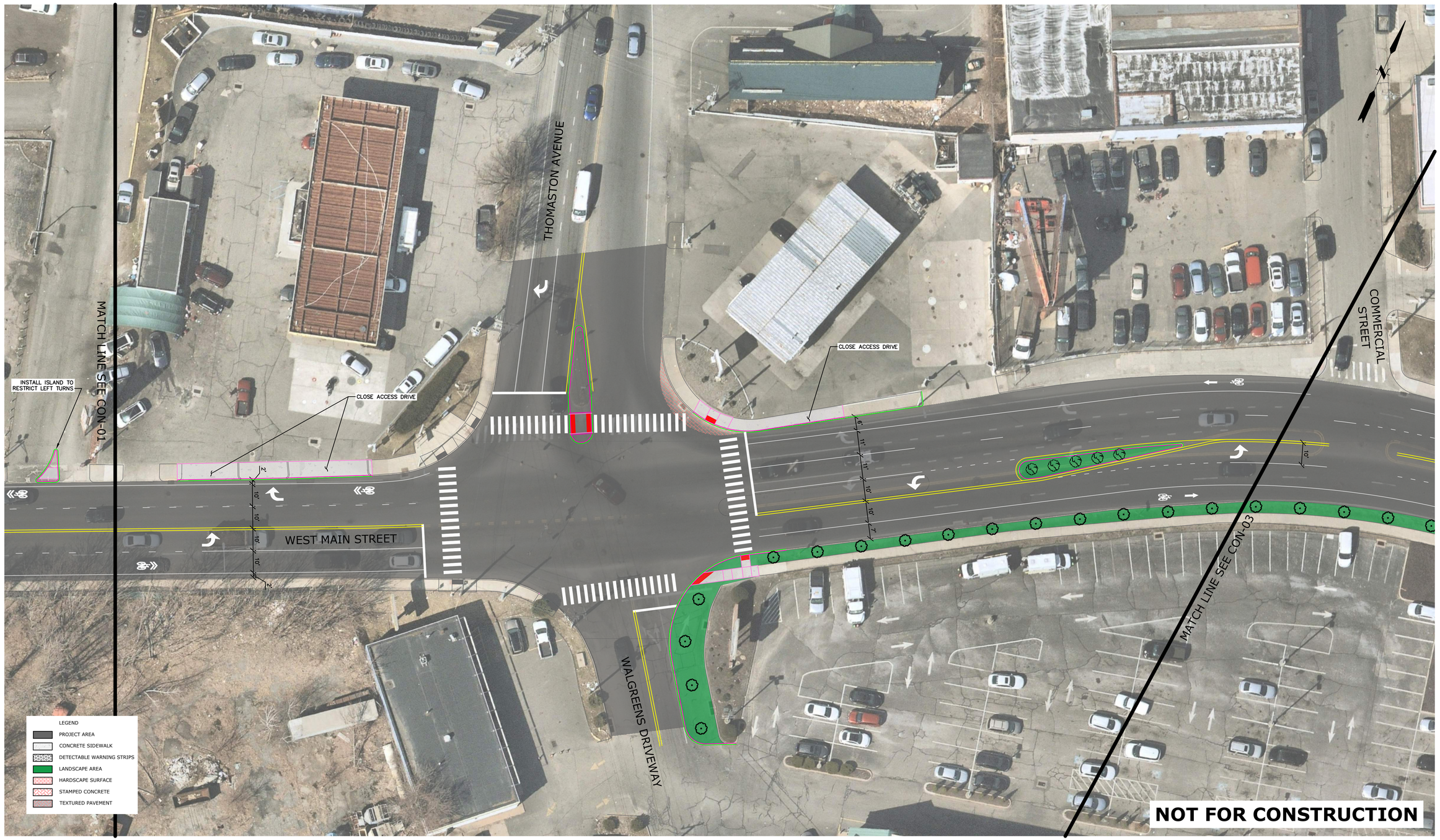
CONCEPT PLAN NO. 1

WEST MAIN STREET CORRIDOR STUDY

WATERBURY CONNECTICUT

PROJ. No.: 20191377.A10
DATE: AUGUST 2021

CON-01



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CONCEPT PLAN NO. 2

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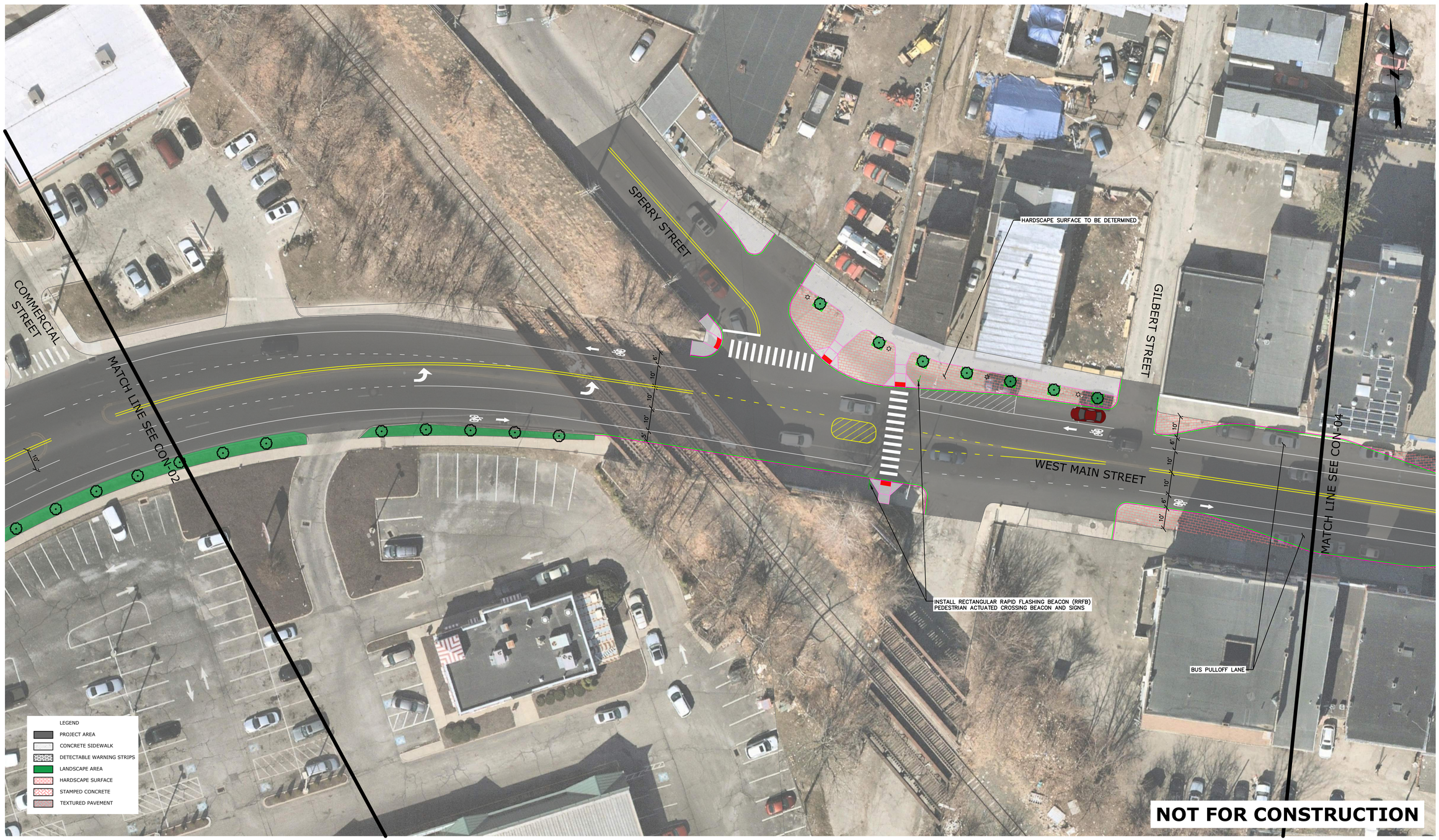
WATERBURY CONNECTICUT

PROJ. No.: 20191377.A10
DATE: AUGUST 2021

CON-02



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CONCEPT PLAN NO. 3

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WATERBURY CONNECTICUT

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DATE: AUGUST 2021

CON-03

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CITY OF WATERBURY

CONCEPT PLAN NO. 4

WEST MAIN STREET CORRIDOR STUDY

WATERBURY CONNECTICUT

PROJ. No.: 20191377.A10
DATE: AUGUST 2021

CON-04

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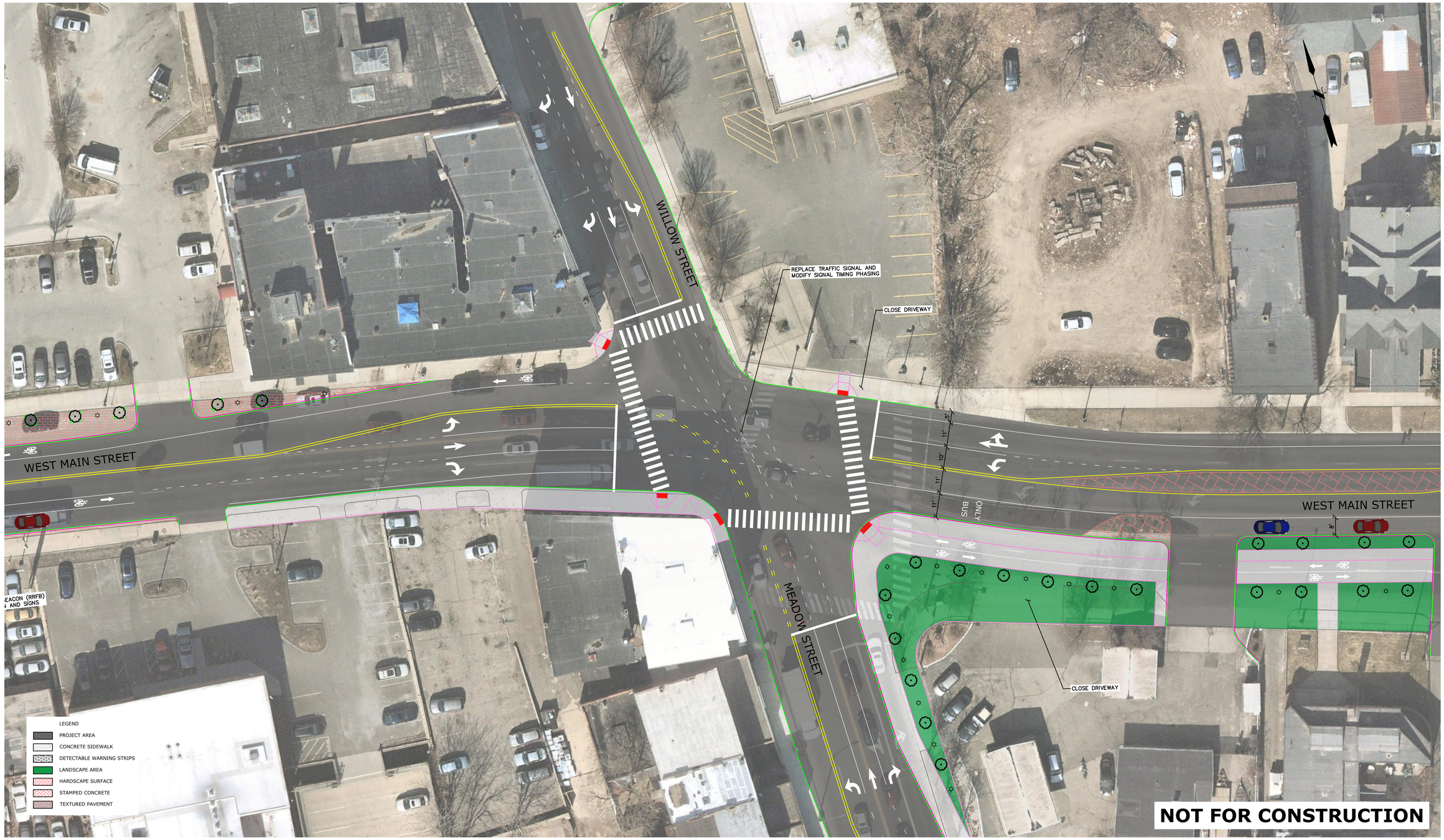

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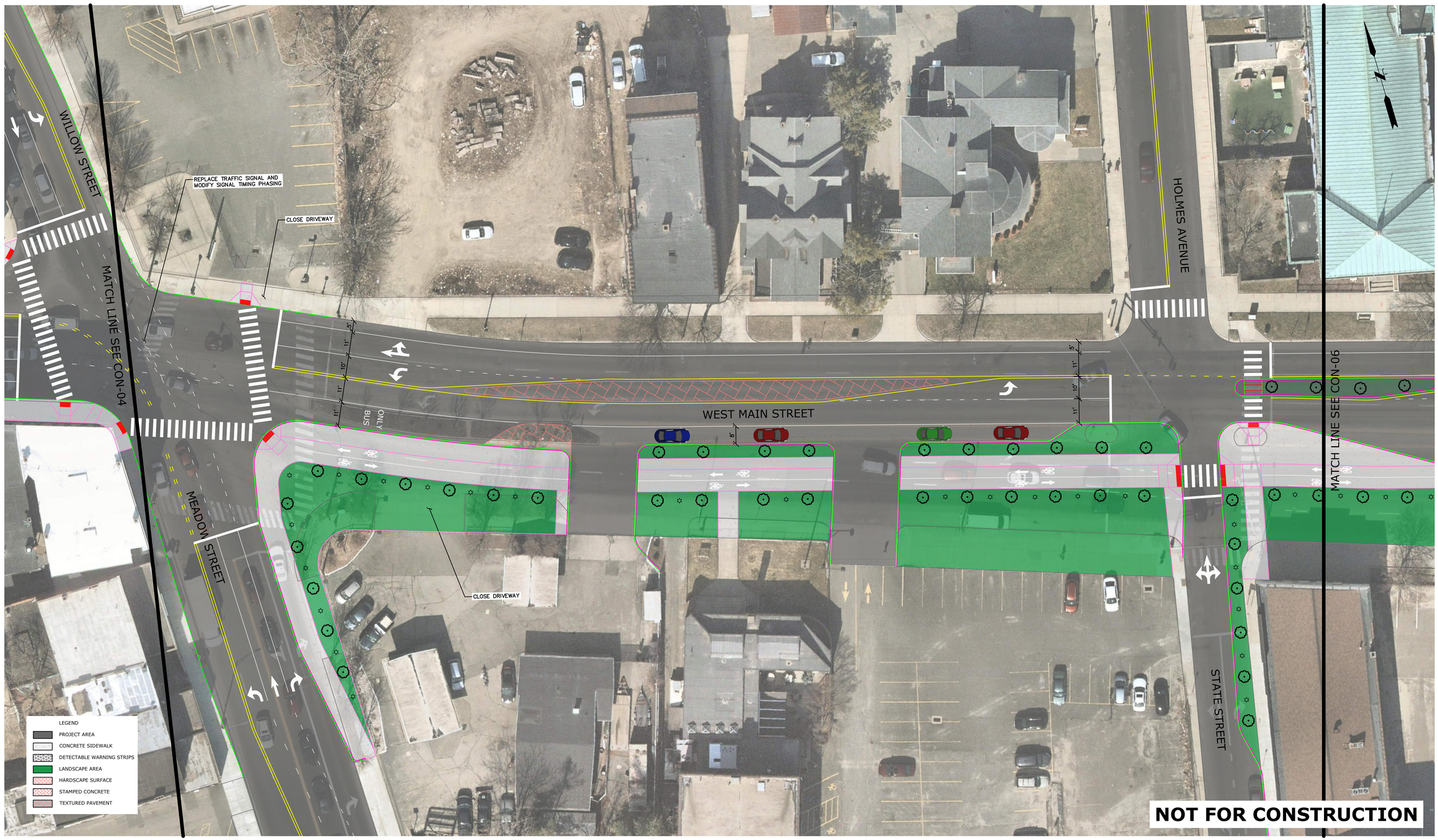
CON-05A



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CITY OF WATERBURY

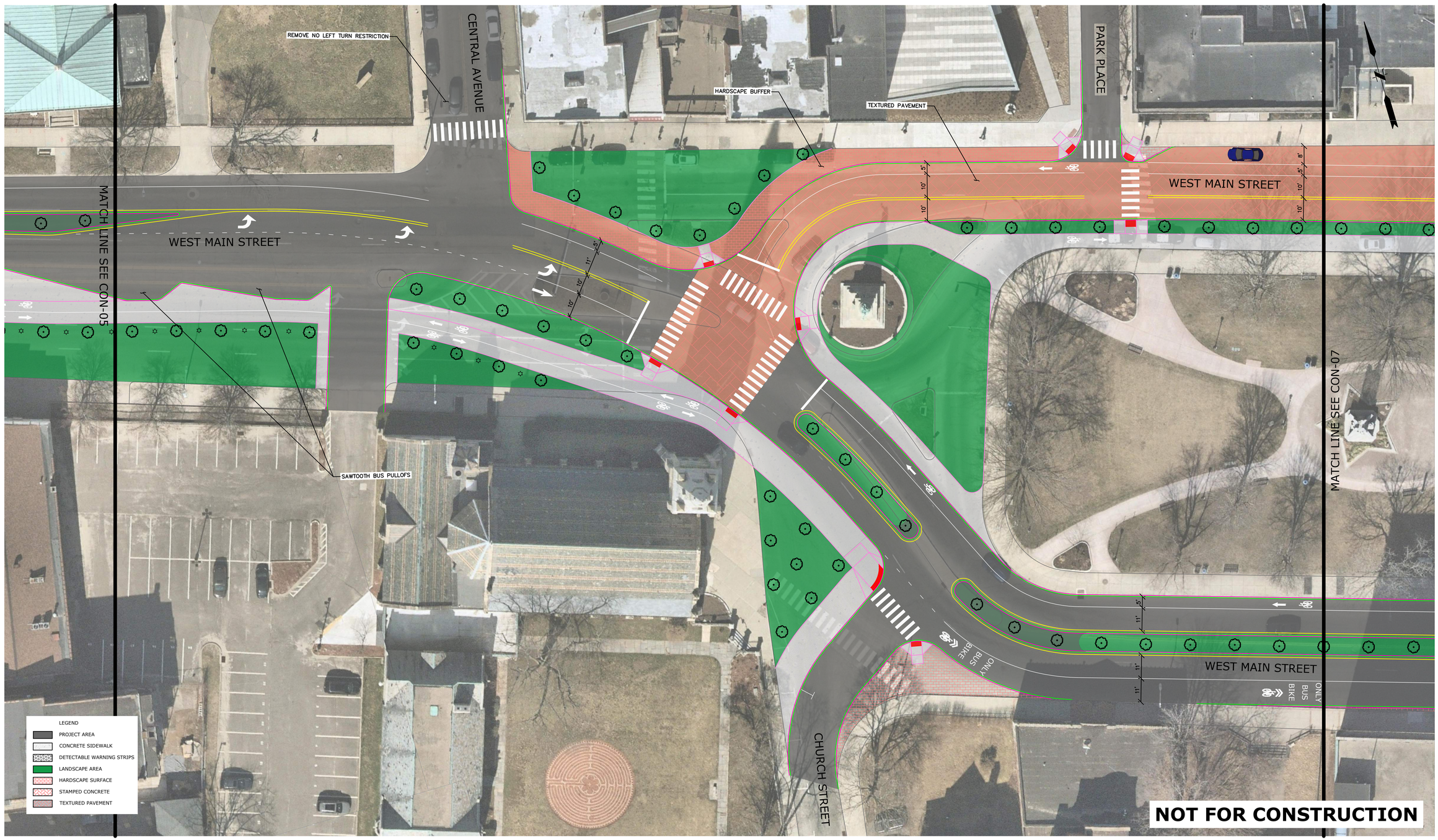
CONCEPT PLAN NO. 5

WEST MAIN STREET CORRIDOR STUDY

WATERBURY CONNECTICUT

PROJ. No.: 20191377.A10
DATE: AUGUST 2021

CON-05



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CITY OF WATERBURY

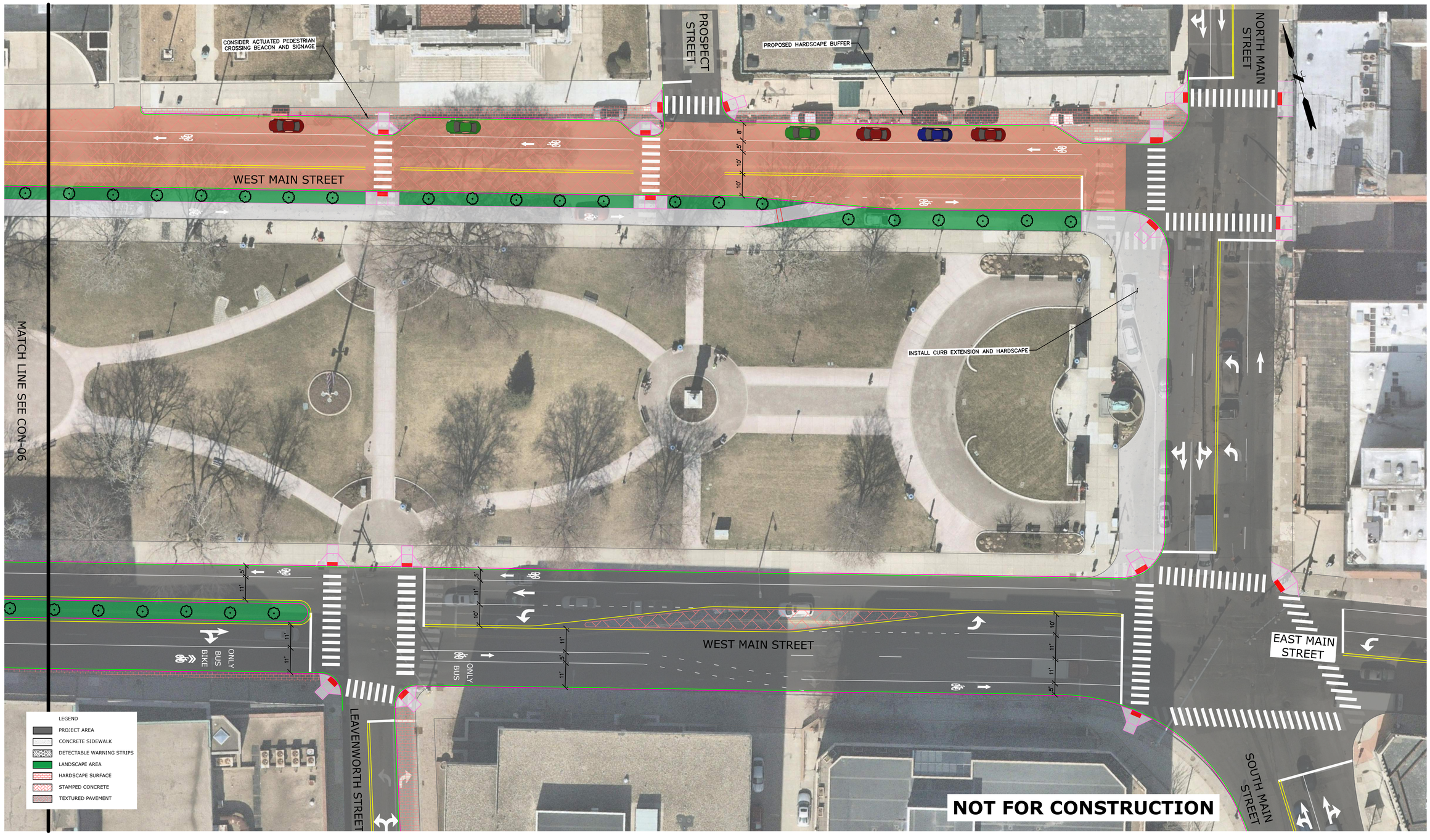
CONCEPT PLAN NO. 6

WEST MAIN STREET CORRIDOR STUDY

WATERBURY CONNECTICUT

PROJ. No.: 20191377.A10
DATE: AUGUST 2021

CON-06



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CITY OF WATERBURY

CONCEPT PLAN NO. 7

WEST MAIN STREET CORRIDOR STUDY

WATERBURY CONNECTICUT

PROJ. No.: 20191377.A10
DATE: AUGUST 2021

CON-07

Appendix B

Intersection Capacity Analysis Worksheets
Weekday Morning Peak Hour

Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	SBR	SEL	SER	SER2	Ø5	Ø6
Lane Configurations												
Traffic Volume (vph)	530	120	237	400	247	131	101	275	122	120		
Future Volume (vph)	530	120	237	400	247	131	101	275	122	120		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)		40	0		0		0	230	0			
Storage Lanes		1	1		1		0	1	1			
Taper Length (ft)			25		25			25				
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00		
Frt		0.850				0.935			0.850			
Flt Protected			0.950		0.950			0.950				
Satd. Flow (prot)	1863	1583	1770	3539	1770	1742	0	1770	1583	0		
Flt Permitted			0.124		0.950			0.950				
Satd. Flow (perm)	1863	1583	231	3539	1770	1742	0	1770	1583	0		
Right Turn on Red		Yes								Yes		
Satd. Flow (RTOR)		82							82			
Link Speed (mph)	30			30		30		30				
Link Distance (ft)	314			357		308		436				
Travel Time (s)	7.1			8.1		7.0		9.9				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Adj. Flow (vph)	576	130	258	435	268	142	110	299	133	130		
Shared Lane Traffic (%)												
Lane Group Flow (vph)	576	130	258	435	268	252	0	299	263	0		
Turn Type	NA	Perm	D.P+P	NA	Split	NA		Prot	Prot			
Protected Phases	1		2	1 2	3	3		4	4		5	6
Permitted Phases		1	1									
Minimum Split (s)	14.0	14.0	7.0		12.0	12.0		12.0	12.0		22.5	22.5
Total Split (s)	48.0	48.0	24.0		22.0	22.0		26.0	26.0		48.0	24.0
Total Split (%)	40.0%	40.0%	20.0%		18.3%	18.3%		21.7%	21.7%		40%	20%
Maximum Green (s)	44.0	44.0	20.0		18.0	18.0		22.0	22.0		44.0	20.0
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0			
Total Lost Time (s)	4.0	4.0	4.0		4.0	4.0		4.0	4.0			
Lead/Lag	Lead	Lead	Lag		Lead	Lead		Lag	Lag		Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes
Act Effct Green (s)	44.0	44.0	64.0	68.0	18.0	18.0		22.0	22.0			
Actuated g/C Ratio	0.37	0.37	0.53	0.57	0.15	0.15		0.18	0.18			
v/c Ratio	0.84	0.21	0.68	0.22	1.01	0.97		0.92	0.74			
Control Delay	47.8	11.5	35.6	7.2	109.1	98.7		82.5	44.9			
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0			
Total Delay	47.8	11.5	35.6	7.2	109.1	98.7		82.5	44.9			
LOS	D	B	D	A	F	F		F	D			
Approach Delay	41.1			17.8		104.1		64.9				
Approach LOS	D			B		F		E				
Queue Length 50th (ft)	405	24	144	35	~213	196		230	135			
Queue Length 95th (ft)	#599	68	m201	m43	#389	#363		#399	#250			
Internal Link Dist (ft)	234			277		228		356				
Turn Bay Length (ft)		40						230				
Base Capacity (vph)	683	632	379	2005	265	261		324	357			

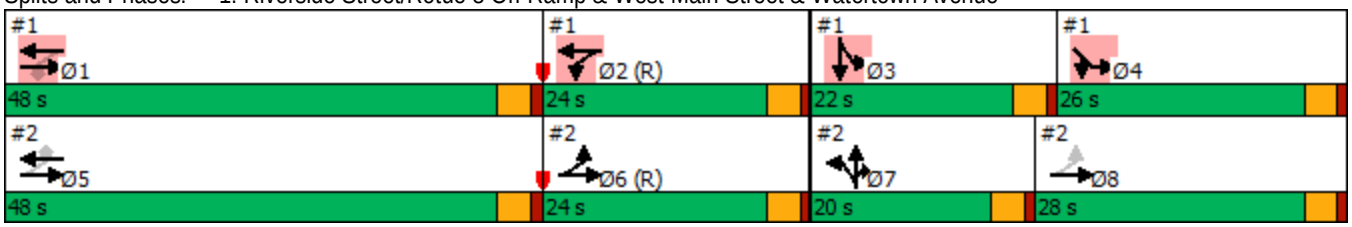
Lane Group	Ø7	Ø8
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	7	8
Permitted Phases		
Minimum Split (s)	10.0	22.5
Total Split (s)	20.0	28.0
Total Split (%)	17%	23%
Maximum Green (s)	16.0	24.0
Yellow Time (s)	3.0	3.0
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		

Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	SBR	SEL	SER	SER2	Ø5	Ø6
Starvation Cap Reductn	0	0	0	0	0	0		0	0			
Spillback Cap Reductn	0	0	0	0	0	0		0	0			
Storage Cap Reductn	0	0	0	0	0	0		0	0			
Reduced v/c Ratio	0.84	0.21	0.68	0.22	1.01	0.97		0.92	0.74			

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:, Start of Green
Natural Cycle: 110
Control Type: Pretimed
Maximum v/c Ratio: 1.80
Intersection Signal Delay: 53.2 Intersection LOS: D
Intersection Capacity Utilization 83.3% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Riverside Street/Rotue 8 Off Ramp & West Main Street & Watertown Avenue



Lane Group	Ø7	Ø8
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	SEL	SER	SER2
Lane Configurations										
Traffic Volume (vph)	530	120	237	400	247	131	101	275	122	120
Future Volume (vph)	530	120	237	400	247	131	101	275	122	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00		1.00	1.00	
Frt	1.00	0.85	1.00	1.00	1.00	0.93		1.00	0.85	
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1863	1583	1770	3539	1770	1741		1770	1583	
Flt Permitted	1.00	1.00	0.12	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1863	1583	232	3539	1770	1741		1770	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	576	130	258	435	268	142	110	299	133	130
RTOR Reduction (vph)	0	52	0	0	0	0	0	0	67	0
Lane Group Flow (vph)	576	78	258	435	268	252	0	299	196	0
Turn Type	NA	Perm	D.P+P	NA	Split	NA		Prot	Prot	
Protected Phases	1		2	1 2	3	3		4	4	
Permitted Phases		1	1							
Actuated Green, G (s)	44.0	44.0	64.0	68.0	18.0	18.0		22.0	22.0	
Effective Green, g (s)	44.0	44.0	64.0	68.0	18.0	18.0		22.0	22.0	
Actuated g/C Ratio	0.37	0.37	0.53	0.57	0.15	0.15		0.18	0.18	
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	683	580	380	2005	265	261		324	290	
v/s Ratio Prot	c0.31		c0.11	c0.12	c0.15	0.14		c0.17	0.12	
v/s Ratio Perm		0.05	0.25							
v/c Ratio	0.84	0.13	0.68	0.22	1.01	0.97		0.92	0.68	
Uniform Delay, d1	34.8	25.3	39.2	12.8	51.0	50.7		48.2	45.7	
Progression Factor	1.00	1.00	0.79	0.54	1.00	1.00		1.00	1.00	
Incremental Delay, d2	12.1	0.5	6.8	0.2	58.2	47.5		33.7	12.0	
Delay (s)	46.9	25.8	37.7	7.1	109.2	98.2		81.9	57.6	
Level of Service	D	C	D	A	F	F		F	E	
Approach Delay (s)	43.1			18.5		103.9		70.5		
Approach LOS	D			B		F		E		

Intersection Summary			
HCM 2000 Control Delay	55.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	880	0	0	510	530	110	410	140	0	0	0
Future Volume (vph)	250	880	0	0	510	530	110	410	140	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1770	3539	0	0	1863	1583	3433	1863	1583	0	0	0
Flt Permitted	0.457						0.950					
Satd. Flow (perm)	851	3539	0	0	1863	1583	3433	1863	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						464			130			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		357			839			247			271	
Travel Time (s)		8.1			19.1			5.6			6.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	272	957	0	0	554	576	120	446	152	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	272	957	0	0	554	576	120	446	152	0	0	0
Turn Type	custom	NA			NA	Perm	Split	NA	Prot			
Protected Phases	6	5 6 8			5		7	7	7			
Permitted Phases	5 8					5						
Minimum Split (s)	22.5				22.5	22.5	10.0	10.0	10.0			
Total Split (s)	24.0				48.0	48.0	20.0	20.0	20.0			
Total Split (%)	20.0%				40.0%	40.0%	16.7%	16.7%	16.7%			
Maximum Green (s)	20.0				44.0	44.0	16.0	16.0	16.0			
Yellow Time (s)	3.0				3.0	3.0	3.0	3.0	3.0			
All-Red Time (s)	1.0				1.0	1.0	1.0	1.0	1.0			
Lost Time Adjust (s)	0.0				0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	4.0				4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lag				Lead	Lead	Lead	Lead	Lead			
Lead-Lag Optimize?	Yes				Yes	Yes	Yes	Yes	Yes			
Act Effct Green (s)	92.0	96.0			44.0	44.0	16.0	16.0	16.0			
Actuated g/C Ratio	0.77	0.80			0.37	0.37	0.13	0.13	0.13			
v/c Ratio	0.34	0.34			0.81	0.66	0.26	1.80	0.47			
Control Delay	2.8	2.1			45.2	10.2	48.4	405.8	16.7			
Queue Delay	0.1	0.9			0.0	0.0	0.0	0.0	0.0			
Total Delay	2.9	3.0			45.2	10.2	48.4	405.8	16.7			
LOS	A	A			D	B	D	F	B			
Approach Delay		3.0			27.4			263.7				
Approach LOS		A			C			F				
Queue Length 50th (ft)	25	58			383	59	43	~519	15			
Queue Length 95th (ft)	m29	m71			#539	185	73	#722	79			
Internal Link Dist (ft)		277			759			167			191	
Turn Bay Length (ft)												
Base Capacity (vph)	805	2831			683	874	457	248	323			
Starvation Cap Reductn	85	1496			0	0	0	0	0			
Spillback Cap Reductn	0	0			0	0	0	0	0			
Storage Cap Reductn	0	0			0	0	0	0	0			

Lane Group	Ø1	Ø2	Ø3	Ø4	Ø8
Lane Configurations					
Traffic Volume (vph)					
Future Volume (vph)					
Ideal Flow (vphpl)					
Lane Util. Factor					
Frt					
Flt Protected					
Satd. Flow (prot)					
Flt Permitted					
Satd. Flow (perm)					
Right Turn on Red					
Satd. Flow (RTOR)					
Link Speed (mph)					
Link Distance (ft)					
Travel Time (s)					
Peak Hour Factor					
Adj. Flow (vph)					
Shared Lane Traffic (%)					
Lane Group Flow (vph)					
Turn Type					
Protected Phases	1	2	3	4	8
Permitted Phases					
Minimum Split (s)	14.0	7.0	12.0	12.0	22.5
Total Split (s)	48.0	24.0	22.0	26.0	28.0
Total Split (%)	40%	20%	18%	22%	23%
Maximum Green (s)	44.0	20.0	18.0	22.0	24.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)					
Total Lost Time (s)					
Lead/Lag	Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes
Act Effct Green (s)					
Actuated g/C Ratio					
v/c Ratio					
Control Delay					
Queue Delay					
Total Delay					
LOS					
Approach Delay					
Approach LOS					
Queue Length 50th (ft)					
Queue Length 95th (ft)					
Internal Link Dist (ft)					
Turn Bay Length (ft)					
Base Capacity (vph)					
Starvation Cap Reductn					
Spillback Cap Reductn					
Storage Cap Reductn					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Reduced v/c Ratio	0.38	0.72			0.81	0.66	0.26	1.80	0.47			

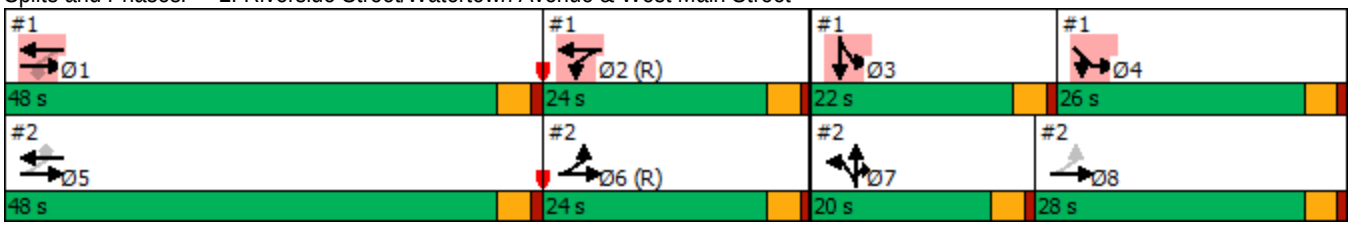
Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:, Start of Green	
Natural Cycle: 110	
Control Type: Pretimed	
Maximum v/c Ratio: 1.80	
Intersection Signal Delay: 72.8	Intersection LOS: E
Intersection Capacity Utilization 78.2%	ICU Level of Service D
Analysis Period (min) 15	

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

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

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

Splits and Phases: 2: Riverside Street/Watertown Avenue & West Main Street



Lane Group	Ø1	Ø2	Ø3	Ø4	Ø8
Reduced v/c Ratio					

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	880	0	0	510	530	110	410	140	0	0	0
Future Volume (vph)	250	880	0	0	510	530	110	410	140	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	1.00	0.95			1.00	1.00	0.97	1.00	1.00			
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00			
Satd. Flow (prot)	1770	3539			1863	1583	3433	1863	1583			
Flt Permitted	0.46	1.00			1.00	1.00	0.95	1.00	1.00			
Satd. Flow (perm)	851	3539			1863	1583	3433	1863	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	272	957	0	0	554	576	120	446	152	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	297	0	0	113	0	0	0
Lane Group Flow (vph)	272	957	0	0	554	279	120	446	39	0	0	0
Turn Type	custom	NA			NA	Perm	Split	NA	Prot			
Protected Phases	6	5 6 8			5		7	7	7			
Permitted Phases	5 8					5						
Actuated Green, G (s)	92.0	96.0			43.2	43.2	16.0	16.0	16.0			
Effective Green, g (s)	92.0	96.0			43.2	43.2	16.0	16.0	16.0			
Actuated g/C Ratio	0.77	0.80			0.36	0.36	0.13	0.13	0.13			
Clearance Time (s)	4.0				4.0	4.0	4.0	4.0	4.0			
Lane Grp Cap (vph)	811	2831			670	569	457	248	211			
v/s Ratio Prot	0.06	c0.27			c0.30		0.03	c0.24	0.02			
v/s Ratio Perm	0.20					0.18						
v/c Ratio	0.34	0.34			0.83	0.49	0.26	1.80	0.19			
Uniform Delay, d1	4.8	3.3			35.0	29.8	46.7	52.0	46.2			
Progression Factor	0.58	0.57			1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2	0.6	0.2			11.2	3.0	1.4	374.9	1.9			
Delay (s)	3.4	2.0			46.2	32.8	48.1	426.9	48.2			
Level of Service	A	A			D	C	D	F	D			
Approach Delay (s)		2.3			39.4			283.4			0.0	
Approach LOS		A			D			F			A	

Intersection Summary			
HCM 2000 Control Delay	81.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	200	810	10	10	710	270	20	0	0	220	10	350
Future Volume (vph)	200	810	10	10	710	270	20	0	0	220	10	350
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999				0.850						0.850
Flt Protected		0.990		0.950			0.950				0.954	
Satd. Flow (prot)	0	3500	0	1770	1863	1583	1770	1863	1863	0	1777	1583
Flt Permitted		0.521		0.189			0.483				0.735	
Satd. Flow (perm)	0	1842	0	352	1863	1583	900	1863	1863	0	1369	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				173						380
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		839			356			196			228	
Travel Time (s)		19.1			8.1			4.5			5.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	217	880	11	11	772	293	22	0	0	239	11	380
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1108	0	11	772	293	22	0	0	0	250	380
Turn Type	custom	NA		custom	NA	custom	Perm		Perm	Perm	NA	Perm
Protected Phases	1	1 2		3	2 3			5			5	
Permitted Phases	2			2		2	5		5	5		5
Detector Phase	1	1 2		3	2 3	2	5	5	5	5	5	5
Switch Phase												
Minimum Initial (s)	1.0			1.0		5.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	5.0			5.0		15.0	9.0	9.0	9.0	9.0	9.0	9.0
Total Split (s)	6.0			5.0		40.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	4.9%			4.1%		32.8%	36.9%	36.9%	36.9%	36.9%	36.9%	36.9%
Maximum Green (s)	3.0			1.0		35.0	40.0	40.0	40.0	40.0	40.0	40.0
Yellow Time (s)	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	0.0			1.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)				0.0		0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)				4.0		5.0	5.0	5.0	5.0		5.0	5.0
Lead/Lag	Lead			Lead		Lag	Lag	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes			Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None			None		Max	None	None	None	None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		40.2		37.2	35.2	35.2	20.3				20.3	20.3
Actuated g/C Ratio		0.52		0.49	0.46	0.46	0.27				0.27	0.27
v/c Ratio		1.07		0.06	0.90	0.36	0.09				0.69	0.54
Control Delay		70.3		12.2	37.1	7.8	20.9				35.5	5.6
Queue Delay		0.0		0.0	0.0	0.0	0.0				0.0	0.0
Total Delay		70.3		12.2	37.1	7.8	20.9				35.5	5.6
LOS		E		B	D	A	C				D	A
Approach Delay		70.3			28.9			20.9			17.5	
Approach LOS		E			C			C			B	

Lane Group	Ø4
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	26.0
Total Split (s)	26.0
Total Split (%)	21%
Maximum Green (s)	23.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	16.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

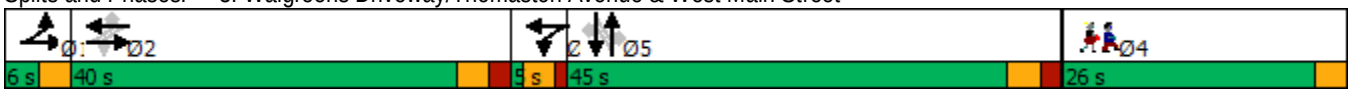
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		~195		2	325	32	8				106	0
Queue Length 95th (ft)		#491		12	#666	100	24				180	57
Internal Link Dist (ft)		759			276			116			148	
Turn Bay Length (ft)												
Base Capacity (vph)		1033		189	856	820	472				719	1011
Starvation Cap Reductn		0		0	0	0	0				0	0
Spillback Cap Reductn		0		0	0	0	0				0	0
Storage Cap Reductn		0		0	0	0	0				0	0
Reduced v/c Ratio		1.07		0.06	0.90	0.36	0.05				0.35	0.38

Intersection Summary	
Area Type:	Other
Cycle Length: 122	
Actuated Cycle Length: 76.6	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.07	
Intersection Signal Delay: 42.5	Intersection LOS: D
Intersection Capacity Utilization 96.9%	ICU Level of Service F
Analysis Period (min) 15	

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

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

Splits and Phases: 3: Walgreens Driveway/Thomaston Avenue & West Main Street



Lane Group	Ø4
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	200	810	10	10	710	270	20	0	0	220	10	350
Future Volume (vph)	200	810	10	10	710	270	20	0	0	220	10	350
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0		4.0	5.0	5.0	5.0				5.0	5.0
Lane Util. Factor		0.95		1.00	1.00	1.00	1.00				1.00	1.00
Frt		1.00		1.00	1.00	0.85	1.00				1.00	0.85
Flt Protected		0.99		0.95	1.00	1.00	0.95				0.95	1.00
Satd. Flow (prot)		3500		1770	1863	1583	1770				1778	1583
Flt Permitted		0.52		0.19	1.00	1.00	0.48				0.74	1.00
Satd. Flow (perm)		1840		352	1863	1583	900				1370	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	217	880	11	11	772	293	22	0	0	239	11	380
RTOR Reduction (vph)	0	1	0	0	0	93	0	0	0	0	0	279
Lane Group Flow (vph)	0	1107	0	11	772	200	22	0	0	0	250	101
Turn Type	custom	NA		custom	NA	custom	Perm		Perm	Perm	NA	Perm
Protected Phases	1	1 2		3	2 3			5			5	
Permitted Phases	2			2		2	5		5	5		5
Actuated Green, G (s)		38.2		36.2	41.2	35.2	20.3				20.3	20.3
Effective Green, g (s)		38.2		36.2	41.2	35.2	20.3				20.3	20.3
Actuated g/C Ratio		0.50		0.47	0.54	0.46	0.27				0.27	0.27
Clearance Time (s)				4.0		5.0	5.0				5.0	5.0
Vehicle Extension (s)				3.0		3.0	3.0				3.0	3.0
Lane Grp Cap (vph)		983		185	1003	728	238				363	420
v/s Ratio Prot		c0.04		0.00	c0.41							
v/s Ratio Perm		c0.52		0.03		0.13	0.02				c0.18	0.06
v/c Ratio		1.13		0.06	0.77	0.27	0.09				0.69	0.24
Uniform Delay, d1		19.1		16.5	13.9	12.8	21.2				25.3	22.0
Progression Factor		1.00		1.00	1.00	1.00	1.00				1.00	1.00
Incremental Delay, d2		70.2		0.1	3.6	0.9	0.2				5.4	0.3
Delay (s)		89.4		16.6	17.5	13.7	21.3				30.6	22.3
Level of Service		F		B	B	B	C				C	C
Approach Delay (s)		89.4			16.5			21.3			25.6	
Approach LOS		F			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	47.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	76.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	96.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	180	820	850	60	100	180
Future Volume (vph)	180	820	850	60	100	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			0	100	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.991			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1846	0	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	1846	0	1770	1583
Link Speed (mph)		30	30		30	
Link Distance (ft)		219	398		263	
Travel Time (s)		5.0	9.0		6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	891	924	65	109	196
Shared Lane Traffic (%)						
Lane Group Flow (vph)	196	891	989	0	109	196
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 73.9%		ICU Level of Service D	
Analysis Period (min) 15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	180	820	850	60	100	180
Future Volume (Veh/h)	180	820	850	60	100	180
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	196	891	924	65	109	196
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		722	846			
pX, platoon unblocked	0.91				0.75	0.91
vC, conflicting volume	989				2240	956
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	937				2209	901
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	70				0	36
cM capacity (veh/h)	663				26	306

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	196	891	989	109	196
Volume Left	196	0	0	109	0
Volume Right	0	0	65	0	196
cSH	663	1700	1700	26	306
Volume to Capacity	0.30	0.52	0.58	4.25	0.64
Queue Length 95th (ft)	31	0	0	Err	103
Control Delay (s)	12.7	0.0	0.0	Err	35.7
Lane LOS	B			F	E
Approach Delay (s)	2.3		0.0	3596.3	
Approach LOS				F	

Intersection Summary			
Average Delay	461.7		
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	438	162	84	304	33	163	252	130	50	163	258
Future Volume (vph)	50	438	162	84	304	33	163	252	130	50	163	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.963			0.985				0.850			0.850
Flt Protected		0.996		0.950				0.981			0.988	
Satd. Flow (prot)	0	3395	0	1770	3486	0	0	1827	1583	0	1840	1583
Flt Permitted		0.886		0.267				0.681			0.751	
Satd. Flow (perm)	0	3020	0	497	3486	0	0	1269	1583	0	1399	1583
Right Turn on Red			No			No			Yes			Yes
Satd. Flow (RTOR)									141			280
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		448			464			449			761	
Travel Time (s)		10.2			10.5			10.2			17.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	476	176	91	330	36	177	274	141	54	177	280
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	706	0	91	366	0	0	451	141	0	231	280
Turn Type	Perm	NA		D.P+P	NA		D.P+P	NA	Perm	Perm	NA	Perm
Protected Phases		2		1	1 2		4	4 5			5	
Permitted Phases	2			2			5		4 5	5		5
Detector Phase	2	2		1	1 2		4	4 5	4 5	5	5	5
Switch Phase												
Minimum Initial (s)	1.0	1.0		1.0			1.0			1.0	1.0	1.0
Minimum Split (s)	15.0	15.0		6.0			6.0			8.0	8.0	8.0
Total Split (s)	30.0	30.0		10.0			10.0			25.0	25.0	25.0
Total Split (%)	31.6%	31.6%		10.5%			10.5%			26.3%	26.3%	26.3%
Maximum Green (s)	24.0	24.0		7.0			6.0			19.0	19.0	19.0
Yellow Time (s)	3.0	3.0		3.0			3.0			3.0	3.0	3.0
All-Red Time (s)	3.0	3.0		0.0			1.0			3.0	3.0	3.0
Lost Time Adjust (s)		0.0		0.0							0.0	0.0
Total Lost Time (s)		6.0		3.0							6.0	6.0
Lead/Lag	Lag	Lag		Lead			Lag					
Lead-Lag Optimize?	Yes	Yes		Yes			Yes					
Vehicle Extension (s)	3.0	3.0		3.0			3.0			3.0	3.0	3.0
Recall Mode	Max	Max		None			None			None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		24.0		34.0	37.0			27.0	31.0		19.0	19.0
Actuated g/C Ratio		0.32		0.45	0.49			0.36	0.41		0.25	0.25
v/c Ratio		0.73		0.26	0.21			0.90	0.19		0.65	0.46
Control Delay		28.0		12.3	11.2			44.9	3.5		35.2	5.9
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay		28.0		12.3	11.2			44.9	3.5		35.2	5.9
LOS		C		B	B			D	A		D	A
Approach Delay		28.0			11.4			35.0			19.2	
Approach LOS		C			B			D			B	

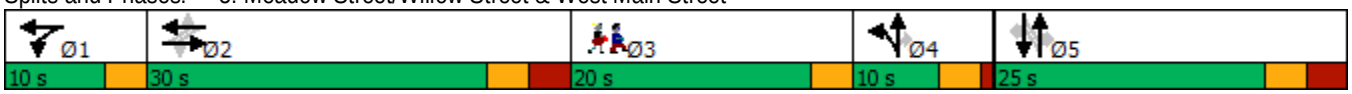
Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	20.0
Total Split (s)	20.0
Total Split (%)	21%
Maximum Green (s)	17.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	6.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		151		21	47			158	0		96	0
Queue Length 95th (ft)		213		45	72			#334	30		#177	55
Internal Link Dist (ft)		368			384			369			681	
Turn Bay Length (ft)												
Base Capacity (vph)		966		344	1719			501	737		354	610
Starvation Cap Reductn		0		0	0			0	0		0	0
Spillback Cap Reductn		0		0	0			0	0		0	0
Storage Cap Reductn		0		0	0			0	0		0	0
Reduced v/c Ratio		0.73		0.26	0.21			0.90	0.19		0.65	0.46

Intersection Summary	
Area Type:	Other
Cycle Length: 95	
Actuated Cycle Length: 75	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 24.5	Intersection LOS: C
Intersection Capacity Utilization 78.5%	ICU Level of Service D
Analysis Period (min) 15	

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

Splits and Phases: 5: Meadow Street/Willow Street & West Main Street



Lane Group	Ø3
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	438	162	84	304	33	163	252	130	50	163	258
Future Volume (vph)	50	438	162	84	304	33	163	252	130	50	163	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		3.0	3.0			4.0	4.0		6.0	6.0
Lane Util. Factor		0.95		1.00	0.95			1.00	1.00		1.00	1.00
Frt		0.96		1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected		1.00		0.95	1.00			0.98	1.00		0.99	1.00
Satd. Flow (prot)		3394		1770	3487			1827	1583		1841	1583
Flt Permitted		0.89		0.27	1.00			0.68	1.00		0.75	1.00
Satd. Flow (perm)		3018		498	3487			1268	1583		1399	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	476	176	91	330	36	177	274	141	54	177	280
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	86	0	0	209
Lane Group Flow (vph)	0	706	0	91	366	0	0	451	55	0	231	71
Turn Type	Perm	NA		D.P+P	NA		D.P+P	NA	Perm	Perm	NA	Perm
Protected Phases		2		1	1 2		4	4 5			5	
Permitted Phases	2			2			5		4 5	5		5
Actuated Green, G (s)		24.0		31.0	34.0			25.0	29.0		19.0	19.0
Effective Green, g (s)		24.0		31.0	34.0			25.0	29.0		19.0	19.0
Actuated g/C Ratio		0.32		0.41	0.45			0.33	0.39		0.25	0.25
Clearance Time (s)		6.0		3.0							6.0	6.0
Vehicle Extension (s)		3.0		3.0							3.0	3.0
Lane Grp Cap (vph)		965		324	1580			467	612		354	401
v/s Ratio Prot				c0.03	0.10			c0.08				
v/s Ratio Perm		c0.23		0.09				c0.24	0.03		0.17	0.04
v/c Ratio		0.73		0.28	0.23			0.97	0.09		0.65	0.18
Uniform Delay, d1		22.6		14.0	12.5			24.6	14.6		25.0	21.9
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2		4.9		0.5	0.1			32.6	0.1		4.3	0.2
Delay (s)		27.5		14.5	12.6			57.2	14.7		29.3	22.1
Level of Service		C		B	B			E	B		C	C
Approach Delay (s)		27.5			13.0			47.1			25.4	
Approach LOS		C			B			D			C	

Intersection Summary			
HCM 2000 Control Delay	29.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		

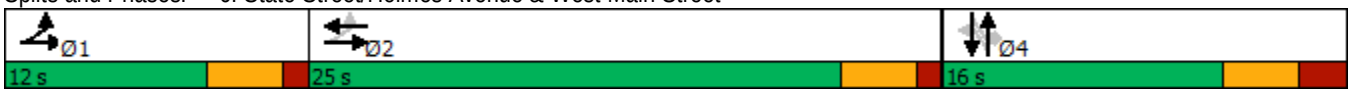
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	600	0	0	500	30	40	40	60	20	0	40
Future Volume (vph)	60	600	0	0	500	30	40	40	60	20	0	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	0.91	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.991				0.850		0.911	
Flt Protected	0.950							0.976			0.983	
Satd. Flow (prot)	1770	3539	0	0	5040	0	0	1818	1583	0	1668	0
Flt Permitted	0.425							0.808			0.853	
Satd. Flow (perm)	792	3539	0	0	5040	0	0	1505	1583	0	1448	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					21				103		103	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		464			269			230			437	
Travel Time (s)		10.5			6.1			5.2			9.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	652	0	0	543	33	43	43	65	22	0	43
Shared Lane Traffic (%)												
Lane Group Flow (vph)	65	652	0	0	576	0	0	86	65	0	65	0
Turn Type	D.P+P	NA			NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	1 2			2			4			4	
Permitted Phases	2						4		4	4		
Detector Phase	1	1 2			2		4	4	4	4	4	
Switch Phase												
Minimum Initial (s)	1.0				1.0		1.0	1.0	1.0	1.0	1.0	
Minimum Split (s)	5.0				15.0		8.0	8.0	8.0	8.0	8.0	
Total Split (s)	12.0				25.0		16.0	16.0	16.0	16.0	16.0	
Total Split (%)	22.6%				47.2%		30.2%	30.2%	30.2%	30.2%	30.2%	
Maximum Green (s)	8.0				21.0		11.0	11.0	11.0	11.0	11.0	
Yellow Time (s)	3.0				3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	1.0				1.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0				0.0			0.0	0.0		0.0	
Total Lost Time (s)	4.0				4.0			5.0	5.0		5.0	
Lead/Lag	Lead				Lag							
Lead-Lag Optimize?	Yes				Yes							
Vehicle Extension (s)	3.0				3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min				Max		None	None	None	None	None	
Act Effct Green (s)	29.1	34.3			21.5			8.1	8.1		8.1	
Actuated g/C Ratio	0.61	0.72			0.45			0.17	0.17		0.17	
v/c Ratio	0.10	0.26			0.25			0.34	0.18		0.20	
Control Delay	4.1	3.9			9.4			22.3	3.5		3.7	
Queue Delay	0.0	0.0			0.0			0.0	0.0		0.0	
Total Delay	4.1	3.9			9.4			22.3	3.5		3.7	
LOS	A	A			A			C	A		A	
Approach Delay		3.9			9.4			14.2			3.7	
Approach LOS		A			A			B			A	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	5	32			36			23	0		0	
Queue Length 95th (ft)	17	62			61			55	14		14	
Internal Link Dist (ft)		384			189			150			357	
Turn Bay Length (ft)	125											
Base Capacity (vph)	661	2509			2285			355	452		420	
Starvation Cap Reductn	0	0			0			0	0		0	
Spillback Cap Reductn	0	0			0			0	0		0	
Storage Cap Reductn	0	0			0			0	0		0	
Reduced v/c Ratio	0.10	0.26			0.25			0.24	0.14		0.15	

Intersection Summary	
Area Type:	Other
Cycle Length: 53	
Actuated Cycle Length: 47.6	
Natural Cycle: 40	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.34	
Intersection Signal Delay: 7.1	Intersection LOS: A
Intersection Capacity Utilization 35.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 6: State Street/Holmes Avenue & West Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	600	0	0	500	30	40	40	60	20	0	40
Future Volume (vph)	60	600	0	0	500	30	40	40	60	20	0	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			5.0	5.0		5.0	
Lane Util. Factor	1.00	0.95			0.91			1.00	1.00		1.00	
Frt	1.00	1.00			0.99			1.00	0.85		0.91	
Flt Protected	0.95	1.00			1.00			0.98	1.00		0.98	
Satd. Flow (prot)	1770	3539			5042			1817	1583		1668	
Flt Permitted	0.42	1.00			1.00			0.81	1.00		0.85	
Satd. Flow (perm)	791	3539			5042			1506	1583		1448	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	652	0	0	543	33	43	43	65	22	0	43
RTOR Reduction (vph)	0	0	0	0	12	0	0	0	56	0	56	0
Lane Group Flow (vph)	65	652	0	0	564	0	0	86	9	0	9	0
Turn Type	D.P+P	NA			NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	1 2			2			4			4	
Permitted Phases	2						4		4	4		
Actuated Green, G (s)	29.1	33.1			21.5			6.6	6.6		6.6	
Effective Green, g (s)	29.1	33.1			21.5			6.6	6.6		6.6	
Actuated g/C Ratio	0.60	0.68			0.44			0.14	0.14		0.14	
Clearance Time (s)	4.0				4.0			5.0	5.0		5.0	
Vehicle Extension (s)	3.0				3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	625	2405			2225			204	214		196	
v/s Ratio Prot	0.02	c0.18			0.11							
v/s Ratio Perm	0.05							c0.06	0.01		0.01	
v/c Ratio	0.10	0.27			0.25			0.42	0.04		0.04	
Uniform Delay, d1	4.1	3.1			8.6			19.3	18.3		18.3	
Progression Factor	1.00	1.00			1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.1	0.1			0.3			1.4	0.1		0.1	
Delay (s)	4.2	3.1			8.8			20.7	18.4		18.4	
Level of Service	A	A			A			C	B		B	
Approach Delay (s)		3.2			8.8			19.7			18.4	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	7.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	48.7	Sum of lost time (s)	13.0
Intersection Capacity Utilization	35.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	20	680	500	40	40	10
Future Volume (vph)	20	680	500	40	40	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.91	0.95	0.95	1.00	1.00
Frt			0.989		0.972	
Flt Protected	0.950				0.962	
Satd. Flow (prot)	1770	5085	3500	0	1742	0
Flt Permitted	0.950				0.962	
Satd. Flow (perm)	1770	5085	3500	0	1742	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		269	98		279	
Travel Time (s)		6.1	2.2		6.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	739	543	43	43	11
Shared Lane Traffic (%)						
Lane Group Flow (vph)	22	739	586	0	54	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 26.6%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	680	500	40	40	10
Future Volume (Veh/h)	20	680	500	40	40	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	739	543	43	43	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		269	98			
pX, platoon unblocked	0.98				0.98	0.98
vC, conflicting volume	586				855	293
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	547				820	249
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				86	99
cM capacity (veh/h)	1002				301	739

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	SB 1
Volume Total	22	246	246	246	362	224	54
Volume Left	22	0	0	0	0	0	43
Volume Right	0	0	0	0	0	43	11
cSH	1002	1700	1700	1700	1700	1700	343
Volume to Capacity	0.02	0.14	0.14	0.14	0.21	0.13	0.16
Queue Length 95th (ft)	2	0	0	0	0	0	14
Control Delay (s)	8.7	0.0	0.0	0.0	0.0	0.0	17.5
Lane LOS	A						C
Approach Delay (s)	0.3				0.0		17.5
Approach LOS							C

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	26.6%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR	Ø1	Ø2	Ø3	Ø4
Lane Configurations										
Traffic Volume (vph)	0	680	0	100	440	0				
Future Volume (vph)	0	680	0	100	440	0				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Lane Util. Factor	1.00	0.76	1.00	0.95	0.97	1.00				
Frt		0.850								
Flt Protected					0.950					
Satd. Flow (prot)	0	3610	0	3539	3433	0				
Flt Permitted					0.950					
Satd. Flow (perm)	0	3610	0	3539	3433	0				
Right Turn on Red		Yes				Yes				
Satd. Flow (RTOR)		2487								
Link Speed (mph)	30			30	30					
Link Distance (ft)	98			190	116					
Travel Time (s)	2.2			4.3	2.6					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Adj. Flow (vph)	0	739	0	109	478	0				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	0	739	0	109	478	0				
Turn Type		pt+ov		NA	Prot					
Protected Phases		1 2		1 4	2 3		1	2	3	4
Permitted Phases										
Detector Phase		1 2		1 4	2 3					
Switch Phase										
Minimum Initial (s)							1.0	1.0	1.0	1.0
Minimum Split (s)							6.0	20.0	5.0	19.0
Total Split (s)							14.0	34.0	6.0	19.0
Total Split (%)							19%	47%	8%	26%
Maximum Green (s)							9.0	30.0	2.0	15.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	1.0	1.0	1.0
Lost Time Adjust (s)										
Total Lost Time (s)										
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							None	Max	None	None
Walk Time (s)								7.0		4.0
Flash Dont Walk (s)								8.0		11.0
Pedestrian Calls (#/hr)								0		0
Act Effct Green (s)		43.1		23.0	36.1					
Actuated g/C Ratio		0.63		0.34	0.53					
v/c Ratio		0.23		0.09	0.26					
Control Delay		0.2		15.3	0.3					
Queue Delay		0.0		0.0	0.3					
Total Delay		0.2		15.3	0.6					
LOS		A		B	A					
Approach Delay	0.2			15.3	0.6					
Approach LOS	A			B	A					

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR	Ø1	Ø2	Ø3	Ø4
Queue Length 50th (ft)		0		15	0					
Queue Length 95th (ft)		0		31	0					
Internal Link Dist (ft)	18			110	36					
Turn Bay Length (ft)										
Base Capacity (vph)		3197		1175	1819					
Starvation Cap Reductn		0		0	723					
Spillback Cap Reductn		495		0	0					
Storage Cap Reductn		0		0	0					
Reduced v/c Ratio		0.27		0.09	0.44					

Intersection Summary	
Area Type:	Other
Cycle Length: 73	
Actuated Cycle Length: 68.1	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.51	
Intersection Signal Delay: 1.6	Intersection LOS: A
Intersection Capacity Utilization 23.4%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 8: West Main Street

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	0	680	0	100	440	0
Future Volume (vph)	0	680	0	100	440	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	4.0	
Lane Util. Factor		0.76		0.95	0.97	
Frt		0.85		1.00	1.00	
Flt Protected		1.00		1.00	0.95	
Satd. Flow (prot)		3610		3539	3433	
Flt Permitted		1.00		1.00	0.95	
Satd. Flow (perm)		3610		3539	3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	739	0	109	478	0
RTOR Reduction (vph)	0	260	0	0	0	0
Lane Group Flow (vph)	0	479	0	109	478	0
Turn Type		pt+ov		NA	Prot	
Protected Phases		1 2		1 4	2 3	
Permitted Phases						
Actuated Green, G (s)		44.1		22.9	36.1	
Effective Green, g (s)		44.1		18.9	36.1	
Actuated g/C Ratio		0.65		0.28	0.53	
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)		2341		983	1822	
v/s Ratio Prot		c0.13		c0.03	c0.14	
v/s Ratio Perm						
v/c Ratio		0.20		0.11	0.26	
Uniform Delay, d1		4.8		18.3	8.7	
Progression Factor		1.00		1.00	0.00	
Incremental Delay, d2		0.0		0.1	0.1	
Delay (s)		4.9		18.3	0.1	
Level of Service		A		B	A	
Approach Delay (s)	4.9			18.3	0.1	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	4.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	68.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	23.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL2	WBL	WBR	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR	Ø3
Lane Configurations												
Traffic Volume (vph)	70	30	0	0	0	110	540	70	20	440	140	
Future Volume (vph)	70	30	0	0	0	110	540	70	20	440	140	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00	
Frt							0.983				0.850	
Flt Protected		0.950				0.950				0.998		
Satd. Flow (prot)	0	1770	0	0	0	1770	3479	0	0	3532	1583	
Flt Permitted		0.950				0.950				0.917		
Satd. Flow (perm)	0	1770	0	0	0	1770	3479	0	0	3245	1583	
Right Turn on Red			Yes					Yes			Yes	
Satd. Flow (RTOR)							33				152	
Link Speed (mph)		30		30			30			30		
Link Distance (ft)		98		240			116			177		
Travel Time (s)		2.2		5.5			2.6			4.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	76	33	0	0	0	120	587	76	22	478	152	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	109	0	0	0	120	663	0	0	500	152	
Turn Type	Prot	Prot				Prot	NA		Perm	NA	custom	
Protected Phases	4	4				1	1 2			2	3 4	3
Permitted Phases									2		2	
Detector Phase	4	4				1	1 2		2	2	3 4	
Switch Phase												
Minimum Initial (s)	1.0	1.0				1.0			1.0	1.0		1.0
Minimum Split (s)	19.0	19.0				6.0			20.0	20.0		5.0
Total Split (s)	19.0	19.0				14.0			34.0	34.0		6.0
Total Split (%)	26.0%	26.0%				19.2%			46.6%	46.6%		8%
Maximum Green (s)	15.0	15.0				9.0			30.0	30.0		2.0
Yellow Time (s)	3.0	3.0				3.0			3.0	3.0		3.0
All-Red Time (s)	1.0	1.0				2.0			1.0	1.0		1.0
Lost Time Adjust (s)		0.0				0.0				0.0		
Total Lost Time (s)		4.0				5.0				4.0		
Lead/Lag	Lag	Lag				Lead			Lag	Lag		Lead
Lead-Lag Optimize?	Yes	Yes				Yes			Yes	Yes		Yes
Vehicle Extension (s)	3.0	3.0				3.0			3.0	3.0		3.0
Recall Mode	None	None				None			Max	Max		None
Walk Time (s)	4.0	4.0							7.0	7.0		
Flash Dont Walk (s)	11.0	11.0							8.0	8.0		
Pedestrian Calls (#/hr)	0	0							0	0		
Act Effct Green (s)		9.9				9.0	43.1			30.1	50.1	
Actuated g/C Ratio		0.15				0.13	0.63			0.44	0.74	
v/c Ratio		0.42				0.51	0.30			0.35	0.13	
Control Delay		31.3				37.0	6.2			14.0	0.7	
Queue Delay		0.0				80.5	0.9			0.0	0.0	
Total Delay		31.3				117.5	7.0			14.0	0.7	
LOS		C				F	A			B	A	
Approach Delay		31.3					24.0			10.9		
Approach LOS		C					C			B		

Lane Group	WBL2	WBL	WBR	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR	Ø3
Queue Length 50th (ft)		42				47	51			67	0	
Queue Length 95th (ft)		85				#104	96			116	10	
Internal Link Dist (ft)		18		160			36			97		
Turn Bay Length (ft)												
Base Capacity (vph)		390				234	2214			1433	1310	
Starvation Cap Reductn		0				149	1193			0	0	
Spillback Cap Reductn		0				0	0			0	0	
Storage Cap Reductn		0				0	0			0	0	
Reduced v/c Ratio		0.28				1.41	0.65			0.35	0.12	

Intersection Summary	
Area Type:	Other
Cycle Length: 73	
Actuated Cycle Length: 68.1	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.51	
Intersection Signal Delay: 19.0	Intersection LOS: B
Intersection Capacity Utilization 46.3%	ICU Level of Service A
Analysis Period (min) 15	

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

Splits and Phases: 9: Church Street & West Main Street

Movement	WBL2	WBL	WBR	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations											
Traffic Volume (vph)	70	30	0	0	0	110	540	70	20	440	140
Future Volume (vph)	70	30	0	0	0	110	540	70	20	440	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0				5.0	5.0			4.0	4.0
Lane Util. Factor		1.00				1.00	0.95			0.95	1.00
Frt		1.00				1.00	0.98			1.00	0.85
Flt Protected		0.95				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1770				1770	3478			3531	1583
Flt Permitted		0.95				0.95	1.00			0.92	1.00
Satd. Flow (perm)		1770				1770	3478			3246	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	33	0	0	0	120	587	76	22	478	152
RTOR Reduction (vph)	0	0	0	0	0	0	12	0	0	0	49
Lane Group Flow (vph)	0	109	0	0	0	120	651	0	0	500	103
Turn Type	Prot	Prot				Prot	NA		Perm	NA	custom
Protected Phases	4	4				1	1 2			2	3 4
Permitted Phases									2		2
Actuated Green, G (s)		9.9				9.0	44.1			30.1	46.0
Effective Green, g (s)		9.9				9.0	44.1			30.1	46.0
Actuated g/C Ratio		0.15				0.13	0.65			0.44	0.68
Clearance Time (s)		4.0				5.0				4.0	
Vehicle Extension (s)		3.0				3.0				3.0	
Lane Grp Cap (vph)		257				234	2255			1436	1163
v/s Ratio Prot		c0.06				c0.07	0.19				c0.02
v/s Ratio Perm										c0.15	0.04
v/c Ratio		0.42				0.51	0.29			0.35	0.09
Uniform Delay, d1		26.5				27.5	5.2			12.5	3.8
Progression Factor		1.00				1.00	1.00			1.00	1.00
Incremental Delay, d2		1.1				1.9	0.1			0.7	0.0
Delay (s)		27.6				29.3	5.2			13.2	3.8
Level of Service		C				C	A			B	A
Approach Delay (s)		27.6		0.0			8.9			11.0	
Approach LOS		C		A			A			B	

Intersection Summary			
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	68.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	46.3%	ICU Level of Service	A
Analysis Period (min)	15		

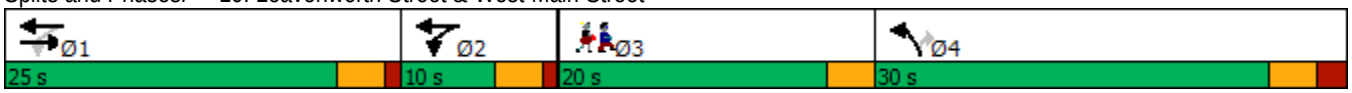
c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø3
Lane Configurations							
Traffic Volume (vph)	610	60	60	500	100	100	
Future Volume (vph)	610	60	60	500	100	100	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00	
Frt	0.987					0.850	
Flt Protected			0.950		0.950		
Satd. Flow (prot)	3493	0	1770	3539	1770	1583	
Flt Permitted			0.323		0.950		
Satd. Flow (perm)	3493	0	602	3539	1770	1583	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	11					109	
Link Speed (mph)	30			30	30		
Link Distance (ft)	289			389	436		
Travel Time (s)	6.6			8.8	9.9		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	663	65	65	543	109	109	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	728	0	65	543	109	109	
Turn Type	NA		D.P+P	NA	Prot	Perm	
Protected Phases	1		2	1 2	4		3
Permitted Phases			1			4	
Detector Phase	1		2	1 2	4	4	
Switch Phase							
Minimum Initial (s)	1.0		1.0		1.0	1.0	1.0
Minimum Split (s)	15.0		6.0		8.0	8.0	20.0
Total Split (s)	25.0		10.0		30.0	30.0	20.0
Total Split (%)	29.4%		11.8%		35.3%	35.3%	24%
Maximum Green (s)	21.0		6.0		25.0	25.0	17.0
Yellow Time (s)	3.0		3.0		3.0	3.0	3.0
All-Red Time (s)	1.0		1.0		2.0	2.0	0.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	4.0		4.0		5.0	5.0	
Lead/Lag	Lead		Lag		Lag	Lag	Lead
Lead-Lag Optimize?	Yes		Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0		3.0		3.0	3.0	3.0
Recall Mode	Max		Max		None	None	None
Walk Time (s)							8.0
Flash Dont Walk (s)							9.0
Pedestrian Calls (#/hr)							0
Act Effct Green (s)	21.4		27.5	32.6	8.2	8.2	
Actuated g/C Ratio	0.46		0.60	0.71	0.18	0.18	
v/c Ratio	0.45		0.13	0.22	0.34	0.29	
Control Delay	10.5		5.0	3.9	20.8	7.0	
Queue Delay	0.0		0.0	0.0	0.0	0.0	
Total Delay	10.5		5.0	3.9	20.8	7.0	
LOS	B		A	A	C	A	
Approach Delay	10.5			4.0	13.9		
Approach LOS	B			A	B		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø3
Queue Length 50th (ft)	70		5	26	27	0	
Queue Length 95th (ft)	118		17	50	62	31	
Internal Link Dist (ft)	209			309	356		
Turn Bay Length (ft)							
Base Capacity (vph)	1627		513	2505	978	923	
Starvation Cap Reductn	0		0	0	0	0	
Spillback Cap Reductn	0		0	0	0	0	
Storage Cap Reductn	0		0	0	0	0	
Reduced v/c Ratio	0.45		0.13	0.22	0.11	0.12	

Intersection Summary	
Area Type:	Other
Cycle Length: 85	
Actuated Cycle Length: 46.1	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.45	
Intersection Signal Delay: 8.4	Intersection LOS: A
Intersection Capacity Utilization 38.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 10: Leavenworth Street & West Main Street



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	610	60	60	500	100	100
Future Volume (vph)	610	60	60	500	100	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	5.0	5.0
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3492		1770	3539	1770	1583
Flt Permitted	1.00		0.32	1.00	0.95	1.00
Satd. Flow (perm)	3492		601	3539	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	663	65	65	543	109	109
RTOR Reduction (vph)	6	0	0	0	0	94
Lane Group Flow (vph)	722	0	65	543	109	15
Turn Type	NA		D.P+P	NA	Prot	Perm
Protected Phases	1		2	1 2	4	
Permitted Phases			1			4
Actuated Green, G (s)	21.4		27.5	31.5	6.7	6.7
Effective Green, g (s)	21.4		27.5	31.5	6.7	6.7
Actuated g/C Ratio	0.45		0.58	0.67	0.14	0.14
Clearance Time (s)	4.0		4.0		5.0	5.0
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	1583		501	2361	251	224
v/s Ratio Prot	c0.21		0.02	c0.15	c0.06	
v/s Ratio Perm			0.06			0.01
v/c Ratio	0.46		0.13	0.23	0.43	0.07
Uniform Delay, d1	8.9		6.0	3.1	18.5	17.5
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9		0.5	0.2	1.2	0.1
Delay (s)	9.8		6.5	3.3	19.7	17.7
Level of Service	A		A	A	B	B
Approach Delay (s)	9.8			3.7	18.7	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	47.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

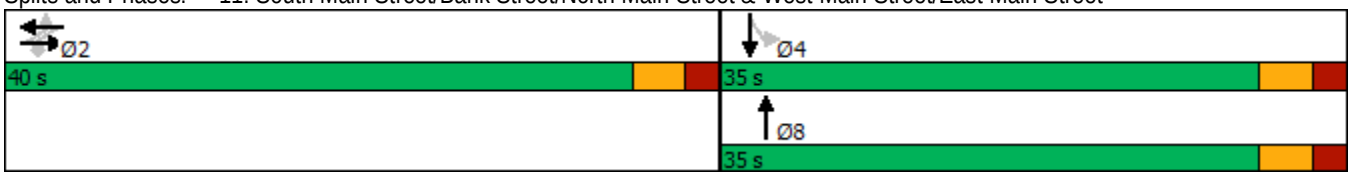
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	650	50	30	550	30	0	290	10	10	390	10
Future Volume (vph)	10	650	50	30	550	30	0	290	10	10	390	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		130	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	0.95	1.00	0.95	0.95	0.95	0.95	0.95
Frt			0.850		0.993			0.995			0.996	
Flt Protected		0.999			0.998						0.999	
Satd. Flow (prot)	0	3536	1583	0	3507	0	0	3522	0	0	3522	0
Flt Permitted		0.945			0.902						0.941	
Satd. Flow (perm)	0	3345	1583	0	3170	0	0	3522	0	0	3317	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			54		9			5			4	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		389			245			286			217	
Travel Time (s)		8.8			5.6			6.5			4.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	707	54	33	598	33	0	315	11	11	424	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	718	54	0	664	0	0	326	0	0	446	0
Turn Type	Perm	NA	Perm	Perm	NA			NA		Perm	NA	
Protected Phases		2			2			8			4	
Permitted Phases	2		2	2						4		
Detector Phase	2	2	2	2	2			8		4	4	
Switch Phase												
Minimum Initial (s)	1.0	1.0	1.0	1.0	1.0			1.0		1.0	1.0	
Minimum Split (s)	37.0	37.0	37.0	37.0	37.0			35.0		35.0	35.0	
Total Split (s)	40.0	40.0	40.0	40.0	40.0			35.0		35.0	35.0	
Total Split (%)	53.3%	53.3%	53.3%	53.3%	53.3%			46.7%		46.7%	46.7%	
Maximum Green (s)	35.0	35.0	35.0	35.0	35.0			30.0		30.0	30.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0			3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0			2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0			0.0			0.0	
Total Lost Time (s)		5.0	5.0		5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0		3.0	3.0	
Recall Mode	Max	Max	Max	Max	Max			None		None	None	
Walk Time (s)	12.0	12.0	12.0	12.0	12.0			12.0		12.0	12.0	
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0			18.0		18.0	18.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0		0	0	
Act Effct Green (s)		35.1	35.1		35.1			13.3			13.3	
Actuated g/C Ratio		0.60	0.60		0.60			0.23			0.23	
v/c Ratio		0.36	0.06		0.35			0.40			0.59	
Control Delay		7.1	2.3		6.9			20.2			23.2	
Queue Delay		0.0	0.0		0.0			0.0			0.0	
Total Delay		7.1	2.3		6.9			20.2			23.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A	A		A			C			C	
Approach Delay		6.7			6.9			20.2			23.2	
Approach LOS		A			A			C			C	
Queue Length 50th (ft)		55	0		50			50			72	
Queue Length 95th (ft)		108	13		100			81			111	
Internal Link Dist (ft)		309			165			206			137	
Turn Bay Length (ft)			130									
Base Capacity (vph)		2009	972		1908			1816			1710	
Starvation Cap Reductn		0	0		0			0			165	
Spillback Cap Reductn		0	0		0			0			0	
Storage Cap Reductn		0	0		0			0			0	
Reduced v/c Ratio		0.36	0.06		0.35			0.18			0.29	

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 58.4
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.59
Intersection Signal Delay: 12.1 Intersection LOS: B
Intersection Capacity Utilization 65.2% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 11: South Main Street/Bank Street/North Main Street & West Main Street/East Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	650	50	30	550	30	0	290	10	10	390	10
Future Volume (vph)	10	650	50	30	550	30	0	290	10	10	390	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0			5.0			5.0	
Lane Util. Factor		0.95	1.00		0.95			0.95			0.95	
Frt		1.00	0.85		0.99			0.99			1.00	
Flt Protected		1.00	1.00		1.00			1.00			1.00	
Satd. Flow (prot)		3537	1583		3504			3521			3522	
Flt Permitted		0.94	1.00		0.90			1.00			0.94	
Satd. Flow (perm)		3344	1583		3168			3521			3320	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	707	54	33	598	33	0	315	11	11	424	11
RTOR Reduction (vph)	0	0	22	0	4	0	0	4	0	0	3	0
Lane Group Flow (vph)	0	718	32	0	660	0	0	322	0	0	443	0
Turn Type	Perm	NA	Perm	Perm	NA			NA		Perm	NA	
Protected Phases		2			2			8			4	
Permitted Phases	2		2	2						4		
Actuated Green, G (s)		35.1	35.1		35.1			13.3			13.3	
Effective Green, g (s)		35.1	35.1		35.1			13.3			13.3	
Actuated g/C Ratio		0.60	0.60		0.60			0.23			0.23	
Clearance Time (s)		5.0	5.0		5.0			5.0			5.0	
Vehicle Extension (s)		3.0	3.0		3.0			3.0			3.0	
Lane Grp Cap (vph)		2009	951		1904			801			756	
v/s Ratio Prot								0.09				
v/s Ratio Perm		c0.21	0.02		0.21						c0.13	
v/c Ratio		0.36	0.03		0.35			0.40			0.59	
Uniform Delay, d1		5.9	4.7		5.9			19.2			20.1	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		0.5	0.1		0.5			0.3			1.2	
Delay (s)		6.4	4.8		6.4			19.5			21.3	
Level of Service		A	A		A			B			C	
Approach Delay (s)		6.3			6.4			19.5			21.3	
Approach LOS		A			A			B			C	

Intersection Summary			
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	58.4	Sum of lost time (s)	10.0
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	110	50	120	210	360	120	
Future Volume (vph)	110	50	120	210	360	120	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	
Frt		0.850			0.963		
Flt Protected	0.950		0.950				
Satd. Flow (prot)	1770	1583	1770	1863	3408	0	
Flt Permitted	0.950		0.950				
Satd. Flow (perm)	1770	1583	1770	1863	3408	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)		54			45		
Link Speed (mph)	30			30	30		
Link Distance (ft)	207			217	246		
Travel Time (s)	4.7			4.9	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	120	54	130	228	391	130	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	120	54	130	228	521	0	
Turn Type	Prot	Perm	Prot	NA	NA		
Protected Phases	4		2	1 2	1		3
Permitted Phases		4					
Detector Phase	4	4	2	1 2	1		
Switch Phase							
Minimum Initial (s)	1.0	1.0	1.0		1.0		1.0
Minimum Split (s)	10.0	10.0	20.0		10.0		18.0
Total Split (s)	25.0	25.0	25.0		30.0		18.0
Total Split (%)	25.5%	25.5%	25.5%		30.6%		18%
Maximum Green (s)	21.0	21.0	21.0		26.0		15.0
Yellow Time (s)	3.0	3.0	3.0		3.0		3.0
All-Red Time (s)	1.0	1.0	1.0		1.0		0.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		
Total Lost Time (s)	4.0	4.0	4.0		4.0		
Lead/Lag	Lag	Lag	Lag		Lead		Lead
Lead-Lag Optimize?	Yes	Yes	Yes		Yes		Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0		3.0
Recall Mode	None	None	Max		None		None
Walk Time (s)							6.0
Flash Dont Walk (s)							9.0
Pedestrian Calls (#/hr)							0
Act Effct Green (s)	9.6	9.6	21.8	42.5	15.3		
Actuated g/C Ratio	0.17	0.17	0.39	0.76	0.27		
v/c Ratio	0.40	0.17	0.19	0.16	0.54		
Control Delay	27.2	9.1	16.2	3.6	18.7		
Queue Delay	0.0	0.0	0.5	0.6	0.0		
Total Delay	27.2	9.1	16.6	4.2	18.7		
LOS	C	A	B	A	B		
Approach Delay	21.6			8.7	18.7		
Approach LOS	C			A	B		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Queue Length 50th (ft)	38	0	30	21	73		
Queue Length 95th (ft)	89	26	81	49	123		
Internal Link Dist (ft)	127			137	166		
Turn Bay Length (ft)							
Base Capacity (vph)	687	647	687	1403	1661		
Starvation Cap Reductn	0	0	284	849	0		
Spillback Cap Reductn	0	0	0	0	0		
Storage Cap Reductn	0	0	0	0	0		
Reduced v/c Ratio	0.17	0.08	0.32	0.41	0.31		

Intersection Summary	
Area Type: Other	
Cycle Length: 98	
Actuated Cycle Length: 56.2	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.54	
Intersection Signal Delay: 15.8	Intersection LOS: B
Intersection Capacity Utilization 36.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 12: North Main Street & West Main Street

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	110	50	120	210	360	120
Future Volume (vph)	110	50	120	210	360	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	
Frt	1.00	0.85	1.00	1.00	0.96	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1770	1583	1770	1863	3407	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1770	1583	1770	1863	3407	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	120	54	130	228	391	130
RTOR Reduction (vph)	0	47	0	0	33	0
Lane Group Flow (vph)	120	7	130	228	488	0
Turn Type	Prot	Perm	Prot	NA	NA	
Protected Phases	4		2	1 2	1	
Permitted Phases		4				
Actuated Green, G (s)	7.8	7.8	21.8	41.1	15.3	
Effective Green, g (s)	7.8	7.8	21.8	41.1	15.3	
Actuated g/C Ratio	0.14	0.14	0.38	0.72	0.27	
Clearance Time (s)	4.0	4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	242	217	678	1345	916	
v/s Ratio Prot	c0.07		c0.07	0.12	c0.14	
v/s Ratio Perm		0.00				
v/c Ratio	0.50	0.03	0.19	0.17	0.53	
Uniform Delay, d1	22.7	21.3	11.7	2.5	17.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.6	0.1	0.6	0.1	0.6	
Delay (s)	24.3	21.3	12.3	2.6	18.3	
Level of Service	C	C	B	A	B	
Approach Delay (s)	23.4			6.1	18.3	
Approach LOS	C			A	B	

Intersection Summary			
HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	56.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	36.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	90	40	70	50	20	10	70	60	20	150	10
Future Volume (vph)	10	90	40	70	50	20	10	70	60	20	150	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.962			0.980			0.942			0.992	
Flt Protected		0.996			0.976			0.996			0.994	
Satd. Flow (prot)	0	1785	0	0	1782	0	0	1748	0	0	1837	0
Flt Permitted		0.996			0.976			0.996			0.994	
Satd. Flow (perm)	0	1785	0	0	1782	0	0	1748	0	0	1837	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		218			342			176			213	
Travel Time (s)		5.0			7.8			4.0			4.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	98	43	76	54	22	11	76	65	22	163	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	152	0	0	152	0	0	152	0	0	196	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 39.7%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	90	40	70	50	20	10	70	60	20	150	10
Future Volume (Veh/h)	10	90	40	70	50	20	10	70	60	20	150	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	98	43	76	54	22	11	76	65	22	163	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	392	376	168	435	348	108	174			141		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	392	376	168	435	348	108	174			141		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	82	95	82	90	98	99			98		
cM capacity (veh/h)	505	543	876	428	562	945	1403			1442		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	152	152	152	196
Volume Left	11	76	11	22
Volume Right	43	22	65	11
cSH	605	512	1403	1442
Volume to Capacity	0.25	0.30	0.01	0.02
Queue Length 95th (ft)	25	31	1	1
Control Delay (s)	12.9	15.0	0.6	1.0
Lane LOS	B	B	A	A
Approach Delay (s)	12.9	15.0	0.6	1.0
Approach LOS	B	B		

Intersection Summary				
Average Delay		6.9		
Intersection Capacity Utilization		39.7%	ICU Level of Service	A
Analysis Period (min)		15		

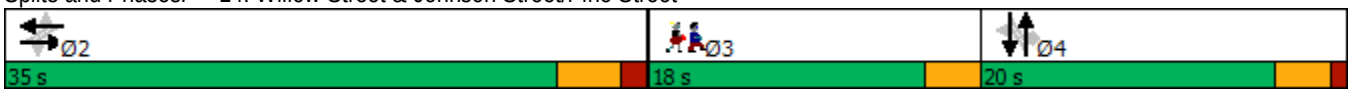
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	130	50	140	50	10	30	260	90	10	260	10
Future Volume (vph)	10	130	50	140	50	10	30	260	90	10	260	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.965			0.993				0.850		0.995	
Flt Protected		0.997			0.966			0.995			0.998	
Satd. Flow (prot)	0	1792	0	0	1787	0	0	1853	1583	0	1850	0
Flt Permitted		0.977			0.722			0.947			0.985	
Satd. Flow (perm)	0	1756	0	0	1335	0	0	1764	1583	0	1826	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		30			4				98		2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		273			331			761			180	
Travel Time (s)		6.2			7.5			17.3			4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	141	54	152	54	11	33	283	98	11	283	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	206	0	0	217	0	0	316	98	0	305	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4		4	4		
Detector Phase	2	2		2	2		4	4	4	4	4	
Switch Phase												
Minimum Initial (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Minimum Split (s)	10.0	10.0		10.0	10.0		7.0	7.0	7.0	7.0	7.0	
Total Split (s)	35.0	35.0		35.0	35.0		20.0	20.0	20.0	20.0	20.0	
Total Split (%)	47.9%	47.9%		47.9%	47.9%		27.4%	27.4%	27.4%	27.4%	27.4%	
Maximum Green (s)	30.0	30.0		30.0	30.0		16.0	16.0	16.0	16.0	16.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0	0.0		0.0	
Total Lost Time (s)		5.0			5.0			4.0	4.0		4.0	
Lead/Lag							Lag	Lag	Lag	Lag	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min		Min	Min		None	None	None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		11.8			11.8			14.1	14.1		14.1	
Actuated g/C Ratio		0.34			0.34			0.40	0.40		0.40	
v/c Ratio		0.34			0.48			0.45	0.14		0.42	
Control Delay		9.3			13.4			10.9	3.2		10.4	
Queue Delay		0.0			0.0			0.0	0.0		0.0	
Total Delay		9.3			13.4			10.9	3.2		10.4	
LOS		A			B			B	A		B	
Approach Delay		9.3			13.4			9.1			10.4	
Approach LOS		A			B			A			B	

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	18.0
Total Split (s)	18.0
Total Split (%)	25%
Maximum Green (s)	15.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	8.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		26			34			38	0		36	
Queue Length 95th (ft)		58			73			109	20		103	
Internal Link Dist (ft)		193			251			681			100	
Turn Bay Length (ft)												
Base Capacity (vph)		1498			1136			824	791		854	
Starvation Cap Reductn		0			0			0	0		0	
Spillback Cap Reductn		0			0			0	0		0	
Storage Cap Reductn		0			0			0	0		0	
Reduced v/c Ratio		0.14			0.19			0.38	0.12		0.36	

Intersection Summary	
Area Type:	Other
Cycle Length: 73	
Actuated Cycle Length: 35.2	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.48	
Intersection Signal Delay: 10.3	Intersection LOS: B
Intersection Capacity Utilization 59.5%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 14: Willow Street & Johnson Street/Pine Street



Lane Group	Ø3
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	130	50	140	50	10	30	260	90	10	260	10
Future Volume (vph)	10	130	50	140	50	10	30	260	90	10	260	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			4.0	4.0		4.0	
Lane Util. Factor		1.00			1.00			1.00	1.00		1.00	
Frt		0.96			0.99			1.00	0.85		1.00	
Flt Protected		1.00			0.97			0.99	1.00		1.00	
Satd. Flow (prot)		1792			1787			1853	1583		1850	
Flt Permitted		0.98			0.72			0.95	1.00		0.98	
Satd. Flow (perm)		1756			1337			1763	1583		1826	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	141	54	152	54	11	33	283	98	11	283	11
RTOR Reduction (vph)	0	20	0	0	3	0	0	0	58	0	1	0
Lane Group Flow (vph)	0	186	0	0	214	0	0	316	40	0	304	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4		4	4		
Actuated Green, G (s)		11.8			11.8			14.1	14.1		14.1	
Effective Green, g (s)		11.8			11.8			14.1	14.1		14.1	
Actuated g/C Ratio		0.34			0.34			0.40	0.40		0.40	
Clearance Time (s)		5.0			5.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		593			452			712	639		737	
v/s Ratio Prot												
v/s Ratio Perm		0.11			c0.16			c0.18	0.03		0.17	
v/c Ratio		0.31			0.47			0.44	0.06		0.41	
Uniform Delay, d1		8.6			9.1			7.6	6.4		7.4	
Progression Factor		1.00			1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.3			0.8			0.4	0.0		0.4	
Delay (s)		8.9			9.9			8.0	6.4		7.8	
Level of Service		A			A			A	A		A	
Approach Delay (s)		8.9			9.9			7.6			7.8	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	34.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	WBR2	SBL	SBR	SEL	SER
Lane Configurations									
Traffic Volume (vph)	80	180	100	100	30	0	0	0	0
Future Volume (vph)	80	180	100	100	30	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.924						
Flt Protected		0.985							
Satd. Flow (prot)	0	1835	1721	0	0	0	0	0	0
Flt Permitted		0.985							
Satd. Flow (perm)	0	1835	1721	0	0	0	0	0	0
Link Speed (mph)		30	30			30		30	
Link Distance (ft)		98	502			174		190	
Travel Time (s)		2.2	11.4			4.0		4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	196	109	109	33	0	0	0	0
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	283	251	0	0	0	0	0	0
Sign Control		Free	Free			Stop		Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 33.8%	ICU Level of Service A
Analysis Period (min) 15	

Intersection has too many legs for HCM analysis.

Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	SBR	SEL	SER	SER2	Ø5	Ø6
Lane Configurations												
Traffic Volume (vph)	530	120	237	400	247	131	101	275	122	120		
Future Volume (vph)	530	120	237	400	247	131	101	275	122	120		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)		40	0		0		0	230	0			
Storage Lanes		1	1		1		0	1	1			
Taper Length (ft)			25		25			25				
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00		
Frt		0.850				0.935			0.850			
Flt Protected			0.950		0.950			0.950				
Satd. Flow (prot)	1863	1583	1770	3539	1770	1742	0	1770	1583	0		
Flt Permitted			0.099		0.950			0.950				
Satd. Flow (perm)	1863	1583	184	3539	1770	1742	0	1770	1583	0		
Right Turn on Red		Yes								Yes		
Satd. Flow (RTOR)		82							82			
Link Speed (mph)	30			30		30		30				
Link Distance (ft)	237			379		329		394				
Travel Time (s)	5.4			8.6		7.5		9.0				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Adj. Flow (vph)	576	130	258	435	268	142	110	299	133	130		
Shared Lane Traffic (%)												
Lane Group Flow (vph)	576	130	258	435	268	252	0	299	263	0		
Turn Type	NA	Perm	pm+pt	NA	Split	NA		Prot	Prot			
Protected Phases	1		2	1 2	3	3		4	4		5	6
Permitted Phases		1	1 2									
Minimum Split (s)	14.0	14.0	7.0		13.0	13.0		13.0	13.0		22.0	6.0
Total Split (s)	46.0	46.0	21.0		25.0	25.0		28.0	28.0		45.0	22.0
Total Split (%)	38.3%	38.3%	17.5%		20.8%	20.8%		23.3%	23.3%		38%	18%
Maximum Green (s)	42.0	42.0	17.0		21.0	21.0		24.0	24.0		41.0	18.0
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0			
Total Lost Time (s)	4.0	4.0	4.0		4.0	4.0		4.0	4.0			
Lead/Lag	Lead	Lead	Lag		Lead	Lead		Lag	Lag		Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes
Act Effct Green (s)	42.0	42.0	59.0	63.0	21.0	21.0		24.0	24.0			
Actuated g/C Ratio	0.35	0.35	0.49	0.52	0.18	0.18		0.20	0.20			
v/c Ratio	0.88	0.21	0.82	0.23	0.87	0.83		0.84	0.69			
Control Delay	53.5	12.1	45.0	7.6	75.2	70.7		68.1	40.6			
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0			
Total Delay	53.5	12.1	45.0	7.6	75.2	70.7		68.1	40.6			
LOS	D	B	D	A	E	E		E	D			
Approach Delay	45.9			21.6		73.0		55.3				
Approach LOS	D			C		E		E				
Queue Length 50th (ft)	417	25	161	35	204	190		225	132			
Queue Length 95th (ft)	#624	70	m204	m41	#353	#328		#376	228			
Internal Link Dist (ft)	157			299		249		314				
Turn Bay Length (ft)		40						230				
Base Capacity (vph)	652	607	315	1857	309	304		354	382			

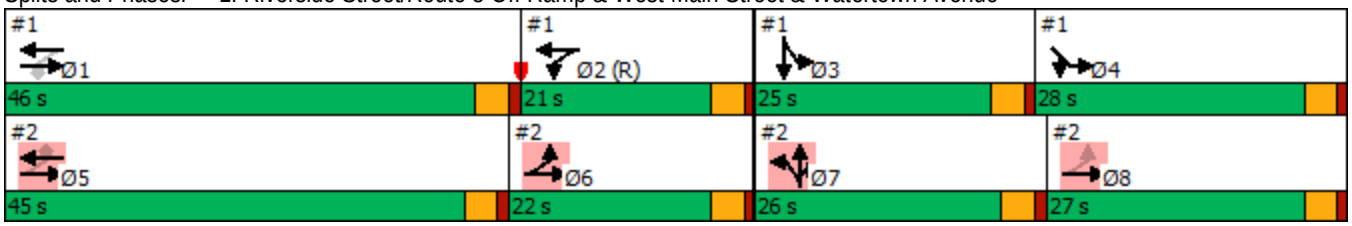
Lane Group	Ø7	Ø8
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	7	8
Permitted Phases		
Minimum Split (s)	18.0	22.5
Total Split (s)	26.0	27.0
Total Split (%)	22%	23%
Maximum Green (s)	22.0	23.0
Yellow Time (s)	3.0	3.0
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		

Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	SBR	SEL	SER	SER2	Ø5	Ø6
Starvation Cap Reductn	0	0	0	0	0	0		0	0			
Spillback Cap Reductn	0	0	0	0	0	0		0	0			
Storage Cap Reductn	0	0	0	0	0	0		0	0			
Reduced v/c Ratio	0.88	0.21	0.82	0.23	0.87	0.83		0.84	0.69			

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:WBTL, Start of Green
Natural Cycle: 90
Control Type: Pretimed
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 46.9 Intersection LOS: D
Intersection Capacity Utilization 83.3% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Riverside Street/Route 8 Off Ramp & West Main Street & Watertown Avenue



Lane Group	Ø7	Ø8
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	SEL	SER	SER2
Lane Configurations										
Traffic Volume (vph)	530	120	237	400	247	131	101	275	122	120
Future Volume (vph)	530	120	237	400	247	131	101	275	122	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00		1.00	1.00	
Frt	1.00	0.85	1.00	1.00	1.00	0.93		1.00	0.85	
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1863	1583	1770	3539	1770	1741		1770	1583	
Flt Permitted	1.00	1.00	0.10	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1863	1583	185	3539	1770	1741		1770	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	576	130	258	435	268	142	110	299	133	130
RTOR Reduction (vph)	0	53	0	0	0	0	0	0	66	0
Lane Group Flow (vph)	576	77	258	435	268	252	0	299	197	0
Turn Type	NA	Perm	pm+pt	NA	Split	NA		Prot	Prot	
Protected Phases	1		2	1 2	3	3		4	4	
Permitted Phases		1	1 2							
Actuated Green, G (s)	42.0	42.0	59.0	63.0	21.0	21.0		24.0	24.0	
Effective Green, g (s)	42.0	42.0	59.0	63.0	21.0	21.0		24.0	24.0	
Actuated g/C Ratio	0.35	0.35	0.49	0.52	0.18	0.18		0.20	0.20	
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	652	554	315	1857	309	304		354	316	
v/s Ratio Prot	c0.31		c0.12	c0.12	c0.15	0.14		c0.17	0.12	
v/s Ratio Perm		0.05	0.29							
v/c Ratio	0.88	0.14	0.82	0.23	0.87	0.83		0.84	0.62	
Uniform Delay, d1	36.7	26.6	44.0	15.4	48.1	47.8		46.2	43.9	
Progression Factor	1.00	1.00	0.72	0.48	1.00	1.00		1.00	1.00	
Incremental Delay, d2	16.0	0.5	13.9	0.2	26.4	22.3		21.2	9.0	
Delay (s)	52.7	27.2	45.4	7.6	74.5	70.0		67.4	52.9	
Level of Service	D	C	D	A	E	E		E	D	
Approach Delay (s)	48.0			21.7		72.4		60.6		
Approach LOS	D			C		E		E		

Intersection Summary			
HCM 2000 Control Delay	48.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	880	0	0	510	530	110	410	140	0	0	0
Future Volume (vph)	250	880	0	0	510	530	110	410	140	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1770	3539	0	0	1863	1583	1770	3539	1583	0	0	0
Flt Permitted	0.457						0.950					
Satd. Flow (perm)	851	3539	0	0	1863	1583	1770	3539	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						424			152			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		379			838			247			271	
Travel Time (s)		8.6			19.0			5.6			6.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	272	957	0	0	554	576	120	446	152	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	272	957	0	0	554	576	120	446	152	0	0	0
Turn Type	custom	NA			NA	Perm	Split	NA	Prot			
Protected Phases	6	5 6 8			5		7	7	7			
Permitted Phases	5 8					5						
Minimum Split (s)	6.0				22.0	22.0	18.0	18.0	18.0			
Total Split (s)	22.0				45.0	45.0	26.0	26.0	26.0			
Total Split (%)	18.3%				37.5%	37.5%	21.7%	21.7%	21.7%			
Maximum Green (s)	18.0				41.0	41.0	22.0	22.0	22.0			
Yellow Time (s)	3.0				3.0	3.0	3.0	3.0	3.0			
All-Red Time (s)	1.0				1.0	1.0	1.0	1.0	1.0			
Lost Time Adjust (s)	0.0				0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	4.0				4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lag				Lead	Lead	Lead	Lead	Lead			
Lead-Lag Optimize?	Yes				Yes	Yes	Yes	Yes	Yes			
Act Effct Green (s)	86.0	90.0			41.0	41.0	22.0	22.0	22.0			
Actuated g/C Ratio	0.72	0.75			0.34	0.34	0.18	0.18	0.18			
v/c Ratio	0.36	0.36			0.87	0.70	0.37	0.69	0.37			
Control Delay	4.3	3.3			53.0	13.9	46.8	52.0	9.3			
Queue Delay	0.1	1.0			0.0	0.0	0.0	0.0	0.0			
Total Delay	4.4	4.3			53.0	13.9	46.8	52.0	9.3			
LOS	A	A			D	B	D	D	A			
Approach Delay		4.3			33.0			42.1				
Approach LOS		A			C			D				
Queue Length 50th (ft)	45	97			400	94	82	171	0			
Queue Length 95th (ft)	m46	m108			#598	235	142	229	57			
Internal Link Dist (ft)		299			758			167			191	
Turn Bay Length (ft)												
Base Capacity (vph)	747	2654			636	819	324	648	414			
Starvation Cap Reductn	72	1352			0	0	0	0	0			
Spillback Cap Reductn	0	0			0	0	0	0	0			
Storage Cap Reductn	0	0			0	0	0	0	0			

Lane Group	Ø1	Ø2	Ø3	Ø4	Ø8
Lane Configurations					
Traffic Volume (vph)					
Future Volume (vph)					
Ideal Flow (vphpl)					
Lane Util. Factor					
Frt					
Flt Protected					
Satd. Flow (prot)					
Flt Permitted					
Satd. Flow (perm)					
Right Turn on Red					
Satd. Flow (RTOR)					
Link Speed (mph)					
Link Distance (ft)					
Travel Time (s)					
Peak Hour Factor					
Adj. Flow (vph)					
Shared Lane Traffic (%)					
Lane Group Flow (vph)					
Turn Type					
Protected Phases	1	2	3	4	8
Permitted Phases					
Minimum Split (s)	14.0	7.0	13.0	13.0	22.5
Total Split (s)	46.0	21.0	25.0	28.0	27.0
Total Split (%)	38%	18%	21%	23%	23%
Maximum Green (s)	42.0	17.0	21.0	24.0	23.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)					
Total Lost Time (s)					
Lead/Lag	Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes
Act Effct Green (s)					
Actuated g/C Ratio					
v/c Ratio					
Control Delay					
Queue Delay					
Total Delay					
LOS					
Approach Delay					
Approach LOS					
Queue Length 50th (ft)					
Queue Length 95th (ft)					
Internal Link Dist (ft)					
Turn Bay Length (ft)					
Base Capacity (vph)					
Starvation Cap Reductn					
Spillback Cap Reductn					
Storage Cap Reductn					

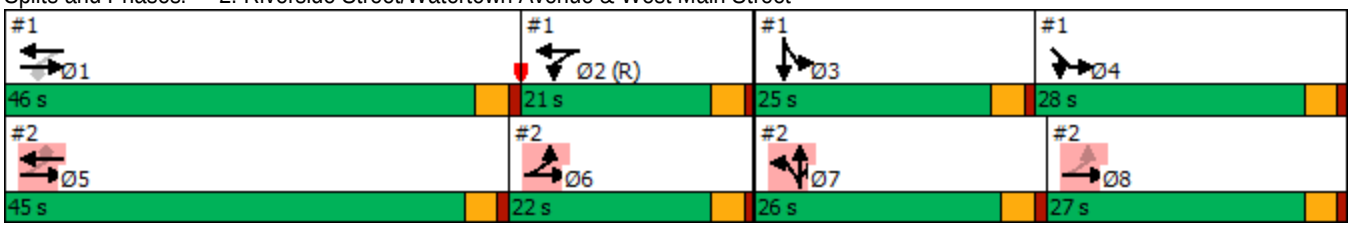
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Reduced v/c Ratio	0.40	0.74			0.87	0.70	0.37	0.69	0.37			

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:WBTL, Start of Green	
Natural Cycle: 90	
Control Type: Pretimed	
Maximum v/c Ratio: 0.88	
Intersection Signal Delay: 23.7	Intersection LOS: C
Intersection Capacity Utilization 68.0%	ICU Level of Service C
Analysis Period (min) 15	

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

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

Splits and Phases: 2: Riverside Street/Watertown Avenue & West Main Street



Lane Group	Ø1	Ø2	Ø3	Ø4	Ø8
Reduced v/c Ratio					

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	880	0	0	510	530	110	410	140	0	0	0
Future Volume (vph)	250	880	0	0	510	530	110	410	140	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	1.00	0.95			1.00	1.00	1.00	0.95	1.00			
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00			
Satd. Flow (prot)	1770	3539			1863	1583	1770	3539	1583			
Flt Permitted	0.46	1.00			1.00	1.00	0.95	1.00	1.00			
Satd. Flow (perm)	851	3539			1863	1583	1770	3539	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	272	957	0	0	554	576	120	446	152	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	279	0	0	127	0	0	0
Lane Group Flow (vph)	272	957	0	0	554	297	120	446	25	0	0	0
Turn Type	custom	NA			NA	Perm	Split	NA	Prot			
Protected Phases	6	5 6 8			5		7	7	7			
Permitted Phases	5 8					5						
Actuated Green, G (s)	88.1	92.1			41.0	41.0	19.9	19.9	19.9			
Effective Green, g (s)	88.1	92.1			41.0	41.0	19.9	19.9	19.9			
Actuated g/C Ratio	0.73	0.77			0.34	0.34	0.17	0.17	0.17			
Clearance Time (s)	4.0				4.0	4.0	4.0	4.0	4.0			
Lane Grp Cap (vph)	762	2716			636	540	293	586	262			
v/s Ratio Prot	0.05	c0.27			c0.30		0.07	c0.13	0.02			
v/s Ratio Perm	c0.21					0.19						
v/c Ratio	0.36	0.35			0.87	0.55	0.41	0.76	0.10			
Uniform Delay, d1	6.2	4.4			37.0	32.0	44.8	47.8	42.4			
Progression Factor	0.59	0.59			1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2	0.7	0.2			15.2	4.0	4.2	9.0	0.7			
Delay (s)	4.4	2.8			52.2	36.0	49.0	56.8	43.2			
Level of Service	A	A			D	D	D	E	D			
Approach Delay (s)		3.2			43.9			52.6			0.0	
Approach LOS		A			D			D			A	

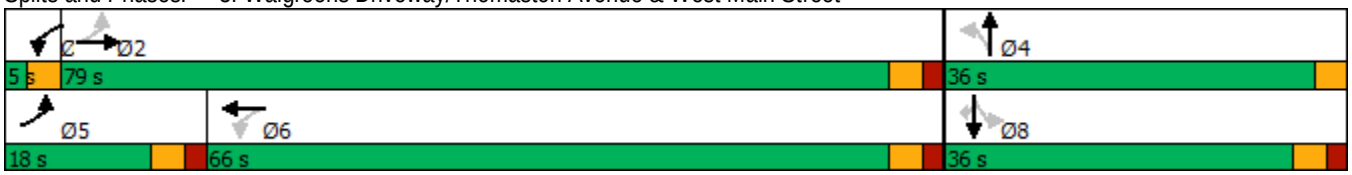
Intersection Summary			
HCM 2000 Control Delay	29.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	68.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	200	810	10	10	710	270	20	0	0	220	10	350
Future Volume (vph)	200	810	10	10	710	270	20	0	0	220	10	350
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.998			0.959							0.850
Flt Protected	0.950				0.999			0.950			0.954	
Satd. Flow (prot)	1770	1859	0	0	3391	0	0	1770	0	0	1777	1583
Flt Permitted	0.127				0.944			0.469			0.719	
Satd. Flow (perm)	237	1859	0	0	3204	0	0	874	0	0	1339	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			65							281
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		838			338			196			228	
Travel Time (s)		19.0			7.7			4.5			5.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	217	880	11	11	772	293	22	0	0	239	11	380
Shared Lane Traffic (%)												
Lane Group Flow (vph)	217	891	0	0	1076	0	0	22	0	0	250	380
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2			6			4			8		8
Detector Phase	5	2		1	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0		1.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	10.0	22.5		5.0	22.5		26.0	26.0		10.0	10.0	10.0
Total Split (s)	18.0	79.0		5.0	66.0		36.0	36.0		36.0	36.0	36.0
Total Split (%)	15.0%	65.8%		4.2%	55.0%		30.0%	30.0%		30.0%	30.0%	30.0%
Maximum Green (s)	13.0	74.0		2.0	61.0		33.0	33.0		31.0	31.0	31.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		0.0	2.0		0.0	0.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	0.0
Total Lost Time (s)	5.0	5.0			5.0			3.0			5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Min		None	Min		None	None		None	None	None
Walk Time (s)							7.0	7.0				
Flash Dont Walk (s)							16.0	16.0				
Pedestrian Calls (#/hr)							0	0				
Act Effct Green (s)	54.7	54.7			37.7			24.3			22.2	22.2
Actuated g/C Ratio	0.63	0.63			0.43			0.28			0.25	0.25
v/c Ratio	0.61	0.77			0.76			0.09			0.74	0.62
Control Delay	20.1	17.9			23.9			28.4			46.2	14.0
Queue Delay	0.0	0.0			0.0			0.0			0.0	0.0
Total Delay	20.1	18.0			23.9			28.4			46.2	14.0
LOS	C	B			C			C			D	B
Approach Delay		18.4			23.9			28.4			26.7	
Approach LOS		B			C			C			C	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	46	316			241			9			125	43
Queue Length 95th (ft)	136	585			368			33			263	159
Internal Link Dist (ft)		758			258			116			148	
Turn Bay Length (ft)												
Base Capacity (vph)	389	1565			2354			349			503	769
Starvation Cap Reductn	0	34			0			0			0	0
Spillback Cap Reductn	0	0			0			0			0	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.56	0.58			0.46			0.06			0.50	0.49

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 87.5	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 22.4	Intersection LOS: C
Intersection Capacity Utilization 96.1%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 3: Walgreens Driveway/Thomaston Avenue & West Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	200	810	10	10	710	270	20	0	0	220	10	350
Future Volume (vph)	200	810	10	10	710	270	20	0	0	220	10	350
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0			3.0			5.0	5.0
Lane Util. Factor	1.00	1.00			0.95			1.00			1.00	1.00
Frt	1.00	1.00			0.96			1.00			1.00	0.85
Flt Protected	0.95	1.00			1.00			0.95			0.95	1.00
Satd. Flow (prot)	1770	1859			3393			1770			1778	1583
Flt Permitted	0.13	1.00			0.94			0.47			0.72	1.00
Satd. Flow (perm)	236	1859			3205			873			1340	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	217	880	11	11	772	293	22	0	0	239	11	380
RTOR Reduction (vph)	0	0	0	0	37	0	0	0	0	0	0	209
Lane Group Flow (vph)	217	891	0	0	1039	0	0	22	0	0	250	171
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2			6			4			8		8
Actuated Green, G (s)	54.7	54.7			38.0			24.3			22.3	22.3
Effective Green, g (s)	54.7	54.7			38.0			24.3			22.3	22.3
Actuated g/C Ratio	0.63	0.63			0.44			0.28			0.26	0.26
Clearance Time (s)	5.0	5.0			5.0			3.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	354	1168			1399			243			343	405
v/s Ratio Prot	0.08	c0.48										
v/s Ratio Perm	0.30				0.32			0.03			c0.19	0.11
v/c Ratio	0.61	0.76			0.74			0.09			0.73	0.42
Uniform Delay, d1	12.0	11.5			20.4			23.2			29.6	27.0
Progression Factor	1.00	1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2	3.1	3.0			2.2			0.2			7.5	0.7
Delay (s)	15.1	14.5			22.6			23.3			37.1	27.7
Level of Service	B	B			C			C			D	C
Approach Delay (s)		14.6			22.6			23.3			31.4	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	21.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	87.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	96.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	180	820	850	60	30	180
Future Volume (vph)	180	820	850	60	30	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			0	100	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.991			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1846	0	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	1846	0	1770	1583
Link Speed (mph)		30	30		30	
Link Distance (ft)		169	487		207	
Travel Time (s)		3.8	11.1		4.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	891	924	65	33	196
Shared Lane Traffic (%)						
Lane Group Flow (vph)	196	891	989	0	33	196
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 71.7%	ICU Level of Service C
Analysis Period (min) 15	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	180	820	850	60	30	180
Future Volume (Veh/h)	180	820	850	60	30	180
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	196	891	924	65	33	196
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		650	921			
pX, platoon unblocked	0.87				0.74	0.87
vC, conflicting volume	989				2240	956
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	913				2109	876
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	70				0	35
cM capacity (veh/h)	650				29	303

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	196	891	989	33	196
Volume Left	196	0	0	33	0
Volume Right	0	0	65	0	196
cSH	650	1700	1700	29	303
Volume to Capacity	0.30	0.52	0.58	1.14	0.65
Queue Length 95th (ft)	32	0	0	95	105
Control Delay (s)	12.9	0.0	0.0	417.8	36.2
Lane LOS	B			F	E
Approach Delay (s)	2.3		0.0	91.2	
Approach LOS				F	

Intersection Summary			
Average Delay	10.2		
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		

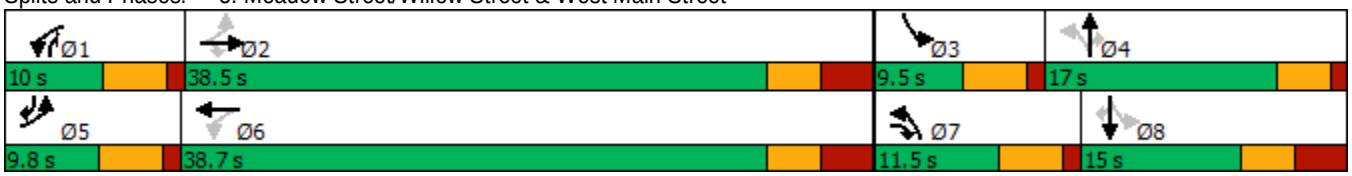
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	438	162	84	304	33	163	252	130	120	163	258
Future Volume (vph)	50	438	162	84	304	33	163	252	130	120	163	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		100	100		0	0		50	0		0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.985				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1835	0	1770	1863	1583	1770	1863	1583
Flt Permitted	0.463			0.344			0.462			0.408		
Satd. Flow (perm)	862	1863	1583	641	1835	0	861	1863	1583	760	1863	1583
Right Turn on Red			No			No			Yes			Yes
Satd. Flow (RTOR)									109			280
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		434			464			449			348	
Travel Time (s)		9.9			10.5			10.2			7.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	476	176	91	330	36	177	274	141	130	177	280
Shared Lane Traffic (%)												
Lane Group Flow (vph)	54	476	176	91	366	0	177	274	141	130	177	280
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	5	2	7	1	6		7	4	1	3	8	5
Permitted Phases	2		2	6			4		4	8		8
Detector Phase	5	2	7	1	6		7	4	1	3	8	5
Switch Phase												
Minimum Initial (s)	5.0	1.0	5.0	5.0	1.0		5.0	1.0	5.0	5.0	1.0	5.0
Minimum Split (s)	9.5	15.0	9.5	9.5	15.0		9.5	6.0	9.5	9.5	8.0	9.5
Total Split (s)	9.8	38.5	11.5	10.0	38.7		11.5	17.0	10.0	9.5	15.0	9.8
Total Split (%)	13.1%	51.3%	15.3%	13.3%	51.6%		15.3%	22.7%	13.3%	12.7%	20.0%	13.1%
Maximum Green (s)	5.3	32.5	7.0	5.5	32.7		7.0	13.0	5.5	5.0	9.0	5.3
Yellow Time (s)	3.5	3.0	3.5	3.5	3.0		3.5	3.0	3.5	3.5	3.0	3.5
All-Red Time (s)	1.0	3.0	1.0	1.0	3.0		1.0	1.0	1.0	1.0	3.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	6.0	4.5	4.5	6.0		4.5	4.0	4.5	4.5	6.0	4.5
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max	None	None	Max		None	None	None	None	None	None
Act Effct Green (s)	39.3	32.5	45.5	39.7	32.7		19.9	14.8	24.3	15.4	8.9	20.2
Actuated g/C Ratio	0.52	0.43	0.61	0.53	0.44		0.27	0.20	0.32	0.21	0.12	0.27
v/c Ratio	0.10	0.59	0.18	0.22	0.46		0.57	0.74	0.24	0.58	0.80	0.44
Control Delay	7.3	19.9	7.1	8.2	17.2		29.2	44.6	7.8	33.2	59.8	5.6
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.3	19.9	7.1	8.2	17.2		29.2	44.6	7.8	33.2	59.8	5.6
LOS	A	B	A	A	B		C	D	A	C	E	A
Approach Delay		15.7			15.4			31.2			28.0	
Approach LOS		B			B			C			C	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	10	162	32	17	115		64	125	11	46	82	0
Queue Length 95th (ft)	23	255	59	35	186		116	#252	49	#93	#182	54
Internal Link Dist (ft)		354			384			369			268	
Turn Bay Length (ft)	50		100	100					50			
Base Capacity (vph)	515	808	961	422	801		313	368	588	224	223	631
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.59	0.18	0.22	0.46		0.57	0.74	0.24	0.58	0.79	0.44

Intersection Summary	
Area Type:	Other
Cycle Length: 75	
Actuated Cycle Length: 74.9	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 22.7	Intersection LOS: C
Intersection Capacity Utilization 63.5%	ICU Level of Service B
Analysis Period (min) 15	

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

Splits and Phases: 5: Meadow Street/Willow Street & West Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	438	162	84	304	33	163	252	130	120	163	258
Future Volume (vph)	50	438	162	84	304	33	163	252	130	120	163	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0	4.5	4.5	6.0		4.5	4.0	4.5	4.5	6.0	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1835		1770	1863	1583	1770	1863	1583
Flt Permitted	0.46	1.00	1.00	0.34	1.00		0.46	1.00	1.00	0.41	1.00	1.00
Satd. Flow (perm)	862	1863	1583	641	1835		861	1863	1583	760	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	476	176	91	330	36	177	274	141	130	177	280
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	80	0	0	224
Lane Group Flow (vph)	54	476	176	91	366	0	177	274	61	130	177	56
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	5	2	7	1	6		7	4	1	3	8	5
Permitted Phases	2		2	6			4		4	8		8
Actuated Green, G (s)	37.8	32.5	39.5	38.2	32.7		21.8	14.8	20.3	13.8	9.8	15.1
Effective Green, g (s)	37.8	32.5	39.5	38.2	32.7		21.8	14.8	20.3	13.8	9.8	15.1
Actuated g/C Ratio	0.50	0.43	0.52	0.50	0.43		0.29	0.20	0.27	0.18	0.13	0.20
Clearance Time (s)	4.5	6.0	4.5	4.5	6.0		4.5	4.0	4.5	4.5	6.0	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	493	798	824	404	791		331	363	423	191	240	315
v/s Ratio Prot	0.01	c0.26	0.02	c0.02	0.20		c0.05	c0.15	0.01	0.04	0.10	0.01
v/s Ratio Perm	0.05		0.09	0.10			0.10		0.03	0.09		0.02
v/c Ratio	0.11	0.60	0.21	0.23	0.46		0.53	0.75	0.14	0.68	0.74	0.18
Uniform Delay, d1	10.0	16.6	9.8	10.5	15.3		21.5	28.8	21.1	28.2	31.8	25.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	3.3	0.1	0.3	1.9		1.7	8.6	0.2	9.6	11.2	0.3
Delay (s)	10.1	19.9	9.9	10.8	17.3		23.2	37.4	21.3	37.7	43.0	25.5
Level of Service	B	B	A	B	B		C	D	C	D	D	C
Approach Delay (s)		16.7			16.0			29.3			33.5	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	75.8	Sum of lost time (s)	21.0
Intersection Capacity Utilization	63.5%	ICU Level of Service	B
Analysis Period (min)	15		

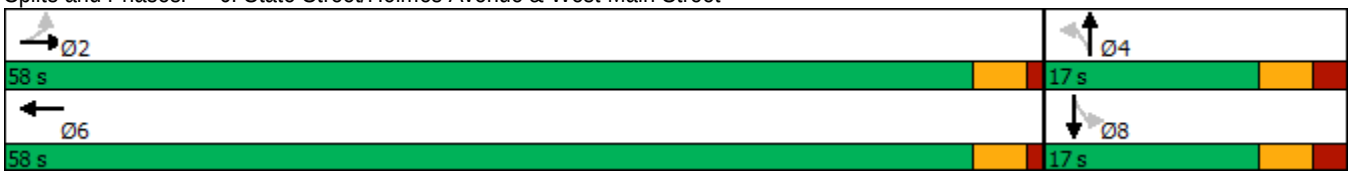
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	600	0	0	500	30	40	40	60	20	0	40
Future Volume (vph)	60	600	0	0	500	30	40	40	60	20	0	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.992			0.942			0.911	
Flt Protected	0.950							0.986			0.983	
Satd. Flow (prot)	1770	1863	0	0	1848	0	0	1730	0	0	1668	0
Flt Permitted	0.408							0.892			0.825	
Satd. Flow (perm)	760	1863	0	0	1848	0	0	1565	0	0	1400	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					10			43			43	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		464			270			230			199	
Travel Time (s)		10.5			6.1			5.2			4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	652	0	0	543	33	43	43	65	22	0	43
Shared Lane Traffic (%)												
Lane Group Flow (vph)	65	652	0	0	576	0	0	151	0	0	65	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2						4			8		
Detector Phase	2	2			6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	1.0	1.0			1.0		1.0	1.0		1.0	1.0	
Minimum Split (s)	15.0	15.0			15.0		8.0	8.0		8.0	8.0	
Total Split (s)	58.0	58.0			58.0		17.0	17.0		17.0	17.0	
Total Split (%)	77.3%	77.3%			77.3%		22.7%	22.7%		22.7%	22.7%	
Maximum Green (s)	54.0	54.0			54.0		12.0	12.0		12.0	12.0	
Yellow Time (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0			1.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	
Total Lost Time (s)	4.0	4.0			4.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Recall Mode	Max	Max			Max		None	None		None	None	
Act Effct Green (s)	54.1	54.1			54.1			9.6			9.6	
Actuated g/C Ratio	0.74	0.74			0.74			0.13			0.13	
v/c Ratio	0.12	0.47			0.42			0.62			0.29	
Control Delay	3.6	5.3			4.8			32.9			17.5	
Queue Delay	0.0	0.7			0.9			0.0			0.0	
Total Delay	3.6	6.0			5.7			32.9			17.5	
LOS	A	A			A			C			B	
Approach Delay		5.8			5.7			32.9			17.5	
Approach LOS		A			A			C			B	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	7	94			76			46			9	
Queue Length 95th (ft)	18	162			134			102			42	
Internal Link Dist (ft)		384			190			150			119	
Turn Bay Length (ft)	50											
Base Capacity (vph)	565	1386			1377			294			267	
Starvation Cap Reductn	0	384			497			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.12	0.65			0.65			0.51			0.24	

Intersection Summary	
Area Type:	Other
Cycle Length: 75	
Actuated Cycle Length: 72.7	
Natural Cycle: 40	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.62	
Intersection Signal Delay: 8.9	Intersection LOS: A
Intersection Capacity Utilization 52.3%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 6: State Street/Holmes Avenue & West Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	600	0	0	500	30	40	40	60	20	0	40
Future Volume (vph)	60	600	0	0	500	30	40	40	60	20	0	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			5.0			5.0	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frt	1.00	1.00			0.99			0.94			0.91	
Flt Protected	0.95	1.00			1.00			0.99			0.98	
Satd. Flow (prot)	1770	1863			1848			1730			1668	
Flt Permitted	0.41	1.00			1.00			0.89			0.82	
Satd. Flow (perm)	761	1863			1848			1565			1399	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	652	0	0	543	33	43	43	65	22	0	43
RTOR Reduction (vph)	0	0	0	0	3	0	0	37	0	0	37	0
Lane Group Flow (vph)	65	652	0	0	573	0	0	114	0	0	28	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2						4			8		
Actuated Green, G (s)	54.1	54.1			54.1			9.6			9.6	
Effective Green, g (s)	54.1	54.1			54.1			9.6			9.6	
Actuated g/C Ratio	0.74	0.74			0.74			0.13			0.13	
Clearance Time (s)	4.0	4.0			4.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)	566	1386			1375			206			184	
v/s Ratio Prot		c0.35			0.31							
v/s Ratio Perm	0.09							c0.07			0.02	
v/c Ratio	0.11	0.47			0.42			0.55			0.15	
Uniform Delay, d1	2.6	3.7			3.5			29.5			27.9	
Progression Factor	1.00	1.00			1.00			1.00			1.00	
Incremental Delay, d2	0.4	1.1			0.9			3.2			0.4	
Delay (s)	3.0	4.8			4.4			32.7			28.3	
Level of Service	A	A			A			C			C	
Approach Delay (s)		4.6			4.4			32.7			28.3	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	72.7	Sum of lost time (s)	9.0
Intersection Capacity Utilization	52.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	20	680	500	40	40	10
Future Volume (vph)	20	680	500	40	40	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50			0	0	0
Storage Lanes	1			0	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.990		0.972	
Flt Protected	0.950				0.962	
Satd. Flow (prot)	1770	1863	1844	0	1742	0
Flt Permitted	0.950				0.962	
Satd. Flow (perm)	1770	1863	1844	0	1742	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		270	124		271	
Travel Time (s)		6.1	2.8		6.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	739	543	43	43	11
Shared Lane Traffic (%)						
Lane Group Flow (vph)	22	739	586	0	54	0
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 45.8%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	680	500	40	40	10
Future Volume (Veh/h)	20	680	500	40	40	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	739	543	43	43	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		270	124			
pX, platoon unblocked	0.80				0.87	0.80
vC, conflicting volume	586				1348	564
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	352				941	324
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				83	98
cM capacity (veh/h)	961				248	570

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	22	739	586	54
Volume Left	22	0	0	43
Volume Right	0	0	43	11
cSH	961	1700	1700	280
Volume to Capacity	0.02	0.43	0.34	0.19
Queue Length 95th (ft)	2	0	0	17
Control Delay (s)	8.8	0.0	0.0	20.9
Lane LOS	A			C
Approach Delay (s)	0.3		0.0	20.9
Approach LOS				C

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	45.8%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	80	180	200	30	0	0
Future Volume (vph)	80	180	200	30	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.982			
Flt Protected		0.985				
Satd. Flow (prot)	0	1835	1829	0	0	0
Flt Permitted		0.985				
Satd. Flow (perm)	0	1835	1829	0	0	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		206	501		201	
Travel Time (s)		4.7	11.4		4.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	196	217	33	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	283	250	0	0	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 32.9%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	80	180	200	30	0	0
Future Volume (Veh/h)	80	180	200	30	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	87	196	217	33	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		206	701			
pX, platoon unblocked						
vC, conflicting volume	250				604	234
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	250				604	234
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				100	100
cM capacity (veh/h)	1316				431	806

Direction, Lane #	EB 1	WB 1
Volume Total	283	250
Volume Left	87	0
Volume Right	0	33
cSH	1316	1700
Volume to Capacity	0.07	0.15
Queue Length 95th (ft)	5	0
Control Delay (s)	2.8	0.0
Lane LOS	A	
Approach Delay (s)	2.8	0.0
Approach LOS		

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	32.9%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	110	610	440	140	90	190
Future Volume (vph)	110	610	440	140	90	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.967		0.908	
Flt Protected	0.950				0.984	
Satd. Flow (prot)	1770	1863	1801	0	1664	0
Flt Permitted	0.309				0.984	
Satd. Flow (perm)	576	1863	1801	0	1664	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			56		130	
Link Speed (mph)		30	30		30	
Link Distance (ft)		124	105		206	
Travel Time (s)		2.8	2.4		4.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	120	663	478	152	98	207
Shared Lane Traffic (%)						
Lane Group Flow (vph)	120	663	630	0	305	0
Turn Type	Perm	NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases	4					
Detector Phase	4	4	8		6	
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	
Minimum Split (s)	22.5	22.5	22.5		16.0	
Total Split (s)	54.0	54.0	54.0		16.0	
Total Split (%)	77.1%	77.1%	77.1%		22.9%	
Maximum Green (s)	49.5	49.5	49.5		11.5	
Yellow Time (s)	3.5	3.5	3.5		3.5	
All-Red Time (s)	1.0	1.0	1.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	4.5	4.5	4.5		4.5	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Recall Mode	None	None	None		None	
Walk Time (s)	7.0	7.0	7.0			
Flash Dont Walk (s)	11.0	11.0	11.0			
Pedestrian Calls (#/hr)	0	0	0			
Act Effct Green (s)	21.0	21.0	21.0		10.0	
Actuated g/C Ratio	0.52	0.52	0.52		0.25	
v/c Ratio	0.40	0.69	0.66		0.60	
Control Delay	10.3	11.3	9.9		15.7	
Queue Delay	0.0	0.0	0.0		0.0	
Total Delay	10.3	11.3	9.9		15.7	
LOS	B	B	A		B	
Approach Delay		11.2	9.9		15.7	
Approach LOS		B	A		B	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 50th (ft)	15	99	82		33	
Queue Length 95th (ft)	42	179	155		#139	
Internal Link Dist (ft)		44	25		126	
Turn Bay Length (ft)						
Base Capacity (vph)	567	1836	1775		590	
Starvation Cap Reductn	0	56	0		0	
Spillback Cap Reductn	0	0	0		0	
Storage Cap Reductn	0	0	0		0	
Reduced v/c Ratio	0.21	0.37	0.35		0.52	

Intersection Summary	
Area Type: Other	
Cycle Length: 70	
Actuated Cycle Length: 40.5	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.69	
Intersection Signal Delay: 11.5	Intersection LOS: B
Intersection Capacity Utilization 65.7%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 9: West Main Street

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	110	610	440	140	90	190
Future Volume (vph)	110	610	440	140	90	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5		4.5	
Lane Util. Factor	1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.97		0.91	
Flt Protected	0.95	1.00	1.00		0.98	
Satd. Flow (prot)	1770	1863	1802		1665	
Flt Permitted	0.31	1.00	1.00		0.98	
Satd. Flow (perm)	576	1863	1802		1665	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	120	663	478	152	98	207
RTOR Reduction (vph)	0	0	27	0	97	0
Lane Group Flow (vph)	120	663	603	0	208	0
Turn Type	Perm	NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases	4					
Actuated Green, G (s)	20.9	20.9	20.9		10.0	
Effective Green, g (s)	20.9	20.9	20.9		10.0	
Actuated g/C Ratio	0.52	0.52	0.52		0.25	
Clearance Time (s)	4.5	4.5	4.5		4.5	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	301	975	943		417	
v/s Ratio Prot		c0.36	0.33		c0.12	
v/s Ratio Perm	0.21					
v/c Ratio	0.40	0.68	0.64		0.50	
Uniform Delay, d1	5.7	7.0	6.8		12.8	
Progression Factor	1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.9	2.0	1.4		0.9	
Delay (s)	6.6	9.0	8.2		13.7	
Level of Service	A	A	A		B	
Approach Delay (s)		8.6	8.2		13.7	
Approach LOS		A	A		B	

Intersection Summary			
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	39.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

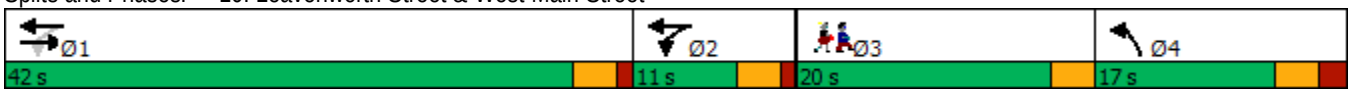
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø3
Lane Configurations							
Traffic Volume (vph)	610	60	60	500	100	100	
Future Volume (vph)	610	60	60	500	100	100	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)		0	100		0	0	
Storage Lanes		0	1		1	0	
Taper Length (ft)			25		25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.988				0.932		
Flt Protected			0.950		0.976		
Satd. Flow (prot)	1840	0	1770	1863	1694	0	
Flt Permitted			0.212		0.976		
Satd. Flow (perm)	1840	0	395	1863	1694	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	7				46		
Link Speed (mph)	30			30	30		
Link Distance (ft)	421			389	436		
Travel Time (s)	9.6			8.8	9.9		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	663	65	65	543	109	109	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	728	0	65	543	218	0	
Turn Type	NA		D.P+P	NA	Prot		
Protected Phases	1		2	1 2	4		3
Permitted Phases			1				
Detector Phase	1		2	1 2	4		
Switch Phase							
Minimum Initial (s)	1.0		1.0		1.0		1.0
Minimum Split (s)	15.0		6.0		8.0		20.0
Total Split (s)	42.0		11.0		17.0		20.0
Total Split (%)	46.7%		12.2%		18.9%		22%
Maximum Green (s)	38.0		7.0		12.0		17.0
Yellow Time (s)	3.0		3.0		3.0		3.0
All-Red Time (s)	1.0		1.0		2.0		0.0
Lost Time Adjust (s)	0.0		0.0		0.0		
Total Lost Time (s)	4.0		4.0		5.0		
Lead/Lag	Lead		Lag		Lag		Lead
Lead-Lag Optimize?	Yes		Yes		Yes		Yes
Vehicle Extension (s)	3.0		3.0		3.0		3.0
Recall Mode	Max		Max		None		None
Walk Time (s)							8.0
Flash Dont Walk (s)							9.0
Pedestrian Calls (#/hr)							0
Act Effct Green (s)	38.0		45.0	49.0	11.3		
Actuated g/C Ratio	0.55		0.65	0.71	0.16		
v/c Ratio	0.72		0.16	0.41	0.69		
Control Delay	16.9		5.3	5.5	34.5		
Queue Delay	0.5		0.0	0.8	0.0		
Total Delay	17.4		5.3	6.3	34.5		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø3
LOS	B		A	A	C		
Approach Delay	17.4			6.2	34.5		
Approach LOS	B			A	C		
Queue Length 50th (ft)	215		7	80	69		
Queue Length 95th (ft)	345		16	127	#155		
Internal Link Dist (ft)	341			309	356		
Turn Bay Length (ft)			100				
Base Capacity (vph)	1012		395	1317	331		
Starvation Cap Reductn	68		0	459	0		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.77		0.16	0.63	0.66		

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 69.3
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 15.4 Intersection LOS: B
Intersection Capacity Utilization 61.6% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: Leavenworth Street & West Main Street



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	610	60	60	500	100	100
Future Volume (vph)	610	60	60	500	100	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.99		1.00	1.00	0.93	
Flt Protected	1.00		0.95	1.00	0.98	
Satd. Flow (prot)	1840		1770	1863	1695	
Flt Permitted	1.00		0.21	1.00	0.98	
Satd. Flow (perm)	1840		395	1863	1695	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	663	65	65	543	109	109
RTOR Reduction (vph)	3	0	0	0	38	0
Lane Group Flow (vph)	725	0	65	543	180	0
Turn Type	NA		D.P+P	NA	Prot	
Protected Phases	1		2	1 2	4	
Permitted Phases			1			
Actuated Green, G (s)	38.0		45.0	49.0	11.3	
Effective Green, g (s)	38.0		45.0	49.0	11.3	
Actuated g/C Ratio	0.55		0.65	0.71	0.16	
Clearance Time (s)	4.0		4.0		5.0	
Vehicle Extension (s)	3.0		3.0		3.0	
Lane Grp Cap (vph)	1008		395	1317	276	
v/s Ratio Prot	c0.39		0.02	c0.29	c0.11	
v/s Ratio Perm			0.09			
v/c Ratio	0.72		0.16	0.41	0.65	
Uniform Delay, d1	11.7		13.7	4.2	27.2	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	4.4		0.9	1.0	5.4	
Delay (s)	16.1		14.6	5.2	32.5	
Level of Service	B		B	A	C	
Approach Delay (s)	16.1			6.2	32.5	
Approach LOS	B			A	C	

Intersection Summary			
HCM 2000 Control Delay	14.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	69.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

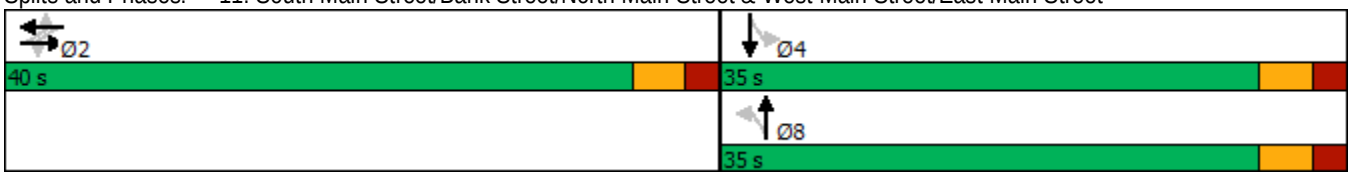
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	600	50	50	500	50	50	200	50	50	300	50
Future Volume (vph)	50	600	50	50	500	50	50	200	50	50	300	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		130	0		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.989			0.986			0.975			0.981	
Flt Protected	0.950			0.950				0.992			0.994	
Satd. Flow (prot)	1770	3500	0	1770	1837	0	0	3423	0	0	3451	0
Flt Permitted	0.356			0.371				0.797			0.860	
Satd. Flow (perm)	663	3500	0	691	1837	0	0	2750	0	0	2986	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			9			37			25	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		389			245			286			217	
Travel Time (s)		8.8			5.6			6.5			4.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	652	54	54	543	54	54	217	54	54	326	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	54	706	0	54	597	0	0	325	0	0	434	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			8			4	
Permitted Phases	2			2			8			4		
Detector Phase	2	2		2	2		8	8		4	4	
Switch Phase												
Minimum Initial (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Minimum Split (s)	37.0	37.0		37.0	37.0		35.0	35.0		35.0	35.0	
Total Split (s)	40.0	40.0		40.0	40.0		35.0	35.0		35.0	35.0	
Total Split (%)	53.3%	53.3%		53.3%	53.3%		46.7%	46.7%		46.7%	46.7%	
Maximum Green (s)	35.0	35.0		35.0	35.0		30.0	30.0		30.0	30.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Walk Time (s)	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	20.0	20.0		20.0	20.0		18.0	18.0		18.0	18.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	35.1	35.1		35.1	35.1			13.4			13.4	
Actuated g/C Ratio	0.60	0.60		0.60	0.60			0.23			0.23	
v/c Ratio	0.14	0.34		0.13	0.54			0.49			0.62	
Control Delay	7.2	6.7		7.1	9.8			19.8			23.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.2	6.7		7.1	9.8			19.8			23.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A		A	A			B			C	
Approach Delay		6.8			9.6			19.8			23.0	
Approach LOS		A			A			B			C	
Queue Length 50th (ft)	7	53		7	102			45			67	
Queue Length 95th (ft)	25	101		25	220			78			107	
Internal Link Dist (ft)		309			165			206			137	
Turn Bay Length (ft)	100											
Base Capacity (vph)	397	2105		414	1105			1432			1547	
Starvation Cap Reductn	0	0		0	0			0			101	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.14	0.34		0.13	0.54			0.23			0.30	

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 58.5
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.62
Intersection Signal Delay: 12.8 Intersection LOS: B
Intersection Capacity Utilization 69.3% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 11: South Main Street/Bank Street/North Main Street & West Main Street/East Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	600	50	50	500	50	50	200	50	50	300	50
Future Volume (vph)	50	600	50	50	500	50	50	200	50	50	300	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	0.95		1.00	1.00			0.95			0.95	
Frt	1.00	0.99		1.00	0.99			0.98			0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1770	3499		1770	1837			3423			3452	
Flt Permitted	0.36	1.00		0.37	1.00			0.80			0.86	
Satd. Flow (perm)	664	3499		692	1837			2750			2986	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	652	54	54	543	54	54	217	54	54	326	54
RTOR Reduction (vph)	0	6	0	0	4	0	0	29	0	0	19	0
Lane Group Flow (vph)	54	700	0	54	593	0	0	296	0	0	415	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			8			4	
Permitted Phases	2			2			8			4		
Actuated Green, G (s)	35.1	35.1		35.1	35.1			13.4			13.4	
Effective Green, g (s)	35.1	35.1		35.1	35.1			13.4			13.4	
Actuated g/C Ratio	0.60	0.60		0.60	0.60			0.23			0.23	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	398	2099		415	1102			629			683	
v/s Ratio Prot		0.20			c0.32							
v/s Ratio Perm	0.08			0.08				0.11			c0.14	
v/c Ratio	0.14	0.33		0.13	0.54			0.47			0.61	
Uniform Delay, d1	5.1	5.9		5.1	6.9			19.5			20.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.7	0.4		0.6	1.9			0.6			1.5	
Delay (s)	5.8	6.3		5.7	8.8			20.0			21.7	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		6.2			8.5			20.0			21.7	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	58.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	110	50	120	210	360	120	
Future Volume (vph)	110	50	120	210	360	120	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	
Frt	0.958				0.963		
Flt Protected	0.967		0.950				
Satd. Flow (prot)	1726	0	1770	1863	3408	0	
Flt Permitted	0.967		0.950				
Satd. Flow (perm)	1726	0	1770	1863	3408	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	21				46		
Link Speed (mph)	30			30	30		
Link Distance (ft)	200			217	246		
Travel Time (s)	4.5			4.9	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	120	54	130	228	391	130	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	174	0	130	228	521	0	
Turn Type	Prot		Prot	NA	NA		
Protected Phases	4		2	1 2	1		3
Permitted Phases							
Detector Phase	4		2	1 2	1		
Switch Phase							
Minimum Initial (s)	1.0		1.0		1.0		1.0
Minimum Split (s)	10.0		20.0		10.0		18.0
Total Split (s)	25.0		25.0		31.0		17.0
Total Split (%)	25.5%		25.5%		31.6%		17%
Maximum Green (s)	21.0		21.0		27.0		14.0
Yellow Time (s)	3.0		3.0		3.0		3.0
All-Red Time (s)	1.0		1.0		1.0		0.0
Lost Time Adjust (s)	0.0		0.0		0.0		
Total Lost Time (s)	4.0		4.0		4.0		
Lead/Lag	Lag		Lag		Lead		Lead
Lead-Lag Optimize?	Yes		Yes		Yes		Yes
Vehicle Extension (s)	3.0		3.0		3.0		3.0
Recall Mode	None		Max		None		None
Walk Time (s)							6.0
Flash Dont Walk (s)							9.0
Pedestrian Calls (#/hr)							0
Act Effct Green (s)	11.0		21.4	41.1	15.7		
Actuated g/C Ratio	0.18		0.35	0.68	0.26		
v/c Ratio	0.52		0.21	0.18	0.57		
Control Delay	26.4		17.5	4.3	20.2		
Queue Delay	0.0		0.7	1.3	0.0		
Total Delay	26.4		18.2	5.5	20.2		
LOS	C		B	A	C		
Approach Delay	26.4			10.1	20.2		
Approach LOS	C			B	C		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Queue Length 50th (ft)	50		32	23	76		
Queue Length 95th (ft)	114		87	57	131		
Internal Link Dist (ft)	120			137	166		
Turn Bay Length (ft)							
Base Capacity (vph)	625		627	1267	1578		
Starvation Cap Reductn	0		274	831	0		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.28		0.37	0.52	0.33		

Intersection Summary	
Area Type:	Other
Cycle Length: 98	
Actuated Cycle Length: 60.3	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.57	
Intersection Signal Delay: 17.8	Intersection LOS: B
Intersection Capacity Utilization 39.6%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 12: North Main Street & West Main Street

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	110	50	120	210	360	120
Future Volume (vph)	110	50	120	210	360	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frt	0.96		1.00	1.00	0.96	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1725		1770	1863	3407	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	1725		1770	1863	3407	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	120	54	130	228	391	130
RTOR Reduction (vph)	17	0	0	0	34	0
Lane Group Flow (vph)	157	0	130	228	487	0
Turn Type	Prot		Prot	NA	NA	
Protected Phases	4		2	1 2	1	
Permitted Phases						
Actuated Green, G (s)	11.0		21.4	41.1	15.7	
Effective Green, g (s)	11.0		21.4	41.1	15.7	
Actuated g/C Ratio	0.18		0.36	0.68	0.26	
Clearance Time (s)	4.0		4.0		4.0	
Vehicle Extension (s)	3.0		3.0		3.0	
Lane Grp Cap (vph)	315		630	1274	890	
v/s Ratio Prot	c0.09		c0.07	0.12	c0.14	
v/s Ratio Perm						
v/c Ratio	0.50		0.21	0.18	0.55	
Uniform Delay, d1	22.1		13.4	3.4	19.1	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.2		0.7	0.1	0.7	
Delay (s)	23.3		14.2	3.5	19.8	
Level of Service	C		B	A	B	
Approach Delay (s)	23.3			7.4	19.8	
Approach LOS	C			A	B	

Intersection Summary			
HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	60.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	90	40	70	50	20	10	70	60	20	150	10
Future Volume (vph)	10	90	40	70	50	20	10	70	60	20	150	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.962			0.980			0.942			0.992	
Flt Protected		0.996			0.976			0.996			0.994	
Satd. Flow (prot)	0	1785	0	0	1782	0	0	1748	0	0	1837	0
Flt Permitted		0.996			0.976			0.996			0.994	
Satd. Flow (perm)	0	1785	0	0	1782	0	0	1748	0	0	1837	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		218			342			241			213	
Travel Time (s)		5.0			7.8			5.5			4.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	98	43	76	54	22	11	76	65	22	163	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	152	0	0	152	0	0	152	0	0	196	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 39.7%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	90	40	70	50	20	10	70	60	20	150	10
Future Volume (Veh/h)	10	90	40	70	50	20	10	70	60	20	150	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	98	43	76	54	22	11	76	65	22	163	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	392	376	168	435	348	108	174			141		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	392	376	168	435	348	108	174			141		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	82	95	82	90	98	99			98		
cM capacity (veh/h)	505	543	876	428	562	945	1403			1442		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	152	152	152	196
Volume Left	11	76	11	22
Volume Right	43	22	65	11
cSH	605	512	1403	1442
Volume to Capacity	0.25	0.30	0.01	0.02
Queue Length 95th (ft)	25	31	1	1
Control Delay (s)	12.9	15.0	0.6	1.0
Lane LOS	B	B	A	A
Approach Delay (s)	12.9	15.0	0.6	1.0
Approach LOS	B	B		

Intersection Summary				
Average Delay		6.9		
Intersection Capacity Utilization		39.7%	ICU Level of Service	A
Analysis Period (min)		15		

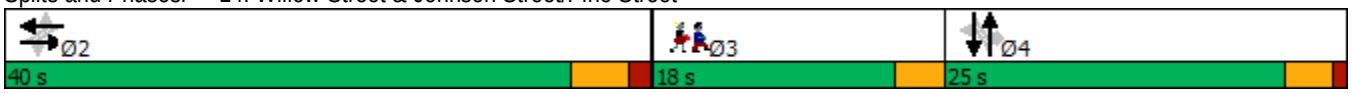
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	130	50	140	50	10	30	260	90	10	260	10
Future Volume (vph)	10	130	50	140	50	10	30	260	90	10	260	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.965			0.993				0.850		0.995	
Flt Protected		0.997			0.966			0.995			0.998	
Satd. Flow (prot)	0	1792	0	0	1787	0	0	1853	1583	0	1850	0
Flt Permitted		0.978			0.717			0.946			0.985	
Satd. Flow (perm)	0	1758	0	0	1326	0	0	1762	1583	0	1826	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		27			4				98		2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		273			331			413			180	
Travel Time (s)		6.2			7.5			9.4			4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	141	54	152	54	11	33	283	98	11	283	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	206	0	0	217	0	0	316	98	0	305	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4		4	4		
Detector Phase	2	2		2	2		4	4	4	4	4	
Switch Phase												
Minimum Initial (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Minimum Split (s)	10.0	10.0		10.0	10.0		7.0	7.0	7.0	7.0	7.0	
Total Split (s)	40.0	40.0		40.0	40.0		25.0	25.0	25.0	25.0	25.0	
Total Split (%)	48.2%	48.2%		48.2%	48.2%		30.1%	30.1%	30.1%	30.1%	30.1%	
Maximum Green (s)	35.0	35.0		35.0	35.0		21.0	21.0	21.0	21.0	21.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0	0.0		0.0	
Total Lost Time (s)		5.0			5.0			4.0	4.0		4.0	
Lead/Lag							Lag	Lag	Lag	Lag	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min		Min	Min		None	None	None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		12.7			12.7			14.2	14.2		14.2	
Actuated g/C Ratio		0.35			0.35			0.39	0.39		0.39	
v/c Ratio		0.33			0.47			0.46	0.14		0.43	
Control Delay		9.9			13.7			11.4	3.1		10.8	
Queue Delay		0.0			0.0			0.0	0.0		0.0	
Total Delay		9.9			13.7			11.4	3.1		10.8	
LOS		A			B			B	A		B	
Approach Delay		9.9			13.7			9.4			10.8	
Approach LOS		A			B			A			B	

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	18.0
Total Split (s)	18.0
Total Split (%)	22%
Maximum Green (s)	15.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	8.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		24			30			41	0		39	
Queue Length 95th (ft)		70			88			113	20		107	
Internal Link Dist (ft)		193			251			333			100	
Turn Bay Length (ft)												
Base Capacity (vph)		1591			1198			1079	1007		1119	
Starvation Cap Reductn		0			0			0	0		0	
Spillback Cap Reductn		0			0			0	0		0	
Storage Cap Reductn		0			0			0	0		0	
Reduced v/c Ratio		0.13			0.18			0.29	0.10		0.27	

Intersection Summary	
Area Type:	Other
Cycle Length: 83	
Actuated Cycle Length: 36.4	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.47	
Intersection Signal Delay: 10.7	Intersection LOS: B
Intersection Capacity Utilization 59.5%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 14: Willow Street & Johnson Street/Pine Street



Lane Group	Ø3
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	130	50	140	50	10	30	260	90	10	260	10
Future Volume (vph)	10	130	50	140	50	10	30	260	90	10	260	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			4.0	4.0		4.0	
Lane Util. Factor		1.00			1.00			1.00	1.00		1.00	
Frt		0.96			0.99			1.00	0.85		1.00	
Flt Protected		1.00			0.97			0.99	1.00		1.00	
Satd. Flow (prot)		1792			1787			1853	1583		1850	
Flt Permitted		0.98			0.72			0.95	1.00		0.98	
Satd. Flow (perm)		1757			1327			1763	1583		1826	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	141	54	152	54	11	33	283	98	11	283	11
RTOR Reduction (vph)	0	17	0	0	3	0	0	0	59	0	1	0
Lane Group Flow (vph)	0	189	0	0	214	0	0	316	39	0	304	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4		4	4		
Actuated Green, G (s)		12.7			12.7			14.2	14.2		14.2	
Effective Green, g (s)		12.7			12.7			14.2	14.2		14.2	
Actuated g/C Ratio		0.35			0.35			0.40	0.40		0.40	
Clearance Time (s)		5.0			5.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		621			469			697	626		722	
v/s Ratio Prot												
v/s Ratio Perm		0.11			c0.16			c0.18	0.02		0.17	
v/c Ratio		0.30			0.46			0.45	0.06		0.42	
Uniform Delay, d1		8.4			8.9			8.0	6.7		7.9	
Progression Factor		1.00			1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.3			0.7			0.5	0.0		0.4	
Delay (s)		8.7			9.7			8.5	6.8		8.3	
Level of Service		A			A			A	A		A	
Approach Delay (s)		8.7			9.7			8.1			8.3	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	35.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	540	70	20	580	0	0
Future Volume (vph)	540	70	20	580	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.985					
Flt Protected				0.998		
Satd. Flow (prot)	1835	0	0	1859	0	0
Flt Permitted				0.998		
Satd. Flow (perm)	1835	0	0	1859	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	105			421	220	
Travel Time (s)	2.4			9.6	5.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	587	76	22	630	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	663	0	0	652	0	0
Sign Control	Free			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 50.0%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection Sign configuration not allowed in HCM analysis.

Appendix C

Intersection Capacity Analysis Worksheets
Weekday Afternoon Peak Hour

Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	SBR	SEL	SER	SER2	Ø5	Ø6
Lane Configurations												
Traffic Volume (vph)	792	172	368	416	177	89	64	367	231	136		
Future Volume (vph)	792	172	368	416	177	89	64	367	231	136		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)		40	0		0		0	230	0			
Storage Lanes		1	1		1		0	1	1			
Taper Length (ft)			25		25			25				
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00		
Frt		0.850				0.937			0.850			
Flt Protected			0.950		0.950			0.950				
Satd. Flow (prot)	1863	1583	1770	3539	1770	1745	0	1770	1583	0		
Flt Permitted			0.103		0.950			0.950				
Satd. Flow (perm)	1863	1583	192	3539	1770	1745	0	1770	1583	0		
Right Turn on Red		Yes								Yes		
Satd. Flow (RTOR)		89							89			
Link Speed (mph)	30			30		30		30				
Link Distance (ft)	237			379		329		394				
Travel Time (s)	5.4			8.6		7.5		9.0				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Adj. Flow (vph)	861	187	400	452	192	97	70	399	251	148		
Shared Lane Traffic (%)												
Lane Group Flow (vph)	861	187	400	452	192	167	0	399	399	0		
Turn Type	NA	Perm	pm+pt	NA	Split	NA		Prot	Prot			
Protected Phases	1		2	1 2	3	3		4	4		5	6
Permitted Phases		1	1 2									
Minimum Split (s)	14.0	14.0	7.0		13.0	13.0		13.0	13.0		22.0	6.0
Total Split (s)	43.0	43.0	21.0		22.0	22.0		24.0	24.0		43.0	21.0
Total Split (%)	39.1%	39.1%	19.1%		20.0%	20.0%		21.8%	21.8%		39%	19%
Maximum Green (s)	39.0	39.0	17.0		18.0	18.0		20.0	20.0		39.0	17.0
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0			
Total Lost Time (s)	4.0	4.0	4.0		4.0	4.0		4.0	4.0			
Lead/Lag	Lead	Lead	Lag		Lead	Lead		Lag	Lag		Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes
Act Effct Green (s)	39.0	39.0	56.0	60.0	18.0	18.0		20.0	20.0			
Actuated g/C Ratio	0.35	0.35	0.51	0.55	0.16	0.16		0.18	0.18			
v/c Ratio	1.30	0.30	1.17	0.23	0.66	0.59		1.24	1.11			
Control Delay	179.5	14.6	126.1	5.8	55.4	51.8		171.7	113.3			
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0			
Total Delay	179.5	14.6	126.1	5.8	55.4	51.8		171.7	113.3			
LOS	F	B	F	A	E	D		F	F			
Approach Delay	150.0			62.3		53.7		142.5				
Approach LOS	F			E		D		F				
Queue Length 50th (ft)	~782	47	~296	31	129	110		~351	~268			
Queue Length 95th (ft)	#1020	103	m#370	m34	#208	183		#541	#461			
Internal Link Dist (ft)	157			299		249		314				
Turn Bay Length (ft)		40						230				
Base Capacity (vph)	660	618	341	1930	289	285		321	360			

Lane Group	Ø7	Ø8
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	7	8
Permitted Phases		
Minimum Split (s)	18.0	22.5
Total Split (s)	20.0	26.0
Total Split (%)	18%	24%
Maximum Green (s)	16.0	22.0
Yellow Time (s)	3.0	3.0
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		

Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	SBR	SEL	SER	SER2	Ø5	Ø6
Starvation Cap Reductn	0	0	0	0	0	0		0	0			
Spillback Cap Reductn	0	0	0	0	0	0		0	0			
Storage Cap Reductn	0	0	0	0	0	0		0	0			
Reduced v/c Ratio	1.30	0.30	1.17	0.23	0.66	0.59		1.24	1.11			

Intersection Summary

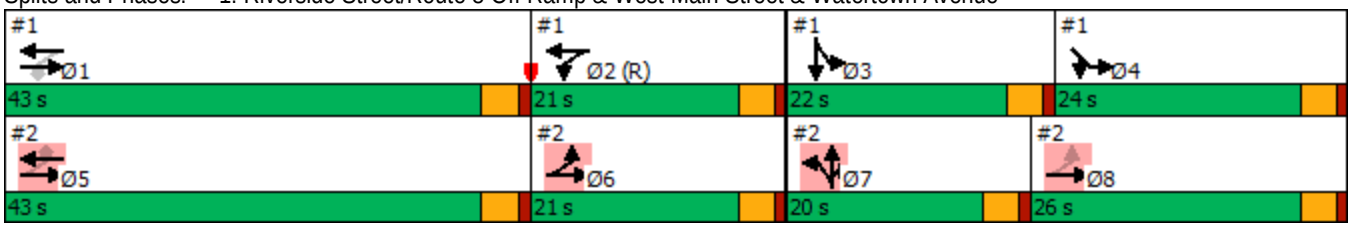
Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:WBTL, Start of Green
Natural Cycle: 150
Control Type: Pretimed
Maximum v/c Ratio: 2.70
Intersection Signal Delay: 112.3 Intersection LOS: F
Intersection Capacity Utilization 106.7% ICU Level of Service G
Analysis Period (min) 15

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

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

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

Splits and Phases: 1: Riverside Street/Route 8 Off Ramp & West Main Street & Watertown Avenue



Lane Group	Ø7	Ø8
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	SEL	SER	SER2
Lane Configurations										
Traffic Volume (vph)	792	172	368	416	177	89	64	367	231	136
Future Volume (vph)	792	172	368	416	177	89	64	367	231	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00		1.00	1.00	
Frt	1.00	0.85	1.00	1.00	1.00	0.94		1.00	0.85	
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1863	1583	1770	3539	1770	1746		1770	1583	
Flt Permitted	1.00	1.00	0.10	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1863	1583	191	3539	1770	1746		1770	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	861	187	400	452	192	97	70	399	251	148
RTOR Reduction (vph)	0	57	0	0	0	0	0	0	73	0
Lane Group Flow (vph)	861	130	400	452	192	167	0	399	326	0
Turn Type	NA	Perm	pm+pt	NA	Split	NA		Prot	Prot	
Protected Phases	1		2	1 2	3	3		4	4	
Permitted Phases		1	1 2							
Actuated Green, G (s)	39.0	39.0	56.0	60.0	18.0	18.0		20.0	20.0	
Effective Green, g (s)	39.0	39.0	56.0	60.0	18.0	18.0		20.0	20.0	
Actuated g/C Ratio	0.35	0.35	0.51	0.55	0.16	0.16		0.18	0.18	
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	660	561	341	1930	289	285		321	287	
v/s Ratio Prot	c0.46		c0.18	0.13	c0.11	0.10		c0.23	0.21	
v/s Ratio Perm		0.08	0.42							
v/c Ratio	1.30	0.23	1.17	0.23	0.66	0.59		1.24	1.14	
Uniform Delay, d1	35.5	25.0	43.1	13.0	43.2	42.6		45.0	45.0	
Progression Factor	1.00	1.00	0.70	0.43	1.00	1.00		1.00	1.00	
Incremental Delay, d2	147.9	1.0	97.2	0.2	11.5	8.5		132.9	95.1	
Delay (s)	183.4	25.9	127.6	5.8	54.6	51.1		177.9	140.1	
Level of Service	F	C	F	A	D	D		F	F	
Approach Delay (s)	155.3			63.0		53.0		159.0		
Approach LOS	F			E		D		F		

Intersection Summary			
HCM 2000 Control Delay	118.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	106.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	330	950	0	0	580	760	80	670	160	0	0	0
Future Volume (vph)	330	950	0	0	580	760	80	670	160	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1770	3539	0	0	1863	1583	3433	1863	1583	0	0	0
Flt Permitted	0.426						0.950					
Satd. Flow (perm)	794	3539	0	0	1863	1583	3433	1863	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						368			101			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		379			839			247			271	
Travel Time (s)		8.6			19.1			5.6			6.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	359	1033	0	0	630	826	87	728	174	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	359	1033	0	0	630	826	87	728	174	0	0	0
Turn Type	custom	NA			NA	Perm	Split	NA	Prot			
Protected Phases	6	5 6 8			5		7	7	7			
Permitted Phases	5 8					5						
Minimum Split (s)	6.0				22.0	22.0	18.0	18.0	18.0			
Total Split (s)	21.0				43.0	43.0	20.0	20.0	20.0			
Total Split (%)	19.1%				39.1%	39.1%	18.2%	18.2%	18.2%			
Maximum Green (s)	17.0				39.0	39.0	16.0	16.0	16.0			
Yellow Time (s)	3.0				3.0	3.0	3.0	3.0	3.0			
All-Red Time (s)	1.0				1.0	1.0	1.0	1.0	1.0			
Lost Time Adjust (s)	0.0				0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	4.0				4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lag				Lead	Lead	Lead	Lead	Lead			
Lead-Lag Optimize?	Yes				Yes	Yes	Yes	Yes	Yes			
Act Effct Green (s)	82.0	86.0			39.0	39.0	16.0	16.0	16.0			
Actuated g/C Ratio	0.75	0.78			0.35	0.35	0.15	0.15	0.15			
v/c Ratio	0.48	0.37			0.95	1.04	0.17	2.70	0.55			
Control Delay	1.6	1.0			61.1	61.8	42.3	794.2	26.4			
Queue Delay	0.1	1.6			4.1	0.0	0.0	0.0	0.0			
Total Delay	1.8	2.6			65.2	61.8	42.3	794.2	26.4			
LOS	A	A			E	E	D	F	C			
Approach Delay		2.4			63.3			593.0				
Approach LOS		A			E			F				
Queue Length 50th (ft)	22	39			430	~448	28	~873	47			
Queue Length 95th (ft)	m11	m17			#661	#688	52	#1103	118			
Internal Link Dist (ft)		299			759			167			191	
Turn Bay Length (ft)												
Base Capacity (vph)	742	2766			660	798	499	270	316			
Starvation Cap Reductn	42	1488			0	0	0	0	0			
Spillback Cap Reductn	0	0			17	0	0	0	0			
Storage Cap Reductn	0	0			0	0	0	0	0			

Lane Group	Ø1	Ø2	Ø3	Ø4	Ø8
Lane Configurations					
Traffic Volume (vph)					
Future Volume (vph)					
Ideal Flow (vphpl)					
Lane Util. Factor					
Frt					
Flt Protected					
Satd. Flow (prot)					
Flt Permitted					
Satd. Flow (perm)					
Right Turn on Red					
Satd. Flow (RTOR)					
Link Speed (mph)					
Link Distance (ft)					
Travel Time (s)					
Peak Hour Factor					
Adj. Flow (vph)					
Shared Lane Traffic (%)					
Lane Group Flow (vph)					
Turn Type					
Protected Phases	1	2	3	4	8
Permitted Phases					
Minimum Split (s)	14.0	7.0	13.0	13.0	22.5
Total Split (s)	43.0	21.0	22.0	24.0	26.0
Total Split (%)	39%	19%	20%	22%	24%
Maximum Green (s)	39.0	17.0	18.0	20.0	22.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)					
Total Lost Time (s)					
Lead/Lag	Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes
Act Effct Green (s)					
Actuated g/C Ratio					
v/c Ratio					
Control Delay					
Queue Delay					
Total Delay					
LOS					
Approach Delay					
Approach LOS					
Queue Length 50th (ft)					
Queue Length 95th (ft)					
Internal Link Dist (ft)					
Turn Bay Length (ft)					
Base Capacity (vph)					
Starvation Cap Reductn					
Spillback Cap Reductn					
Storage Cap Reductn					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Reduced v/c Ratio	0.51	0.81			0.98	1.04	0.17	2.70	0.55			

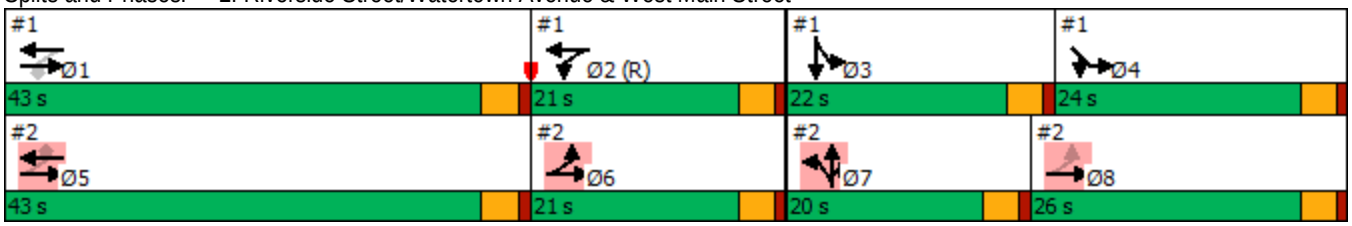
Intersection Summary	
Area Type:	Other
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 0 (0%), Referenced to phase 2:WBTL, Start of Green	
Natural Cycle: 150	
Control Type: Pretimed	
Maximum v/c Ratio: 2.70	
Intersection Signal Delay: 177.7	Intersection LOS: F
Intersection Capacity Utilization 110.6%	ICU Level of Service H
Analysis Period (min) 15	

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

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

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

Splits and Phases: 2: Riverside Street/Watertown Avenue & West Main Street



Lane Group	Ø1	Ø2	Ø3	Ø4	Ø8
Reduced v/c Ratio					

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	330	950	0	0	580	760	80	670	160	0	0	0
Future Volume (vph)	330	950	0	0	580	760	80	670	160	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	1.00	0.95			1.00	1.00	0.97	1.00	1.00			
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00			
Satd. Flow (prot)	1770	3539			1863	1583	3433	1863	1583			
Flt Permitted	0.43	1.00			1.00	1.00	0.95	1.00	1.00			
Satd. Flow (perm)	793	3539			1863	1583	3433	1863	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	359	1033	0	0	630	826	87	728	174	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	238	0	0	86	0	0	0
Lane Group Flow (vph)	359	1033	0	0	630	588	87	728	88	0	0	0
Turn Type	custom	NA			NA	Perm	Split	NA	Prot			
Protected Phases	6	5 6 8			5		7	7	7			
Permitted Phases	5 8					5						
Actuated Green, G (s)	82.0	86.0			39.0	39.0	16.0	16.0	16.0			
Effective Green, g (s)	82.0	86.0			39.0	39.0	16.0	16.0	16.0			
Actuated g/C Ratio	0.75	0.78			0.35	0.35	0.15	0.15	0.15			
Clearance Time (s)	4.0				4.0	4.0	4.0	4.0	4.0			
Lane Grp Cap (vph)	742	2766			660	561	499	270	230			
v/s Ratio Prot	c0.07	0.29			0.34		0.03	c0.39	0.06			
v/s Ratio Perm	c0.29					c0.37						
v/c Ratio	0.48	0.37			0.95	1.05	0.17	2.70	0.38			
Uniform Delay, d1	6.5	3.7			34.6	35.5	41.2	47.0	42.5			
Progression Factor	0.26	0.25			1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2	0.2	0.0			25.5	51.5	0.8	773.8	4.7			
Delay (s)	1.9	1.0			60.1	87.0	42.0	820.8	47.3			
Level of Service	A	A			E	F	D	F	D			
Approach Delay (s)		1.2			75.4			616.2			0.0	
Approach LOS		A			E			F			A	

Intersection Summary			
HCM 2000 Control Delay	187.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	110.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	270	820	20	10	920	320	10	10	10	360	10	370
Future Volume (vph)	270	820	20	10	920	320	10	10	10	360	10	370
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997				0.850			0.850			0.850
Flt Protected		0.988		0.950			0.950				0.954	
Satd. Flow (prot)	0	3486	0	1770	1863	1583	1770	1863	1583	0	1777	1583
Flt Permitted		0.548		0.114			0.357				0.724	
Satd. Flow (perm)	0	1934	0	212	1863	1583	665	1863	1583	0	1349	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2				158			107			402
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		839			338			196			228	
Travel Time (s)		19.1			7.7			4.5			5.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	293	891	22	11	1000	348	11	11	11	391	11	402
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1206	0	11	1000	348	11	11	11	0	402	402
Turn Type	custom	NA		custom	NA	custom	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	1 2		3	2 3			5			5	
Permitted Phases	2			2		2	5		5	5		5
Detector Phase	1	1 2		3	2 3	2	5	5	5	5	5	5
Switch Phase												
Minimum Initial (s)	1.0			1.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	5.0			5.0		22.5	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	6.0			5.0		40.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	4.9%			4.1%		32.8%	36.9%	36.9%	36.9%	36.9%	36.9%	36.9%
Maximum Green (s)	3.0			1.0		35.0	40.0	40.0	40.0	40.0	40.0	40.0
Yellow Time (s)	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	0.0			1.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)				0.0		0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)				4.0		5.0	5.0	5.0	5.0		5.0	5.0
Lead/Lag	Lead			Lead		Lag	Lag	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes			Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None			None		Min	None	None	None	None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		40.2		37.2	35.2	35.2	34.9	34.9	34.9		34.9	34.9
Actuated g/C Ratio		0.44		0.41	0.39	0.39	0.38	0.38	0.38		0.38	0.38
v/c Ratio		2.01dl		0.11	1.39	0.49	0.04	0.02	0.02		0.78	0.47
Control Delay		182.4		20.3	211.5	14.7	17.4	16.7	0.0		36.2	3.9
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay		182.4		20.3	211.5	14.7	17.4	16.7	0.0		36.2	3.9
LOS		F		C	F	B	B	B	A		D	A
Approach Delay		182.4			159.6			11.4			20.0	
Approach LOS		F			F			B			C	

Lane Group	Ø4
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	26.0
Total Split (s)	26.0
Total Split (%)	21%
Maximum Green (s)	23.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	16.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		~481		4	~821	82	4	4	0		199	0
Queue Length 95th (ft)		#661		14	#1083	169	15	14	0		317	54
Internal Link Dist (ft)		759			258			116			148	
Turn Bay Length (ft)												
Base Capacity (vph)		905		103	718	707	293	821	758		595	922
Starvation Cap Reductn		0		0	0	0	0	0	0		0	0
Spillback Cap Reductn		0		0	0	0	0	0	0		0	0
Storage Cap Reductn		0		0	0	0	0	0	0		0	0
Reduced v/c Ratio		1.33		0.11	1.39	0.49	0.04	0.01	0.01		0.68	0.44

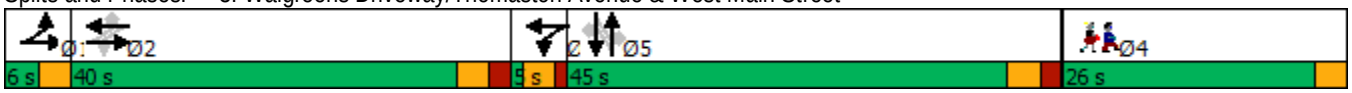
Intersection Summary	
Area Type:	Other
Cycle Length: 122	
Actuated Cycle Length: 91.1	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.39	
Intersection Signal Delay: 133.3	Intersection LOS: F
Intersection Capacity Utilization 118.4%	ICU Level of Service H
Analysis Period (min) 15	

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

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

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

Splits and Phases: 3: Walgreens Driveway/Thomaston Avenue & West Main Street



Lane Group	Ø4
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	270	820	20	10	920	320	10	10	10	360	10	370
Future Volume (vph)	270	820	20	10	920	320	10	10	10	360	10	370
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0		4.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor		0.95		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Frt		1.00		1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected		0.99		0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)		3487		1770	1863	1583	1770	1863	1583		1776	1583
Flt Permitted		0.55		0.11	1.00	1.00	0.36	1.00	1.00		0.72	1.00
Satd. Flow (perm)		1933		212	1863	1583	666	1863	1583		1349	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	293	891	22	11	1000	348	11	11	11	391	11	402
RTOR Reduction (vph)	0	1	0	0	0	97	0	0	7	0	0	248
Lane Group Flow (vph)	0	1205	0	11	1000	251	11	11	4	0	402	154
Turn Type	custom	NA		custom	NA	custom	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	1 2		3	2 3			5			5	
Permitted Phases	2			2		2	5		5	5		5
Actuated Green, G (s)		38.2		36.2	41.2	35.2	34.9	34.9	34.9		34.9	34.9
Effective Green, g (s)		38.2		36.2	41.2	35.2	34.9	34.9	34.9		34.9	34.9
Actuated g/C Ratio		0.42		0.40	0.45	0.39	0.38	0.38	0.38		0.38	0.38
Clearance Time (s)				4.0		5.0	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)				3.0		3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		861		101	842	611	255	713	606		516	606
v/s Ratio Prot		c0.05		0.00	c0.54			0.01				
v/s Ratio Perm		c0.54		0.04		0.16	0.02		0.00		c0.30	0.10
v/c Ratio		2.01dl		0.11	1.19	0.41	0.04	0.02	0.01		0.78	0.25
Uniform Delay, d1		26.4		31.4	24.9	20.4	17.6	17.4	17.4		24.7	19.2
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2		186.8		0.5	96.3	0.5	0.1	0.0	0.0		7.3	0.2
Delay (s)		213.2		31.8	121.3	20.8	17.7	17.4	17.4		32.0	19.4
Level of Service		F		C	F	C	B	B	B		C	B
Approach Delay (s)		213.2			94.8			17.5			25.7	
Approach LOS		F			F			B			C	

Intersection Summary			
HCM 2000 Control Delay	119.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	91.1	Sum of lost time (s)	20.0
Intersection Capacity Utilization	118.4%	ICU Level of Service	H
Analysis Period (min)	15		

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

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	240	1020	1070	120	110	210
Future Volume (vph)	240	1020	1070	120	110	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			0	100	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.986			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1837	0	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	1837	0	1770	1583
Link Speed (mph)		30	30		30	
Link Distance (ft)		169	487		207	
Travel Time (s)		3.8	11.1		4.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	261	1109	1163	130	120	228
Shared Lane Traffic (%)						
Lane Group Flow (vph)	261	1109	1293	0	120	228
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 93.0%	ICU Level of Service F
Analysis Period (min) 15	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	240	1020	1070	120	110	210
Future Volume (Veh/h)	240	1020	1070	120	110	210
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	261	1109	1163	130	120	228
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		650	921			
pX, platoon unblocked	0.76				0.76	0.76
vC, conflicting volume	1293				2859	1228
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1228				2572	1142
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	40				0	0
cM capacity (veh/h)	432				9	185

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	261	1109	1293	120	228
Volume Left	261	0	0	120	0
Volume Right	0	0	130	0	228
cSH	432	1700	1700	9	185
Volume to Capacity	0.60	0.65	0.76	13.93	1.23
Queue Length 95th (ft)	97	0	0	Err	307
Control Delay (s)	25.3	0.0	0.0	Err	192.0
Lane LOS	D			F	F
Approach Delay (s)	4.8		0.0	3573.8	
Approach LOS				F	

Intersection Summary			
Average Delay	415.2		
Intersection Capacity Utilization	93.0%	ICU Level of Service	F
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	670	360	140	560	150	440	320	140	110	290	210
Future Volume (vph)	140	670	360	140	560	150	440	320	140	110	290	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.954			0.968				0.850			0.850
Flt Protected		0.994		0.950				0.972			0.986	
Satd. Flow (prot)	0	3356	0	1770	3426	0	0	1811	1583	0	1837	1583
Flt Permitted		0.739		0.167				0.226			0.134	
Satd. Flow (perm)	0	2495	0	311	3426	0	0	421	1583	0	250	1583
Right Turn on Red			No			No			Yes			Yes
Satd. Flow (RTOR)									114			228
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		434			464			449			761	
Travel Time (s)		9.9			10.5			10.2			17.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	728	391	152	609	163	478	348	152	120	315	228
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1271	0	152	772	0	0	826	152	0	435	228
Turn Type	Perm	NA		D.P+P	NA		D.P+P	NA	Perm	Perm	NA	Perm
Protected Phases		2		1	1 2		4	4 5			5	
Permitted Phases	2			2			5		4 5	5		5
Detector Phase	2	2		1	1 2		4	4 5	4 5	5	5	5
Switch Phase												
Minimum Initial (s)	1.0	1.0		1.0			1.0			1.0	1.0	1.0
Minimum Split (s)	15.0	15.0		6.0			6.0			8.0	8.0	8.0
Total Split (s)	30.0	30.0		10.0			10.0			25.0	25.0	25.0
Total Split (%)	31.6%	31.6%		10.5%			10.5%			26.3%	26.3%	26.3%
Maximum Green (s)	24.0	24.0		7.0			6.0			19.0	19.0	19.0
Yellow Time (s)	3.0	3.0		3.0			3.0			3.0	3.0	3.0
All-Red Time (s)	3.0	3.0		0.0			1.0			3.0	3.0	3.0
Lost Time Adjust (s)		0.0		0.0							0.0	0.0
Total Lost Time (s)		6.0		3.0							6.0	6.0
Lead/Lag	Lag	Lag		Lead			Lag					
Lead-Lag Optimize?	Yes	Yes		Yes			Yes					
Vehicle Extension (s)	3.0	3.0		3.0			3.0			3.0	3.0	3.0
Recall Mode	Max	Max		None			None			None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		24.0		34.0	37.0			27.0	31.0		19.0	19.0
Actuated g/C Ratio		0.32		0.45	0.49			0.36	0.41		0.25	0.25
v/c Ratio		1.59		0.55	0.46			3.15	0.21		6.90	0.40
Control Delay		296.7		18.6	13.5			993.4	5.6		2698.2	5.9
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay		296.7		18.6	13.5			993.4	5.6		2698.2	5.9
LOS		F		B	B			F	A		F	A
Approach Delay		296.7			14.4			839.9			1772.3	
Approach LOS		F			B			F			F	

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	20.0
Total Split (s)	20.0
Total Split (%)	21%
Maximum Green (s)	17.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	6.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		~452		37	116			~640	10		~382	0
Queue Length 95th (ft)		#576		69	160			#856	44		#556	50
Internal Link Dist (ft)		354			384			369			681	
Turn Bay Length (ft)												
Base Capacity (vph)		798		277	1690			262	721		63	571
Starvation Cap Reductn		0		0	0			0	0		0	0
Spillback Cap Reductn		0		0	0			0	0		0	0
Storage Cap Reductn		0		0	0			0	0		0	0
Reduced v/c Ratio		1.59		0.55	0.46			3.15	0.21		6.90	0.40

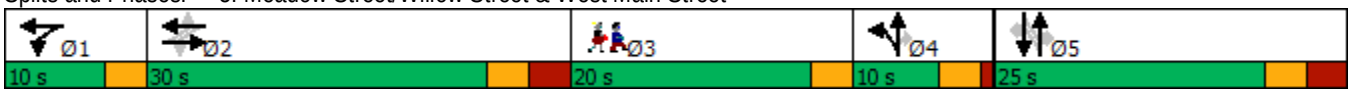
Intersection Summary

Area Type: Other
Cycle Length: 95
Actuated Cycle Length: 75
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 6.90
Intersection Signal Delay: 622.2 Intersection LOS: F
Intersection Capacity Utilization 133.6% ICU Level of Service H
Analysis Period (min) 15

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

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

Splits and Phases: 5: Meadow Street/Willow Street & West Main Street



Lane Group	Ø3
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	670	360	140	560	150	440	320	140	110	290	210
Future Volume (vph)	140	670	360	140	560	150	440	320	140	110	290	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		3.0	3.0			4.0	4.0		6.0	6.0
Lane Util. Factor		0.95		1.00	0.95			1.00	1.00		1.00	1.00
Frt		0.95		1.00	0.97			1.00	0.85		1.00	0.85
Flt Protected		0.99		0.95	1.00			0.97	1.00		0.99	1.00
Satd. Flow (prot)		3356		1770	3427			1810	1583		1837	1583
Flt Permitted		0.74		0.17	1.00			0.23	1.00		0.13	1.00
Satd. Flow (perm)		2494		310	3427			420	1583		250	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	728	391	152	609	163	478	348	152	120	315	228
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	70	0	0	170
Lane Group Flow (vph)	0	1271	0	152	772	0	0	826	82	0	435	58
Turn Type	Perm	NA		D.P+P	NA		D.P+P	NA	Perm	Perm	NA	Perm
Protected Phases		2		1	1 2		4	4 5			5	
Permitted Phases	2			2			5		4 5	5		5
Actuated Green, G (s)		24.0		31.0	34.0			25.0	29.0		19.0	19.0
Effective Green, g (s)		24.0		31.0	34.0			25.0	29.0		19.0	19.0
Actuated g/C Ratio		0.32		0.41	0.45			0.33	0.39		0.25	0.25
Clearance Time (s)		6.0		3.0							6.0	6.0
Vehicle Extension (s)		3.0		3.0							3.0	3.0
Lane Grp Cap (vph)		798		264	1553			251	612		63	401
v/s Ratio Prot				c0.05	0.23			c0.26				
v/s Ratio Perm		c0.51		0.18				0.83	0.05		c1.74	0.04
v/c Ratio		1.59		0.58	0.50			3.29	0.13		6.90	0.14
Uniform Delay, d1		25.5		17.0	14.5			25.0	14.9		28.0	21.7
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2		272.7		3.0	0.3			1041.1	0.1		2690.1	0.2
Delay (s)		298.2		20.0	14.7			1066.1	15.0		2718.1	21.9
Level of Service		F		C	B			F	B		F	C
Approach Delay (s)		298.2			15.6			902.7			1790.9	
Approach LOS		F			B			F			F	

Intersection Summary			
HCM 2000 Control Delay	642.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	3.63		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	133.6%	ICU Level of Service	H
Analysis Period (min)	15		

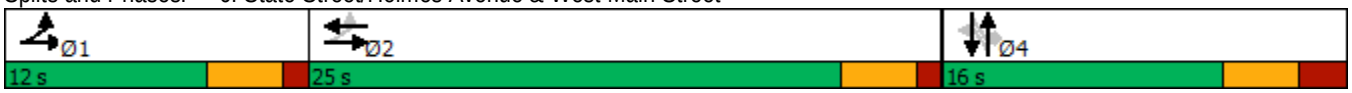
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	810	0	0	730	20	50	60	30	80	0	60
Future Volume (vph)	80	810	0	0	730	20	50	60	30	80	0	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	0.91	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.996				0.850		0.942	
Flt Protected	0.950							0.978			0.972	
Satd. Flow (prot)	1770	3539	0	0	5065	0	0	1822	1583	0	1706	0
Flt Permitted	0.307							0.838			0.757	
Satd. Flow (perm)	572	3539	0	0	5065	0	0	1561	1583	0	1328	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					9				103		103	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		464			264			230			199	
Travel Time (s)		10.5			6.0			5.2			4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	880	0	0	793	22	54	65	33	87	0	65
Shared Lane Traffic (%)												
Lane Group Flow (vph)	87	880	0	0	815	0	0	119	33	0	152	0
Turn Type	D.P+P	NA			NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	1 2			2			4			4	
Permitted Phases	2						4		4	4		
Detector Phase	1	1 2			2		4	4	4	4	4	
Switch Phase												
Minimum Initial (s)	1.0				1.0		1.0	1.0	1.0	1.0	1.0	
Minimum Split (s)	5.0				15.0		8.0	8.0	8.0	8.0	8.0	
Total Split (s)	12.0				25.0		16.0	16.0	16.0	16.0	16.0	
Total Split (%)	22.6%				47.2%		30.2%	30.2%	30.2%	30.2%	30.2%	
Maximum Green (s)	8.0				21.0		11.0	11.0	11.0	11.0	11.0	
Yellow Time (s)	3.0				3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	1.0				1.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0				0.0			0.0	0.0		0.0	
Total Lost Time (s)	4.0				4.0			5.0	5.0		5.0	
Lead/Lag	Lead				Lag							
Lead-Lag Optimize?	Yes				Yes							
Vehicle Extension (s)	3.0				3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min				Max		None	None	None	None	None	
Act Effct Green (s)	29.4	34.6			21.5			8.7	8.7		8.7	
Actuated g/C Ratio	0.60	0.71			0.44			0.18	0.18		0.18	
v/c Ratio	0.16	0.35			0.36			0.42	0.09		0.47	
Control Delay	4.7	4.6			10.7			23.7	0.5		13.3	
Queue Delay	0.0	0.0			0.0			0.0	0.0		0.0	
Total Delay	4.7	4.6			10.7			23.7	0.5		13.3	
LOS	A	A			B			C	A		B	
Approach Delay		4.6			10.7			18.6			13.3	
Approach LOS		A			B			B			B	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	8	52			59			32	0		13	
Queue Length 95th (ft)	21	87			90			71	0		53	
Internal Link Dist (ft)		384			184			150			119	
Turn Bay Length (ft)	125											
Base Capacity (vph)	550	2455			2241			361	445		386	
Starvation Cap Reductn	0	0			0			0	0		0	
Spillback Cap Reductn	0	0			0			0	0		0	
Storage Cap Reductn	0	0			0			0	0		0	
Reduced v/c Ratio	0.16	0.36			0.36			0.33	0.07		0.39	

Intersection Summary	
Area Type:	Other
Cycle Length: 53	
Actuated Cycle Length: 48.6	
Natural Cycle: 40	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.47	
Intersection Signal Delay: 8.6	Intersection LOS: A
Intersection Capacity Utilization 45.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 6: State Street/Holmes Avenue & West Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	810	0	0	730	20	50	60	30	80	0	60
Future Volume (vph)	80	810	0	0	730	20	50	60	30	80	0	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			5.0	5.0		5.0	
Lane Util. Factor	1.00	0.95			0.91			1.00	1.00		1.00	
Frt	1.00	1.00			1.00			1.00	0.85		0.94	
Flt Protected	0.95	1.00			1.00			0.98	1.00		0.97	
Satd. Flow (prot)	1770	3539			5065			1821	1583		1706	
Flt Permitted	0.31	1.00			1.00			0.84	1.00		0.76	
Satd. Flow (perm)	572	3539			5065			1562	1583		1329	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	880	0	0	793	22	54	65	33	87	0	65
RTOR Reduction (vph)	0	0	0	0	5	0	0	0	28	0	88	0
Lane Group Flow (vph)	87	880	0	0	810	0	0	119	5	0	64	0
Turn Type	D.P+P	NA			NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	1 2			2			4			4	
Permitted Phases	2						4		4	4		
Actuated Green, G (s)	29.4	33.4			21.4			7.2	7.2		7.2	
Effective Green, g (s)	29.4	33.4			21.4			7.2	7.2		7.2	
Actuated g/C Ratio	0.59	0.67			0.43			0.15	0.15		0.15	
Clearance Time (s)	4.0				4.0			5.0	5.0		5.0	
Vehicle Extension (s)	3.0				3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	532	2383			2185			226	229		192	
v/s Ratio Prot	0.03	c0.25			0.16							
v/s Ratio Perm	0.07							c0.08	0.00		0.05	
v/c Ratio	0.16	0.37			0.37			0.53	0.02		0.33	
Uniform Delay, d1	4.4	3.5			9.5			19.6	18.2		19.0	
Progression Factor	1.00	1.00			1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.1	0.1			0.5			2.2	0.0		1.0	
Delay (s)	4.5	3.6			10.0			21.8	18.2		20.1	
Level of Service	A	A			B			C	B		C	
Approach Delay (s)		3.7			10.0			21.0			20.1	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	8.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	49.6	Sum of lost time (s)	13.0
Intersection Capacity Utilization	45.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	40	930	690	140	60	30
Future Volume (vph)	40	930	690	140	60	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.91	0.95	0.95	1.00	1.00
Frt			0.975		0.955	
Flt Protected	0.950				0.968	
Satd. Flow (prot)	1770	5085	3451	0	1722	0
Flt Permitted	0.950				0.968	
Satd. Flow (perm)	1770	5085	3451	0	1722	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		264	120		271	
Travel Time (s)		6.0	2.7		6.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	1011	750	152	65	33
Shared Lane Traffic (%)						
Lane Group Flow (vph)	43	1011	902	0	98	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 42.0%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	40	930	690	140	60	30
Future Volume (Veh/h)	40	930	690	140	60	30
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	1011	750	152	65	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		264	120			
pX, platoon unblocked	0.94				0.95	0.94
vC, conflicting volume	902				1249	451
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	770				1014	291
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				69	95
cM capacity (veh/h)	790				212	664

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	SB 1
Volume Total	43	337	337	337	500	402	98
Volume Left	43	0	0	0	0	0	65
Volume Right	0	0	0	0	0	152	33
cSH	790	1700	1700	1700	1700	1700	275
Volume to Capacity	0.05	0.20	0.20	0.20	0.29	0.24	0.36
Queue Length 95th (ft)	4	0	0	0	0	0	39
Control Delay (s)	9.8	0.0	0.0	0.0	0.0	0.0	25.2
Lane LOS	A						D
Approach Delay (s)	0.4				0.0		25.2
Approach LOS							D

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	42.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR	Ø1	Ø2	Ø3	Ø4
Lane Configurations										
Traffic Volume (vph)	0	930	0	280	640	0				
Future Volume (vph)	0	930	0	280	640	0				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Lane Util. Factor	1.00	0.76	1.00	0.95	0.97	1.00				
Frt		0.850								
Flt Protected					0.950					
Satd. Flow (prot)	0	3610	0	3539	3433	0				
Flt Permitted					0.950					
Satd. Flow (perm)	0	3610	0	3539	3433	0				
Right Turn on Red		Yes				Yes				
Satd. Flow (RTOR)		2487								
Link Speed (mph)	30			30	30					
Link Distance (ft)	120			184	92					
Travel Time (s)	2.7			4.2	2.1					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Adj. Flow (vph)	0	1011	0	304	696	0				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	0	1011	0	304	696	0				
Turn Type		pt+ov		NA	Prot					
Protected Phases		1 2		1 4	2 3		1	2	3	4
Permitted Phases										
Detector Phase		1 2		1 4	2 3					
Switch Phase										
Minimum Initial (s)							1.0	1.0	1.0	1.0
Minimum Split (s)							6.0	19.0	5.0	19.0
Total Split (s)							14.0	34.0	6.0	19.0
Total Split (%)							19%	47%	8%	26%
Maximum Green (s)							9.0	30.0	2.0	15.0
Yellow Time (s)							3.0	3.0	3.0	3.0
All-Red Time (s)							2.0	1.0	1.0	1.0
Lost Time Adjust (s)										
Total Lost Time (s)										
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes
Vehicle Extension (s)							3.0	3.0	3.0	3.0
Recall Mode							None	Max	None	None
Walk Time (s)								7.0		4.0
Flash Dont Walk (s)								8.0		11.0
Pedestrian Calls (#/hr)								0		0
Act Effct Green (s)		43.1		23.8	36.1					
Actuated g/C Ratio		0.63		0.35	0.52					
v/c Ratio		0.32		0.25	0.39					
Control Delay		0.3		16.5	0.6					
Queue Delay		0.1		0.0	0.0					
Total Delay		0.3		16.5	0.6					
LOS		A		B	A					
Approach Delay	0.3			16.5	0.6					
Approach LOS	A			B	A					

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR	Ø1	Ø2	Ø3	Ø4
Queue Length 50th (ft)		0		47	0					
Queue Length 95th (ft)		0		74	0					
Internal Link Dist (ft)	40			104	12					
Turn Bay Length (ft)										
Base Capacity (vph)		3188		1189	1796					
Starvation Cap Reductn		0		0	0					
Spillback Cap Reductn		609		0	0					
Storage Cap Reductn		0		0	0					
Reduced v/c Ratio		0.39		0.26	0.39					

Intersection Summary	
Area Type:	Other
Cycle Length: 73	
Actuated Cycle Length: 68.9	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 2.9	Intersection LOS: A
Intersection Capacity Utilization 33.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 8: West Main Street

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	0	930	0	280	640	0
Future Volume (vph)	0	930	0	280	640	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	4.0	
Lane Util. Factor		0.76		0.95	0.97	
Frt		0.85		1.00	1.00	
Flt Protected		1.00		1.00	0.95	
Satd. Flow (prot)		3610		3539	3433	
Flt Permitted		1.00		1.00	0.95	
Satd. Flow (perm)		3610		3539	3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1011	0	304	696	0
RTOR Reduction (vph)	0	364	0	0	0	0
Lane Group Flow (vph)	0	647	0	304	696	0
Turn Type		pt+ov		NA	Prot	
Protected Phases		1 2		1 4	2 3	
Permitted Phases						
Actuated Green, G (s)		44.0		23.8	36.0	
Effective Green, g (s)		44.0		19.8	36.0	
Actuated g/C Ratio		0.64		0.29	0.52	
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)		2308		1018	1796	
v/s Ratio Prot		c0.18		c0.09	c0.20	
v/s Ratio Perm						
v/c Ratio		0.28		0.30	0.39	
Uniform Delay, d1		5.4		19.1	9.8	
Progression Factor		1.00		1.00	0.00	
Incremental Delay, d2		0.1		0.2	0.1	
Delay (s)		5.5		19.3	0.1	
Level of Service		A		B	A	
Approach Delay (s)	5.5			19.3	0.1	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	5.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	68.8	Sum of lost time (s)	17.0
Intersection Capacity Utilization	33.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL2	WBL	WBR	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR	Ø3
Lane Configurations												
Traffic Volume (vph)	70	20	0	0	0	150	790	50	20	640	130	
Future Volume (vph)	70	20	0	0	0	150	790	50	20	640	130	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00	
Frt							0.991				0.850	
Flt Protected		0.950				0.950				0.998		
Satd. Flow (prot)	0	1770	0	0	0	1770	3507	0	0	3532	1583	
Flt Permitted		0.950				0.950				0.916		
Satd. Flow (perm)	0	1770	0	0	0	1770	3507	0	0	3242	1583	
Right Turn on Red			Yes					Yes			Yes	
Satd. Flow (RTOR)							15				141	
Link Speed (mph)		30		30			30			30		
Link Distance (ft)		124		240			92			178		
Travel Time (s)		2.8		5.5			2.1			4.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	76	22	0	0	0	163	859	54	22	696	141	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	98	0	0	0	163	913	0	0	718	141	
Turn Type	Prot	Prot				Prot	NA		Perm	NA	custom	
Protected Phases	4	4				1	1 2			2	3 4	3
Permitted Phases									2		2	
Detector Phase	4	4				1	1 2		2	2	3 4	
Switch Phase												
Minimum Initial (s)	1.0	1.0				1.0			1.0	1.0		1.0
Minimum Split (s)	19.0	19.0				6.0			19.0	19.0		5.0
Total Split (s)	19.0	19.0				14.0			34.0	34.0		6.0
Total Split (%)	26.0%	26.0%				19.2%			46.6%	46.6%		8%
Maximum Green (s)	15.0	15.0				9.0			30.0	30.0		2.0
Yellow Time (s)	3.0	3.0				3.0			3.0	3.0		3.0
All-Red Time (s)	1.0	1.0				2.0			1.0	1.0		1.0
Lost Time Adjust (s)		0.0				0.0				0.0		
Total Lost Time (s)		4.0				5.0				4.0		
Lead/Lag	Lag	Lag				Lead			Lag	Lag		Lead
Lead-Lag Optimize?	Yes	Yes				Yes			Yes	Yes		Yes
Vehicle Extension (s)	3.0	3.0				3.0			3.0	3.0		3.0
Recall Mode	None	None				None			Max	Max		None
Walk Time (s)	4.0	4.0							7.0	7.0		
Flash Dont Walk (s)	11.0	11.0							8.0	8.0		
Pedestrian Calls (#/hr)	0	0							0	0		
Act Effct Green (s)		10.8				9.0	43.1			30.0	50.9	
Actuated g/C Ratio		0.16				0.13	0.63			0.44	0.74	
v/c Ratio		0.35				0.71	0.42			0.51	0.12	
Control Delay		29.3				48.0	7.5			16.1	0.7	
Queue Delay		0.0				0.0	0.0			0.0	0.0	
Total Delay		29.3				48.0	7.5			16.1	0.7	
LOS		C				D	A			B	A	
Approach Delay		29.3					13.6			13.6		
Approach LOS		C					B			B		

Lane Group	WBL2	WBL	WBR	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR	Ø3
Queue Length 50th (ft)		37				67	86			110	0	
Queue Length 95th (ft)		77				#163	145			174	10	
Internal Link Dist (ft)		44		160			12			98		
Turn Bay Length (ft)												
Base Capacity (vph)		385				231	2197			1413	1293	
Starvation Cap Reductn		0				0	0			0	0	
Spillback Cap Reductn		0				0	0			0	0	
Storage Cap Reductn		0				0	0			0	0	
Reduced v/c Ratio		0.25				0.71	0.42			0.51	0.11	

Intersection Summary	
Area Type:	Other
Cycle Length: 73	
Actuated Cycle Length: 68.9	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 14.4	Intersection LOS: B
Intersection Capacity Utilization 57.5%	ICU Level of Service B
Analysis Period (min) 15	

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

Splits and Phases: 9: Church Street & West Main Street

Movement	WBL2	WBL	WBR	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations											
Traffic Volume (vph)	70	20	0	0	0	150	790	50	20	640	130
Future Volume (vph)	70	20	0	0	0	150	790	50	20	640	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0				5.0	5.0			4.0	4.0
Lane Util. Factor		1.00				1.00	0.95			0.95	1.00
Frt		1.00				1.00	0.99			1.00	0.85
Flt Protected		0.95				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1770				1770	3508			3534	1583
Flt Permitted		0.95				0.95	1.00			0.92	1.00
Satd. Flow (perm)		1770				1770	3508			3240	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	22	0	0	0	163	859	54	22	696	141
RTOR Reduction (vph)	0	0	0	0	0	0	5	0	0	0	45
Lane Group Flow (vph)	0	98	0	0	0	163	908	0	0	718	96
Turn Type	Prot	Prot				Prot	NA		Perm	NA	custom
Protected Phases	4	4				1	1 2			2	3 4
Permitted Phases									2		2
Actuated Green, G (s)		10.8				9.0	44.0			30.0	46.8
Effective Green, g (s)		10.8				9.0	44.0			30.0	46.8
Actuated g/C Ratio		0.16				0.13	0.64			0.44	0.68
Clearance Time (s)		4.0				5.0				4.0	
Vehicle Extension (s)		3.0				3.0				3.0	
Lane Grp Cap (vph)		277				231	2243			1412	1168
v/s Ratio Prot		c0.06				c0.09	0.26				c0.02
v/s Ratio Perm										c0.22	0.04
v/c Ratio		0.35				0.71	0.40			0.51	0.08
Uniform Delay, d1		25.9				28.6	6.0			14.1	3.7
Progression Factor		1.00				1.00	1.00			1.00	1.00
Incremental Delay, d2		0.8				9.1	0.1			1.3	0.0
Delay (s)		26.7				37.8	6.1			15.4	3.8
Level of Service		C				D	A			B	A
Approach Delay (s)		26.7		0.0			10.9			13.5	
Approach LOS		C		A			B			B	

Intersection Summary			
HCM 2000 Control Delay	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	68.8	Sum of lost time (s)	17.0
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		

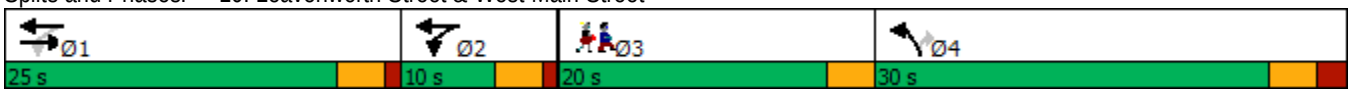
c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø3
Lane Configurations							
Traffic Volume (vph)	820	40	80	660	130	120	
Future Volume (vph)	820	40	80	660	130	120	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00	
Frt	0.993					0.850	
Flt Protected			0.950		0.950		
Satd. Flow (prot)	3514	0	1770	3539	1770	1583	
Flt Permitted			0.210		0.950		
Satd. Flow (perm)	3514	0	391	3539	1770	1583	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	5					130	
Link Speed (mph)	30			30	30		
Link Distance (ft)	289			389	436		
Travel Time (s)	6.6			8.8	9.9		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	891	43	87	717	141	130	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	934	0	87	717	141	130	
Turn Type	NA		D.P+P	NA	Prot	Perm	
Protected Phases	1		2	1 2	4		3
Permitted Phases			1			4	
Detector Phase	1		2	1 2	4	4	
Switch Phase							
Minimum Initial (s)	1.0		1.0		1.0	1.0	1.0
Minimum Split (s)	15.0		6.0		8.0	8.0	20.0
Total Split (s)	25.0		10.0		30.0	30.0	20.0
Total Split (%)	29.4%		11.8%		35.3%	35.3%	24%
Maximum Green (s)	21.0		6.0		25.0	25.0	17.0
Yellow Time (s)	3.0		3.0		3.0	3.0	3.0
All-Red Time (s)	1.0		1.0		2.0	2.0	0.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	4.0		4.0		5.0	5.0	
Lead/Lag	Lead		Lag		Lag	Lag	Lead
Lead-Lag Optimize?	Yes		Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0		3.0		3.0	3.0	3.0
Recall Mode	Max		Max		None	None	None
Walk Time (s)							8.0
Flash Dont Walk (s)							9.0
Pedestrian Calls (#/hr)							0
Act Effct Green (s)	21.0		27.0	31.0	9.1	9.1	
Actuated g/C Ratio	0.43		0.55	0.63	0.18	0.18	
v/c Ratio	0.62		0.23	0.32	0.43	0.33	
Control Delay	13.5		7.7	5.0	21.9	6.6	
Queue Delay	0.0		0.0	0.1	0.0	0.0	
Total Delay	13.5		7.7	5.0	21.9	6.6	
LOS	B		A	A	C	A	
Approach Delay	13.5			5.3	14.6		
Approach LOS	B			A	B		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø3
Queue Length 50th (ft)	102		8	39	36	0	
Queue Length 95th (ft)	170		23	74	76	33	
Internal Link Dist (ft)	209			309	356		
Turn Bay Length (ft)							
Base Capacity (vph)	1504		383	2233	900	869	
Starvation Cap Reductn	0		0	360	0	0	
Spillback Cap Reductn	0		0	0	0	0	
Storage Cap Reductn	0		0	0	0	0	
Reduced v/c Ratio	0.62		0.23	0.38	0.16	0.15	

Intersection Summary	
Area Type:	Other
Cycle Length: 85	
Actuated Cycle Length: 49.2	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.62	
Intersection Signal Delay: 10.4	Intersection LOS: B
Intersection Capacity Utilization 46.4%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 10: Leavenworth Street & West Main Street



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	820	40	80	660	130	120
Future Volume (vph)	820	40	80	660	130	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	5.0	5.0
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3515		1770	3539	1770	1583
Flt Permitted	1.00		0.21	1.00	0.95	1.00
Satd. Flow (perm)	3515		392	3539	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	891	43	87	717	141	130
RTOR Reduction (vph)	3	0	0	0	0	106
Lane Group Flow (vph)	931	0	87	717	141	24
Turn Type	NA		D.P+P	NA	Prot	Perm
Protected Phases	1		2	1 2	4	
Permitted Phases			1			4
Actuated Green, G (s)	21.0		27.0	31.0	9.1	9.1
Effective Green, g (s)	21.0		27.0	31.0	9.1	9.1
Actuated g/C Ratio	0.43		0.55	0.63	0.19	0.19
Clearance Time (s)	4.0		4.0		5.0	5.0
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	1503		383	2234	328	293
v/s Ratio Prot	c0.26		0.03	c0.20	c0.08	
v/s Ratio Perm			0.10			0.02
v/c Ratio	0.62		0.23	0.32	0.43	0.08
Uniform Delay, d1	10.9		9.9	4.2	17.7	16.5
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9		1.4	0.4	0.9	0.1
Delay (s)	12.9		11.2	4.6	18.6	16.7
Level of Service	B		B	A	B	B
Approach Delay (s)	12.9			5.3	17.7	
Approach LOS	B			A	B	

Intersection Summary			
HCM 2000 Control Delay	10.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	49.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

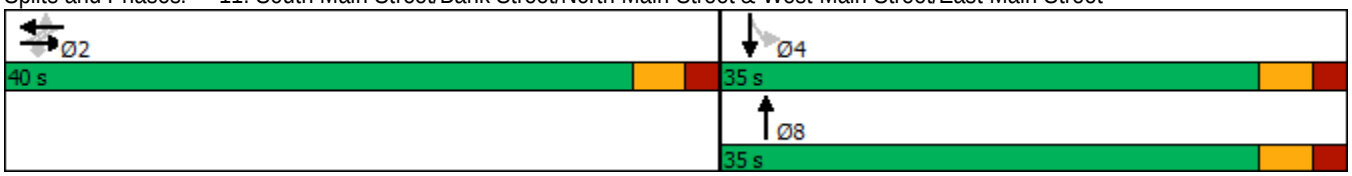
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	860	70	50	730	20	0	510	10	30	440	10
Future Volume (vph)	10	860	70	50	730	20	0	510	10	30	440	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		130	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	0.95	1.00	0.95	0.95	0.95	0.95	0.95
Frt			0.850		0.996			0.997			0.997	
Flt Protected		0.999			0.997						0.997	
Satd. Flow (prot)	0	3536	1583	0	3514	0	0	3529	0	0	3518	0
Flt Permitted		0.944			0.846						0.887	
Satd. Flow (perm)	0	3341	1583	0	2982	0	0	3529	0	0	3130	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			76		5			3			3	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		389			245			286			217	
Travel Time (s)		8.8			5.6			6.5			4.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	935	76	54	793	22	0	554	11	33	478	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	946	76	0	869	0	0	565	0	0	522	0
Turn Type	Perm	NA	Perm	Perm	NA			NA		Perm	NA	
Protected Phases		2			2			8			4	
Permitted Phases	2		2	2						4		
Detector Phase	2	2	2	2	2			8		4	4	
Switch Phase												
Minimum Initial (s)	1.0	1.0	1.0	1.0	1.0			1.0		1.0	1.0	
Minimum Split (s)	37.0	37.0	37.0	37.0	37.0			35.0		35.0	35.0	
Total Split (s)	40.0	40.0	40.0	40.0	40.0			35.0		35.0	35.0	
Total Split (%)	53.3%	53.3%	53.3%	53.3%	53.3%			46.7%		46.7%	46.7%	
Maximum Green (s)	35.0	35.0	35.0	35.0	35.0			30.0		30.0	30.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0			3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0			2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0			0.0			0.0	
Total Lost Time (s)		5.0	5.0		5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0		3.0	3.0	
Recall Mode	Max	Max	Max	Max	Max			None		None	None	
Walk Time (s)	12.0	12.0	12.0	12.0	12.0			12.0		12.0	12.0	
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0			18.0		18.0	18.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0		0	0	
Act Effct Green (s)		35.2	35.2		35.2			15.9			15.9	
Actuated g/C Ratio		0.58	0.58		0.58			0.26			0.26	
v/c Ratio		0.49	0.08		0.51			0.61			0.64	
Control Delay		9.4	2.5		9.7			22.7			23.6	
Queue Delay		0.2	0.0		0.0			0.0			0.1	
Total Delay		9.7	2.5		9.7			22.7			23.7	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A	A		A			C			C	
Approach Delay		9.1			9.7			22.7			23.7	
Approach LOS		A			A			C			C	
Queue Length 50th (ft)		95	0		88			95			88	
Queue Length 95th (ft)		173	17		164			139			132	
Internal Link Dist (ft)		309			165			206			137	
Turn Bay Length (ft)			130									
Base Capacity (vph)		1922	942		1717			1741			1545	
Starvation Cap Reductn		335	0		0			0			245	
Spillback Cap Reductn		0	0		0			0			0	
Storage Cap Reductn		0	0		0			0			0	
Reduced v/c Ratio		0.60	0.08		0.51			0.32			0.40	

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 61.1
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.64
Intersection Signal Delay: 14.4 Intersection LOS: B
Intersection Capacity Utilization 90.8% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 11: South Main Street/Bank Street/North Main Street & West Main Street/East Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	860	70	50	730	20	0	510	10	30	440	10
Future Volume (vph)	10	860	70	50	730	20	0	510	10	30	440	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0			5.0			5.0	
Lane Util. Factor		0.95	1.00		0.95			0.95			0.95	
Frt		1.00	0.85		1.00			1.00			1.00	
Flt Protected		1.00	1.00		1.00			1.00			1.00	
Satd. Flow (prot)		3537	1583		3515			3529			3517	
Flt Permitted		0.94	1.00		0.85			1.00			0.89	
Satd. Flow (perm)		3341	1583		2983			3529			3130	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	935	76	54	793	22	0	554	11	33	478	11
RTOR Reduction (vph)	0	0	32	0	2	0	0	2	0	0	2	0
Lane Group Flow (vph)	0	946	44	0	867	0	0	563	0	0	520	0
Turn Type	Perm	NA	Perm	Perm	NA			NA		Perm	NA	
Protected Phases		2			2			8			4	
Permitted Phases	2		2	2						4		
Actuated Green, G (s)		35.1	35.1		35.1			15.9			15.9	
Effective Green, g (s)		35.1	35.1		35.1			15.9			15.9	
Actuated g/C Ratio		0.58	0.58		0.58			0.26			0.26	
Clearance Time (s)		5.0	5.0		5.0			5.0			5.0	
Vehicle Extension (s)		3.0	3.0		3.0			3.0			3.0	
Lane Grp Cap (vph)		1922	910		1716			919			815	
v/s Ratio Prot								0.16				
v/s Ratio Perm		0.28	0.03		c0.29						c0.17	
v/c Ratio		0.49	0.05		0.51			0.61			0.64	
Uniform Delay, d1		7.7	5.7		7.8			19.8			20.0	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		0.9	0.1		1.1			1.2			1.6	
Delay (s)		8.6	5.8		8.8			21.1			21.6	
Level of Service		A	A		A			C			C	
Approach Delay (s)		8.4			8.8			21.1			21.6	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	13.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	61.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	90.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	140	100	210	330	380	140	
Future Volume (vph)	140	100	210	330	380	140	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	
Frt		0.850			0.960		
Flt Protected	0.950		0.950				
Satd. Flow (prot)	1770	1583	1770	1863	3398	0	
Flt Permitted	0.950		0.950				
Satd. Flow (perm)	1770	1583	1770	1863	3398	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)		109			52		
Link Speed (mph)	30			30	30		
Link Distance (ft)	200			217	246		
Travel Time (s)	4.5			4.9	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	152	109	228	359	413	152	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	152	109	228	359	565	0	
Turn Type	Prot	Perm	Prot	NA	NA		
Protected Phases	4		2	1 2	1		3
Permitted Phases		4					
Detector Phase	4	4	2	1 2	1		
Switch Phase							
Minimum Initial (s)	1.0	1.0	1.0		1.0		1.0
Minimum Split (s)	10.0	10.0	20.0		10.0		18.0
Total Split (s)	25.0	25.0	25.0		30.0		18.0
Total Split (%)	25.5%	25.5%	25.5%		30.6%		18%
Maximum Green (s)	21.0	21.0	21.0		26.0		15.0
Yellow Time (s)	3.0	3.0	3.0		3.0		3.0
All-Red Time (s)	1.0	1.0	1.0		1.0		0.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		
Total Lost Time (s)	4.0	4.0	4.0		4.0		
Lead/Lag	Lag	Lag	Lag		Lead		Lead
Lead-Lag Optimize?	Yes	Yes	Yes		Yes		Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0		3.0
Recall Mode	None	None	Max		None		None
Walk Time (s)							6.0
Flash Dont Walk (s)							9.0
Pedestrian Calls (#/hr)							0
Act Effct Green (s)	10.9	10.9	21.3	43.5	18.1		
Actuated g/C Ratio	0.17	0.17	0.34	0.70	0.29		
v/c Ratio	0.49	0.30	0.38	0.28	0.56		
Control Delay	30.3	8.2	20.3	4.5	19.2		
Queue Delay	0.0	0.0	2.1	2.4	0.0		
Total Delay	30.3	8.2	22.3	6.9	19.2		
LOS	C	A	C	A	B		
Approach Delay	21.0			12.9	19.2		
Approach LOS	C			B	B		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Queue Length 50th (ft)	52	0	64	40	83		
Queue Length 95th (ft)	114	38	150	87	138		
Internal Link Dist (ft)	120			137	166		
Turn Bay Length (ft)							
Base Capacity (vph)	604	612	604	1295	1465		
Starvation Cap Reductn	0	0	246	788	0		
Spillback Cap Reductn	0	0	0	0	0		
Storage Cap Reductn	0	0	0	0	0		
Reduced v/c Ratio	0.25	0.18	0.64	0.71	0.39		

Intersection Summary	
Area Type:	Other
Cycle Length: 98	
Actuated Cycle Length: 62.5	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.56	
Intersection Signal Delay: 16.9	Intersection LOS: B
Intersection Capacity Utilization 44.4%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 12: North Main Street & West Main Street

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	140	100	210	330	380	140
Future Volume (vph)	140	100	210	330	380	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	
Frt	1.00	0.85	1.00	1.00	0.96	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1770	1583	1770	1863	3396	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1770	1583	1770	1863	3396	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	109	228	359	413	152
RTOR Reduction (vph)	0	90	0	0	37	0
Lane Group Flow (vph)	152	19	228	359	528	0
Turn Type	Prot	Perm	Prot	NA	NA	
Protected Phases	4		2	1 2	1	
Permitted Phases		4				
Actuated Green, G (s)	10.9	10.9	21.3	43.4	18.1	
Effective Green, g (s)	10.9	10.9	21.3	43.4	18.1	
Actuated g/C Ratio	0.17	0.17	0.34	0.70	0.29	
Clearance Time (s)	4.0	4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	309	276	605	1297	986	
v/s Ratio Prot	c0.09		c0.13	0.19	c0.16	
v/s Ratio Perm		0.01				
v/c Ratio	0.49	0.07	0.38	0.28	0.54	
Uniform Delay, d1	23.2	21.5	15.5	3.6	18.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.2	0.1	1.8	0.1	0.6	
Delay (s)	24.4	21.6	17.3	3.7	19.1	
Level of Service	C	C	B	A	B	
Approach Delay (s)	23.2			9.0	19.1	
Approach LOS	C			A	B	

Intersection Summary			
HCM 2000 Control Delay	15.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	62.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	60	20	80	60	40	70	180	120	40	150	0
Future Volume (vph)	10	60	20	80	60	40	70	180	120	40	150	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.970			0.970			0.956				
Flt Protected		0.994			0.978			0.991			0.990	
Satd. Flow (prot)	0	1796	0	0	1767	0	0	1765	0	0	1844	0
Flt Permitted		0.994			0.978			0.991			0.990	
Satd. Flow (perm)	0	1796	0	0	1767	0	0	1765	0	0	1844	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		218			342			241			213	
Travel Time (s)		5.0			7.8			5.5			4.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	65	22	87	65	43	76	196	130	43	163	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	98	0	0	195	0	0	402	0	0	206	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 50.1%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	60	20	80	60	40	70	180	120	40	150	0
Future Volume (Veh/h)	10	60	20	80	60	40	70	180	120	40	150	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	65	22	87	65	43	76	196	130	43	163	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	738	727	163	716	662	261	163			326		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	738	727	163	716	662	261	163			326		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	80	98	67	81	94	95			97		
cM capacity (veh/h)	253	320	882	266	349	778	1416			1234		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	98	195	402	206
Volume Left	11	87	76	43
Volume Right	22	43	130	0
cSH	361	343	1416	1234
Volume to Capacity	0.27	0.57	0.05	0.03
Queue Length 95th (ft)	27	84	4	3
Control Delay (s)	18.6	28.5	1.9	1.9
Lane LOS	C	D	A	A
Approach Delay (s)	18.6	28.5	1.9	1.9
Approach LOS	C	D		

Intersection Summary			
Average Delay	9.5		
Intersection Capacity Utilization	50.1%	ICU Level of Service	A
Analysis Period (min)	15		

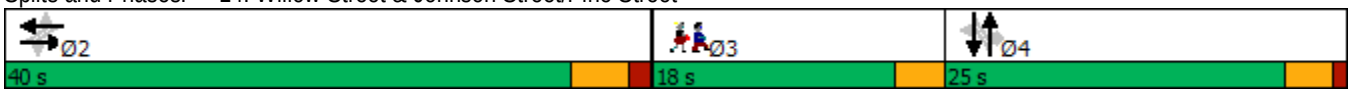
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	140	100	130	80	10	50	320	160	10	320	10
Future Volume (vph)	40	140	100	130	80	10	50	320	160	10	320	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.952			0.994				0.850		0.996	
Flt Protected		0.993			0.971			0.993			0.999	
Satd. Flow (prot)	0	1761	0	0	1798	0	0	1850	1583	0	1853	0
Flt Permitted		0.924			0.659			0.918			0.987	
Satd. Flow (perm)	0	1639	0	0	1220	0	0	1710	1583	0	1831	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		42			4				174		2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		273			331			761			180	
Travel Time (s)		6.2			7.5			17.3			4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	152	109	141	87	11	54	348	174	11	348	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	304	0	0	239	0	0	402	174	0	370	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4		4	4		
Detector Phase	2	2		2	2		4	4	4	4	4	
Switch Phase												
Minimum Initial (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Minimum Split (s)	10.0	10.0		10.0	10.0		7.0	7.0	7.0	7.0	7.0	
Total Split (s)	40.0	40.0		40.0	40.0		25.0	25.0	25.0	25.0	25.0	
Total Split (%)	48.2%	48.2%		48.2%	48.2%		30.1%	30.1%	30.1%	30.1%	30.1%	
Maximum Green (s)	35.0	35.0		35.0	35.0		21.0	21.0	21.0	21.0	21.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0	0.0		0.0	
Total Lost Time (s)		5.0			5.0			4.0	4.0		4.0	
Lead/Lag							Lag	Lag	Lag	Lag	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min		Min	Min		None	None	None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		14.8			14.8			21.3	21.3		21.3	
Actuated g/C Ratio		0.33			0.33			0.47	0.47		0.47	
v/c Ratio		0.54			0.59			0.50	0.21		0.43	
Control Delay		13.9			18.6			12.6	2.9		11.4	
Queue Delay		0.0			0.0			0.0	0.0		0.0	
Total Delay		13.9			18.6			12.6	2.9		11.4	
LOS		B			B			B	A		B	
Approach Delay		13.9			18.6			9.7			11.4	
Approach LOS		B			B			A			B	

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	18.0
Total Split (s)	18.0
Total Split (%)	22%
Maximum Green (s)	15.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	8.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		52			49			64	0		56	
Queue Length 95th (ft)		103			99			172	29		150	
Internal Link Dist (ft)		193			251			681			100	
Turn Bay Length (ft)												
Base Capacity (vph)		1294			957			804	837		862	
Starvation Cap Reductn		0			0			0	0		0	
Spillback Cap Reductn		0			0			0	0		0	
Storage Cap Reductn		0			0			0	0		0	
Reduced v/c Ratio		0.23			0.25			0.50	0.21		0.43	

Intersection Summary	
Area Type:	Other
Cycle Length: 83	
Actuated Cycle Length: 45.2	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.59	
Intersection Signal Delay: 12.4	Intersection LOS: B
Intersection Capacity Utilization 80.1%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 14: Willow Street & Johnson Street/Pine Street



Lane Group	Ø3
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	140	100	130	80	10	50	320	160	10	320	10
Future Volume (vph)	40	140	100	130	80	10	50	320	160	10	320	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			4.0	4.0		4.0	
Lane Util. Factor		1.00			1.00			1.00	1.00		1.00	
Frt		0.95			0.99			1.00	0.85		1.00	
Flt Protected		0.99			0.97			0.99	1.00		1.00	
Satd. Flow (prot)		1760			1798			1850	1583		1853	
Flt Permitted		0.92			0.66			0.92	1.00		0.99	
Satd. Flow (perm)		1637			1219			1711	1583		1832	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	152	109	141	87	11	54	348	174	11	348	11
RTOR Reduction (vph)	0	28	0	0	3	0	0	0	92	0	1	0
Lane Group Flow (vph)	0	276	0	0	236	0	0	402	82	0	369	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4		4	4		
Actuated Green, G (s)		14.8			14.8			21.3	21.3		21.3	
Effective Green, g (s)		14.8			14.8			21.3	21.3		21.3	
Actuated g/C Ratio		0.33			0.33			0.47	0.47		0.47	
Clearance Time (s)		5.0			5.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		537			400			808	747		865	
v/s Ratio Prot												
v/s Ratio Perm		0.17			c0.19			c0.23	0.05		0.20	
v/c Ratio		0.51			0.59			0.50	0.11		0.43	
Uniform Delay, d1		12.2			12.6			8.2	6.6		7.9	
Progression Factor		1.00			1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.8			2.3			0.5	0.1		0.3	
Delay (s)		13.1			15.0			8.7	6.7		8.2	
Level of Service		B			B			A	A		A	
Approach Delay (s)		13.1			15.0			8.1			8.2	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	45.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	WBR2	SBL	SBR	SEL	SER
Lane Configurations									
Traffic Volume (vph)	80	200	90	280	80	0	0	0	0
Future Volume (vph)	80	200	90	280	80	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.892						
Flt Protected		0.986							
Satd. Flow (prot)	0	1837	1662	0	0	0	0	0	0
Flt Permitted		0.986							
Satd. Flow (perm)	0	1837	1662	0	0	0	0	0	0
Link Speed (mph)		30	30			30		30	
Link Distance (ft)		124	497			185		184	
Travel Time (s)		2.8	11.3			4.2		4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	217	98	304	87	0	0	0	0
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	304	489	0	0	0	0	0	0
Sign Control		Free	Free			Stop		Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 48.5%	ICU Level of Service A
Analysis Period (min) 15	

Intersection has too many legs for HCM analysis.

Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	SBR	SEL	SER	SER2	Ø5	Ø6
Lane Configurations												
Traffic Volume (vph)	689	150	320	362	154	77	56	319	201	118		
Future Volume (vph)	689	150	320	362	154	77	56	319	201	118		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)		40	0		0		0	230	0			
Storage Lanes		1	1		1		0	1	1			
Taper Length (ft)			25		25			25				
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00		
Frt		0.850				0.937			0.850			
Flt Protected			0.950		0.950			0.950				
Satd. Flow (prot)	1863	1583	1770	3539	1770	1745	0	1770	1583	0		
Flt Permitted			0.091		0.950			0.950				
Satd. Flow (perm)	1863	1583	170	3539	1770	1745	0	1770	1583	0		
Right Turn on Red		Yes								Yes		
Satd. Flow (RTOR)		118							82			
Link Speed (mph)	30			30		30		30				
Link Distance (ft)	237			379		329		394				
Travel Time (s)	5.4			8.6		7.5		9.0				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Adj. Flow (vph)	749	163	348	393	167	84	61	347	218	128		
Shared Lane Traffic (%)												
Lane Group Flow (vph)	749	163	348	393	167	145	0	347	346	0		
Turn Type	NA	Perm	pm+pt	NA	Split	NA		Prot	Prot			
Protected Phases	1		2	1 2	3	3		4	4		5	6
Permitted Phases		1	1 2									
Minimum Split (s)	14.0	14.0	7.0		13.0	13.0		13.0	13.0		22.0	6.0
Total Split (s)	48.0	48.0	22.5		16.0	16.0		33.5	33.5		50.0	20.5
Total Split (%)	40.0%	40.0%	18.8%		13.3%	13.3%		27.9%	27.9%		42%	17%
Maximum Green (s)	44.0	44.0	18.5		12.0	12.0		29.5	29.5		46.0	16.5
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0			
Total Lost Time (s)	4.0	4.0	4.0		4.0	4.0		4.0	4.0			
Lead/Lag	Lead	Lead	Lag		Lead	Lead		Lag	Lag		Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes
Act Effct Green (s)	44.0	44.0	62.5	66.5	12.0	12.0		29.5	29.5			
Actuated g/C Ratio	0.37	0.37	0.52	0.55	0.10	0.10		0.25	0.25			
v/c Ratio	1.10	0.25	1.04	0.20	0.94	0.83		0.80	0.77			
Control Delay	100.4	9.5	80.2	5.0	108.4	88.8		57.4	44.4			
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0			
Total Delay	100.4	9.5	80.2	5.0	108.4	88.8		57.4	44.4			
LOS	F	A	F	A	F	F		E	D			
Approach Delay	84.2			40.3		99.3		50.9				
Approach LOS	F			D		F		D				
Queue Length 50th (ft)	~657	23	~249	22	131	112		253	194			
Queue Length 95th (ft)	#894	70	m#342	m26	#268	#227		#397	#332			
Internal Link Dist (ft)	157			299		249		314				
Turn Bay Length (ft)		40						230				
Base Capacity (vph)	683	655	335	1961	177	174		435	450			

Lane Group	Ø7	Ø8
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	7	8
Permitted Phases		
Minimum Split (s)	18.0	22.5
Total Split (s)	27.0	22.5
Total Split (%)	23%	19%
Maximum Green (s)	23.0	18.5
Yellow Time (s)	3.0	3.0
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		

Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	SBR	SEL	SER	SER2	Ø5	Ø6
Starvation Cap Reductn	0	0	0	0	0	0		0	0			
Spillback Cap Reductn	0	0	0	0	0	0		0	0			
Storage Cap Reductn	0	0	0	0	0	0		0	0			
Reduced v/c Ratio	1.10	0.25	1.04	0.20	0.94	0.83		0.80	0.77			

Intersection Summary

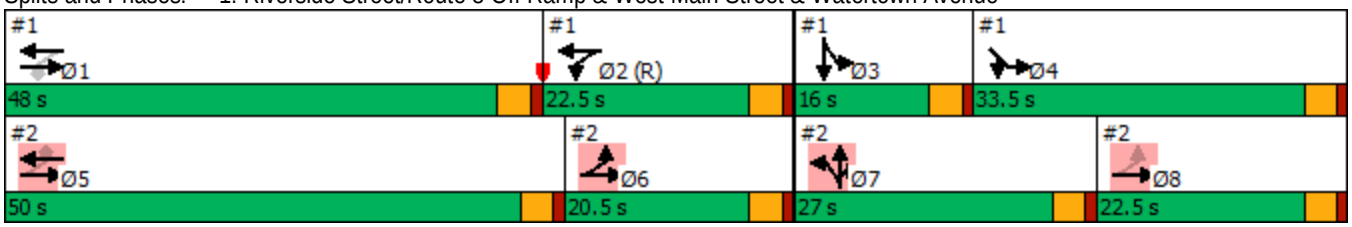
Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:WBTL, Start of Green
Natural Cycle: 140
Control Type: Pretimed
Maximum v/c Ratio: 1.10
Intersection Signal Delay: 65.0 Intersection LOS: E
Intersection Capacity Utilization 94.5% ICU Level of Service F
Analysis Period (min) 15

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

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

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

Splits and Phases: 1: Riverside Street/Route 8 Off Ramp & West Main Street & Watertown Avenue



Lane Group	Ø7	Ø8
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	SEL	SER	SER2
Lane Configurations										
Traffic Volume (vph)	689	150	320	362	154	77	56	319	201	118
Future Volume (vph)	689	150	320	362	154	77	56	319	201	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00		1.00	1.00	
Frt	1.00	0.85	1.00	1.00	1.00	0.94		1.00	0.85	
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1863	1583	1770	3539	1770	1745		1770	1583	
Flt Permitted	1.00	1.00	0.09	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1863	1583	169	3539	1770	1745		1770	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	749	163	348	393	167	84	61	347	218	128
RTOR Reduction (vph)	0	75	0	0	0	0	0	0	62	0
Lane Group Flow (vph)	749	88	348	393	167	145	0	347	284	0
Turn Type	NA	Perm	pm+pt	NA	Split	NA		Prot	Prot	
Protected Phases	1		2	1 2	3	3		4	4	
Permitted Phases		1	1 2							
Actuated Green, G (s)	44.0	44.0	62.5	66.5	12.0	12.0		29.5	29.5	
Effective Green, g (s)	44.0	44.0	62.5	66.5	12.0	12.0		29.5	29.5	
Actuated g/C Ratio	0.37	0.37	0.52	0.55	0.10	0.10		0.25	0.25	
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	683	580	334	1961	177	174		435	389	
v/s Ratio Prot	c0.40		c0.16	c0.11	c0.09	0.08		c0.20	0.18	
v/s Ratio Perm		0.06	0.38							
v/c Ratio	1.10	0.15	1.04	0.20	0.94	0.83		0.80	0.73	
Uniform Delay, d1	38.0	25.5	47.3	13.4	53.7	53.0		42.5	41.6	
Progression Factor	1.00	1.00	0.67	0.36	1.00	1.00		1.00	1.00	
Incremental Delay, d2	63.9	0.6	49.5	0.1	54.2	35.2		14.1	11.5	
Delay (s)	101.9	26.0	81.4	4.9	107.9	88.2		56.6	53.1	
Level of Service	F	C	F	A	F	F		E	D	
Approach Delay (s)	88.3			40.8		98.7		54.8		
Approach LOS	F			D		F		D		

Intersection Summary			
HCM 2000 Control Delay	67.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	330	950	0	0	580	760	80	670	160	0	0	0
Future Volume (vph)	330	950	0	0	580	760	80	670	160	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1770	3539	0	0	1863	1583	1770	3539	1583	0	0	0
Flt Permitted	0.426						0.950					
Satd. Flow (perm)	794	3539	0	0	1863	1583	1770	3539	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						325			174			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		379			838			247			271	
Travel Time (s)		8.6			19.0			5.6			6.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	359	1033	0	0	630	826	87	728	174	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	359	1033	0	0	630	826	87	728	174	0	0	0
Turn Type	custom	NA			NA	Perm	Split	NA	Prot			
Protected Phases	6	5 6 8			5		7	7	7			
Permitted Phases	5 8					5						
Minimum Split (s)	6.0				22.0	22.0	18.0	18.0	18.0			
Total Split (s)	20.5				50.0	50.0	27.0	27.0	27.0			
Total Split (%)	17.1%				41.7%	41.7%	22.5%	22.5%	22.5%			
Maximum Green (s)	16.5				46.0	46.0	23.0	23.0	23.0			
Yellow Time (s)	3.0				3.0	3.0	3.0	3.0	3.0			
All-Red Time (s)	1.0				1.0	1.0	1.0	1.0	1.0			
Lost Time Adjust (s)	0.0				0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	4.0				4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lag				Lead	Lead	Lead	Lead	Lead			
Lead-Lag Optimize?	Yes				Yes	Yes	Yes	Yes	Yes			
Act Effct Green (s)	85.0	89.0			46.0	46.0	23.0	23.0	23.0			
Actuated g/C Ratio	0.71	0.74			0.38	0.38	0.19	0.19	0.19			
v/c Ratio	0.52	0.39			0.88	1.02	0.26	1.07	0.39			
Control Delay	5.5	3.1			50.1	60.8	43.6	102.0	8.8			
Queue Delay	0.2	1.7			1.1	0.0	0.0	0.0	0.0			
Total Delay	5.6	4.8			51.2	60.8	43.6	102.0	8.8			
LOS	A	A			D	E	D	F	A			
Approach Delay		5.0			56.6			80.5				
Approach LOS		A			E			F				
Queue Length 50th (ft)	43	76			450	~514	58	~330	0			
Queue Length 95th (ft)	m45	m74			#666	#762	107	#453	60			
Internal Link Dist (ft)		299			758			167			191	
Turn Bay Length (ft)												
Base Capacity (vph)	696	2624			714	807	339	678	444			
Starvation Cap Reductn	41	1356			0	0	0	0	0			
Spillback Cap Reductn	0	0			16	0	0	0	0			
Storage Cap Reductn	0	0			0	0	0	0	0			

Lane Group	Ø1	Ø2	Ø3	Ø4	Ø8
Lane Configurations					
Traffic Volume (vph)					
Future Volume (vph)					
Ideal Flow (vphpl)					
Lane Util. Factor					
Frt					
Flt Protected					
Satd. Flow (prot)					
Flt Permitted					
Satd. Flow (perm)					
Right Turn on Red					
Satd. Flow (RTOR)					
Link Speed (mph)					
Link Distance (ft)					
Travel Time (s)					
Peak Hour Factor					
Adj. Flow (vph)					
Shared Lane Traffic (%)					
Lane Group Flow (vph)					
Turn Type					
Protected Phases	1	2	3	4	8
Permitted Phases					
Minimum Split (s)	14.0	7.0	13.0	13.0	22.5
Total Split (s)	48.0	22.5	16.0	33.5	22.5
Total Split (%)	40%	19%	13%	28%	19%
Maximum Green (s)	44.0	18.5	12.0	29.5	18.5
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)					
Total Lost Time (s)					
Lead/Lag	Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes
Act Effct Green (s)					
Actuated g/C Ratio					
v/c Ratio					
Control Delay					
Queue Delay					
Total Delay					
LOS					
Approach Delay					
Approach LOS					
Queue Length 50th (ft)					
Queue Length 95th (ft)					
Internal Link Dist (ft)					
Turn Bay Length (ft)					
Base Capacity (vph)					
Starvation Cap Reductn					
Spillback Cap Reductn					
Storage Cap Reductn					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Reduced v/c Ratio	0.55	0.81			0.90	1.02	0.26	1.07	0.39			

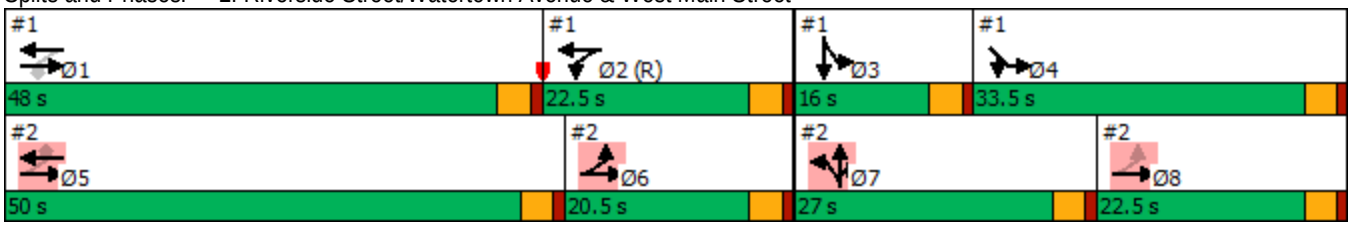
Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:WBTL, Start of Green	
Natural Cycle: 140	
Control Type: Pretimed	
Maximum v/c Ratio: 1.10	
Intersection Signal Delay: 44.0	Intersection LOS: D
Intersection Capacity Utilization 93.9%	ICU Level of Service F
Analysis Period (min) 15	

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

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

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

Splits and Phases: 2: Riverside Street/Watertown Avenue & West Main Street



Lane Group	Ø1	Ø2	Ø3	Ø4	Ø8
Reduced v/c Ratio					

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	330	950	0	0	580	760	80	670	160	0	0	0
Future Volume (vph)	330	950	0	0	580	760	80	670	160	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	1.00	0.95			1.00	1.00	1.00	0.95	1.00			
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00			
Satd. Flow (prot)	1770	3539			1863	1583	1770	3539	1583			
Flt Permitted	0.43	1.00			1.00	1.00	0.95	1.00	1.00			
Satd. Flow (perm)	793	3539			1863	1583	1770	3539	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	359	1033	0	0	630	826	87	728	174	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	200	0	0	141	0	0	0
Lane Group Flow (vph)	359	1033	0	0	630	626	87	728	33	0	0	0
Turn Type	custom	NA			NA	Perm	Split	NA	Prot			
Protected Phases	6	5 6 8			5		7	7	7			
Permitted Phases	5 8					5						
Actuated Green, G (s)	85.0	89.0			46.0	46.0	23.0	23.0	23.0			
Effective Green, g (s)	85.0	89.0			46.0	46.0	23.0	23.0	23.0			
Actuated g/C Ratio	0.71	0.74			0.38	0.38	0.19	0.19	0.19			
Clearance Time (s)	4.0				4.0	4.0	4.0	4.0	4.0			
Lane Grp Cap (vph)	696	2624			714	606	339	678	303			
v/s Ratio Prot	c0.07	c0.29			0.34		0.05	c0.21	0.02			
v/s Ratio Perm	c0.29					c0.40						
v/c Ratio	0.52	0.39			0.88	1.03	0.26	1.07	0.11			
Uniform Delay, d1	9.3	5.7			34.5	37.0	41.2	48.5	40.0			
Progression Factor	0.53	0.50			1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2	1.1	0.2			14.8	45.1	1.8	56.1	0.7			
Delay (s)	6.1	3.0			49.3	82.1	43.1	104.6	40.8			
Level of Service	A	A			D	F	D	F	D			
Approach Delay (s)		3.8			67.9			87.9			0.0	
Approach LOS		A			E			F			A	

Intersection Summary			
HCM 2000 Control Delay	49.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	93.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

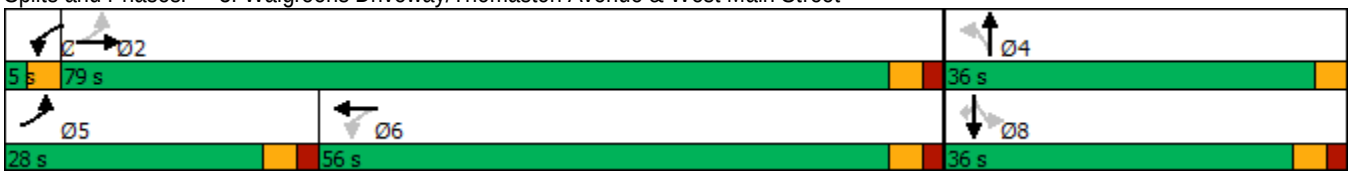
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	270	820	20	10	920	320	10	10	10	360	10	370
Future Volume (vph)	270	820	20	10	920	320	10	10	10	360	10	370
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.962			0.955				0.850
Flt Protected	0.950							0.984			0.954	
Satd. Flow (prot)	1770	1855	0	0	3405	0	0	1750	0	0	1777	1583
Flt Permitted	0.072				0.945			0.863			0.748	
Satd. Flow (perm)	134	1855	0	0	3217	0	0	1535	0	0	1393	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			49			11				341
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		838			378			196			228	
Travel Time (s)		19.0			8.6			4.5			5.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	293	891	22	11	1000	348	11	11	11	391	11	402
Shared Lane Traffic (%)												
Lane Group Flow (vph)	293	913	0	0	1359	0	0	33	0	0	402	402
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2			6			4			8		8
Detector Phase	5	2		1	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0		1.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	10.0	22.5		5.0	22.5		26.0	26.0		10.0	10.0	10.0
Total Split (s)	28.0	79.0		5.0	56.0		36.0	36.0		36.0	36.0	36.0
Total Split (%)	23.3%	65.8%		4.2%	46.7%		30.0%	30.0%		30.0%	30.0%	30.0%
Maximum Green (s)	23.0	74.0		2.0	51.0		33.0	33.0		31.0	31.0	31.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		0.0	2.0		0.0	0.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	0.0
Total Lost Time (s)	5.0	5.0			5.0			3.0			5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Min		None	Min		None	None		None	None	None
Walk Time (s)							7.0	7.0				
Flash Dont Walk (s)							16.0	16.0				
Pedestrian Calls (#/hr)							0	0				
Act Effct Green (s)	73.5	73.5			50.3			33.1			31.1	31.1
Actuated g/C Ratio	0.64	0.64			0.44			0.29			0.27	0.27
v/c Ratio	0.85	0.77			0.94			0.07			1.07	0.59
Control Delay	52.3	19.7			44.1			23.9			106.2	10.9
Queue Delay	0.0	1.1			0.0			0.0			0.0	0.0
Total Delay	52.3	20.8			44.1			23.9			106.2	10.9
LOS	D	C			D			C			F	B
Approach Delay		28.5			44.1			23.9			58.5	
Approach LOS		C			D			C			E	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	159	437			480			12			~331	34
Queue Length 95th (ft)	#262	610			#688			39			#556	138
Internal Link Dist (ft)		758			298			116			148	
Turn Bay Length (ft)												
Base Capacity (vph)	414	1225			1461			450			377	677
Starvation Cap Reductn	0	129			0			0			0	0
Spillback Cap Reductn	0	0			0			0			0	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.71	0.83			0.93			0.07			1.07	0.59

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 114.6
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.07
Intersection Signal Delay: 41.8 Intersection LOS: D
Intersection Capacity Utilization 120.0% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Walgreens Driveway/Thomaston Avenue & West Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	270	820	20	10	920	320	10	10	10	360	10	370
Future Volume (vph)	270	820	20	10	920	320	10	10	10	360	10	370
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0			3.0			5.0	5.0
Lane Util. Factor	1.00	1.00			0.95			1.00			1.00	1.00
Frt	1.00	1.00			0.96			0.95			1.00	0.85
Flt Protected	0.95	1.00			1.00			0.98			0.95	1.00
Satd. Flow (prot)	1770	1856			3402			1750			1776	1583
Flt Permitted	0.07	1.00			0.95			0.86			0.75	1.00
Satd. Flow (perm)	135	1856			3218			1535			1393	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	293	891	22	11	1000	348	11	11	11	391	11	402
RTOR Reduction (vph)	0	1	0	0	27	0	0	8	0	0	0	248
Lane Group Flow (vph)	293	912	0	0	1332	0	0	25	0	0	402	154
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2			6			4			8		8
Actuated Green, G (s)	73.5	73.5			50.3			33.1			31.1	31.1
Effective Green, g (s)	73.5	73.5			50.3			33.1			31.1	31.1
Actuated g/C Ratio	0.64	0.64			0.44			0.29			0.27	0.27
Clearance Time (s)	5.0	5.0			5.0			3.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	346	1190			1412			443			378	429
v/s Ratio Prot	0.13	c0.49										
v/s Ratio Perm	0.41				c0.41			0.02			c0.29	0.10
v/c Ratio	0.85	0.77			0.94			0.06			1.06	0.36
Uniform Delay, d1	34.4	14.5			30.8			29.5			41.8	33.7
Progression Factor	1.00	1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2	17.1	3.0			12.7			0.1			64.1	0.5
Delay (s)	51.5	17.5			43.5			29.5			105.9	34.2
Level of Service	D	B			D			C			F	C
Approach Delay (s)		25.8			43.5			29.5			70.0	
Approach LOS		C			D			C			E	

Intersection Summary			
HCM 2000 Control Delay	43.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	114.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	120.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	240	1020	1070	120	33	210
Future Volume (vph)	240	1020	1070	120	33	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			0	100	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.986			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1837	0	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	1837	0	1770	1583
Link Speed (mph)		30	30		30	
Link Distance (ft)		141	487		207	
Travel Time (s)		3.2	11.1		4.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	261	1109	1163	130	36	228
Shared Lane Traffic (%)						
Lane Group Flow (vph)	261	1109	1293	0	36	228
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 90.2%	ICU Level of Service E
Analysis Period (min) 15	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	240	1020	1070	120	33	210
Future Volume (Veh/h)	240	1020	1070	120	33	210
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	261	1109	1163	130	36	228
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		646	921			
pX, platoon unblocked	0.69				0.81	0.69
vC, conflicting volume	1293				2859	1228
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1200				2312	1106
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	35				0	0
cM capacity (veh/h)	401				12	177

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	261	1109	1293	36	228
Volume Left	261	0	0	36	0
Volume Right	0	0	130	0	228
cSH	401	1700	1700	12	177
Volume to Capacity	0.65	0.65	0.76	3.02	1.29
Queue Length 95th (ft)	111	0	0	Err	325
Control Delay (s)	29.2	0.0	0.0	Err	217.7
Lane LOS	D			F	F
Approach Delay (s)	5.6		0.0	1551.5	
Approach LOS				F	

Intersection Summary			
Average Delay	142.5		
Intersection Capacity Utilization	90.2%	ICU Level of Service	E
Analysis Period (min)	15		

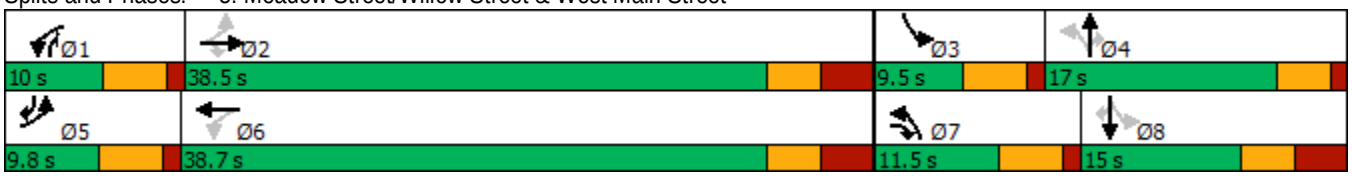
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	602	200	155	467	68	198	258	143	187	140	228
Future Volume (vph)	50	602	200	155	467	68	198	258	143	187	140	228
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		100	100		0	0		50	0		0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.981				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1827	0	1770	1863	1583	1770	1863	1583
Flt Permitted	0.255			0.183			0.553			0.455		
Satd. Flow (perm)	475	1863	1583	341	1827	0	1030	1863	1583	848	1863	1583
Right Turn on Red			No			No			Yes			Yes
Satd. Flow (RTOR)									114			240
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		434			464			449			348	
Travel Time (s)		9.9			10.5			10.2			7.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	654	217	168	508	74	215	280	155	203	152	248
Shared Lane Traffic (%)												
Lane Group Flow (vph)	54	654	217	168	582	0	215	280	155	203	152	248
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	5	2	7	1	6		7	4	1	3	8	5
Permitted Phases	2		2	6			4		4	8		8
Detector Phase	5	2	7	1	6		7	4	1	3	8	5
Switch Phase												
Minimum Initial (s)	5.0	1.0	5.0	5.0	1.0		5.0	1.0	5.0	5.0	1.0	5.0
Minimum Split (s)	9.5	15.0	9.5	9.5	15.0		9.5	6.0	9.5	9.5	8.0	9.5
Total Split (s)	9.8	38.5	11.5	10.0	38.7		11.5	17.0	10.0	9.5	15.0	9.8
Total Split (%)	13.1%	51.3%	15.3%	13.3%	51.6%		15.3%	22.7%	13.3%	12.7%	20.0%	13.1%
Maximum Green (s)	5.3	32.5	7.0	5.5	32.7		7.0	13.0	5.5	5.0	9.0	5.3
Yellow Time (s)	3.5	3.0	3.5	3.5	3.0		3.5	3.0	3.5	3.5	3.0	3.5
All-Red Time (s)	1.0	3.0	1.0	1.0	3.0		1.0	1.0	1.0	1.0	3.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	6.0	4.5	4.5	6.0		4.5	4.0	4.5	4.5	6.0	4.5
Lead/Lag	Lead	Lag	Lead	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max	None	None	Max		None	None	None	None	None	None
Act Effct Green (s)	39.3	32.5	45.5	39.7	32.7		19.3	12.8	22.3	15.3	8.8	20.1
Actuated g/C Ratio	0.53	0.43	0.61	0.53	0.44		0.26	0.17	0.30	0.20	0.12	0.27
v/c Ratio	0.16	0.81	0.23	0.59	0.73		0.64	0.88	0.28	0.86	0.69	0.41
Control Delay	7.9	28.4	7.4	16.5	24.0		32.3	60.2	8.4	59.8	50.1	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.6		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.9	28.4	7.4	16.5	24.6		32.3	60.2	8.4	59.8	50.1	6.0
LOS	A	C	A	B	C		C	E	A	E	D	A
Approach Delay		22.3			22.8			38.6			35.2	
Approach LOS		C			C			D			D	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	10	255	41	32	215		80	128	14	75	69	3
Queue Length 95th (ft)	23	#441	72	59	337		#144	#259	55	#184	#150	54
Internal Link Dist (ft)		354			384			369			268	
Turn Bay Length (ft)	50		100	100					50			
Base Capacity (vph)	341	809	962	286	798		334	323	552	235	224	601
Starvation Cap Reductn	0	0	0	0	48		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.81	0.23	0.59	0.78		0.64	0.87	0.28	0.86	0.68	0.41

Intersection Summary	
Area Type:	Other
Cycle Length: 75	
Actuated Cycle Length: 74.8	
Natural Cycle: 75	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.88	
Intersection Signal Delay: 28.7	Intersection LOS: C
Intersection Capacity Utilization 80.0%	ICU Level of Service D
Analysis Period (min) 15	

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

Splits and Phases: 5: Meadow Street/Willow Street & West Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	602	200	155	467	68	198	258	143	187	140	228
Future Volume (vph)	50	602	200	155	467	68	198	258	143	187	140	228
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0	4.5	4.5	6.0		4.5	4.0	4.5	4.5	6.0	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1827		1770	1863	1583	1770	1863	1583
Flt Permitted	0.25	1.00	1.00	0.18	1.00		0.55	1.00	1.00	0.45	1.00	1.00
Satd. Flow (perm)	474	1863	1583	341	1827		1030	1863	1583	847	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	654	217	168	508	74	215	280	155	203	152	248
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	86	0	0	195
Lane Group Flow (vph)	54	654	217	168	582	0	215	280	69	203	152	53
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	5	2	7	1	6		7	4	1	3	8	5
Permitted Phases	2		2	6			4		4	8		8
Actuated Green, G (s)	37.8	32.5	39.5	38.2	32.7		19.8	12.8	18.3	13.8	8.8	14.1
Effective Green, g (s)	37.8	32.5	39.5	38.2	32.7		19.8	12.8	18.3	13.8	8.8	14.1
Actuated g/C Ratio	0.51	0.43	0.53	0.51	0.44		0.26	0.17	0.24	0.18	0.12	0.19
Clearance Time (s)	4.5	6.0	4.5	4.5	6.0		4.5	4.0	4.5	4.5	6.0	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	331	809	835	279	798		341	318	387	217	219	298
v/s Ratio Prot	0.01	c0.35	0.02	c0.04	0.32		0.06	c0.15	0.01	c0.06	0.08	0.01
v/s Ratio Perm	0.07		0.11	0.26			0.11		0.03	0.11		0.02
v/c Ratio	0.16	0.81	0.26	0.60	0.73		0.63	0.88	0.18	0.94	0.69	0.18
Uniform Delay, d1	10.8	18.4	9.7	12.8	17.4		23.2	30.3	22.3	29.9	31.7	25.5
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	8.5	0.2	3.6	5.8		3.8	23.5	0.2	43.0	9.2	0.3
Delay (s)	11.1	27.0	9.8	16.4	23.2		27.0	53.7	22.5	72.9	40.9	25.8
Level of Service	B	C	A	B	C		C	D	C	E	D	C
Approach Delay (s)		22.0			21.7			37.4			45.4	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	30.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	74.8	Sum of lost time (s)	21.0
Intersection Capacity Utilization	80.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

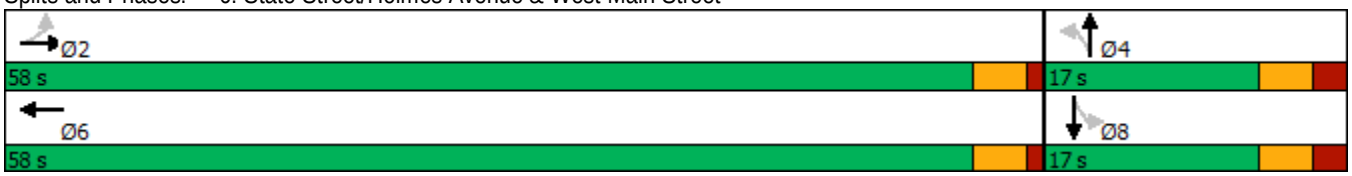
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	810	0	0	730	20	50	60	30	80	0	60
Future Volume (vph)	80	810	0	0	730	20	50	60	30	80	0	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.996			0.971			0.942	
Flt Protected	0.950							0.983			0.972	
Satd. Flow (prot)	1770	1863	0	0	1855	0	0	1778	0	0	1706	0
Flt Permitted	0.278							0.830			0.706	
Satd. Flow (perm)	518	1863	0	0	1855	0	0	1501	0	0	1239	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					5			16			43	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		464			270			230			199	
Travel Time (s)		10.5			6.1			5.2			4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	880	0	0	793	22	54	65	33	87	0	65
Shared Lane Traffic (%)												
Lane Group Flow (vph)	87	880	0	0	815	0	0	152	0	0	152	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2						4			8		
Detector Phase	2	2			6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	1.0	1.0			1.0		1.0	1.0		1.0	1.0	
Minimum Split (s)	15.0	15.0			15.0		8.0	8.0		8.0	8.0	
Total Split (s)	58.0	58.0			58.0		17.0	17.0		17.0	17.0	
Total Split (%)	77.3%	77.3%			77.3%		22.7%	22.7%		22.7%	22.7%	
Maximum Green (s)	54.0	54.0			54.0		12.0	12.0		12.0	12.0	
Yellow Time (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0			1.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	
Total Lost Time (s)	4.0	4.0			4.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Recall Mode	Max	Max			Max		None	None		None	None	
Act Effct Green (s)	54.0	54.0			54.0			10.5			10.5	
Actuated g/C Ratio	0.73	0.73			0.73			0.14			0.14	
v/c Ratio	0.23	0.64			0.60			0.67			0.71	
Control Delay	5.2	7.9			7.1			42.0			41.5	
Queue Delay	0.0	1.6			2.1			0.0			0.0	
Total Delay	5.2	9.5			9.2			42.0			41.5	
LOS	A	A			A			D			D	
Approach Delay		9.1			9.2			42.0			41.5	
Approach LOS		A			A			D			D	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	11	174			151			59			47	
Queue Length 95th (ft)	27	278			238			#129			#127	
Internal Link Dist (ft)		384			190			150			119	
Turn Bay Length (ft)	50											
Base Capacity (vph)	380	1369			1365			258			238	
Starvation Cap Reductn	0	298			390			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.23	0.82			0.84			0.59			0.64	

Intersection Summary	
Area Type:	Other
Cycle Length: 75	
Actuated Cycle Length: 73.5	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 13.9	Intersection LOS: B
Intersection Capacity Utilization 68.1%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 6: State Street/Holmes Avenue & West Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	810	0	0	730	20	50	60	30	80	0	60
Future Volume (vph)	80	810	0	0	730	20	50	60	30	80	0	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			5.0			5.0	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frt	1.00	1.00			1.00			0.97			0.94	
Flt Protected	0.95	1.00			1.00			0.98			0.97	
Satd. Flow (prot)	1770	1863			1856			1777			1706	
Flt Permitted	0.28	1.00			1.00			0.83			0.71	
Satd. Flow (perm)	517	1863			1856			1501			1240	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	880	0	0	793	22	54	65	33	87	0	65
RTOR Reduction (vph)	0	0	0	0	1	0	0	14	0	0	37	0
Lane Group Flow (vph)	87	880	0	0	814	0	0	138	0	0	115	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2						4			8		
Actuated Green, G (s)	54.0	54.0			54.0			10.5			10.5	
Effective Green, g (s)	54.0	54.0			54.0			10.5			10.5	
Actuated g/C Ratio	0.73	0.73			0.73			0.14			0.14	
Clearance Time (s)	4.0	4.0			4.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)	379	1368			1363			214			177	
v/s Ratio Prot		c0.47			0.44							
v/s Ratio Perm	0.17							0.09			c0.09	
v/c Ratio	0.23	0.64			0.60			0.65			0.65	
Uniform Delay, d1	3.1	4.9			4.6			29.7			29.8	
Progression Factor	1.00	1.00			1.00			1.00			1.00	
Incremental Delay, d2	1.4	2.3			1.9			6.6			8.3	
Delay (s)	4.5	7.2			6.5			36.3			38.0	
Level of Service	A	A			A			D			D	
Approach Delay (s)		7.0			6.5			36.3			38.0	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	11.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	73.5	Sum of lost time (s)	9.0
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	40	930	690	140	60	30
Future Volume (vph)	40	930	690	140	60	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50			0	0	0
Storage Lanes	1			0	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.977		0.955	
Flt Protected	0.950				0.968	
Satd. Flow (prot)	1770	1863	1820	0	1722	0
Flt Permitted	0.950				0.968	
Satd. Flow (perm)	1770	1863	1820	0	1722	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		270	124		271	
Travel Time (s)		6.1	2.8		6.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	1011	750	152	65	33
Shared Lane Traffic (%)						
Lane Group Flow (vph)	43	1011	902	0	98	0
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 60.8%	ICU Level of Service B
Analysis Period (min) 15	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	40	930	690	140	60	30
Future Volume (Veh/h)	40	930	690	140	60	30
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	1011	750	152	65	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		270	124			
pX, platoon unblocked	0.68				0.82	0.68
vC, conflicting volume	902				1923	826
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	626				1283	515
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				53	91
cM capacity (veh/h)	654				139	383

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	43	1011	902	98
Volume Left	43	0	0	65
Volume Right	0	0	152	33
cSH	654	1700	1700	177
Volume to Capacity	0.07	0.59	0.53	0.55
Queue Length 95th (ft)	5	0	0	72
Control Delay (s)	10.9	0.0	0.0	47.9
Lane LOS	B			E
Approach Delay (s)	0.4		0.0	47.9
Approach LOS				E

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	80	200	280	80	0	0
Future Volume (vph)	80	200	280	80	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.970			
Flt Protected		0.986				
Satd. Flow (prot)	0	1837	1807	0	0	0
Flt Permitted		0.986				
Satd. Flow (perm)	0	1837	1807	0	0	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		247	452		201	
Travel Time (s)		5.6	10.3		4.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	217	304	87	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	304	391	0	0	0
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 41.2%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	80	200	280	80	0	0
Future Volume (Veh/h)	80	200	280	80	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	87	217	304	87	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		247	652			
pX, platoon unblocked						
vC, conflicting volume	391				738	348
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	391				738	348
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				100	100
cM capacity (veh/h)	1168				356	696

Direction, Lane #	EB 1	WB 1
Volume Total	304	391
Volume Left	87	0
Volume Right	0	87
cSH	1168	1700
Volume to Capacity	0.07	0.23
Queue Length 95th (ft)	6	0
Control Delay (s)	2.9	0.0
Lane LOS	A	
Approach Delay (s)	2.9	0.0
Approach LOS		

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	41.2%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	150	840	640	130	90	190
Future Volume (vph)	150	840	640	130	90	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.977		0.908	
Flt Protected	0.950				0.984	
Satd. Flow (prot)	1770	1863	1820	0	1664	0
Flt Permitted	0.218				0.984	
Satd. Flow (perm)	406	1863	1820	0	1664	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			36		130	
Link Speed (mph)		30	30		30	
Link Distance (ft)		124	105		247	
Travel Time (s)		2.8	2.4		5.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	913	696	141	98	207
Shared Lane Traffic (%)						
Lane Group Flow (vph)	163	913	837	0	305	0
Turn Type	Perm	NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases	4					
Detector Phase	4	4	8		6	
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	
Minimum Split (s)	22.5	22.5	22.5		16.0	
Total Split (s)	54.0	54.0	54.0		16.0	
Total Split (%)	77.1%	77.1%	77.1%		22.9%	
Maximum Green (s)	49.5	49.5	49.5		11.5	
Yellow Time (s)	3.5	3.5	3.5		3.5	
All-Red Time (s)	1.0	1.0	1.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	4.5	4.5	4.5		4.5	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Recall Mode	None	None	None		None	
Walk Time (s)	7.0	7.0	7.0			
Flash Dont Walk (s)	11.0	11.0	11.0			
Pedestrian Calls (#/hr)	0	0	0			
Act Effct Green (s)	32.5	32.5	32.5		10.4	
Actuated g/C Ratio	0.62	0.62	0.62		0.20	
v/c Ratio	0.65	0.79	0.73		0.70	
Control Delay	20.0	13.0	10.7		24.9	
Queue Delay	0.0	0.2	0.0		0.0	
Total Delay	20.0	13.2	10.8		24.9	
LOS	C	B	B		C	
Approach Delay		14.3	10.8		24.9	
Approach LOS		B	B		C	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 50th (ft)	27	181	147		48	
Queue Length 95th (ft)	94	298	245		#196	
Internal Link Dist (ft)		44	25		167	
Turn Bay Length (ft)						
Base Capacity (vph)	361	1657	1623		489	
Starvation Cap Reductn	0	196	54		0	
Spillback Cap Reductn	0	0	0		0	
Storage Cap Reductn	0	0	0		0	
Reduced v/c Ratio	0.45	0.62	0.53		0.62	

Intersection Summary	
Area Type: Other	
Cycle Length: 70	
Actuated Cycle Length: 52.5	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.79	
Intersection Signal Delay: 14.4	Intersection LOS: B
Intersection Capacity Utilization 77.8%	ICU Level of Service D
Analysis Period (min) 15	

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

Splits and Phases: 9: West Main Street

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	150	840	640	130	90	190
Future Volume (vph)	150	840	640	130	90	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5		4.5	
Lane Util. Factor	1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.98		0.91	
Flt Protected	0.95	1.00	1.00		0.98	
Satd. Flow (prot)	1770	1863	1820		1665	
Flt Permitted	0.22	1.00	1.00		0.98	
Satd. Flow (perm)	405	1863	1820		1665	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	913	696	141	98	207
RTOR Reduction (vph)	0	0	13	0	104	0
Lane Group Flow (vph)	163	913	824	0	201	0
Turn Type	Perm	NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases	4					
Actuated Green, G (s)	32.5	32.5	32.5		10.4	
Effective Green, g (s)	32.5	32.5	32.5		10.4	
Actuated g/C Ratio	0.63	0.63	0.63		0.20	
Clearance Time (s)	4.5	4.5	4.5		4.5	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	253	1166	1139		333	
v/s Ratio Prot		c0.49	0.45		c0.12	
v/s Ratio Perm	0.40					
v/c Ratio	0.64	0.78	0.72		0.60	
Uniform Delay, d1	6.1	7.1	6.6		18.9	
Progression Factor	1.00	1.00	1.00		1.00	
Incremental Delay, d2	5.5	3.5	2.3		3.1	
Delay (s)	11.6	10.6	8.9		22.0	
Level of Service	B	B	A		C	
Approach Delay (s)		10.8	8.9		22.0	
Approach LOS		B	A		C	

Intersection Summary			
HCM 2000 Control Delay	11.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	51.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø3
Lane Configurations							
Traffic Volume (vph)	820	40	80	660	130	120	
Future Volume (vph)	820	40	80	660	130	120	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)		0	100		0	0	
Storage Lanes		0	1		1	0	
Taper Length (ft)			25		25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.994				0.935		
Flt Protected			0.950		0.975		
Satd. Flow (prot)	1852	0	1770	1863	1698	0	
Flt Permitted			0.153		0.975		
Satd. Flow (perm)	1852	0	285	1863	1698	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	4				41		
Link Speed (mph)	30			30	30		
Link Distance (ft)	421			389	436		
Travel Time (s)	9.6			8.8	9.9		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	891	43	87	717	141	130	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	934	0	87	717	271	0	
Turn Type	NA		D.P+P	NA	Prot		
Protected Phases	1		2	1 2	4		3
Permitted Phases			1				
Detector Phase	1		2	1 2	4		
Switch Phase							
Minimum Initial (s)	1.0		1.0		1.0		1.0
Minimum Split (s)	15.0		6.0		8.0		20.0
Total Split (s)	48.0		6.0		15.0		21.0
Total Split (%)	53.3%		6.7%		16.7%		23%
Maximum Green (s)	44.0		2.0		10.0		18.0
Yellow Time (s)	3.0		3.0		3.0		3.0
All-Red Time (s)	1.0		1.0		2.0		0.0
Lost Time Adjust (s)	0.0		0.0		0.0		
Total Lost Time (s)	4.0		4.0		5.0		
Lead/Lag	Lead		Lag		Lag		Lead
Lead-Lag Optimize?	Yes		Yes		Yes		Yes
Vehicle Extension (s)	3.0		3.0		3.0		3.0
Recall Mode	Max		Max		None		None
Walk Time (s)							8.0
Flash Dont Walk (s)							9.0
Pedestrian Calls (#/hr)							0
Act Effct Green (s)	44.0		46.0	50.0	10.0		
Actuated g/C Ratio	0.64		0.67	0.72	0.14		
v/c Ratio	0.79		0.37	0.53	0.96		
Control Delay	15.5		9.7	6.0	74.3		
Queue Delay	2.1		0.0	1.4	0.0		
Total Delay	17.7		9.7	7.4	74.3		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø3
LOS	B		A	A	E		
Approach Delay	17.7			7.6	74.3		
Approach LOS	B			A	E		
Queue Length 50th (ft)	248		8	105	99		
Queue Length 95th (ft)	415		18	169	#240		
Internal Link Dist (ft)	341			309	356		
Turn Bay Length (ft)			100				
Base Capacity (vph)	1182		233	1350	281		
Starvation Cap Reductn	131		0	413	0		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.89		0.37	0.77	0.96		

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 69
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 21.3 Intersection LOS: C
Intersection Capacity Utilization 75.4% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: Leavenworth Street & West Main Street

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	820	40	80	660	130	120
Future Volume (vph)	820	40	80	660	130	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.99		1.00	1.00	0.94	
Flt Protected	1.00		0.95	1.00	0.97	
Satd. Flow (prot)	1851		1770	1863	1698	
Flt Permitted	1.00		0.15	1.00	0.97	
Satd. Flow (perm)	1851		285	1863	1698	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	891	43	87	717	141	130
RTOR Reduction (vph)	1	0	0	0	35	0
Lane Group Flow (vph)	933	0	87	717	236	0
Turn Type	NA		D.P+P	NA	Prot	
Protected Phases	1		2	1 2	4	
Permitted Phases			1			
Actuated Green, G (s)	44.0		46.0	50.0	10.0	
Effective Green, g (s)	44.0		46.0	50.0	10.0	
Actuated g/C Ratio	0.64		0.67	0.72	0.14	
Clearance Time (s)	4.0		4.0		5.0	
Vehicle Extension (s)	3.0		3.0		3.0	
Lane Grp Cap (vph)	1180		233	1350	246	
v/s Ratio Prot	c0.50		0.01	c0.38	c0.14	
v/s Ratio Perm			0.24			
v/c Ratio	0.79		0.37	0.53	0.96	
Uniform Delay, d1	9.1		17.9	4.3	29.3	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	5.4		4.5	1.5	45.5	
Delay (s)	14.6		22.5	5.8	74.8	
Level of Service	B		C	A	E	
Approach Delay (s)	14.6			7.6	74.8	
Approach LOS	B			A	E	

Intersection Summary			
HCM 2000 Control Delay	19.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

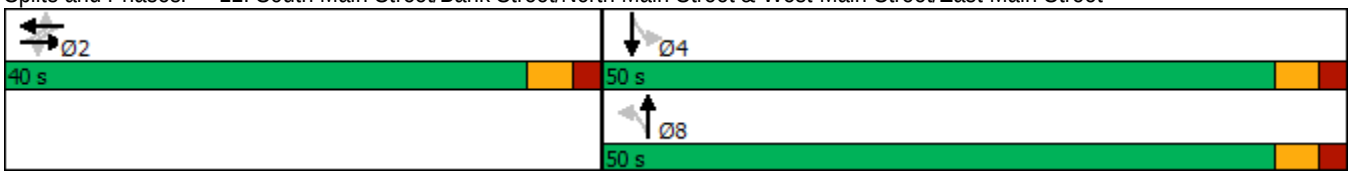
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	810	70	100	650	50	50	420	50	50	380	50
Future Volume (vph)	60	810	70	100	650	50	50	420	50	50	380	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		130	0		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.988			0.989			0.986			0.984	
Flt Protected	0.950			0.950				0.995			0.995	
Satd. Flow (prot)	1770	3497	0	1770	1842	0	0	3472	0	0	3465	0
Flt Permitted	0.215			0.251				0.838			0.806	
Satd. Flow (perm)	400	3497	0	468	1842	0	0	2924	0	0	2807	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			5			18			20	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		389			245			286			217	
Travel Time (s)		8.8			5.6			6.5			4.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	880	76	109	707	54	54	457	54	54	413	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	65	956	0	109	761	0	0	565	0	0	521	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			8			4	
Permitted Phases	2			2			8			4		
Detector Phase	2	2		2	2		8	8		4	4	
Switch Phase												
Minimum Initial (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Minimum Split (s)	37.0	37.0		37.0	37.0		35.0	35.0		35.0	35.0	
Total Split (s)	40.0	40.0		40.0	40.0		50.0	50.0		50.0	50.0	
Total Split (%)	44.4%	44.4%		44.4%	44.4%		55.6%	55.6%		55.6%	55.6%	
Maximum Green (s)	35.0	35.0		35.0	35.0		45.0	45.0		45.0	45.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Walk Time (s)	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	20.0	20.0		20.0	20.0		18.0	18.0		18.0	18.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	35.2	35.2		35.2	35.2			17.4			17.4	
Actuated g/C Ratio	0.56	0.56		0.56	0.56			0.28			0.28	
v/c Ratio	0.29	0.49		0.42	0.73			0.68			0.66	
Control Delay	13.1	9.8		15.6	17.0			23.9			23.2	
Queue Delay	0.0	0.3		0.0	0.0			0.0			0.0	
Total Delay	13.1	10.1		15.6	17.0			23.9			23.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	B		B	B			C			C	
Approach Delay		10.3			16.9			23.9			23.2	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	12	100		21	190			96			87	
Queue Length 95th (ft)	43	177		73	#453			143			132	
Internal Link Dist (ft)		309			165			206			137	
Turn Bay Length (ft)	100											
Base Capacity (vph)	224	1969		262	1036			2116			2032	
Starvation Cap Reductn	0	394		0	0			0			213	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.29	0.61		0.42	0.73			0.27			0.29	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 62.6
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 17.1 Intersection LOS: B
Intersection Capacity Utilization 85.4% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 11: South Main Street/Bank Street/North Main Street & West Main Street/East Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	810	70	100	650	50	50	420	50	50	380	50
Future Volume (vph)	60	810	70	100	650	50	50	420	50	50	380	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	0.95		1.00	1.00			0.95			0.95	
Frt	1.00	0.99		1.00	0.99			0.99			0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (prot)	1770	3497		1770	1843			3472			3466	
Flt Permitted	0.22	1.00		0.25	1.00			0.84			0.81	
Satd. Flow (perm)	401	3497		468	1843			2923			2809	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	880	76	109	707	54	54	457	54	54	413	54
RTOR Reduction (vph)	0	5	0	0	2	0	0	13	0	0	14	0
Lane Group Flow (vph)	65	951	0	109	759	0	0	552	0	0	507	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			8			4	
Permitted Phases	2			2			8			4		
Actuated Green, G (s)	35.1	35.1		35.1	35.1			17.4			17.4	
Effective Green, g (s)	35.1	35.1		35.1	35.1			17.4			17.4	
Actuated g/C Ratio	0.56	0.56		0.56	0.56			0.28			0.28	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	225	1963		262	1035			813			782	
v/s Ratio Prot		0.27			c0.41							
v/s Ratio Perm	0.16			0.23				c0.19			0.18	
v/c Ratio	0.29	0.48		0.42	0.73			0.68			0.65	
Uniform Delay, d1	7.2	8.3		7.8	10.2			20.1			19.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	3.2	0.9		4.8	4.6			2.3			1.9	
Delay (s)	10.4	9.1		12.6	14.8			22.3			21.7	
Level of Service	B	A		B	B			C			C	
Approach Delay (s)		9.2			14.5			22.3			21.7	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	62.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	85.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	140	100	210	330	380	140	
Future Volume (vph)	140	100	210	330	380	140	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	
Frt	0.944				0.960		
Flt Protected	0.972		0.950				
Satd. Flow (prot)	1709	0	1770	1863	3398	0	
Flt Permitted	0.972		0.950				
Satd. Flow (perm)	1709	0	1770	1863	3398	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	34				52		
Link Speed (mph)	30			30	30		
Link Distance (ft)	200			217	246		
Travel Time (s)	4.5			4.9	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	152	109	228	359	413	152	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	261	0	228	359	565	0	
Turn Type	Prot		Prot	NA	NA		
Protected Phases	4		2	1 2	1		3
Permitted Phases							
Detector Phase	4		2	1 2	1		
Switch Phase							
Minimum Initial (s)	1.0		1.0		1.0		1.0
Minimum Split (s)	10.0		20.0		10.0		18.0
Total Split (s)	25.0		25.0		30.0		18.0
Total Split (%)	25.5%		25.5%		30.6%		18%
Maximum Green (s)	21.0		21.0		26.0		15.0
Yellow Time (s)	3.0		3.0		3.0		3.0
All-Red Time (s)	1.0		1.0		1.0		0.0
Lost Time Adjust (s)	0.0		0.0		0.0		
Total Lost Time (s)	4.0		4.0		4.0		
Lead/Lag	Lag		Lag		Lead		Lead
Lead-Lag Optimize?	Yes		Yes		Yes		Yes
Vehicle Extension (s)	3.0		3.0		3.0		3.0
Recall Mode	None		Max		None		None
Walk Time (s)							6.0
Flash Dont Walk (s)							9.0
Pedestrian Calls (#/hr)							0
Act Effct Green (s)	14.5		21.4	44.2	18.7		
Actuated g/C Ratio	0.22		0.32	0.66	0.28		
v/c Ratio	0.66		0.40	0.29	0.57		
Control Delay	29.9		23.1	6.0	21.3		
Queue Delay	0.0		2.6	3.0	0.0		
Total Delay	29.9		25.8	9.0	21.3		
LOS	C		C	A	C		
Approach Delay	29.9			15.5	21.3		
Approach LOS	C			B	C		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Queue Length 50th (ft)	84		72	51	92		
Queue Length 95th (ft)	171		164	113	153		
Internal Link Dist (ft)	120			137	166		
Turn Bay Length (ft)							
Base Capacity (vph)	571		567	1229	1380		
Starvation Cap Reductn	0		230	747	0		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.46		0.68	0.74	0.41		

Intersection Summary	
Area Type:	Other
Cycle Length: 98	
Actuated Cycle Length: 66.8	
Natural Cycle: 65	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.66	
Intersection Signal Delay: 20.5	Intersection LOS: C
Intersection Capacity Utilization 50.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 12: North Main Street & West Main Street

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	140	100	210	330	380	140
Future Volume (vph)	140	100	210	330	380	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frt	0.94		1.00	1.00	0.96	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1708		1770	1863	3396	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	1708		1770	1863	3396	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	109	228	359	413	152
RTOR Reduction (vph)	27	0	0	0	37	0
Lane Group Flow (vph)	234	0	228	359	528	0
Turn Type	Prot		Prot	NA	NA	
Protected Phases	4		2	1 2	1	
Permitted Phases						
Actuated Green, G (s)	14.5		21.4	44.1	18.7	
Effective Green, g (s)	14.5		21.4	44.1	18.7	
Actuated g/C Ratio	0.22		0.32	0.66	0.28	
Clearance Time (s)	4.0		4.0		4.0	
Vehicle Extension (s)	3.0		3.0		3.0	
Lane Grp Cap (vph)	371		568	1233	953	
v/s Ratio Prot	c0.14		c0.13	0.19	c0.16	
v/s Ratio Perm						
v/c Ratio	0.63		0.40	0.29	0.55	
Uniform Delay, d1	23.6		17.6	4.7	20.4	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	3.5		2.1	0.1	0.7	
Delay (s)	27.1		19.7	4.8	21.1	
Level of Service	C		B	A	C	
Approach Delay (s)	27.1			10.6	21.1	
Approach LOS	C			B	C	

Intersection Summary			
HCM 2000 Control Delay	17.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	66.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	50	21	71	52	32	66	164	106	35	134	0
Future Volume (vph)	5	50	21	71	52	32	66	164	106	35	134	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.962			0.972			0.957				
Flt Protected		0.997			0.978			0.990			0.990	
Satd. Flow (prot)	0	1787	0	0	1771	0	0	1765	0	0	1844	0
Flt Permitted		0.997			0.978			0.990			0.990	
Satd. Flow (perm)	0	1787	0	0	1771	0	0	1765	0	0	1844	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		218			342			241			213	
Travel Time (s)		5.0			7.8			5.5			4.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	54	23	77	57	35	72	178	115	38	146	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	82	0	0	169	0	0	365	0	0	184	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 46.6%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	50	21	71	52	32	66	164	106	35	134	0
Future Volume (Veh/h)	5	50	21	71	52	32	66	164	106	35	134	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	54	23	77	57	35	72	178	115	38	146	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	665	659	146	652	602	236	146			293		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	665	659	146	652	602	236	146			293		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	85	97	75	85	96	95			97		
cM capacity (veh/h)	298	353	901	309	381	804	1436			1269		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	82	169	365	184
Volume Left	5	77	72	38
Volume Right	23	35	115	0
cSH	420	382	1436	1269
Volume to Capacity	0.20	0.44	0.05	0.03
Queue Length 95th (ft)	18	55	4	2
Control Delay (s)	15.6	21.7	1.9	1.8
Lane LOS	C	C	A	A
Approach Delay (s)	15.6	21.7	1.9	1.8
Approach LOS	C	C		

Intersection Summary			
Average Delay	7.5		
Intersection Capacity Utilization	46.6%	ICU Level of Service	A
Analysis Period (min)	15		

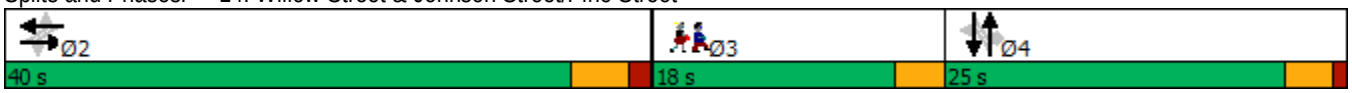
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	123	91	115	73	12	42	275	145	12	287	12
Future Volume (vph)	34	123	91	115	73	12	42	275	145	12	287	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.950			0.992				0.850		0.995	
Flt Protected		0.993			0.972			0.993			0.998	
Satd. Flow (prot)	0	1757	0	0	1796	0	0	1850	1583	0	1850	0
Flt Permitted		0.929			0.721			0.926			0.984	
Satd. Flow (perm)	0	1644	0	0	1332	0	0	1725	1583	0	1824	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		43			5				158		2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		273			331			413			180	
Travel Time (s)		6.2			7.5			9.4			4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	134	99	125	79	13	46	299	158	13	312	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	270	0	0	217	0	0	345	158	0	338	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4		4	4		
Detector Phase	2	2		2	2		4	4	4	4	4	
Switch Phase												
Minimum Initial (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Minimum Split (s)	10.0	10.0		10.0	10.0		7.0	7.0	7.0	7.0	7.0	
Total Split (s)	40.0	40.0		40.0	40.0		25.0	25.0	25.0	25.0	25.0	
Total Split (%)	48.2%	48.2%		48.2%	48.2%		30.1%	30.1%	30.1%	30.1%	30.1%	
Maximum Green (s)	35.0	35.0		35.0	35.0		21.0	21.0	21.0	21.0	21.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0	0.0		0.0	
Total Lost Time (s)		5.0			5.0			4.0	4.0		4.0	
Lead/Lag							Lag	Lag	Lag	Lag	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min		Min	Min		None	None	None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		12.7			12.7			17.4	17.4		17.4	
Actuated g/C Ratio		0.32			0.32			0.44	0.44		0.44	
v/c Ratio		0.48			0.50			0.45	0.20		0.42	
Control Delay		12.7			15.7			10.8	2.7		10.2	
Queue Delay		0.0			0.0			0.0	0.0		0.0	
Total Delay		12.7			15.7			10.8	2.7		10.2	
LOS		B			B			B	A		B	
Approach Delay		12.7			15.7			8.2			10.2	
Approach LOS		B			B			A			B	

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	18.0
Total Split (s)	18.0
Total Split (%)	22%
Maximum Green (s)	15.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	8.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		41			39			48	0		46	
Queue Length 95th (ft)		91			88			124	25		117	
Internal Link Dist (ft)		193			251			333			100	
Turn Bay Length (ft)												
Base Capacity (vph)		1431			1155			956	948		1012	
Starvation Cap Reductn		0			0			0	0		0	
Spillback Cap Reductn		0			0			0	0		0	
Storage Cap Reductn		0			0			0	0		0	
Reduced v/c Ratio		0.19			0.19			0.36	0.17		0.33	

Intersection Summary	
Area Type:	Other
Cycle Length: 83	
Actuated Cycle Length: 39.5	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.50	
Intersection Signal Delay: 10.8	Intersection LOS: B
Intersection Capacity Utilization 68.6%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 14: Willow Street & Johnson Street/Pine Street



Lane Group	Ø3
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	123	91	115	73	12	42	275	145	12	287	12
Future Volume (vph)	34	123	91	115	73	12	42	275	145	12	287	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			4.0	4.0		4.0	
Lane Util. Factor		1.00			1.00			1.00	1.00		1.00	
Frt		0.95			0.99			1.00	0.85		0.99	
Flt Protected		0.99			0.97			0.99	1.00		1.00	
Satd. Flow (prot)		1758			1796			1850	1583		1850	
Flt Permitted		0.93			0.72			0.93	1.00		0.98	
Satd. Flow (perm)		1646			1332			1725	1583		1823	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	134	99	125	79	13	46	299	158	13	312	13
RTOR Reduction (vph)	0	29	0	0	3	0	0	0	88	0	1	0
Lane Group Flow (vph)	0	241	0	0	214	0	0	345	70	0	337	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4		4	4		
Actuated Green, G (s)		12.7			12.7			17.4	17.4		17.4	
Effective Green, g (s)		12.7			12.7			17.4	17.4		17.4	
Actuated g/C Ratio		0.32			0.32			0.45	0.45		0.45	
Clearance Time (s)		5.0			5.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		534			432			767	704		811	
v/s Ratio Prot												
v/s Ratio Perm		0.15			c0.16			c0.20	0.04		0.18	
v/c Ratio		0.45			0.49			0.45	0.10		0.42	
Uniform Delay, d1		10.4			10.6			7.5	6.3		7.4	
Progression Factor		1.00			1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.6			0.9			0.4	0.1		0.3	
Delay (s)		11.1			11.5			7.9	6.4		7.7	
Level of Service		B			B			A	A		A	
Approach Delay (s)		11.1			11.5			7.5			7.7	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	39.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	790	50	20	770	0	0
Future Volume (vph)	790	50	20	770	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.992					
Flt Protected				0.999		
Satd. Flow (prot)	1848	0	0	1861	0	0
Flt Permitted				0.999		
Satd. Flow (perm)	1848	0	0	1861	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	105			421	220	
Travel Time (s)	2.4			9.6	5.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	859	54	22	837	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	913	0	0	859	0	0
Sign Control	Free			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 59.9%	ICU Level of Service B
Analysis Period (min) 15	

Intersection Sign configuration not allowed in HCM analysis.

Appendix D

Public Outreach Meeting Notes

FUSS & O'NEILL

MEETING NOTES
PROJECT ADVISORY COMMITTEE MEETING #1
Waterbury West Main Street Corridor Study
Monday, November 16 from 3-5PM

PROJECT NUMBER:	20191377.A10
PROJECT NAME:	Waterbury West Main Street Corridor Study
ATTENDEEES:	Project Advisory Committee (PAC), Project Team Members, and representatives from CTDOT (see list below)
SUBMITTED BY:	Mark Vertucci, PE, PTOE

This meeting was held to introduce the Project Advisory Committee (PAC) and team members, review the project background, objectives, scope and schedule, discuss each of the four Character sections of the corridor, and obtain initial input from the PAC on the strengths and weaknesses of the corridor.

The meeting began with each attendee introducing him/herself and discussing their affiliation as well as their role/interest in the project:

Anna Bergeron – Serving as CTDOT Project Manager, Intermodal Planning,
Bob Burns – Director of Mattatuck Museum, which is located off West Main St and he drives the corridor every day, looking to get people safely to the museum
Bob Nerney – City Planner City of Waterbury great opportunity to address aesthetics and safety issues along the corridor
Carl Rosa – Executive Director of Main Street Waterbury, concerned with the section from the green to the railroad, also lives nearby
Christian Meyer – Transportation Planner, NVCOG, administering the project
Clifford Brammer – Land Use Officer, Waterbury City Planning
Angie Mathis – Executive Director of Greater Waterbury Health Services, drives the corridor every day
Erika Lindeberg – CTDOT Traffic Engineering, will be providing project oversight
Francisco Gomes – Fitzgerald & Halliday (FHI), Subconsultant on the project team
Gary Sojka – CTDOT Policy and Planning – Will review traffic volumes, interested in changes resulting from Covid
Jim O'Rourke – CEO YMCA, runner on the corridor, wants to get people to and from the Y safely
Jon Dean – CTDOT Highway Design, looking at replacement options for the mixmaster
Joseph McGrath – Economic Development for City of Waterbury, project is the next step for enhancing economic development
Judy Mancini – Assistant to Mayor O'Leary, City of Waterbury
Lesley Barewin – Planner, NVCOG, managing project
Matt Skelly – Fuss &O'Neill, Prime consultant on the project
Mark Vertucci – F&O, Prime consultant on the project and Project Manager
Peter Brazaitis – CTDOT Traffic Engineering, technical committee member, will be reviewing from a traffic operations standpoint, Waterbury High graduate and familiar with the area
Sue Smith (caller 2) – Bike Walk CT, also grew up in the Naugatuck Valley
Peter Vaccarelli (caller 1 with Louis) – NE Transportation, has 3 bus routes using the corridor each hour

Maria Taveras – Owner or Via Al Paraiso Restaurant, provided many comments below

Following introductions and a Powerpoint presentation by the project team (attached), a number of initial comments were received from the PAC Members:

1. Corridor Strengths
    a. This corridor serves as a Gateway to the City. This project provides the opportunity to knit the community together.
    b. The road width along many segments of the corridor provides opportunity for improvements to bicycle, pedestrian, and transit accommodations as well as traffic calming measures.
    c. The corridor has aesthetic features, particularly in the area of the Green and an eclectic mix of uses. We have the opportunity to thread these sections of roadway together as part of a major downtown streetscape improvement program.
    d. The Waterbury Green is a strength and has aspects that function well. Lights at the Green at Christmas are very nice.

2. Other Corridor Wide comments:
    a. Peter from Northeast Transit would like us to consider areas for dedicated bus lanes and curb cut outs at bus stops.
    b. There are many school bus stops along the corridor – these need to be better accommodated.
    c. Wayfinding/sign improvements are lacking and needed along the entire corridor.

3. Route 8 Underpass Area to Thomaston Avenue
    a. CTDOT has recently restriped the West Main Street westbound right lane to be an exclusive right turn lane onto Route 8 northbound as part of the VIP 2020 program (plans were forwarded by CTDOT following the meeting). It was noted that many vehicles violate control and continue straight out of the right turn lane into the wide accepting lanes under the overpass.
    b. CTDOT is now reviewing the lane assignments under Route 8. This whole area is part of the ongoing Mixmaster "Active" Projects work.
    c. This is area is very difficult for pedestrians to cross safely.
    d. There is lots of volume at the Wendy's/shared access driveway, difficulties enforcing the posted no left turns out from there and from Jackson Street.

4. Sperry Street and Railroad Overpass
    a. Bypass width does exist for vehicles turning left into Sperry Street.
    b. Vehicle speeds through this intersection are too fast.
    c. Awkward intersection geometry and poor sight lines existing coming out of Sperry

d. Very hard for pedestrians to cross here. No other crosswalks nearby in either direction. New crosswalk and wider sidewalks should be considered here.
e. On Street parking is good east of Sperry and does serve to calm traffic more.
f. Railroad overpass is an eyesore with an unsightly and neglected advertisement banner. This would be a good spot for some artwork to provide a nice Gateway into the City.
g. A State project is in the works to replace the railroad bridge (currently at 30% design)
h. Puddling/ponding frequently occurs under the overpass and ices over in the winter
i. There are school bus stops between Sperry and Meadow Street.

5. Sperry Street to Meadow Street
    a. There are several City and State lots in this area but the general public cannot park in the State DCF lot and you need to pay to park in the City lot. The City has a parking website with information, inventory and rates for each lot (waterburyparking.com)
    b. It is hard to park and pull out of the lots this area with too much crossing traffic on West Main Street.
    c. On the north side of West Main Street, west of Meadow Street, no on street parking is signed in front of Maria's Restaurant. Two westbound travel lanes merge into one in this area, and buses use it for a pull off. It is a challenging area.
    d. Many crashes at the West Main Street/Meadow intersection. Intersection is offset and there're are several confusing crossings and lane configurations. There was also a pedestrian fatality near the Apple Motel.
    e. 7-11 driveway is in the middle of the intersection creating additional vehicle conflicts. Very hard to pull out of the 7-11 driveway. People use the site as a cut through as well.
    f. Left turns and right turns are restricted at the intersection but there are constant violations.
    g. Many people parking on street get ticketed.
    h. People do not feel safe not only due to traffic but also crime in the vicinity of the Apple Motel.
    i. More visible signage is needed.
    j. A bulb out/curb extension with capability for outdoor seating is not something that Maria would be interested in at this time. Feels the wider sidewalks would promote more crime.
    k. There has been little police enforcement in this area to address all the violations.
    l. A CMAQ signalization upgrade project is being completed at several intersections in this area. These improvements should be accounted for in our study. VN Engineers is designing the signal and should have the latest plans.

6. Meadow Street to the Green:
    a. Trees in the median east of Meadow/Willow Street are a strength and look nice.
    b. Left turns are prohibited at Central Avenue but there are many violations.

c. A traffic calming study was done at the intersection with West Main, Church and Park Place. Looking at changing the eastbound lane arrangement approaching the monument to a left, through, and right turn lane as opposed to the double rights that currently exist.
d. There are several churches along this segment of road. Visitors often park in the right turn lanes and right travel lanes on Sundays. There is some private parking but not enough. If the Churches have weeknight events, police control is typically provided.
e. Bike lanes are being installed on Meadow Street as part of the TIGER project. Providing bike facilities on West Main Street would be a logical connection and extension of the new bike route on Meadow Street.

7. Waterbury Green:
    a. Flow around the Green is confusing. If you miss a turn, you are "screwed" and have to drive all the way around. Need better defined lanes and signage.
    b. There is a lack of signage at the west end of the Green. Very confusing.
    c. Need wayfinding signage and uniformity of new signage along the corridor. There are a few small blue signs out there now but in general, no uniformity of signs in the downtown area.
    d. Plenty of right of way exists and provides the opportunity for traffic calming improvements.
    e. Streetscape and road diet improvements are coming along East Main Street which provides a nice transition into this project.
    f. Coordination with NE Transportation needed here with all the bus hub activity. The perimeter of the green is being used for bus staging - NET's main bus hub is normally on East Main Street, but it's temporarily been relocated to the Green.
    g. A study was completed in 2012 by TO for the renovation of the Green. This study looked at making the north side of the Green two-way traffic with angled parking. This design did not work as the angled parking presented problems for school buses. Turns onto and off of Park and Prospect Street would also be problematic with the presence of on street parking.

Attachments:

Powerpoint presentation
Meeting agenda

FUSS & O'NEILL

MEETING NOTES
PROJECT ADVISORY COMMITTEE MEETING #2
Waterbury West Main Street Corridor Study
Monday, March 29, 2021 from 3-5PM

PROJECT NUMBER:	20191377.A10
PROJECT NAME:	Waterbury West Main Street Corridor Study
ATTENDEEES:	Project Advisory Committee (PAC), Project Team Members, and representatives from CTDOT (see list below)
SUBMITTED BY:	Mark Vertucci, PE, PTOE

This meeting was held to update the Project Advisory Committee (PAC) on the findings of our existing conditions analysis and public involvement process completed as part of the study thus far. In addition, a workshop session was held during the second half of the meeting to brainstorm possible improvements and solutions along each segment of the corridor. The following PAC Members, Project Team members, and CTDOT representatives were in attendance:

Anna Bergeron – CTDOT Project Manager, Intermodal Planning
Bob Burns – Director of Mattatuck Museum
Bob Nerney – City Planner
Carl Rosa – Executive Director of Main Street Waterbury
Clifford Brammer – Land Use Officer, Waterbury City Planning
Francisco Gomes – FHI Studio, subconsultant on the project team
Fred Kulakowski – CTDOT Traffic Operations & Safety
Gabriel Filer - NVCOG
Gary Sojka – CTDOT Policy and Planning
Jim O'Rourke – CEO YMCA
Jon Dean – CTDOT Highway Design
Joseph McGrath – Economic Development for City of Waterbury
Judy Mancini – Assistant to Mayor O'Leary, City of Waterbury
Katherine Patch – Fuss &O'Neill, Prime consultant on the project
Lesley Barewin – Planner, NVCOG Project Manager
Matt Skelly – Fuss &O'Neill, Prime consultant on the project
Mark Vertucci – F&O, Prime consultant on the project and Project Manager
Peter Brazaitis – CTDOT Traffic Engineering
Sue Smith (caller 1) – Bike Walk CT
Peter Vaccarelli (caller 1 with Louis) – NE Transportation
Zack Keith – WDC Urban Historian and Project Manager

The meeting began with the Project Team reviewing the goals, objectives and funding of the study discussed in the first meeting. A discussion of the findings of the existing conditions analysis followed, including areas of traffic congestion, crash history, access management issues, parking issues, pedestrian and bicycle safety concerns, transit operations summary, and initial economic/market analysis summary. A review of the public outreach efforts conducted to date was then presented, including the project

website, social media pages, stakeholder interviews, and the survey results. Following this summary, a toolbox of possible solutions along the corridor was reviewed with the PAC and a brainstorming session was conducted for each section of the roadway. The full PowerPoint presentation for this meeting is attached.

Following the presentation, a number of comments were received from the PAC Members:

1. Jackson Street Extension
    i. Connecting this road provides a great asset to West Main Street
    ii. Left turn restrictions exiting Jackson Street are in place but necessary due to sight distance concerns and queueing at Thomaston Avenue
    iii. This intersection should not be signalized due to its proximity to the signals at Thomaston and Riverside, but geometric changes could be proposed to further enforce the turning restrictions; count data would need to be gathered before changes are recommended
    iv. Judy Mancini worked on the TIGER Grant that brought Jackson Street up to West Main Street and emphasized that the current configuration is safest for northbound vehicles during periods of peak congestion as crossing all four lanes in the existing configuration was not safe.

2. Route 8 Underpass Area to Thomaston Avenue
    a. Access management/frequent curb cuts are the result of multiple property owners along this stretch of the corridor. Having multiple property owners makes the coordination of closing driveways a complicated process.
    b. Vertical and/or visual separation between the travel way and the sidewalks, parking lots, businesses is lacking; the addition of landscape would improve the area
    c. Parking behind buildings should be encouraged to develop more of an urban downtown sentiment; however a detailed zoning review is not part of this study
    d. A bus shelter, bus pull-off area, and crossing facilities could be implemented in the vicinity of Jackson Street to avoid buses stopping in the middle of a travel lane, causing congestion and having transit riders cross four lanes of traffic
        i. Fred K. at CTDOT suggested reviewing the new Connecticut Pedestrian Safety Guide (July 2019) before proposing crossing treatments
        ii. Vegetated parcel of land on the south side of the corridor, east of Jackson Street, could be a potential location for an established bus stop/pull off but would require a partial property take. The owner of this parcel is currently unknown.
    e. The westbound queue at Thomaston Avenue often extends past Sperry Street. The Thomaston Avenue signal is State owned. Operational deficiencies and improvement recommendations will be reviewed as part of the next step of this project

3. Sperry Street and Railroad Overpass
    a. The radius on the northeast corner of the West Main Street/Sperry Street intersection is excessively large and pedestrians/cyclists have had near misses with westbound right turning vehicles where motorists do not look before "turning" up Sperry Street
        i. Potential for curb extension here and/or other geometric changes to shorten the crossing distance and make the turn for motorists more deliberate
    b. The railroad overpass is in the process of being redesigned and has the potential to be more of a "gateway" to downtown. This project is in the early-mid stages of design and CTDOT will put F&O in touch with the railroad design team to coordinate on design elements and schedule.
    c. A midblock crossing of West Main Street in this area would need to be east of the railroad bridge and Sperry Street to improve sight lines and lighting. Push buttons and flashing beacons would also be recommended
4. Sperry Street to Meadow Street
    a. This section looks wide enough to support four lanes but is designated as one lane of travel in each direction with parking along the majority of both sides of the street.
    b. Crosswalk at the Apple motel is worn. The crosswalk length, location and striping maintenance will be evaluated. This is likely a great candidate for a curb extension to shorten the current 50+ foot crossing distance and provide protection for the parking lanes.
    c. Bike lanes would be a great addition to this wide section of road and would provide some connectivity to the cycle track along Freight Street

5. Meadow Street to the Green:
    a. Bus lanes could be an option here allowing buses direct access to the Green and reducing congestion for through vehicles
    b. Willow Street/Meadow Street
        i. Parking and turning restrictions are not obeyed
        ii. Parking lot at Boru's is tricky to navigate – narrow lot and queueing for eastbound right turn at Willow Street/Meadow Street often extends past the curb cut
        iii. Intersection alignment/through movements are an issue but are difficult to fix without property impacts on the southwest and northeast corners of the intersection.
        iv. The new 7-Eleven store model requires a gas station so the northeast corner parcel is no longer viable for them, but the site has not yet been placed on the market. Any redevelopment of this parcel would need to go through City Planning & Zoning, which could mandate the removal of the driveway on West Main Street (in the center of the intersection) for better access management. This parcel also has potential to be combined with the vacant lot

to the east, which would allow for a driveway on West Main Street much further away from the intersection.

v. Median on eastern leg causes confusion and property damage collisions (because of its alignment for eastbound through vehicles)

vi. The westbound through movement on West Main Street has a 3 to 1 lane drop in a matter of seconds that is confusing to drivers.

vii. Meadow Street Automotive experiences some cut through traffic and would not be averse to closing a curb cut.

6. Waterbury Green:
    a. Western intersection (with monument) is difficult to navigate – lack of wayfinding, narrow lanes/corners for buses, circulation concerns due to turning restrictions, lack of pedestrian crossings. A roundabout could be one of several alternatives to explore here.
    b. Inadequate bus facilities leave people wandering waiting for transit
    c. The north side of the Green has less travel lane capacity and Father Sullivan (Basilica) had mentioned a need for funeral parking within the travel way during large services
    d. YMCA has a parent drop-off area along their site frontage every morning for daycare services
    e. Expanding ped space on the north side of the Green could be considered as well as providing a woonerf (Dutch festival street) where pedestrian walkways, parking and travel lanes all share the same place. Temporary street closures (or an "open" street) could be a great opportunity to bring more people to the Green with live events and/or food trucks
    f. A City parking lot is proposed between Prospect Street and North Main Street – vehicle access will need to be maintained on West Main Street and Prospect Street to access the lot.

FUSS & O'NEILL

MEETING NOTES
PROJECT ADVISORY COMMITTEE MEETING #3
Waterbury West Main Street Corridor Study
Tuesday, September 28, 2021 from 3-5PM

PROJECT NUMBER:	20191377.A10
PROJECT NAME:	Waterbury West Main Street Corridor Study
ATTENDEEES:	Project Advisory Committee (PAC), Project Team Members, and representatives from CTDOT (see list below)
SUBMITTED BY:	Mark Vertucci, PE, PTOE

This meeting was held to present the design team's preliminary recommendations and concept plan alternatives for the corridor based on the analysis and public involvement that have been completed as part of the study to date. In addition, a workshop session was held during the second half of the meeting to gather feedback on the proposed recommendations. The following PAC Members, Project Team members, and CTDOT representatives were in attendance:

Carl Rosa – Executive Director of Main Street Waterbury
David Schweitzer – CTDOT (Mixmaster Project)
Francisco Gomes – FHI Studio, subconsultant on the project team
Fred Kulakowski – CTDOT Traffic Operations & Safety
Jim O'Rourke – CEO YMCA
Joe Belrose – CTDOT (Mixmaster Project)
Joseph McGrath – Economic Development for City of Waterbury
Joshua Lecar – Project Manager, NVCOG
Judy Mancini – Assistant to Mayor O'Leary, City of Waterbury
Katherine Patch – Fuss &O'Neill, Prime consultant on the project
Kevin Ellis – NVCOG
Luis – NE Transportation
Matthew Skelly – Fuss &O'Neill, Prime consultant on the project
Mark Vertucci – F&O, Prime consultant on the project and Project Manager
Obesebea Aye-Addo – CTDOT Traffic Engineering
Peter Vaccarelli (caller 2) – NE Transportation
Rich Donovan – Transportation Planner, NVCOG
Sara Radacsi – NVCOG Coordination Unit
Scott Roberts – Project Manager, CTDOT (Mixmaster Project)
Zach Keith – WDC Urban Historian and Project Manager

The meeting began with the Project Team reviewing the completed analysis and public engagement efforts thus far as well as looking ahead to the final steps for this project to wrap up in the coming months. Following this summary, the presentation continued with the general recommendations for the corridor as they pertain to pedestrians, bicycles, vehicles, access management, parking, placemaking, transit and the economic/market analysis. Once the general recommendations were established, the

Project Team reviewed the draft concept improvement plans with the PAC and feedback was provided on each section of roadway.

The full PowerPoint presentation for this meeting is attached.

Following the presentation, several comments were received from the PAC Members:

1. Route 8 to Jackson Street – no comments
2. Intersection at Thomaston Avenue
    a. The westbound left turn lane at Thomaston Avenue has the potential to be "back to back" with the eastbound left turn lane at Commercial Street. It was noted that the eastbound left turn does not have a high volume so the median was added to break up the pavement area.
3. Intersection at Sperry Street
    a. Bus pull offs are noted as a great asset to the corridor and bus lanes are a potential as well. West Main Street west of Sperry Street has limited space, which is why the pull offs were added near Jackson Street. East of Sperry Street has the potential for bus lanes or pull offs and could be incorporated as an alternative in lieu of on street parking.
    b. The crosswalk at West Main Street/Sperry Street should be evaluated for some type of pedestrian actuated crossing device given the geometry/sight distance constraints.
    c. Fred Kulakowski noted that the proposed eastbound striping at Sperry Street needed to be revised to provide sufficient width for queue space for left turning vehicles in the middle of the intersection.
4. French Street to Willow Street
    a. NE Transportation would like to relocate the eastbound bus stop west of Willow/Meadow to the east side of the Willow/Meadow intersection to avoid the wider portion of the roadway. This would be a great place for another bus pull off while still being able to maintain the proposed landscaped area on the south side of the roadway east of the intersection. Bus stop westbound is in the vicinity of 7-Eleven is in a good place – we could potentially move this east and provide a pull off and a bus shelter in this direction as well.
5. Willow Street at Meadow Street
    a. Methodology for the revised traffic analysis at this intersection was presented. Volumes from the recent Mixmaster project and East Main Street project were used and grown to the design year in lieu of the Streetlight volumes which were overly conservative. This enabled us to reduce lanes at the intersection.
    b. Design vehicles and turning radii need to be confirmed, especially the eastbound right turn to Meadow Street southbound. May need to move the stop bar back on the northbound approach.

   c. Realigning the intersection to provide better sight distance for vehicles and pedestrians was well received.
6. Willow Street to State Street/Holmes Avenue – no comments
7. West Main Street at the Green – Option #1
   a. The proposed shared street on the northern portion of West Main Street along the Green and extending the Green to include the monument was very well received. This also improves circulation getting to the museum and YMCA.
   b. Providing one through lane eastbound and westbound on West Main Street will ease the "speedway" feeling along this portion of the Green and make navigation easier for buses and other large vehicles.
   c. Maintenance and snow removal concerns were mentioned as a potential issue with regard to the curb extensions and bike lanes. It was noted that the bike lanes will not be used in the winter and could provide snow storage. The curb extensions can be demarcated to make them visible to plow drivers and/or be designed as mountable. These would both be considered at a later phase of design.
8. West Main Street at the Green – Option #2
   a. Not preferred; Option #1 of "T'ing" the northern portion of West Main into the southern portion makes more sense.
9. West Main Street at the Green – Option #3 – Roundabout concept
   a. Plowing was noted to be a concern with this concept.
   b. Downside is that monument remains surrounded by vehicular traffic and disconnected from the Green.
10. The Waterbury Green
   a. Many of the City's events are moving to Library Park and the Green will continue to be utilized as event space for the entities around it (YMCA, churches, community events, etc.)

It was noted that many new apartments are planned to be built Downtown over the next 5-7 years (Waterbury NEXT) and it was confirmed that the market analysis takes this into account.

The signalization upgrade project underway by VN has been considered in our planning study efforts. Several intersection signals along the corridor are currently being designed and this study is still conceptual. VN will be made aware of the final study recommendations and changes will be incorporated into the signal designs where possible.

The PAC, including CTDOT, will have the opportunity to comment on the concept plans. The plans will be revised based on feedback received today and shared with the PAC in advance of the Public Meeting on October 27.

Attachment: PowerPoint presentation

FUSS & O'NEILL

MEETING NOTES
Virtual Workshop #1 – Introduction
Waterbury West Main Street Corridor Study

Tuesday January 12, 2021 via GoToWebinar, 5-7 pm

PROJECT NAME:	Waterbury West Main Street Corridor Study
PANELISTS:	Mark Vertucci (F&O), Matthew Skelly (F&O), Katherine Patch (F&O) Lesley Barewin (NVCOG), Christian Meyer (NVCOG), Judy Mancini (City of Waterbury)
SUBMITTED BY:	Mark G. Vertucci, PE, PTOE

This meeting was held to introduce the public to the project and obtain initial input to inform the study. The meeting began with Mark Vertucci and Matthew Skelly from Fuss and O'Neill, and Lesley Barewin of NVCOG introducing the project goals, objectives, scope and schedule. A moderated conversation followed between the project team and the public during the last half of the meeting. The following is a summary of strengths, weaknesses, and general comments as they relate to the study corridor:

Overall Comments about the Corridor

- General concerns about safety on the roadway and the need for enhanced police enforcement.
- Lighting was brought up as a concern. There are many dark areas along West Main Street. Appropriately scaled lighting should be included in the recommendations of this project as it pertains to traffic/bicycle/pedestrian safety.
- Parking availability (both on and off street) is a concern throughout the corridor.
- Accessibility/ADA requirements on sidewalks and ramps are a concern throughout the corridor.
- Study should recommend street trees where it's possible.
- Fewer driveway curb cuts to businesses are better for safety. Study will look into recommendations for better driveway access management.
- TIGER project has been completed on Freight and Meadow Streets. Recommendations of the West Main Street Study will build off the recent bicycle, pedestrian, roadway and streetscape improvements completed in the area.
- Storm event flooding happens regularly, especially between Route 8 and Thomaston Avenue, and under the railroad overpass.
- Store fronts and facades along the corridor could use an update and better continuity. While largely out of the scope of this study, it was stated that recommendations could be made to businesses from a planning perspective.

Route 8 to Railroad Overpass

Strengths

- A mural should be considered on the Samuel K. Beamon Bridge over the Naugatuck River.
- A mural and lighting should be considered on the Route 8 bridge structure over West Main Street.

Weaknesses

- Queuing related to the eastbound left turns before the traffic signal at Thomaston Avenue.
- Frequent and wide curb cuts.

- Minimal shoulders and snow shelf.
- Sidewalks are in poor condition, not ADA compliant.
- Lacking traffic calming measures and bike lanes.
- Lacking green space/streetscape along the roadway.
- Lacking illumination under the railroad overpass, feels unsafe for pedestrians.
- Railroad overpass aesthetics are poor and should be coordinated with the DOT who are replacing the bridge.
- Storm flooding along the south side of West Main Street, causing drivers to avoid using the right travel lane.
- Homeless population present in the vicinity of Thomaston Avenue is of concern.
    - Response to this comment was given that this is out of the scope of this project. The focus of the study efforts will be on how to improve the design of the roadway within the public right of way.

<u>Railroad Overpass to Meadow Street</u>

Strengths

- Travel lanes are wide enough to potentially support the addition of bike lanes.

Weaknesses

- Parking is hard to find in this area.
    - It was noted that the City is in the process of adding a new municipal surface parking lot on North Main Street, just north of the Green.
- There is a long stretch of road between Thomaston Avenue and the Big Apple Motel that has no crosswalk. A new actuated pedestrian crosswalk with warning lights should be considered between Sperry Street and the motel.
- Queuing and sight distance at the intersection of West Main Street and Sperry Street, this intersection has a history of crashes.
- Railroad bridge has low clearance and the lighting and sight distance is poor.
    - Response to this comment was that the State is in the process of designing a new railroad bridge that will replace the existing structure.
- Drainage concerns under the bridge, ponding turns to ice and creates dangerous areas on the road and sidewalk.

General

- Allowing eastbound left turns onto Willow Street was suggested to eliminate the need for vehicles to turn left onto Sperry and travel up to Johnson Street to get to Willow Street.
- This section was stated to potentially benefit from traffic calming measures such as a decrease of travel lane widths.
- The sign at the former 7-Eleven has been taken down, it is anticipated that a new occupant could soon move into this building.
- There was a comment regarding upgrades to Judd Street between Freight Street and West Main Street. Response was given that improvements to Judd Street were addressed as part of the Freight Street project.

Meadow Street to the Green

Strengths

- Median islands were identified as an opportunity for aesthetic enhancements to the corridor.

Weaknesses

- The Waterbury Baptist Ministries has a very popular food pantry that lines up on the sidewalk, and there's not enough sidewalk space for folks waiting.
- Speeding vehicles eastbound toward the Green.
- Abundance of concrete and striped median islands in the road along with excessive pavement width.
- Crosswalks are weathered and worn; stamped crosswalks would offer higher visibility and an effort towards place making.

General

- Opportunity to link improvements on Freight and Meadow Street.
    - Response to this comment was given that the streetscape and bike lane improvements on Freight and Meadow Streets was completed under the Tiger project. This project will provide an opportunity to extend those improvements onto West Main Street.

The Green

Strengths

- Turn restrictions do not apply to buses at the West Main/East Main/North Main/South Main intersection.

Weaknesses

- Regional bus accommodations are lacking - a shelter with ample seating and a public restroom would be beneficial.
    - Specifically, the bus to New Haven that picks up by St. John's / the old Mattatuck really needs better accommodations.
    - The bus is regularly late by over half an hour, so especially during the winter it can be tough there.
- Crosswalks are weathered and worn; stamped crosswalks would offer higher visibility and an effort towards place making.

Stakeholder/Interview Candidates

- Marc DePietro volunteered to be part of the stakeholder interviews as he is the owner of Boru's Bar and Grill at 357 West Main Street.

FUSS & O'NEILL

MEETING NOTES
Virtual Workshop #2 – Introduction
Waterbury West Main Street Corridor Study
Wednesday, April 14, 2021 via Zoom, 5-7 pm

PROJECT NAME:	Waterbury West Main Street Corridor Study
PANELISTS:	Mark Vertucci (F&O), Matthew Skelly (F&O), Katherine Patch (F&O), Francisco Gomes (FHI), Lesley Barewin (NVCOG), Judy Mancini (City of Waterbury)
SUBMITTED BY:	Mark G. Vertucci, PE, PTOE

This meeting was held to update the public on the findings of the existing conditions analysis and public involvement process completed as part of the study thus far. In addition, an interactive workshop session was held during the second half of the meeting to brainstorm possible improvements and solutions along each segment of the corridor. The following is a summary of comments as they relate to the study corridor:

Route 8 to Railroad Overpass

- The new Jackson Street extension has begun to cause additional congestion during both the morning and afternoon peak hours. It was mentioned that many people traveling northbound ignore the left turn restriction and it led to a crash recently.
    - Geometric changes to the intersection to prohibit the left turn out were noted as a possible solution and it was also noted that any changes would need to be coordinated through CTDOT.
- The westbound right turn at Riverside Street was reported to have extensive queuing that can extend as far back at Jackson Street, causing further congestion at the new intersection.
    - Coordination with CTDOT and potential signal timing changes were noted as possible solutions.
- The bus stop at the fish market sees a lot of ridership. People do not have a space to queue and cross the street, nor do buses have a place to pull out of traffic to pick up and drop riders off.
    - A curb recession here could provide a bus pull off and a bus shelter would provide space for riders to queue. Crosswalks and ADA compliant curb ramps would make this stop more accessible.
- Drivers traveling westbound under the railroad bridge towards Thomaston Avenue often create two lanes of travel/queueing. The expansive pavement width and lack of pavement markings causes driver confusion.
    - Better lane definition, using pavement markings, curbing, and other vertical elements, were noted as a possible solution in this area.
- This area was noted to be too heavily traveled to be suitable for a road diet. All intersection approach lanes at the Thomaston Avenue intersection are needed.
- It was noted by residents, as well as a Google maps image, that a crosswalk should be considered west of the railroad bridge, in the vicinity of Commercial Street. There are currently no crosswalks available for pedestrians in a long stretch between Thomaston Avenue and the Apple Motel.

    - A crosswalk, potentially an actuated crosswalk to increase visibility for eastbound vehicles, was noted as a possible solution.
- It was noted that drivers have difficulty making a right turn out of the eastern access driveway of the Walgreens plaza. Landscaping and parked cars along the property frontage were reported to obstruct driver's sight distance.
    - A potential solution to this issue would be having the City reach out to the owner of the plaza to alter landscape and potentially restrict parking along the property frontage.

<u>Railroad Overpass to Meadow Street/Willow Street</u>

- It was noted that the railroad bridge is an eye sore and trucks have gotten stuck under it a few times over the years.
    - It was noted by Jonathan Dean of CTDOT that in the rehabilitation of the bridge, the height will remain the same due to the impact of the rail line and aesthetic improvements can potentially be incorporated, if recommended.
- It was noted that the westbound travel lane that traverses under the railroad bridge is confusing as it "goes from two lanes to one lane". In actuality, West Main Street from Willow Street/Meadow Street to the railroad bridge provides one westbound travel lane.
    - A potential solution to this confusion would be more/refreshed pavement markings to delineate the space between the travel lane, parking lane, and potential bicycle lanes.
- Eastbound left turns are not permitted, except for buses, at the Willow Street/Meadow Street intersection; however it was noted that drivers often make this left turn illegally.
    - A potential solution to this was noted to be increased police enforcement
    - A capacity/safety analysis should also be conducted to determine if this left turn can be allowed in the future.
- With regard to the recently closed 7-Eleven at Willow/Meadow Street, the central business district does not support their new store model so it is unlikely that they will reopen. A new occupant will need to be permitted through the City of Waterbury who can then coordinate the closure of the parcel's southern driveway on West Main Street. Combining the 7-11 property with the adjacent property to the east would be helpful for the future developer of this parcel as it would enable the construction of a driveway on West Main Street further east of the intersection.
- It was noted that improvements should be considered for the vehicles that travel this area currently, before multi-modal considerations are brought to West Main Street. A "wider space" is needed at the intersection of West Main Street/Willow Street/Meadow Street.

<u>Meadow Street/Willow Street to the Green</u>

- This section of the corridor has been nicknamed "the runway" due to its expansive width and long straight section.
    - It is anticipated that three travel lanes in each direction will not be warranted based on the capacity analysis and this section could be reallocated to incorporate dedicated bus lanes, bike lanes, street trees, and/or wider sidewalks.
- It was noted that crossing so many lanes makes it difficult to turn left out of the properties and the Central Avenue left turn restriction restricts movement to the east, inadvertently promoting the Sperry Street "cut through".

- A potential solution to this was noted to be to create safer turns onto West Main Street for pedestrians and motorists from Central Avenue as well as St. John's Church. This will be something to note in the analysis.
- It was noted that on street parking in this six lane section of roadway would be a better use of the space than bus lanes.

<u>The Green</u>

- It was noted that parking is limited around The Green.
  - A solution in this area will be the public surface lot currently planned by the City between Prospect Street and North Main Street.
  - Angled parking spaces along The Green were also discussed as a potential solution.
  - Support for bicycle lanes was expressed but it was noted that they should not be implemented at the expense of on-street parking around The Green.
- It was noted that turn restrictions at the intersections and buses traversing The Green increases confusion and congestion. It was also noted that the turn restrictions are often violated at both the northeast and southeast intersections along The Green.
  - Turn restrictions throughout this section will be evaluated as part of the analysis and recommendations will be made regarding their rationality.
  - Wide sections of roadway were identified as placed where bus pull off locations could be implemented.
  - One-way circulation around The Green was also offered as a potential solution to provide order, as well as the potential to allocate existing space to bicycle lanes, bus lanes, bus shelters, parking, etc.
- It was noted that the circulation around the west side of The Green, in the vicinity of the monument, is less confusing with the amount of signalization and curb islands to direct traffic. Turning radii were noted to be tight for buses in this area and it was also noted to be unfriendly to a pedestrians due to the lack of crossing locations in this area.
  - A potential reconfiguration of this space was discussed including extending The Green west to provide access to the monument as was once proposed in the past. Vehicle traffic would then be routed around the west side of the monument. A wider Green would also provide more space for community events.

FUSS & O'NEILL

MEETING NOTES
Hybrid Workshop #3
Waterbury West Main Street Corridor Study

Wednesday, October 27, 2021, 5-7 pm
via Zoom and live from Veterans Memorial Hall

PROJECT NAME:	Waterbury West Main Street Corridor Study
PROJECT TEAM:	Mark Vertucci (F&O), Matthew Skelly (F&O), Katherine Patch (F&O), Francisco Gomes (FHI), Josh Lecar (NVCOG), Rich Donovan (NVCOG), Kevin Ellis (NVCOG) Judy Mancini (City of Waterbury)
SUBMITTED BY:	Mark G. Vertucci, PE, PTOE

This meeting was held to update the public on the initial findings of the study and present the preliminary alternative concepts prepared for the West Main Street Corridor Study. In addition, an interactive session was held during the second half of the meeting to hear feedback on the alternatives and how they align with the public's perspective on traffic, walking, biking, and bus access along each segment of the corridor. The following is a summary of comments as they relate to the study corridor:

<u>Route 8 to Jackson Street</u>

- Westbound right turn lane at the Riverside intersection is not well marked and some people in the right lane still proceed straight where there is only one receiving lane on the other side of the intersection.
- Signal head alignment approaching the Riverside intersection heading westbound is also poor.
- This intersection is proposed for improvements as part of the Mixmaster project and we will pass this information along to that team to address

<u>Commercial Drive between Jackson Street and Thomaston Avenue</u>

- Vehicles turning left out of this unsignalized intersection have difficulties during the peak hours. A similar No Left Turn restriction as to what is proposed at Jackson Street should be considered here.

<u>Sperry Street Intersection</u>

- The type of sidewalk and hardscape proposed on the northeast corner of Sperry was questioned. Proposed brick areas would need a budget for maintenance. Brick pavers were used near the Palace and were not maintained
    - F&O clarified that this is a planning study and we have not specified materials for construction/maintenance. There is potential for this space to be textured pavement, landscape, grass, etc. depending on City preference.
- Brick areas are "unsightly" and deteriorate over time. It was generally agreed that brick pavers were not preferred here.
- F&O clarified that the northeast corner curb extension will be raised as an extension of the sidewalk, not flush with the street level

French Street to Willow Street – no comments

Willow Street at Meadow Street

- Can parking be restored along the west side of Meadow Street?
    - Stop line being so far back and the necessary turn lanes impact space available for parking
    - Options here may include parking south of the turn lanes on Meadow Street and/or parking along the south side of West Main
- It was commented that the southeast corner radius appeared too sharp for northbound right turning vehicles
    - F&O concurred that when design plans are advanced, truck turning movements will need to be run here to finalize an appropriate corner radius. There is a balancing act between keeping the crosswalks as short as possible while at the same time allowing comfortable turning movements.

Willow Street to State Street/Holmes Avenue

- With the plethora of green space added on the south side, there is the potential to add some on-street parking or angled bus "bays" for improved pickup/drop off of passengers.

West Main Street at the Waterbury Green

- Option #1
    - This option was preferred by all who participated in this meeting.
    - There was some concern that parking has been eliminated on the south side of West Main Street (north), even with the new public lot planned by the City one block north on Prospect Street.
    - Central Avenue southbound left turn restriction can likely be eliminated with this layout, now that vehicles turning would only need to cross one lane as opposed to three or four, like what exists today.
- Option #2 – no comments
- Option #3 – no comments

The Waterbury Green

- Potential for textured pavement/curb extension on North Main Street, east side of the Green, where there is existing excess pavement in the southbound right lane. This presents the opportunity to extend the Green a bit farther east.

NEXT STEPS:

- F&O indicated that the design team would be wrapping up their public engagement, alternatives analysis, and market analysis deliverables in the coming weeks and beginning work on the final report.
- Final report will be issued in early 2022.
- The public was encouraged to check the project website for additional updates and posting of documents, and to reach out to the design team with any comments or questions.