To: Ms. Nora Loughnane,
Town Planner, Town of Westwood

From: Nancy B. Doherty, P.E., Tetra Tech
Jeffrey S. Dirk, P.E., PTOE, Vanasse & Associates, Inc.

Re: **University Station – Response to University Station Peer Review**

Date: April 11, 2013

Tetra Tech and Vanasse & Associates, Inc. (Tt/VAI) are providing detailed responses to the comments that were raised in the March 15, 2013 University Station Peer Review memorandum prepared by BETA Group, Inc. (BETA) concerning their review of the various plans, documents and traffic simulations prepared in support of the November 2012 Traffic Impact Study submitted for the University Station mixed-use, transit oriented development. The purpose of the BETA memorandum was to identify areas where additional information was required and those items that have been addressed and should be included in a final or amended Traffic Impact Study. We offer the following responses in a comment/response format generally following the structure of the March 15, 2013 BETA memorandum:

Memo – "University Station at Harvard Street", dated February 12th, 2013

Comment 1. We concur that the analyses indicate good levels of service for all three peak hours, but caution that the analyses do not consider potential increases in northbound University Avenue traffic created by the full build I-95/I93 interchange or by changes in local travel patterns brought about by modifications to the University Avenue/Canton Street intersection. In addition we note that at such time the I-95 NB off ramp to Dedham Street is implemented, the projected volume of left turns to Harvard Street is such that NB left/thru lane may become a de facto left, which is not consistent with the Planning Board's goal of two uninterrupted through lanes. It is recommended that the Town consider implementation of a future condition that provides an exclusive left turn lane and two through lanes northbound at Harvard Street, which will require takings. This may entail specification of requirements in the Development Agreement.

Response 1. Supplemental capacity analyses have been prepared for the University Avenue/Harvard Street intersection assuming i) the I-93/I-95 interchange has been constructed; ii) the University Avenue northbound approach consists of a shared left/through lane and shared through/right turn lane; and iii) the traffic signal system provides an exclusive pedestrian phase accommodating crosswalks on all four approaches. These analyses are provided in Attachment A and indicate that even if the inside northbound lane functions as a de facto left turn lane, the intersection would operate at LOS C or better and the University Avenue approaches at LOS B or better for the weekday morning and afternoon peak hours. As such, this analysis has indicated that the University Avenue/Harvard Street intersection will operate under acceptable conditions with the shared northbound left-turn/through travel lane.

Comment 2 and 3. Exclusive pedestrian phasing should be provided at University Avenue/Harvard Street. The final TIS should incorporate the proposed lane and pedestrian crossing changes at University Avenue/Harvard Street.

Response 2 and 3. Capacity analyses have been prepared for the University Avenue/Harvard Street intersection using the 2017 and 2022 traffic volumes provided in the updated figures submitted on February 28, 2013 and assuming:i) the University Avenue northbound approach consists of a shared left/through lane and shared through/right turn lane; and ii) the traffic signal system provides an exclusive pedestrian phase accommodating crosswalks on all four approaches. These analyses are provided in Attachment B and indicate the intersection would be expected to operate at LOS C or better during peak hours.

Memo – "University Station – Preliminary Impact Analysis of Full I-95/I-93 Interchange Project on University Avenue", dated February 19th, 2013

Comment 1. The impact of the full build interchange on the University Avenue/Canton Street intersection results in acceptable overall Level of Service (LOS), but shows v/c ratios exceeding 1 and poor LOS for certain individual movements. This is true for both the AM and PM peak hour for the University Avenue SB left, and in the PM peak hour for the University Avenue NB through movement. These individual lane group operations illustrate that additional capacity may be needed at the intersection before the connection from I-95 NB to University Avenue is eliminated, which occurs in conjunction with the full build interchange.

Response 1. MassDOT is proceeding with the intersection design as depicted in the November 2012 Traffic Impact Study and has indicated that the planned geometry can accommodate the additional traffic demand associated with the University Station project. That said, the University Station project proponent will consult with MassDOT with respect to extending the right turn lanes on westbound Canton Street and northbound University Avenue to the maximum extent practicable and recognizing right-of-way constraints and roadway jurisdiction.

The suggested modified conceptual design for the University Avenue/Canton Street intersection is shown on Figure 1. University Avenue, south of the Grainger Driveway, would require widening along its easterly side by approximately three feet to accommodate the longer right turn lane.

Comment 2. Vehicles traveling north on I-95 to Rosemont Road via University Avenue today are redistributed to the Dedham Street off-ramp to University Avenue and Harvard Street after the full build interchange. We concur with this redistribution, and note that it further supports the need for an exclusive left turn lane and two NB through lanes at Harvard Street.

Response 2. Please refer to the response to Comment 1 under Memo – "University Station at Harvard Street", dated February 12th, 2013.

Comment 3. University Avenue/Harvard Street is analyzed with an exclusive left turn lane and a single through lane northbound, which is inconsistent with the current design. Two northbound through lanes are required along the entire University Avenue corridor in the current design to promote University Avenue over Canton Street as a preferred route to access I-95/Route 128, a

requirement that will become more important in the future once the full build interchange is in place and traffic along University Avenue increases. An update to this sensitivity analysis is not required for this item at this time; however any future analysis of the corridor in a full build interchange condition should incorporate this change.

Response 3. Please refer to the response to Comment 1 under Memo – "University Station at Harvard Street", dated February 12th, 2013.

Traffic Simulations for 2022 PM condition, with and without SB crosswalk, submitted electronically on February 20th, March 8th and March 18th, 2013

Traffic Simulation for 2017 PM condition, with SB crosswalk, submitted electronically on March 18th, 2013

Comment 1. Volume exiting the MBTA garage will peak following train arrival times. The revised simulation showed improvement of this driveway operation, but phasing refinements may still be necessary and should be coordinated with MassDOT.

Response 1. Agreed and will be coordinated with MassDOT as the University Station project is developed.

Comment 2. Adaptive signal control should be considered along the University Avenue corridor.

Response 2. The University Station project proponent is committed to providing adaptive signal control along University Avenue to the extent that such control is approved by MassDOT.

Comment 3. The simulation shows queuing concerns for the University Avenue NB through movement at Canton Street, which traps right turning vehicles before the beginning of the exclusive right turn lane. It is recommended that this turn lane be extended to the greatest extent practicable. Existing observations at this intersection reveal that right turning vehicles currently use the shoulder to bypass queued through vehicles. Widening in this area to formally establish a right turn lane can likely be accomplished without impacting ROW, existing guardrail or existing wetlands.

Response 3. The University Station project proponent has committed to working with MassDOT to extend the right-turn lanes on westbound Canton Street and northbound University Avenue as a part of the MassDOT intersection improvement project. A revised conceptual design of the University Avenue/Canton Street intersection with the suggested right-turn extensions is shown on Figure 1.

Comment 4. The Synchro file supporting the simulation shows that University Avenue/Canton Street and University Avenue/Harvard Street are uncoordinated. These locations should be included in the coordinated system along University Avenue to promote continuous flow from Canton and Dedham Streets to I-95/Route 128.

Response 4. While we recognize the benefits of traffic signal coordination along the University Avenue corridor, the distance between the Harvard Street and Canton Street intersections

combined with the presence of intervening driveways may negate the benefits of coordinating these two signals. That said, coordination of the traffic signals will be reconsidered when the University Avenue corridor and traffic signal system is designed.

Comment 5. The site drive opposite Rosemont Road shows a two lane approach, which does not match the design as conveyed by the proponent. A response from Tetra Tech stated that this approach should be a shared left/through and a right turn lane, and that the plans will be modified accordingly.

Response 5. This modification is reflected in the revised design of the University Avenue corridor.

Comment 6. The Canton Street/Dedham Street WB right turn to Canton Street has been presented to the Planning Board by the Development team as a free right turn, but is shown under yield condition in the simulation. The simulation and Synchro model should match the design as presented.

Response 6. The Canton Street/University Avenue intersection has been reanalyzed assuming the 2017 and 2022 volumes shown on the updated traffic volume figures submitted on February 28, 2013 and a free right-turn movement from westbound Canton Street onto northbound University Avenue. The analyses are provided in Attachment C.

Comment 7. The Synchro model should be updated based on these comments, with the revised analysis results incorporated into the final TIS. No further review of the simulation is required.

Response 7. The Synchro model has been revised as requested and the results are presented herein.

Memo – "University Station – Canton Street/University Avenue", dated February 20th, 2013

Comment 1. Table 1 provides a comparison between the peak hours with the I-95 site trips and with the full build interchange. Our review indicates that key movements at the Canton Street intersection would reach/slightly exceed max capacity.

Response 1. Agreed. Recognizing these conditions, the University Station project proponent has agreed to providing monies to the Town in order to facilitate the study and advancement with MassDOT of refinements to the Dedham Street/Canton Street/University Avenue intersection design prior to the construction of the I-95 northbound off-ramp to Dedham Street.

Memo – "University Station – Southbound Crosswalk Impact Analyses", dated February 21st, 2013

Comment 1 and 2. The analysis assumes no change at Harvard Street, since a crosswalk is already provided across the southbound leg. For clarification, our request was for crosswalks across all four legs of each intersection, which would require a new crosswalk across the northbound leg of University Avenue at Harvard Street. Exclusive phasing should be provided

for Harvard Street, as noted in comment #2 for the February 12th memo above. Revised analysis should be provided for University Avenue/Harvard Street with exclusive pedestrian phasing.

Response 1 and 2. The analyses have been revised and are provided in Attachment B.

Comment 3. The increased pedestrian clearance time has very little impact on delays and queue lengths; therefore, it is recommended that the additional pedestrian crossing across University Avenue be added at all four intersections, pending review of updated analysis for University Avenue/Harvard Street.

Response 3. At a working meeting held on Wednesday, January 16, 2013 with BETA, Tetra Tech, VAI and town officials, it was agreed that five (5) pedestrian actuations each for the weekday and Saturday peak hours were reasonable assumptions for the University Avenue intersections with Relocated Rosemont Street, North Site Drive and South Site Drive. We have also assumed five (5) actuations for the exclusive pedestrian phase at Harvard Street.

Comment 4. These operating conditions should be incorporated into the final TIS.

Response 4. The revised analyses have been completed and are reflected herein.

Memo – "University Station – Assessment of Alternative Configurations for the Canton Street/University Avenue Intersection", dated February 22nd, 2013

Comment 1. We note that previous memoranda support consideration for additional capacity at the University Avenue/Canton Street intersection before the full build I-95/I-93 interchange is implemented.

Response 1. No response required.

Comment 2. Option 1 should consider aligning the connector road with the north-south roadway that provides connection to both existing and future office uses, thereby creating a T-intersection, with Harvard Street under STOP control. This will provide a natural separation of access for office and retail/grocery uses, and will reduce left and right turns both at Harvard Street and at the University Avenue/Canton Street intersection.

Response 2. Agreed.

Comment 3. We generally agree with the trip redistribution for Option 1. Further refinement can be accomplished based on land use, especially if comment #2 above is implemented. Consideration of redistribution of traffic from Canton Street NB to University Avenue is also appropriate and should be considered in future study of Option 1.

Response 3. Agreed.

Comment 4. Volume redistribution for Option 2 is conservative in that it does not account for any redistribution of I-95/Route 128 destined traffic from Canton Street to University Avenue. Further refinement is necessary at a later stage in conjunction with MassDOT.

Response 4. Agreed.

Comment 5. The preliminary analysis provided for Option 2 will require refinement. Queues in the PM peak hour will exceed the storage provided between the two proposed intersections. The volume redistributions noted under item 4 may help mitigate queuing. These considerations should be included in future study of Option 2

Response 5. Agreed.

Comment 6. Future analysis of these alternatives may also need to consider Full Build Interchange conditions.

Response 6. Agreed.

Updated TIS Fig. 17 through 40, submitted electronically on February 28th, 2013

Comment 1. These figures were provided at BETA's request to reflect modifications to trip distributions at the University Avenue/Everett Street intersection, as described in the February 19th memo. This increases the number of project trips using University Avenue northbound, and decreases the project trips on Everett Street and Canton Street. This is more indicative of expected travel patterns, and we offer no further comments on the figures as provided. These figures should be incorporated into the final TIS.

Response 1. Agreed.

Outstanding Items

Comment 1. A license plate survey should be conducted to determine the existing volume of traffic traveling from I-95 through the Canton Street/Dedham Street or University Avenue corridors. This would identify existing cut-through traffic, and would be helpful in projecting future redistributions. The license plate survey has been discussed with Tetra Tech and has been on hold due to the lack of sufficient daylight during the afternoon peak period, but should be scheduled after March 10th, which marks the beginning of Daylight Savings Time.

Response 1. The license plate survey and the associated data reduction are underway and will form the basis of the subsequent traffic monitoring program for the Project and the traffic calming program for Canton Street. As such, this analysis will be provided as a part of the follow-on studies associated with the traffic monitoring/traffic calming program.

Comment 2. The TIS assumes that improvements to the "bookend" intersections of Blue Hill Drive/University Avenue and Canton Street/University Avenue will be complete by 2017, and presents a 2017 Build Analysis that applies project trips to these reconstructed intersections. If it is anticipated that an interim condition could occur, an analysis should be presented which includes project trips applied to the geometry at these two intersections or any others where geometry other than full build might occur.

Response 2. At present, it is anticipated that construction of the MassDOT I-95/University Avenue/Blue Hill Drive interchange improvement project would begin in early 2014, require two construction seasons, and be substantially complete by October 2015. Thus, the improvements assumed for 2017 Build condition analyses are expected to complete by October 2015. However, should this schedule not be met by the MassDOT, the University Station project proponent will coordinate with MassDOT in order to ensure that the necessary infrastructure to support the expected first phase of development (450,000 ± sf of retail/grocery/restaurant space and 350 apartment units) is completed. These improvements are shown on Figure 2 and are expected to include:

- Blue Hill Drive terminated in a cul-de-sac west of the I-95 off-ramp.
- Removal of the current I-95 off-Ramp/Blue Hill Drive intersection so vehicles exiting I-95 southbound progress unimpeded to the traffic signal at University Avenue.
- Signal timing modifications at the University Avenue/Blue Hill Drive intersection to accommodate the University Station Project.

Construction of the Canton Street/University Avenue intersection is expected to require one (1) construction season and is expected to be substantially complete prior to the first phase of the University Station project.

Comment 3. No parking generation or parking demand analysis was included in the TIS. The Proponent should detail the parking requirements of the project, the number of proposed spaces by land use, and any assumptions that are included in the Project.

Response 3. The parking requirements for the University Station project were included in the Site Plan submission and are a part of the proposed underlying zoning that will be approved by the Town for the Project.

Comment 4. To what extent have the impacts been presented to the surrounding communities such as Norwood and Canton as well as MassDOT? Please provide a copy of any review comments.

Response 4. At the present time, MassDOT and the Town of Canton have undertaken a review of the materials submitted in support of the University Station project, neither of which has offered formal written comments. That said, both MassDOT and the review consultant for the Town of Canton have indicated concurrence with the methodology and analysis results that form the basis of the November 2012 TIS. Further, MassDOT has indicated general concurrence with respect to the adequacy of the planned MassDOT improvements that are to be completed at the I-95/University Avenue/Blue Hill Drive and Dedham Street/Canton Street/University Avenue intersections to support the planned build-out of the University Station project.

Mitigation

Comment 1. The TIS states that a timing and phasing improvements plan will be provided for the intersection of Route 1A at Everett Street in Westwood, but also states that the intersection

will continue to operate at LOS F during the weekday peak hours with optimized timings under the 2022 Build conditions. This shows that additional improvements should be considered to add capacity at this intersection. A study should be conducted immediately to determine potential improvements that can be implemented.

Response 1. Based upon a review of available information and the analyses that have been completed to date in support of the Project, the Route 1A approaches to the intersection should be widened to accommodate additional travel lanes in each direction, the Clapboardtree Street approach should be widened to accommodate two lanes and the traffic signal system should be reconstructed to accommodate the recommended widening. A review of MassDOT right-of-way information for the intersection indicates that these improvements would require the acquisition of private property along both sides of Route 1A and Clapboardtree Street. As such, this analysis will be provided as part of the follow on studies associated with the traffic monitoring/traffic calming program.

Comment 2. Higher than average crash rates show the need for a safety study at the intersection of Nahatan Street and Clapboardtree Street in Westwood. This study should be conducted immediately and should engage Town personnel in a discussion of potential geometric or traffic control improvements.

Response 2. On April 2, 2013, two meetings were held with Town personnel regarding the Nahatan Street/Clapboardtree intersection. The first meeting was with the Westwood Police Department and the second meeting was with Westwood Public Works staff. At both meetings, it was suggested that the left turn from the northerly connector road onto northbound Clapboardtree Street is a difficult maneuver due to sight line constraints to the north and the angle which the connector road intersects Clapboardtree Street. Due to the difficultly of the left turn maneuver, the queue on the connector road often extends to Nahatan Street effectively blocking through traffic. Both Police and Public Works staff suggested that the northerly connector road be restricted to westbound travel only, effectively eliminating the left turn onto Clapboardtree Street, and shifting the left turn movement to the four-way, stopped controlled intersection. It was also agreed that the four-way stop control of the intersection works well. Public works staff indicated that they currently require public works trucks turning left from eastbound Nahatan Street onto northbound Clapboardtree Street to travel through the four-way stop control intersection and to not use the northerly connector road due to the concerns cited above.

Crash reports for collisions that the Westwood Police Department responded to were obtained from the Westwood Police Department for the three year period between January 2010 and December 2012. A collision diagram summarizing the data is shown on Figure 3. The diagram shows that the Police Department responded to 16 crashes at the intersection, one of which occurred where the northerly connector road intersects Clapboardtree Street. Ten (10) of the sixteen (16) collisions occurred at the four-way stop.

Observations made at the intersection, confirmed that a left turn movement from the connector road onto Clapboardtree Street is difficult. Both the horizontal and vertical alignments of Clapboardtree Street restrict visibility for vehicles turning left out of the connector road.

From a safety perspective, converting the connector road to one-way operation would have benefits for the reasons cited above; however, during the morning peak hour approximately 300 vehicles turn left from the connector road onto Clapboardtree Street. Shifting these vehicles to the four-way stop controlled intersection would increase delays and vehicle queuing at the intersection. Therefore, an alternative to the one-way connector road option was developed that involves shifting the connector road approach to Clapboardtree Street to the south. This alternative is depicted on Figure 4. As a result of this realignment, sight lines would improve for vehicles turning left and there would not be a significant impact to motorist delays or vehicle queuing at the four-way stop controlled intersection. In a follow-up discussion with Public Works staff, this option was presented and it was agreed that the realignment of the connector road intersection with Clapboardtree Street would improve safety and facilitate the efficient flow of traffic through the intersection.

Comment 3. Since the intersection of Route 1/Everett Street/University Avenue in Norwood is identified as a high crash location, we recommend that a Road Safety Audit be conducted following MassDOT guidelines in addition to timing and phasing adjustments. We note that the TIS states that the intersection will continue to operate at LOS F during all peak hours with optimized timings under the 2022 Build conditions. This shows that additional improvements should be considered to add capacity at this intersection. Efforts should be coordinated with the Town of Norwood and MassDOT, who are advancing a design project at this location.

Response 3. Recommendations for safety improvements at the Route 1/Everett Street/University Avenue intersection were developed based on observations made of the intersection, a meeting with the Norwood Town Engineer and a review of MassDOT crash data. Operator crash reports have also been requested from the Norwood Police Department . Based on our review of this information, the following safety deficiencies were noted at the intersection:

- Pedestrian signal equipment was in poor condition. Push buttons were either missing or not functioning.
- Crosswalks on the channelized right turn lanes were not signed.
- Driver visibility of the crosswalk on the southbound right turn lane was blocked by vegetation along the west side of Route 1.
- Pedestrians are crossing Route 1 north of the intersection (between McDonald's and land uses on the east side of Route 1).
- Vehicles turning left from the Everett Street and University Avenue approaches to the intersection move concurrently with the opposing through traffic. Because of the lack of an exclusive phase for the left turns, motorist exhibited aggressive behavior when turning left from Everett Street and University Avenue onto Route 1 (northbound and southbound).

A review of MassDOT crash data provided in the November 2012 Traffic Impact Study indicates:

- One-third of crashes were angle collisions
- One-third of crashes were rear-end collisions.

- One-third of angle collisions involved two vehicles entering the intersection from University Avenue and Everett Street.
- One-quarter of all collision occurred in the evening.
- One-quarter of all collision occurred on wet pavement.

Recommendations for improving safety are shown on Figure 5, and include the following elements.

- Repair the existing pedestrian signal equipment.
- Provide appropriate warning signs for the existing crosswalk on the channelized right turn lanes on Route 1.
- Clear vegetation along the west side of Route 1 to improve visibility of the crosswalk.
- Restripe the shared left/through lanes as exclusive left turn lanes on the University Avenue and Everett Street approaches.
- Update the existing traffic signal equipment to provide a protected left turn movement for University Avenue and Everett Street.
- Review intersection street lighting and provide supplemental lighting to reduce dark areas.

The Project proponent will implement these improvements subject to receipt of all necessary rights, permits and approvals as may be required to complete the improvements.

Currently, the Route 1/University Avenue/Everett Street intersection provides a poor level of service for the weekday and Saturday peak hours. Additional capacity is necessary at this intersection to accommodate existing and future traffic demands independent of the Project. Figure 6 depicts the improvements that would be required to achieve LOS E or better operating conditions for the 2022 Build condition peak hours. These improvements include:

- Providing a third through travel lane on Route 1 in both the north and southbound directions

- Widening Everett Street and University Avenue to provide an exclusive left turn lane, two through lanes and an exclusive right turn lane.

A review of MassDOT right-of-way information for the intersection indicates that these improvements would require the acquisition of private property. As such, these improvements cannot be completed as a part of the Project; however, the Project proponent has committed to providing detailed design plans (up to and including MassDOT 100 % Design/PS&E) for the recommended capacity improvements. The Project proponent will design and implement the safety improvements shown on Figure 5.

Comment 4. Please clarify the proponent's involvement in mitigation at Dedham Street/Washington Street and Dedham Street/Elm Street in Canton. Is the proponent funding design only, or design and construction?

Response 4. The University Station project proponent has committed to provided design plans for the identified intersection improvements, up to and including the MassDOT 100 Percent PS&E design level.

Comment 5. TIS states 300 vehicle increase at Route 138/Green Lodge Street in Canton during the Saturday midday peak hour, but Figure 34 shows 200. Please clarify. Also, is it the proponent's intention to fund construction of any improvements necessary at this location?

Response 5. The increase in traffic at the Route 138/Green Lodge Street intersection during the Saturday midday peak hour as a result of the University Station project is 200 vehicles. The University Station project proponent has committed to conducting a traffic signal warrants analysis for the intersection and providing design plans for the identified intersection improvements, up to and including the MassDOT 100 Percent PS&E design level.

Comment 6. Clarify who is responsible for construction of the right turn lane on the Shawmut Road approach to Dedham Street in Canton.

Response 6. The University Station project proponent will provide design plans for the identified improvements to the Town of Canton for construction by others.

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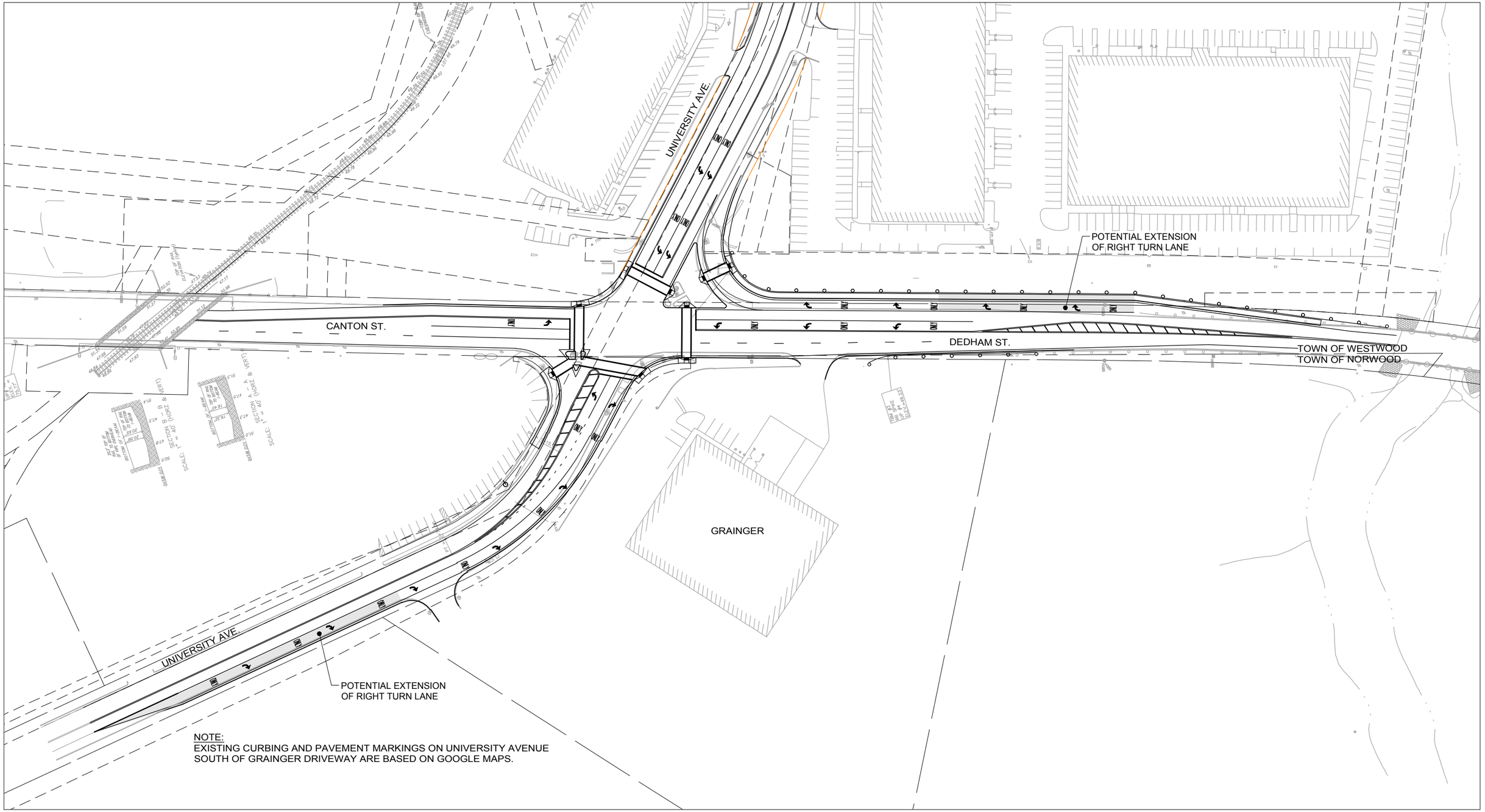

NOTE:
EXISTING CURBING AND PAVEMENT MARKINGS ON UNIVERSITY AVENUE SOUTH OF GRAINGER DRIVEWAY ARE BASED ON GOOGLE MAPS.

TETRA TECH | VAi

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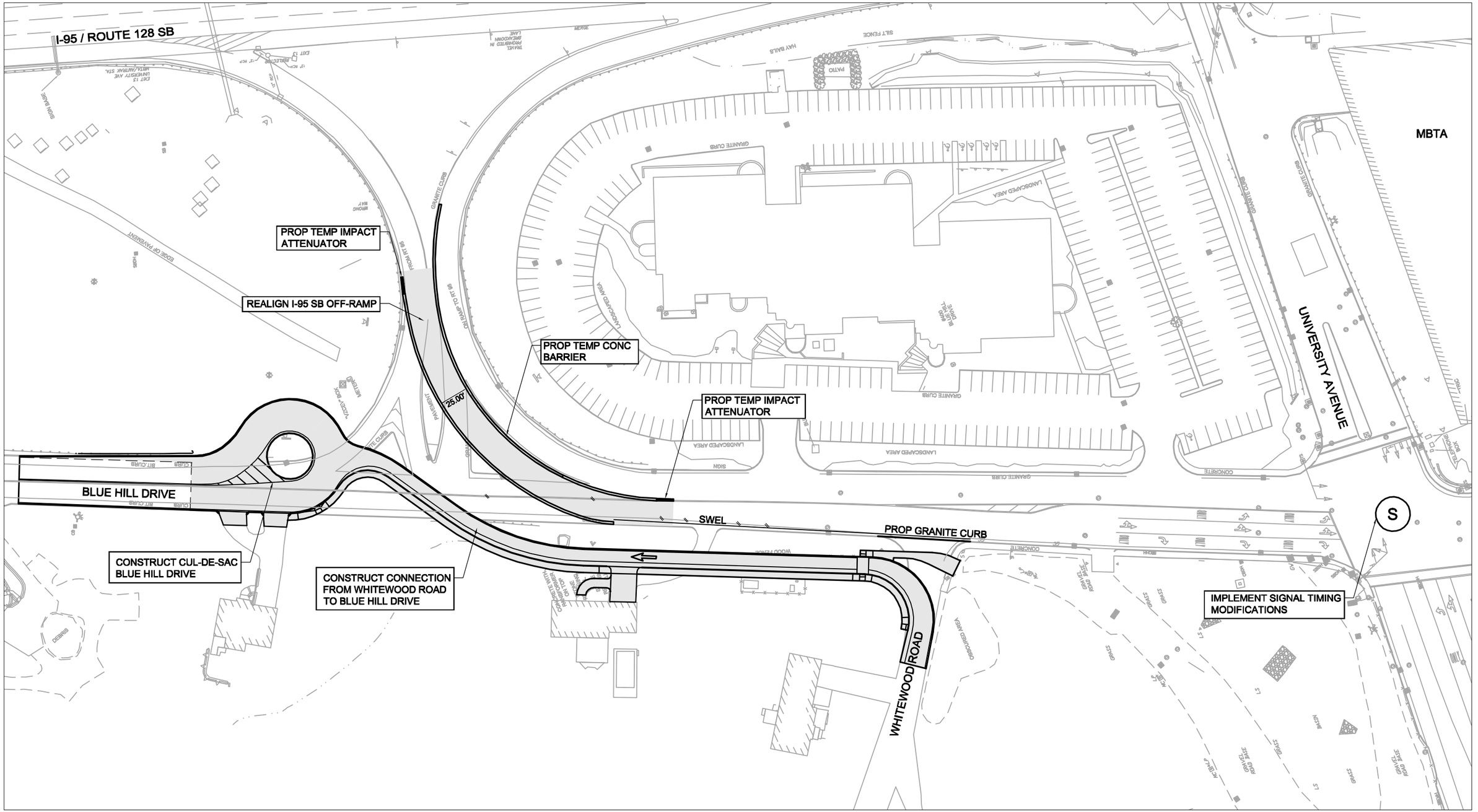
University Station
Westwood, Massachusetts

Conceptual Improvement Plan
University Avenue @ Canton St/Dedham Street with Extended Right Turn Lanes

Figure 1

P:\3659\127-3659-12003\CAD\Conceptual\On-Off_Ramp\I-95 SB Off Ramp_Interim_Improvements_REV2.dwg



University Station
Westwood, Massachusetts

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Interim Improvements
I-95 SB Off Ramp

Figure 2

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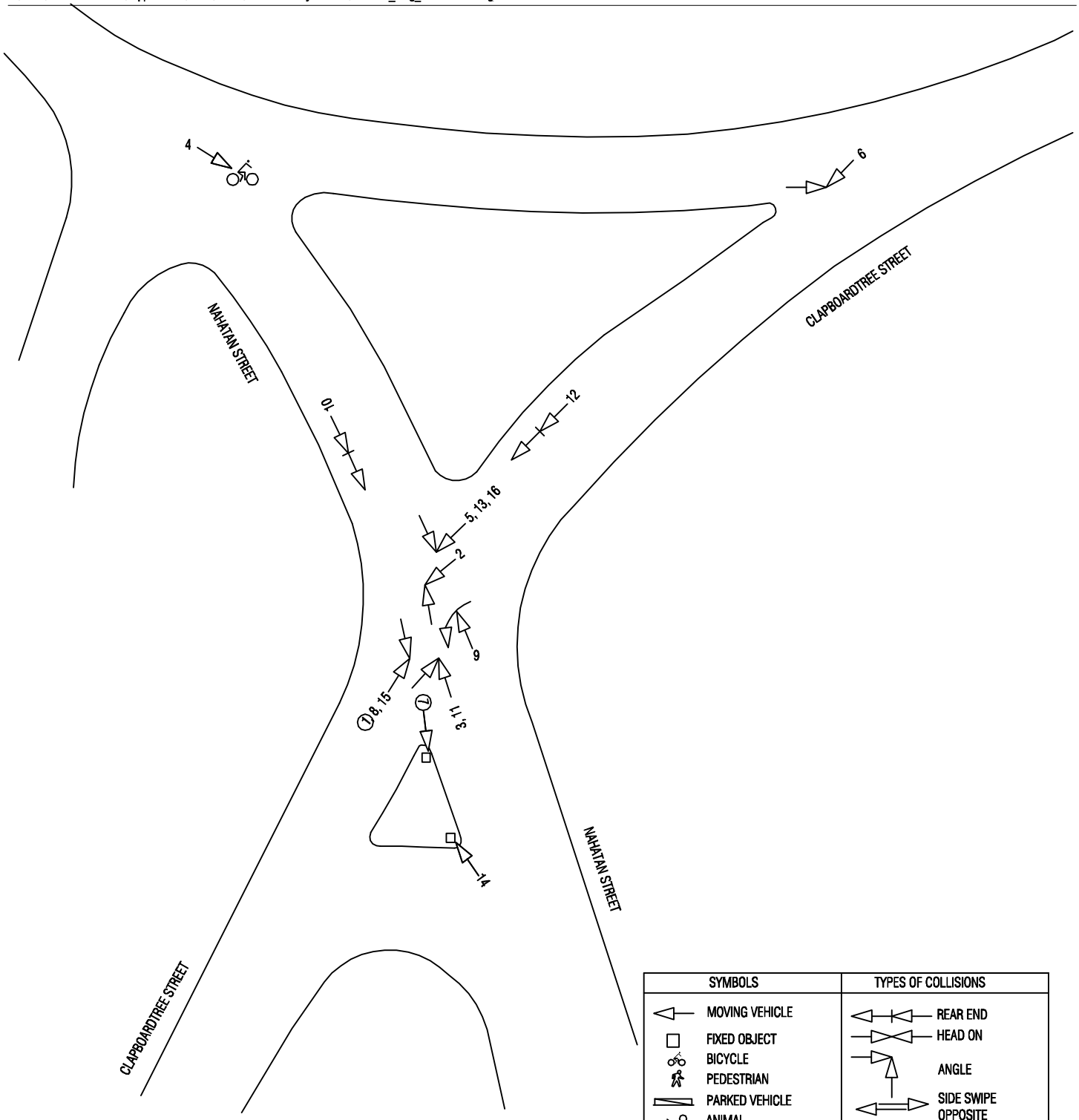

Not to Scale

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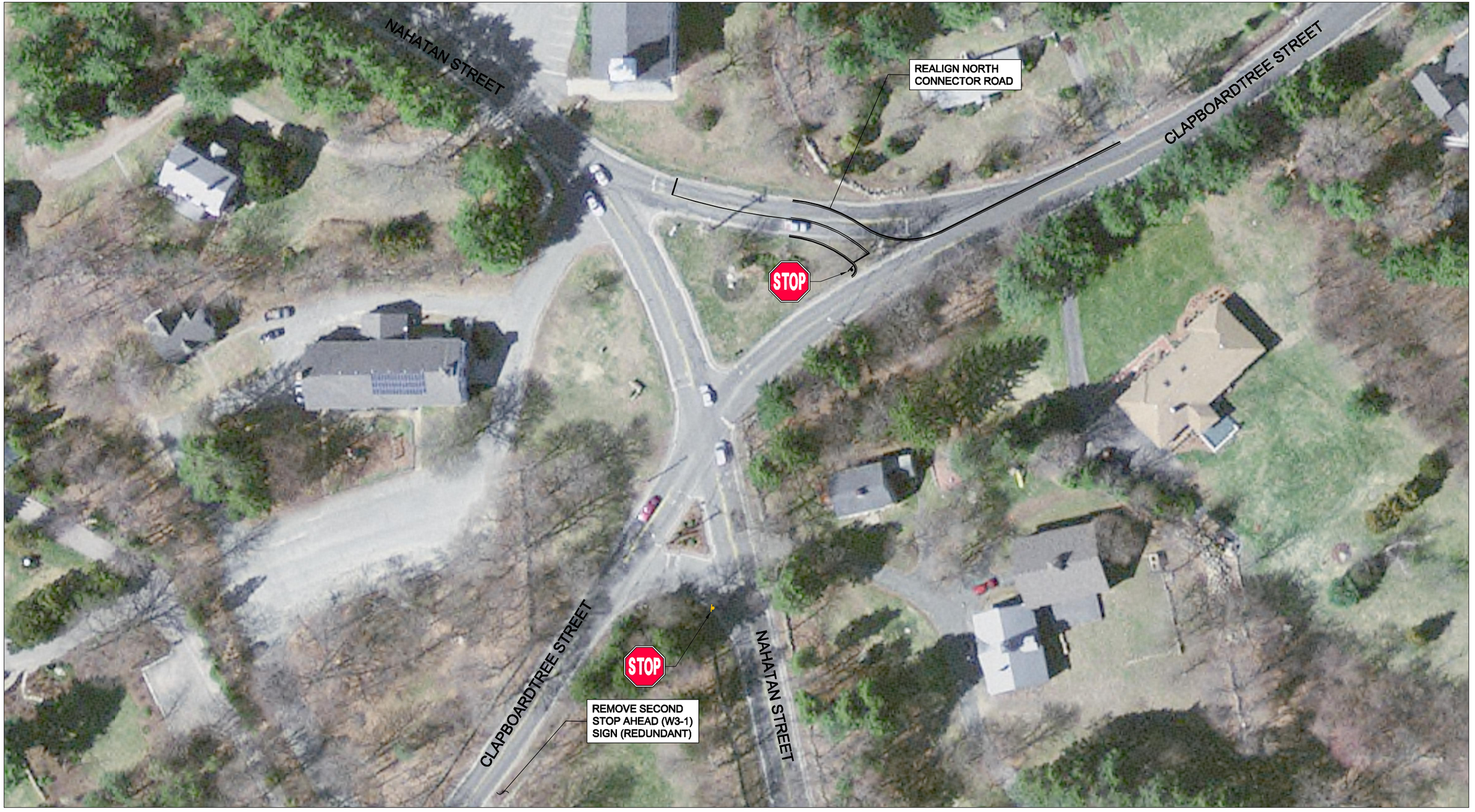
University Station
Westwood, Massachusetts

Collision Diagram
Nahatan Street / Clapboardtree Street

Figure 3

P:\3659\127-3659-12003\CAD\Conceptual\Traffic Figures\2013-04-05_Clapboardtree St @ Nahatan St Safety.dwg



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Conceptual Safety Improvements -
Nahatan Street @ Clapboardtree Street

Figure 4

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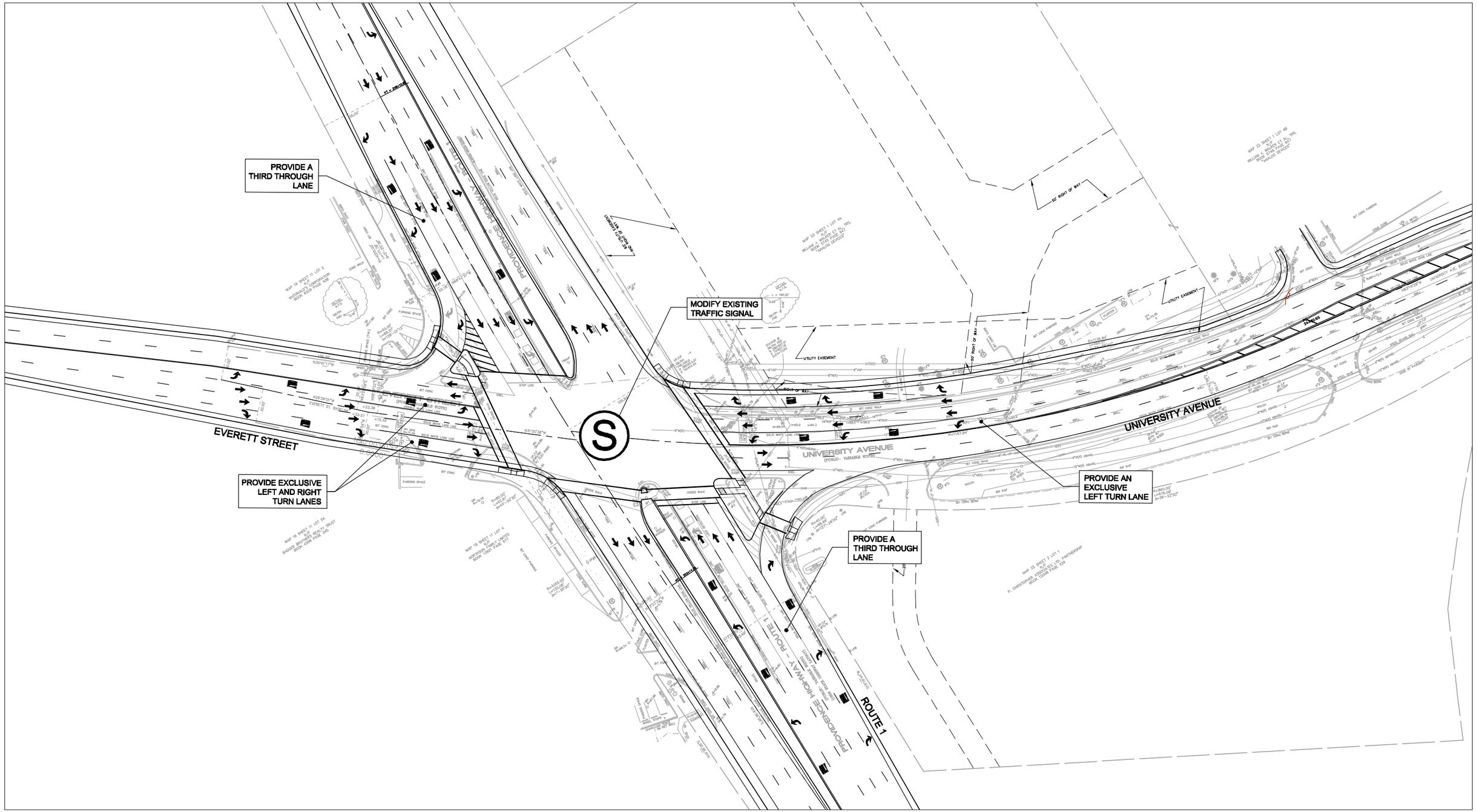

University Station
Westwood, Massachusetts

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Conceptual Capacity Improvements
Route 1 @ University Avenue / Everett Street

Figure 5

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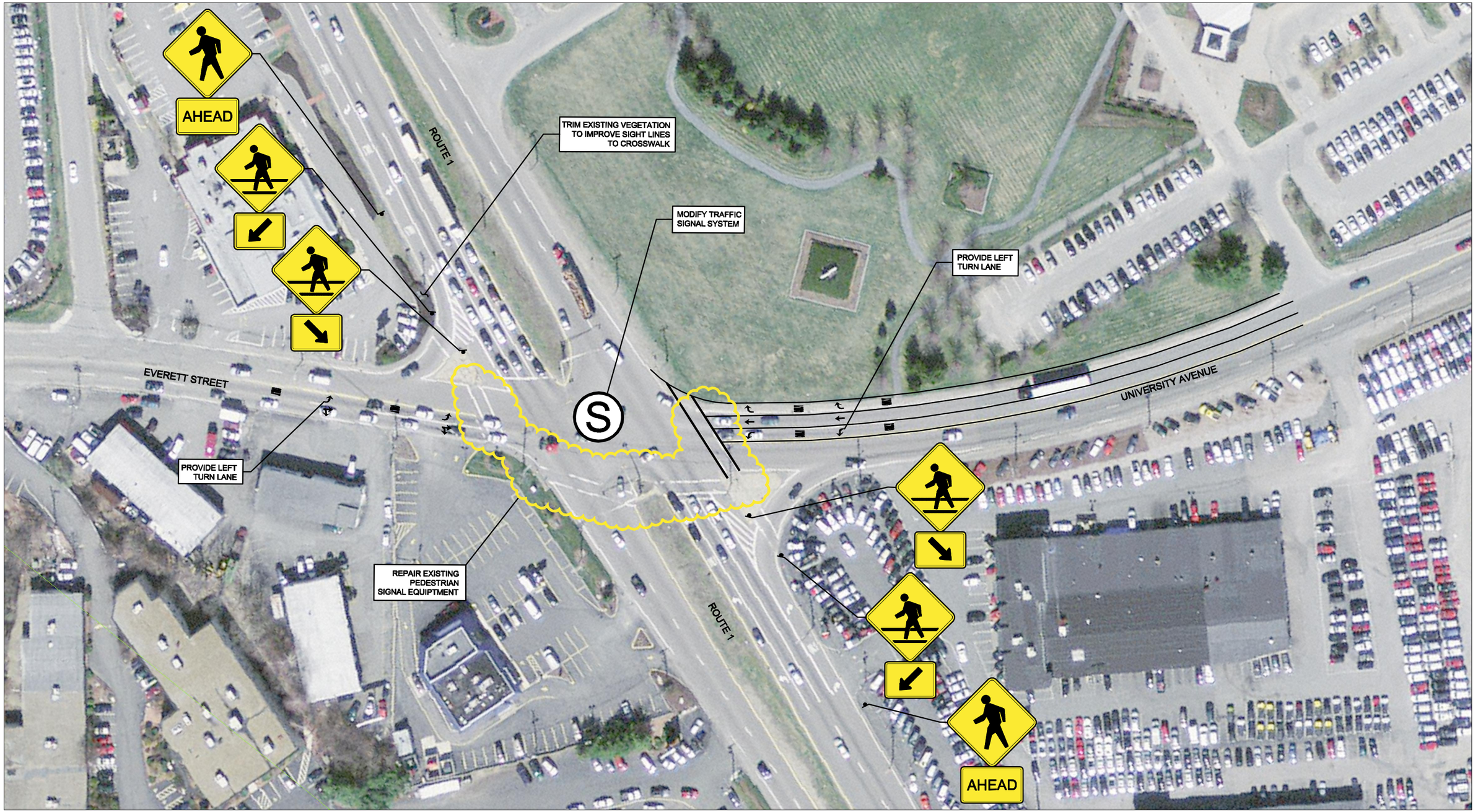

University Station
Westwood, Massachusetts

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Conceptual Safety Improvements
Route 1 @ University Avenue / Everett Street

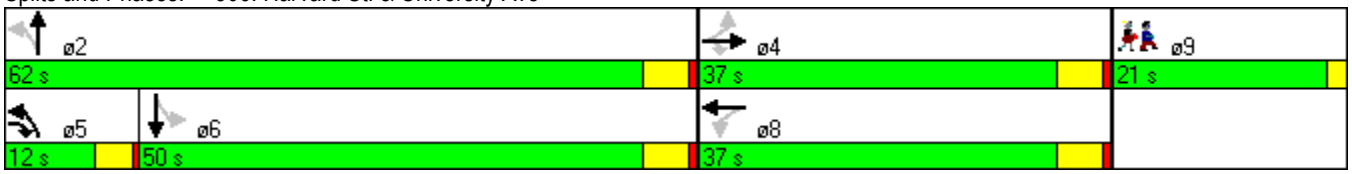
Figure 6

Attachment A
University Avenue/Harvard Street Capacity Analyses
(with I-93/I-95 Interchange Improvements and an Exclusive Pedestrian Phase)

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	ø9
Lane Configurations										
Volume (vph)	24	0	95	1	0	576	715	6	674	
Lane Group Flow (vph)	0	26	103	0	2	0	1408	0	772	
Turn Type	Perm		pm+ov	Perm		pm+pt		Perm		
Protected Phases		4	5		8	5	2		6	9
Permitted Phases	4		4	8		2		6		
Detector Phase	4	4	5	8	8	5	2	6	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	12.0	21.0	21.0	12.0	21.0	21.0	21.0	21.0
Total Split (s)	37.0	37.0	12.0	37.0	37.0	12.0	62.0	50.0	50.0	21.0
Total Split (%)	30.8%	30.8%	10.0%	30.8%	30.8%	10.0%	51.7%	41.7%	41.7%	18%
Yellow Time (s)	4.0	4.0	3.5	4.0	4.0	3.5	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0	0.5	1.0	1.0	0.5	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	4.0	
Lead/Lag			Lead			Lead		Lag	Lag	
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	Max	Min	Min	None
v/c Ratio		0.13	0.31		0.02		1.06dl		0.32	
Control Delay		34.8	7.0		31.0		13.1		7.2	
Queue Delay		0.0	0.0		0.0		0.0		0.0	
Total Delay		34.8	7.0		31.0		13.1		7.2	
Queue Length 50th (ft)		9	0		0		0		27	
Queue Length 95th (ft)		40	29		7		#593		214	
Internal Link Dist (ft)		673			220		177		692	
Turn Bay Length (ft)										
Base Capacity (vph)		830	378		448		1711		2408	
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		0.03	0.27		0.00		0.82		0.32	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 74.7
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
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: 306: Harvard St. & University Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	0	95	1	0	1	576	715	5	6	674	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	3.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			0.95			0.95	
Frt		1.00	0.85		0.93			1.00			0.99	
Flt Protected		0.95	1.00		0.98			0.98			1.00	
Satd. Flow (prot)		1736	1615		1160			3380			3450	
Flt Permitted		1.00	1.00		0.83			0.55			0.94	
Satd. Flow (perm)		1827	1615		985			1907			3251	
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)	26	0	103	1	0	1	626	777	5	7	733	32
RTOR Reduction (vph)	0	0	90	0	1	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	26	13	0	1	0	0	1408	0	0	771	0
Heavy Vehicles (%)	4%	0%	0%	0%	0%	98%	0%	8%	0%	16%	4%	0%
Turn Type	Perm		pm+ov	Perm			pm+pt			Perm		
Protected Phases		4	5		8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		3.0	7.8		3.0			62.2			53.4	
Effective Green, g (s)		4.0	9.8		4.0			63.2			54.4	
Actuated g/C Ratio		0.05	0.12		0.05			0.79			0.68	
Clearance Time (s)		5.0	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)		91	198		49			1611			2208	
v/s Ratio Prot			0.00					c0.06				
v/s Ratio Perm		c0.01	0.00		0.00			c0.63			0.24	
v/c Ratio		0.29	0.06		0.02			1.06dl			0.35	
Uniform Delay, d1		36.7	31.1		36.2			5.7			5.4	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		1.7	0.1		0.2			5.6			0.1	
Delay (s)		38.4	31.2		36.4			11.3			5.5	
Level of Service		D	C		D			B			A	
Approach Delay (s)		32.7			36.4			11.3			5.5	
Approach LOS		C			D			B			A	

Intersection Summary			
HCM Average Control Delay	10.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	80.1	Sum of lost time (s)	12.9
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		

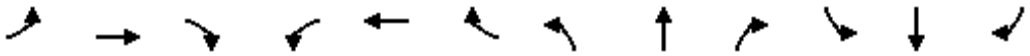
dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	ø9
Lane Configurations										
Volume (vph)	101	0	497	8	0	227	1038	1	1050	
Lane Group Flow (vph)	0	110	540	0	27	247	1128	0	1229	
Turn Type	Perm		pm+ov	Perm		pm+pt		Perm		
Protected Phases		4	5		8	5	2		6	9
Permitted Phases	4		4	8		2		6		
Detector Phase	4	4	5	8	8	5	2	6	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	12.0	12.0	12.0	12.0	21.0	21.0	21.0	21.0
Total Split (s)	23.0	23.0	16.0	23.0	23.0	16.0	76.0	60.0	60.0	21.0
Total Split (%)	19.2%	19.2%	13.3%	19.2%	19.2%	13.3%	63.3%	50.0%	50.0%	18%
Yellow Time (s)	4.0	4.0	3.5	4.0	4.0	3.5	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0	0.5	1.0	1.0	0.5	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	4.0	
Lead/Lag			Lead			Lead		Lag	Lag	
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	Max	Min	Min	None
v/c Ratio		0.57	0.77		0.12	0.63	0.81		0.63	
Control Delay		52.6	19.7		23.1	17.0	17.2		17.2	
Queue Delay		0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay		52.6	19.7		23.1	17.0	17.2		17.2	
Queue Length 50th (ft)		61	117		5	29	308		223	
Queue Length 95th (ft)		140	#233		33	#192	#1175		505	
Internal Link Dist (ft)		673			220		177		692	
Turn Bay Length (ft)										
Base Capacity (vph)		276	713		308	403	1387		1947	
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		0.40	0.76		0.09	0.61	0.81		0.63	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 97.9
Natural Cycle: 110
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 306: Harvard St. & University Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	101	0	497	8	0	17	227	1038	0	1	1050	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	3.0		4.0		3.0	4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00			0.95	
Frt		1.00	0.85		0.91		1.00	1.00			0.99	
Flt Protected		0.95	1.00		0.98		0.95	1.00			1.00	
Satd. Flow (prot)		1805	1615		1635		1770	1863			3470	
Flt Permitted		0.74	1.00		0.90		0.14	1.00			0.95	
Satd. Flow (perm)		1405	1615		1496		266	1863			3312	
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)	110	0	540	9	0	18	247	1128	0	1	1141	87
RTOR Reduction (vph)	0	0	229	0	16	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	110	311	0	11	0	247	1128	0	0	1225	0
Heavy Vehicles (%)	0%	0%	0%	12%	0%	0%	2%	2%	0%	98%	3%	1%
Turn Type	Perm		pm+ov	Perm			pm+pt			Perm		
Protected Phases		4	5		8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		12.5	23.9		12.5		71.8	71.8			56.4	
Effective Green, g (s)		13.5	25.9		13.5		72.8	72.8			57.4	
Actuated g/C Ratio		0.14	0.26		0.14		0.73	0.73			0.58	
Clearance Time (s)		5.0	4.0		5.0		4.0	5.0			5.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		191	421		203		382	1364			1913	
v/s Ratio Prot			c0.09				0.08	c0.61				
v/s Ratio Perm		0.08	0.10		0.01		0.39				0.37	
v/c Ratio		0.58	0.74		0.06		0.65	0.83			0.64	
Uniform Delay, d1		40.3	33.6		37.4		10.3	9.0			14.1	
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	
Incremental Delay, d2		4.2	6.6		0.1		3.7	5.9			0.7	
Delay (s)		44.4	40.3		37.5		14.0	14.9			14.8	
Level of Service		D	D		D		B	B			B	
Approach Delay (s)		41.0			37.5			14.7			14.8	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM Average Control Delay	20.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	99.4	Sum of lost time (s)	12.1
Intersection Capacity Utilization	108.5%	ICU Level of Service	G
Analysis Period (min)	15		

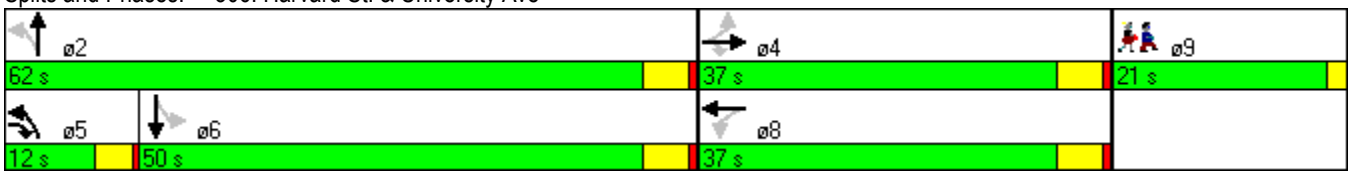
c Critical Lane Group

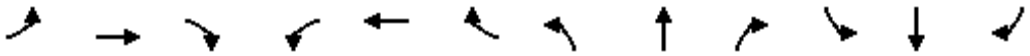
Attachment B
University Avenue/Harvard Street Capacity Analyses
(with an Exclusive Pedestrian Phase)

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	ø9
Lane Configurations										
Volume (vph)	25	0	79	1	0	219	474	6	712	
Lane Group Flow (vph)	0	27	86	0	2	0	758	0	818	
Turn Type	Perm		pm+ov	Perm		pm+pt		Perm		
Protected Phases		4	5		8	5	2		6	9
Permitted Phases	4		4	8		2		6		
Detector Phase	4	4	5	8	8	5	2	6	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	12.0	20.0	20.0	12.0	20.0	20.0	20.0	21.0
Total Split (s)	37.0	37.0	12.0	37.0	37.0	12.0	62.0	50.0	50.0	21.0
Total Split (%)	30.8%	30.8%	10.0%	30.8%	30.8%	10.0%	51.7%	41.7%	41.7%	18%
Yellow Time (s)	4.0	4.0	3.5	4.0	4.0	3.5	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0	0.5	1.0	1.0	0.5	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	4.0	
Lead/Lag			Lead			Lead		Lag	Lag	
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	Max	Min	Min	None
v/c Ratio		0.14	0.27		0.02		0.43		0.34	
Control Delay		34.8	7.1		31.0		4.8		7.4	
Queue Delay		0.0	0.0		0.0		0.0		0.0	
Total Delay		34.8	7.1		31.0		4.8		7.4	
Queue Length 50th (ft)		9	0		0		0		30	
Queue Length 95th (ft)		42	27		7		158		229	
Internal Link Dist (ft)		673			220		177		692	
Turn Bay Length (ft)										
Base Capacity (vph)		830	364		448		1747		2427	
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		0.03	0.24		0.00		0.43		0.34	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 74.7
Natural Cycle: 75
Control Type: Actuated-Uncoordinated

Splits and Phases: 306: Harvard St. & University Ave





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	0	79	1	0	1	219	474	5	6	712	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	3.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			0.95			0.95	
Frt		1.00	0.85		0.93			1.00			0.99	
Flt Protected		0.95	1.00		0.98			0.98			1.00	
Satd. Flow (prot)		1736	1615		1160			3368			3449	
Flt Permitted		1.00	1.00		0.83			0.57			0.95	
Satd. Flow (perm)		1827	1615		985			1952			3276	
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)	27	0	86	1	0	1	238	515	5	7	774	37
RTOR Reduction (vph)	0	0	76	0	1	0	0	0	0	0	2	0
Lane Group Flow (vph)	0	27	10	0	1	0	0	758	0	0	816	0
Heavy Vehicles (%)	4%	0%	0%	0%	0%	98%	0%	8%	0%	16%	4%	0%
Turn Type	Perm		pm+ov	Perm			pm+pt			Perm		
Protected Phases		4	5		8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		3.0	7.7		3.0			62.2			53.5	
Effective Green, g (s)		4.0	9.7		4.0			63.2			54.5	
Actuated g/C Ratio		0.05	0.12		0.05			0.79			0.68	
Clearance Time (s)		5.0	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)		91	196		49			1641			2229	
v/s Ratio Prot			0.00					c0.03				
v/s Ratio Perm		c0.01	0.00		0.00			c0.33			0.25	
v/c Ratio		0.30	0.05		0.02			0.46			0.37	
Uniform Delay, d1		36.7	31.1		36.2			2.8			5.4	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		1.8	0.1		0.2			0.2			0.1	
Delay (s)		38.5	31.3		36.4			3.0			5.6	
Level of Service		D	C		D			A			A	
Approach Delay (s)		33.0			36.4			3.0			5.6	
Approach LOS		C			D			A			A	

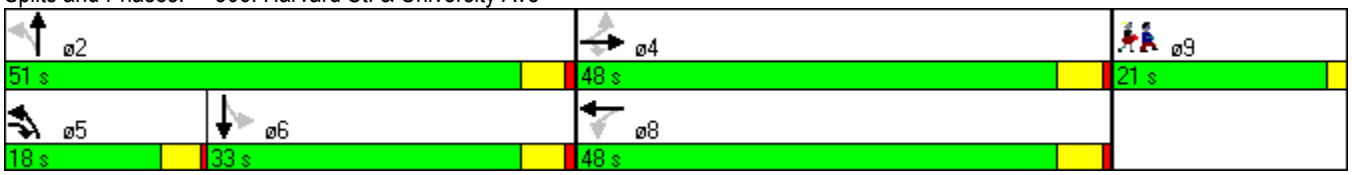
Intersection Summary			
HCM Average Control Delay	6.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	80.1	Sum of lost time (s)	12.9
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	ø9
Lane Configurations										
Volume (vph)	107	0	389	8	0	124	808	1	855	
Lane Group Flow (vph)	0	116	423	0	26	0	1013	0	1031	
Turn Type	Perm		pm+ov	Perm		pm+pt		Perm		
Protected Phases		4	5		8	5	2		6	9
Permitted Phases	4		4	8		2		6		
Detector Phase	4	4	5	8	8	5	2	6	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	12.0	20.0	20.0	12.0	20.0	20.0	20.0	21.0
Total Split (s)	48.0	48.0	18.0	48.0	48.0	18.0	51.0	33.0	33.0	21.0
Total Split (%)	40.0%	40.0%	15.0%	40.0%	40.0%	15.0%	42.5%	27.5%	27.5%	18%
Yellow Time (s)	4.0	4.0	3.5	4.0	4.0	3.5	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0	0.5	1.0	1.0	0.5	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	4.0	
Lead/Lag			Lead			Lead		Lag	Lag	
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	Max	Min	Min	None
v/c Ratio		0.46	0.55		0.10		0.59		0.56	
Control Delay		34.8	4.5		17.4		10.1		15.4	
Queue Delay		0.0	0.0		0.0		0.0		0.0	
Total Delay		34.8	4.5		17.4		10.1		15.4	
Queue Length 50th (ft)		43	0		3		71		125	
Queue Length 95th (ft)		115	39		27		280		#397	
Internal Link Dist (ft)		673			220		177		692	
Turn Bay Length (ft)										
Base Capacity (vph)		929	910		979		1704		1838	
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		0.12	0.46		0.03		0.59		0.56	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 69.2
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 306: Harvard St. & University Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	0	389	8	0	16	124	808	0	1	855	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	3.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			0.95			0.95	
Frt		1.00	0.85		0.91			1.00			0.99	
Flt Protected		0.95	1.00		0.98			0.99			1.00	
Satd. Flow (prot)		1805	1615		1635			3516			3457	
Flt Permitted		0.74	1.00		0.88			0.64			0.95	
Satd. Flow (perm)		1407	1615		1472			2254			3299	
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)	116	0	423	9	0	17	135	878	0	1	929	101
RTOR Reduction (vph)	0	0	320	0	15	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	116	103	0	11	0	0	1013	0	0	1027	0
Heavy Vehicles (%)	0%	0%	0%	12%	0%	0%	2%	2%	0%	98%	3%	1%
Turn Type	Perm		pm+ov	Perm			pm+pt			Perm		
Protected Phases		4	5		8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		9.3	15.5		9.3			47.8			37.6	
Effective Green, g (s)		10.3	17.5		10.3			48.8			38.6	
Actuated g/C Ratio		0.14	0.24		0.14			0.68			0.54	
Clearance Time (s)		5.0	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)		202	393		211			1656			1771	
v/s Ratio Prot			0.03					c0.06				
v/s Ratio Perm		c0.08	0.04		0.01			c0.35			0.31	
v/c Ratio		0.57	0.26		0.05			0.61			0.58	
Uniform Delay, d1		28.8	22.0		26.6			6.3			11.2	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		3.9	0.4		0.1			0.7			0.5	
Delay (s)		32.7	22.3		26.7			7.0			11.7	
Level of Service		C	C		C			A			B	
Approach Delay (s)		24.6			26.7			7.0			11.7	
Approach LOS		C			C			A			B	

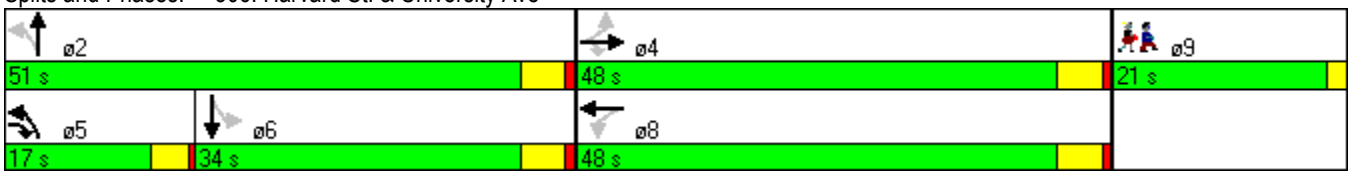
Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	71.9	Sum of lost time (s)	12.8
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT	ø9
Lane Configurations									
Volume (vph)	96	0	220	1	0	152	556	651	
Lane Group Flow (vph)	0	104	239	0	2	0	769	841	
Turn Type	Perm		pm+ov	Perm		pm+pt			
Protected Phases		4	5		8	5	2	6	9
Permitted Phases	4		4	8		2			
Detector Phase	4	4	5	8	8	5	2	6	
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	12.0	24.0	24.0	12.0	20.0	20.0	21.0
Total Split (s)	48.0	48.0	17.0	48.0	48.0	17.0	51.0	34.0	21.0
Total Split (%)	40.0%	40.0%	14.2%	40.0%	40.0%	14.2%	42.5%	28.3%	18%
Yellow Time (s)	4.0	4.0	3.5	4.0	4.0	3.5	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0	0.5	1.0	1.0	0.5	1.0	1.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	
Lead/Lag			Lead			Lead		Lag	
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	None	Max	Min	None
v/c Ratio		0.44	0.40		0.01		0.46	0.43	
Control Delay		34.6	4.3		24.0		7.9	12.6	
Queue Delay		0.0	0.0		0.0		0.0	0.0	
Total Delay		34.6	4.3		24.0		7.9	12.6	
Queue Length 50th (ft)		38	0		0		47	89	
Queue Length 95th (ft)		105	32		6		193	273	
Internal Link Dist (ft)		673			220		177	692	
Turn Bay Length (ft)									
Base Capacity (vph)		919	729		1035		1677	1970	
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		0.11	0.33		0.00		0.46	0.43	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 68.7
Natural Cycle: 80
Control Type: Actuated-Uncoordinated

Splits and Phases: 306: Harvard St. & University Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	96	0	220	1	0	1	152	556	0	0	651	122
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	3.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			0.95			0.95	
Frt		1.00	0.85		0.93			1.00			0.98	
Flt Protected		0.95	1.00		0.98			0.99			1.00	
Satd. Flow (prot)		1736	1495		1729			3529			3495	
Flt Permitted		0.76	1.00		0.88			0.62			1.00	
Satd. Flow (perm)		1382	1495		1557			2197			3495	
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)	104	0	239	1	0	1	165	604	0	0	708	133
RTOR Reduction (vph)	0	0	182	0	1	0	0	0	0	0	8	0
Lane Group Flow (vph)	0	104	57	0	1	0	0	769	0	0	833	0
Heavy Vehicles (%)	4%	0%	8%	0%	0%	0%	2%	1%	0%	0%	1%	0%
Turn Type	Perm		pm+ov	Perm			pm+pt			Perm		
Protected Phases		4	5		8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		8.8	14.9		8.8			47.8			37.7	
Effective Green, g (s)		9.8	16.9		9.8			48.8			38.7	
Actuated g/C Ratio		0.14	0.24		0.14			0.68			0.54	
Clearance Time (s)		5.0	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)		190	354		214			1634			1894	
v/s Ratio Prot			0.02					c0.05			0.24	
v/s Ratio Perm		c0.08	0.02		0.00			c0.27				
v/c Ratio		0.55	0.16		0.01			0.47			0.44	
Uniform Delay, d1		28.7	21.6		26.6			5.3			9.8	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		3.2	0.2		0.0			0.2			0.2	
Delay (s)		31.9	21.8		26.6			5.5			10.0	
Level of Service		C	C		C			A			A	
Approach Delay (s)		24.9			26.6			5.5			10.0	
Approach LOS		C			C			A			A	

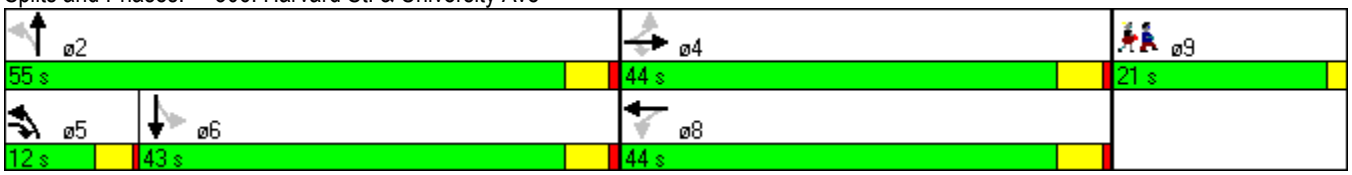
Intersection Summary			
HCM Average Control Delay	10.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	71.4	Sum of lost time (s)	12.8
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

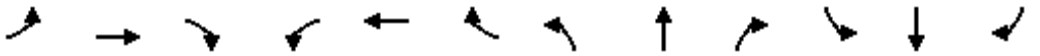
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	ø9
Lane Configurations										
Volume (vph)	25	0	80	1	0	387	636	6	757	
Lane Group Flow (vph)	0	27	87	0	2	0	1117	0	863	
Turn Type	Perm		pm+ov	Perm		pm+pt		Perm		
Protected Phases		4	5		8	5	2		6	9
Permitted Phases	4		4	8		2		6		
Detector Phase	4	4	5	8	8	5	2	6	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	12.0	20.0	20.0	12.0	20.0	20.0	20.0	21.0
Total Split (s)	44.0	44.0	12.0	44.0	44.0	12.0	55.0	43.0	43.0	21.0
Total Split (%)	36.7%	36.7%	10.0%	36.7%	36.7%	10.0%	45.8%	35.8%	35.8%	18%
Yellow Time (s)	4.0	4.0	3.5	4.0	4.0	3.5	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0	0.5	1.0	1.0	0.5	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	4.0	
Lead/Lag			Lead			Lead		Lag	Lag	
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	Max	Min	Min	None
v/c Ratio		0.12	0.26		0.02		0.67		0.37	
Control Delay		31.2	6.3		28.0		9.1		8.2	
Queue Delay		0.0	0.0		0.0		0.0		0.0	
Total Delay		31.2	6.3		28.0		9.1		8.2	
Queue Length 50th (ft)		8	0		0		0		32	
Queue Length 95th (ft)		39	24		7		#334		247	
Internal Link Dist (ft)		673			220		177		692	
Turn Bay Length (ft)										
Base Capacity (vph)		1119	392		603		1672		2337	
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		0.02	0.22		0.00		0.67		0.37	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 67.6
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 306: Harvard St. & University Ave





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	0	80	1	0	1	387	636	5	6	757	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	3.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			0.95			0.95	
Frt		1.00	0.85		0.93			1.00			0.99	
Flt Protected		0.95	1.00		0.98			0.98			1.00	
Satd. Flow (prot)		1736	1615		1160			3374			3452	
Flt Permitted		1.00	1.00		0.83			0.55			0.95	
Satd. Flow (perm)		1827	1615		985			1878			3269	
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)	27	0	87	1	0	1	421	691	5	7	823	33
RTOR Reduction (vph)	0	0	75	0	1	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	27	12	0	1	0	0	1117	0	0	862	0
Heavy Vehicles (%)	4%	0%	0%	0%	0%	98%	0%	8%	0%	16%	4%	0%
Turn Type	Perm		pm+ov	Perm			pm+pt			Perm		
Protected Phases		4	5		8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		2.9	7.7		2.9			55.3			46.5	
Effective Green, g (s)		3.9	9.7		3.9			56.3			47.5	
Actuated g/C Ratio		0.05	0.13		0.05			0.77			0.65	
Clearance Time (s)		5.0	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)		98	215		53			1567			2127	
v/s Ratio Prot			0.00					c0.06				
v/s Ratio Perm		c0.01	0.00		0.00			c0.49			0.26	
v/c Ratio		0.28	0.05		0.02			0.71			0.41	
Uniform Delay, d1		33.2	27.6		32.7			4.2			6.0	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		1.5	0.1		0.2			1.6			0.1	
Delay (s)		34.7	27.7		32.9			5.8			6.2	
Level of Service		C	C		C			A			A	
Approach Delay (s)		29.4			32.9			5.8			6.2	
Approach LOS		C			C			A			A	

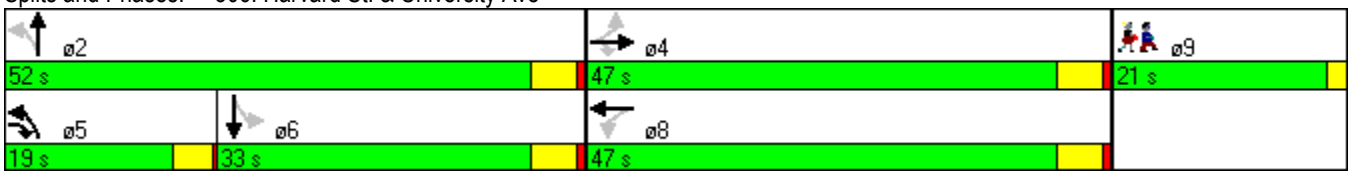
Intersection Summary			
HCM Average Control Delay	7.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	73.0	Sum of lost time (s)	12.8
Intersection Capacity Utilization	64.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	ø9
Lane Configurations										
Volume (vph)	107	0	391	8	0	190	1031	1	871	
Lane Group Flow (vph)	0	116	425	0	27	0	1328	0	1038	
Turn Type	Perm		pm+ov	Perm		pm+pt		Perm		
Protected Phases		4	5		8	5	2		6	9
Permitted Phases	4		4	8		2		6		
Detector Phase	4	4	5	8	8	5	2	6	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	12.0	20.0	20.0	12.0	20.0	20.0	20.0	21.0
Total Split (s)	47.0	47.0	19.0	47.0	47.0	19.0	52.0	33.0	33.0	21.0
Total Split (%)	39.2%	39.2%	15.8%	39.2%	39.2%	15.8%	43.3%	27.5%	27.5%	18%
Yellow Time (s)	4.0	4.0	3.5	4.0	4.0	3.5	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0	0.5	1.0	1.0	0.5	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	4.0	
Lead/Lag			Lead			Lead		Lag	Lag	
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	Max	Min	Min	None
v/c Ratio		0.47	0.56		0.10		0.86		0.56	
Control Delay		35.4	4.6		17.4		18.6		15.3	
Queue Delay		0.0	0.0		0.0		0.0		0.0	
Total Delay		35.4	4.6		17.4		18.6		15.3	
Queue Length 50th (ft)		44	0		3		107		127	
Queue Length 95th (ft)		116	40		27		#647		#396	
Internal Link Dist (ft)		673			220		177		692	
Turn Bay Length (ft)										
Base Capacity (vph)		893	923		946		1543		1859	
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	0.46		0.03		0.86		0.56	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 70.3
Natural Cycle: 110
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 306: Harvard St. & University Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	0	391	8	0	17	190	1031	0	1	871	83
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	3.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			0.95			0.95	
Frt		1.00	0.85		0.91			1.00			0.99	
Flt Protected		0.95	1.00		0.98			0.99			1.00	
Satd. Flow (prot)		1805	1615		1635			3512			3462	
Flt Permitted		0.74	1.00		0.89			0.56			0.95	
Satd. Flow (perm)		1405	1615		1478			1987			3304	
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)	116	0	425	9	0	18	207	1121	0	1	947	90
RTOR Reduction (vph)	0	0	323	0	15	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	116	102	0	12	0	0	1328	0	0	1034	0
Heavy Vehicles (%)	0%	0%	0%	12%	0%	0%	2%	2%	0%	98%	3%	1%
Turn Type	Perm		pm+ov	Perm			pm+pt			Perm		
Protected Phases		4	5		8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		9.4	15.6		9.4			48.8			38.6	
Effective Green, g (s)		10.4	17.6		10.4			49.8			39.6	
Actuated g/C Ratio		0.14	0.24		0.14			0.68			0.54	
Clearance Time (s)		5.0	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)		200	389		211			1506			1792	
v/s Ratio Prot			0.03					c0.09				
v/s Ratio Perm		c0.08	0.04		0.01			c0.51			0.31	
v/c Ratio		0.58	0.26		0.05			0.88			0.58	
Uniform Delay, d1		29.3	22.4		27.1			9.3			11.1	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		4.0	0.4		0.1			6.4			0.5	
Delay (s)		33.3	22.8		27.2			15.7			11.6	
Level of Service		C	C		C			B			B	
Approach Delay (s)		25.1			27.2			15.7			11.6	
Approach LOS		C			C			B			B	

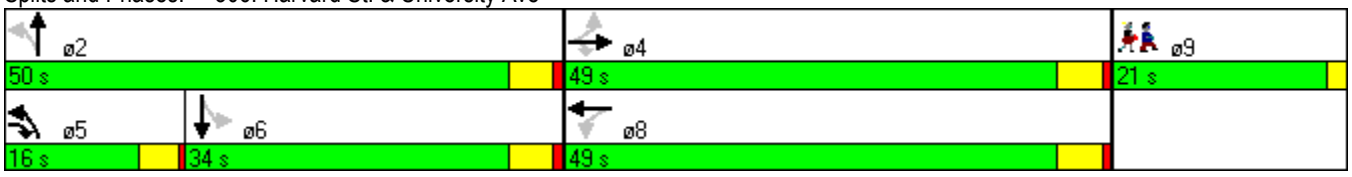
Intersection Summary			
HCM Average Control Delay	16.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	73.0	Sum of lost time (s)	12.8
Intersection Capacity Utilization	83.4%	ICU Level of Service	E
Analysis Period (min)	15		

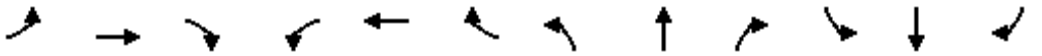
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT	ø9
Lane Configurations									
Volume (vph)	96	0	220	1	0	234	785	657	
Lane Group Flow (vph)	0	104	239	0	2	0	1107	829	
Turn Type	Perm		pm+ov	Perm		pm+pt			
Protected Phases		4	5		8	5	2	6	9
Permitted Phases	4		4	8		2			
Detector Phase	4	4	5	8	8	5	2	6	
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	12.0	20.0	20.0	12.0	20.0	20.0	21.0
Total Split (s)	49.0	49.0	16.0	49.0	49.0	16.0	50.0	34.0	21.0
Total Split (%)	40.8%	40.8%	13.3%	40.8%	40.8%	13.3%	41.7%	28.3%	18%
Yellow Time (s)	4.0	4.0	3.5	4.0	4.0	3.5	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0	0.5	1.0	1.0	0.5	1.0	1.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	
Lead/Lag			Lead			Lead		Lag	
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	None	Max	Min	None
v/c Ratio		0.44	0.40		0.01		0.70	0.42	
Control Delay		33.9	4.2		23.5		12.4	12.8	
Queue Delay		0.0	0.0		0.0		0.0	0.0	
Total Delay		33.9	4.2		23.5		12.4	12.8	
Queue Length 50th (ft)		37	0		0		77	87	
Queue Length 95th (ft)		104	31		6		#384	269	
Internal Link Dist (ft)		673			220		177	692	
Turn Bay Length (ft)									
Base Capacity (vph)		956	716		1077		1591	1954	
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		0.11	0.33		0.00		0.70	0.42	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 67.7
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 306: Harvard St. & University Ave





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	96	0	220	1	0	1	234	785	0	0	657	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	3.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			0.95			0.95	
Frt		1.00	0.85		0.93			1.00			0.98	
Flt Protected		0.95	1.00		0.98			0.99			1.00	
Satd. Flow (prot)		1736	1495		1729			3526			3505	
Flt Permitted		0.76	1.00		0.88			0.58			1.00	
Satd. Flow (perm)		1382	1495		1557			2064			3505	
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)	104	0	239	1	0	1	254	853	0	0	714	115
RTOR Reduction (vph)	0	0	182	0	1	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	104	57	0	1	0	0	1107	0	0	822	0
Heavy Vehicles (%)	4%	0%	8%	0%	0%	0%	2%	1%	0%	0%	1%	0%
Turn Type	Perm		pm+ov	Perm			pm+pt			Perm		
Protected Phases		4	5		8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		8.8	14.9		8.8			46.8			36.7	
Effective Green, g (s)		9.8	16.9		9.8			47.8			37.7	
Actuated g/C Ratio		0.14	0.24		0.14			0.68			0.54	
Clearance Time (s)		5.0	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)		192	359		217			1549			1877	
v/s Ratio Prot			0.02					c0.07			0.23	
v/s Ratio Perm		c0.08	0.02		0.00			c0.41				
v/c Ratio		0.54	0.16		0.01			0.71			0.44	
Uniform Delay, d1		28.2	21.1		26.1			7.0			9.9	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		3.1	0.2		0.0			1.6			0.2	
Delay (s)		31.3	21.3		26.1			8.6			10.1	
Level of Service		C	C		C			A			B	
Approach Delay (s)		24.4			26.1			8.6			10.1	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM Average Control Delay	11.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	70.4	Sum of lost time (s)	12.8
Intersection Capacity Utilization	69.4%	ICU Level of Service	C
Analysis Period (min)	15		

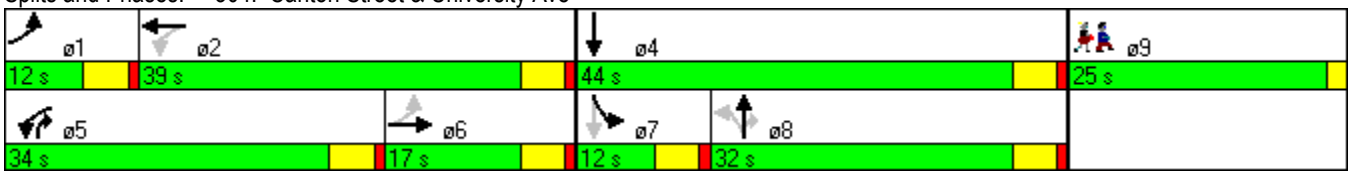
c Critical Lane Group

Attachment C
Canton Street/University Avenue
(with a free westbound right turn)

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	ø9
Lane Configurations											
Volume (vph)	83	144	508	513	300	48	384	201	231	432	
Lane Group Flow (vph)	90	204	552	558	326	52	417	218	251	617	
Turn Type	pm+pt		pm+pt		Free	Perm		pm+ov	Prot		
Protected Phases	1	6	5	2			8	5	7	4	9
Permitted Phases	6		2		Free	8		8		7	
Detector Phase	1	6	5	2		8	8	5	7	4	
Switch Phase											
Minimum Initial (s)	4.0	7.0	4.0	7.0		3.0	3.0	4.0	4.0	3.0	4.0
Minimum Split (s)	12.0	12.0	12.0	12.0		12.0	12.0	12.0	12.0	12.0	25.0
Total Split (s)	12.0	17.0	34.0	39.0	0.0	32.0	32.0	34.0	12.0	44.0	25.0
Total Split (%)	10.0%	14.2%	28.3%	32.5%	0.0%	26.7%	26.7%	28.3%	10.0%	36.7%	21%
Yellow Time (s)	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag		Lag	Lag	Lead	Lead		
Lead-Lag Optimize?											
Recall Mode	None	None	None	None		None	None	None	None	None	None
v/c Ratio	0.40	0.46	0.82	0.79	0.21	0.55	0.81	0.23	0.90	0.87	
Control Delay	26.3	40.0	33.5	39.8	0.3	57.8	48.0	1.7	79.8	42.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	26.3	40.0	33.5	39.8	0.3	57.8	48.0	1.7	79.8	42.2	
Queue Length 50th (ft)	28	52	233	298	0	26	230	0	78	319	
Queue Length 95th (ft)	81	110	#565	#676	0	#107	#532	20	#200	#747	
Internal Link Dist (ft)		332		114			1592			622	
Turn Bay Length (ft)	150				350	50		260	350		
Base Capacity (vph)	226	477	676	702	1553	95	516	960	280	711	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.40	0.43	0.82	0.79	0.21	0.55	0.81	0.23	0.90	0.87	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 99.1
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 304: Canton Street & University Ave



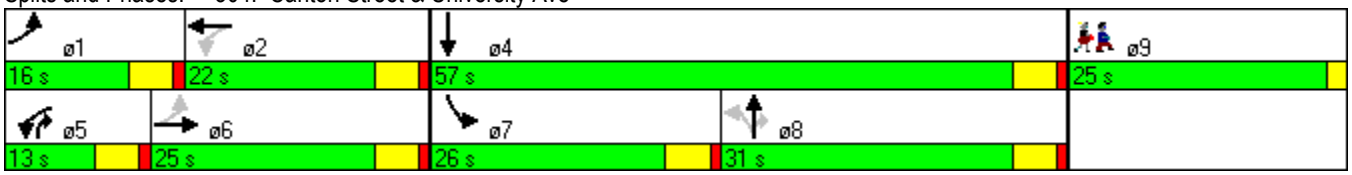
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	83	144	43	508	513	300	48	384	201	231	432	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	14	12	12	12	12	12	12	12	12	11	12
Total Lost time (s)	4.0	4.0		4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00	0.97	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1678	3433		1787	1881	1553	1671	1810	1404	3433	1723	
Flt Permitted	0.41	1.00		0.42	1.00	1.00	0.19	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	727	3433		790	1881	1553	333	1810	1404	3433	1723	
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)	90	157	47	552	558	326	52	417	218	251	470	147
RTOR Reduction (vph)	0	23	0	0	0	0	0	0	92	0	8	0
Lane Group Flow (vph)	90	181	0	552	558	326	52	417	126	251	609	0
Heavy Vehicles (%)	4%	3%	26%	1%	1%	4%	8%	5%	15%	2%	3%	2%
Turn Type	pm+pt			pm+pt		Free	Perm		pm+ov	Prot		
Protected Phases	1	6		5	2			8	5	7	4	
Permitted Phases	6			2		Free	8		8		7	
Actuated Green, G (s)	17.7	12.2		46.5	36.0	101.7	27.3	27.3	56.6	7.1	39.4	
Effective Green, g (s)	19.7	13.2		47.5	37.0	101.7	28.3	28.3	58.6	8.1	40.4	
Actuated g/C Ratio	0.19	0.13		0.47	0.36	1.00	0.28	0.28	0.58	0.08	0.40	
Clearance Time (s)	5.0	5.0		5.0	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	3.0	3.0	
Lane Grp Cap (vph)	202	446		666	684	1553	93	504	809	273	684	
v/s Ratio Prot	0.03	0.05		c0.25	0.30			0.23	0.05	0.07	c0.35	
v/s Ratio Perm	0.06			c0.14		c0.21	0.16		0.04			
v/c Ratio	0.45	0.41		0.83	0.82	0.21	0.56	0.83	0.16	0.92	0.89	
Uniform Delay, d1	34.9	40.7		21.2	29.3	0.0	31.4	34.4	10.0	46.5	28.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.6	0.6		8.4	7.4	0.3	7.1	10.7	0.1	33.5	13.5	
Delay (s)	36.5	41.3		29.6	36.7	0.3	38.5	45.1	10.1	80.0	42.1	
Level of Service	D	D		C	D	A	D	D	B	E	D	
Approach Delay (s)		39.8			25.7			33.5			53.0	
Approach LOS		D			C			C			D	

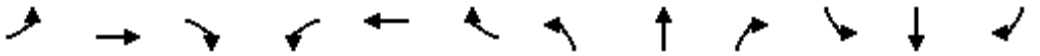
Intersection Summary			
HCM Average Control Delay	35.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	101.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	ø9
Lane Configurations											
Volume (vph)	182	640	157	163	274	28	471	598	636	507	
Lane Group Flow (vph)	198	723	171	177	298	30	512	650	691	681	
Turn Type	pm+pt		pm+pt		Free	Perm		pm+ov	Prot		
Protected Phases	1	6	5	2			8	5	7	4	9
Permitted Phases	6		2		Free	8		8			
Detector Phase	1	6	5	2		8	8	5	7	4	
Switch Phase											
Minimum Initial (s)	4.0	7.0	4.0	7.0		3.0	3.0	4.0	4.0	3.0	4.0
Minimum Split (s)	12.0	12.0	12.0	12.0		12.0	12.0	12.0	12.0	12.0	25.0
Total Split (s)	16.0	25.0	13.0	22.0	0.0	31.0	31.0	13.0	26.0	57.0	25.0
Total Split (%)	13.3%	20.8%	10.8%	18.3%	0.0%	25.8%	25.8%	10.8%	21.7%	47.5%	21%
Yellow Time (s)	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag		Lag	Lag	Lead	Lead		
Lead-Lag Optimize?											
Recall Mode	None	None	None	None		None	None	None	None	None	None
v/c Ratio	0.55	0.90	0.74	0.51	0.19	0.17	1.00	0.74	0.90	0.74	
Control Delay	33.3	54.8	47.4	44.5	0.3	34.3	77.5	14.4	54.5	25.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	33.3	54.8	47.4	44.5	0.3	34.3	77.5	14.4	54.5	25.4	
Queue Length 50th (ft)	86	221	72	96	0	14	303	107	206	277	
Queue Length 95th (ft)	196	#457	#215	207	0	48	#697	#319	#429	#709	
Internal Link Dist (ft)		342		114			1623			622	
Turn Bay Length (ft)	150				350	50		260	350		
Base Capacity (vph)	363	801	232	347	1599	172	513	879	770	921	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.55	0.90	0.74	0.51	0.19	0.17	1.00	0.74	0.90	0.74	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 100
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 304: Canton Street & University Ave





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	182	640	25	157	163	274	28	471	598	636	507	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	14	12	12	12	12	12	12	12	12	11	12
Total Lost time (s)	4.0	4.0		4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00	0.97	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1711	3774		1752	1881	1599	1480	1881	1583	3467	1712	
Flt Permitted	0.41	1.00		0.22	1.00	1.00	0.41	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	737	3774		399	1881	1599	632	1881	1583	3467	1712	
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)	198	696	27	171	177	298	30	512	650	691	551	130
RTOR Reduction (vph)	0	2	0	0	0	0	0	0	266	0	6	0
Lane Group Flow (vph)	198	721	0	171	177	298	30	512	384	691	675	0
Heavy Vehicles (%)	2%	1%	8%	3%	1%	1%	22%	1%	2%	1%	4%	5%
Bus Blockages (#/hr)	0	1	0	0	0	0	0	0	0	0	0	0
Turn Type	pm+pt			pm+pt		Free	Perm		pm+ov	Prot		
Protected Phases	1	6		5	2			8	5	7	4	
Permitted Phases	6			2		Free	8		8			
Actuated Green, G (s)	31.0	20.2		25.6	17.5	101.6	26.3	26.3	34.4	21.2	52.5	
Effective Green, g (s)	33.0	21.2		27.6	18.5	101.6	27.3	27.3	36.4	22.2	53.5	
Actuated g/C Ratio	0.32	0.21		0.27	0.18	1.00	0.27	0.27	0.36	0.22	0.53	
Clearance Time (s)	5.0	5.0		5.0	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	3.0	3.0	
Lane Grp Cap (vph)	353	787		230	343	1599	170	505	567	758	901	
v/s Ratio Prot	c0.07	c0.19		c0.07	0.09			c0.27	0.06	c0.20	0.39	
v/s Ratio Perm	0.12			0.14		c0.19	0.05		0.18			
v/c Ratio	0.56	0.92		0.74	0.52	0.19	0.18	1.01	0.68	0.91	0.75	
Uniform Delay, d1	26.5	39.3		31.0	37.5	0.0	28.5	37.1	27.6	38.7	18.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.0	15.2		12.2	1.3	0.3	0.5	43.6	3.2	15.2	3.4	
Delay (s)	28.6	54.5		43.2	38.8	0.3	29.0	80.7	30.8	53.9	22.2	
Level of Service	C	D		D	D	A	C	F	C	D	C	
Approach Delay (s)		48.9			22.2			52.2			38.2	
Approach LOS		D			C			D			D	

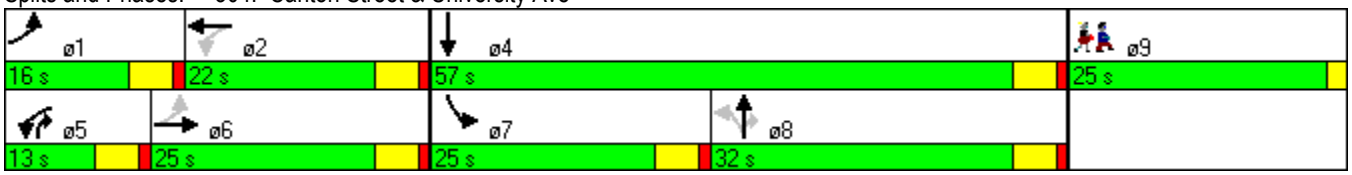
Intersection Summary			
HCM Average Control Delay	42.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	101.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	83.7%	ICU Level of Service	E
Analysis Period (min)	15		

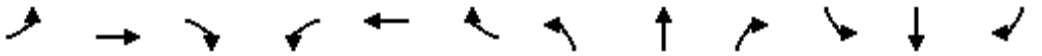
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	ø9
Lane Configurations											
Volume (vph)	110	139	115	99	214	9	392	108	424	371	
Lane Group Flow (vph)	120	164	125	108	233	10	426	117	461	518	
Turn Type	pm+pt		pm+pt		Free	Perm		pm+ov	Prot		
Protected Phases	1	6	5	2			8	5	7	4	9
Permitted Phases	6		2		Free	8		8			
Detector Phase	1	6	5	2		8	8	5	7	4	
Switch Phase											
Minimum Initial (s)	4.0	7.0	4.0	7.0		3.0	3.0	4.0	4.0	3.0	4.0
Minimum Split (s)	12.0	12.0	12.0	12.0		12.0	12.0	12.0	12.0	12.0	25.0
Total Split (s)	16.0	25.0	13.0	22.0	0.0	32.0	32.0	13.0	25.0	57.0	25.0
Total Split (%)	13.3%	20.8%	10.8%	18.3%	0.0%	26.7%	26.7%	10.8%	20.8%	47.5%	21%
Yellow Time (s)	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag		Lag	Lag	Lead	Lead		
Lead-Lag Optimize?											
Recall Mode	None	None	None	None		None	None	None	None	None	None
v/c Ratio	0.33	0.29	0.37	0.42	0.15	0.04	0.72	0.15	0.67	0.53	
Control Delay	28.3	35.0	29.8	43.6	0.2	29.1	38.0	3.5	39.6	16.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	28.3	35.0	29.8	43.6	0.2	29.1	38.0	3.5	39.6	16.8	
Queue Length 50th (ft)	46	38	48	53	0	4	191	0	114	140	
Queue Length 95th (ft)	124	89	128	134	0	22	#528	27	236	428	
Internal Link Dist (ft)		333		121			1614			622	
Turn Bay Length (ft)	150				350	50		260	350		
Base Capacity (vph)	401	920	345	406	1599	244	632	768	856	1096	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.30	0.18	0.36	0.27	0.15	0.04	0.67	0.15	0.54	0.47	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 87.4
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 304: Canton Street & University Ave





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	110	139	12	115	99	214	9	392	108	424	371	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	14	12	12	12	12	12	12	12	12	11	12
Total Lost time (s)	4.0	4.0		4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00	0.97	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1728	3673		1736	1900	1599	1480	1900	1538	3433	1733	
Flt Permitted	0.56	1.00		0.65	1.00	1.00	0.47	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1014	3673		1184	1900	1599	735	1900	1538	3433	1733	
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)	120	151	13	125	108	233	10	426	117	461	403	115
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	69	0	7	0
Lane Group Flow (vph)	120	159	0	125	108	233	10	426	48	461	511	0
Heavy Vehicles (%)	1%	3%	8%	4%	0%	1%	22%	0%	5%	2%	2%	4%
Bus Blockages (#/hr)	0	1	0	0	0	0	0	0	0	0	0	0
Turn Type	pm+pt			pm+pt		Free	Perm		pm+ov	Prot		
Protected Phases	1	6		5	2			8	5	7	4	
Permitted Phases	6			2		Free	8		8			
Actuated Green, G (s)	21.9	12.3		18.7	10.7	88.6	26.3	26.3	34.3	16.6	47.9	
Effective Green, g (s)	23.9	13.3		20.7	11.7	88.6	27.3	27.3	36.3	17.6	48.9	
Actuated g/C Ratio	0.27	0.15		0.23	0.13	1.00	0.31	0.31	0.41	0.20	0.55	
Clearance Time (s)	5.0	5.0		5.0	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	3.0	3.0	
Lane Grp Cap (vph)	359	551		333	251	1599	226	585	630	682	956	
v/s Ratio Prot	c0.04	0.04		0.04	c0.06			c0.22	0.01	c0.13	0.30	
v/s Ratio Perm	0.05			0.05		c0.15	0.01		0.02			
v/c Ratio	0.33	0.29		0.38	0.43	0.15	0.04	0.73	0.08	0.68	0.53	
Uniform Delay, d1	25.4	33.4		28.0	35.4	0.0	21.5	27.3	15.9	32.9	12.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.6	0.3		0.7	1.2	0.2	0.1	4.5	0.1	2.7	0.6	
Delay (s)	26.0	33.7		28.8	36.6	0.2	21.6	31.9	16.0	35.5	13.2	
Level of Service	C	C		C	D	A	C	C	B	D	B	
Approach Delay (s)		30.5			16.3			28.3			23.7	
Approach LOS		C			B			C			C	

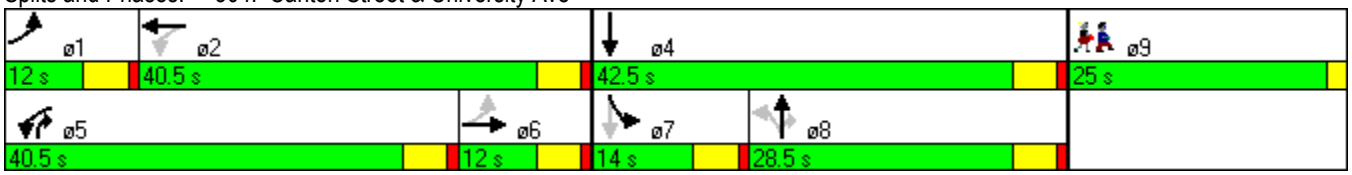
Intersection Summary			
HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	88.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	ø9
Lane Configurations											
Volume (vph)	84	179	573	595	698	49	320	184	271	422	
Lane Group Flow (vph)	91	243	623	647	759	53	348	200	295	609	
Turn Type	pm+pt		pm+pt		Free	Perm		pm+ov	Prot		
Protected Phases	1	6	5	2			8	5	7	4	9
Permitted Phases	6		2		Free	8		8		7	
Detector Phase	1	6	5	2		8	8	5	7	4	
Switch Phase											
Minimum Initial (s)	4.0	7.0	4.0	7.0		3.0	3.0	4.0	4.0	3.0	4.0
Minimum Split (s)	12.0	12.0	12.0	12.0		12.0	12.0	12.0	12.0	12.0	25.0
Total Split (s)	12.0	12.0	40.5	40.5	0.0	28.5	28.5	40.5	14.0	42.5	25.0
Total Split (%)	10.0%	10.0%	33.8%	33.8%	0.0%	23.8%	23.8%	33.8%	11.7%	35.4%	21%
Yellow Time (s)	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag		Lag	Lag	Lead	Lead		
Lead-Lag Optimize?											
Recall Mode	None	None	None	None		None	None	None	None	None	None
v/c Ratio	0.47	0.82	0.86	0.87	0.49	0.67	0.78	0.20	0.85	0.90	
Control Delay	30.2	64.5	35.8	44.6	1.1	78.0	49.7	1.5	68.2	47.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	30.2	64.5	35.8	44.6	1.1	78.0	49.7	1.5	68.2	47.2	
Queue Length 50th (ft)	27	71	275	360	0	29	193	0	91	322	
Queue Length 95th (ft)	82	#180	#702	#809	0	#120	#450	17	#217	#750	
Internal Link Dist (ft)		333		114			1633			620	
Turn Bay Length (ft)	150				350	50		260	350		
Base Capacity (vph)	198	298	727	740	1553	79	448	982	346	677	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.46	0.82	0.86	0.87	0.49	0.67	0.78	0.20	0.85	0.90	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 100
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 304: Canton Street & University Ave



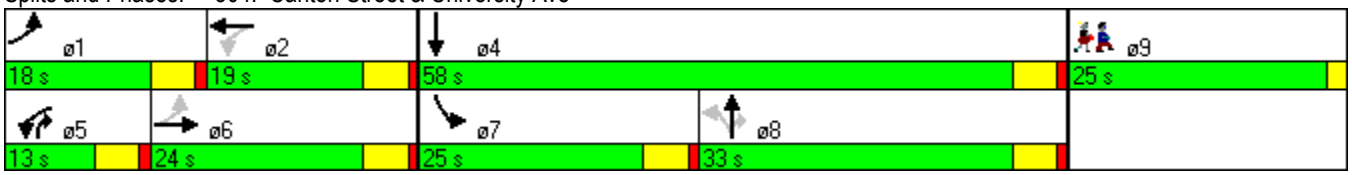
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	84	179	44	573	595	698	49	320	184	271	422	138
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	14	12	12	12	12	12	12	12	12	11	12
Total Lost time (s)	4.0	4.0		4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00	0.97	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1678	3474		1787	1881	1553	1671	1810	1404	3433	1721	
Flt Permitted	0.44	1.00		0.31	1.00	1.00	0.18	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	776	3474		574	1881	1553	316	1810	1404	3433	1721	
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)	91	195	48	623	647	759	53	348	200	295	459	150
RTOR Reduction (vph)	0	17	0	0	0	0	0	0	80	0	9	0
Lane Group Flow (vph)	91	226	0	623	647	759	53	348	120	295	600	0
Heavy Vehicles (%)	4%	3%	26%	1%	1%	4%	8%	5%	15%	2%	3%	2%
Turn Type	pm+pt			pm+pt		Free	Perm		pm+ov	Prot		
Protected Phases	1	6		5	2			8	5	7	4	
Permitted Phases	6			2		Free	8		8		7	
Actuated Green, G (s)	13.7	8.1		48.9	38.3	102.5	23.7	23.7	59.5	9.1	37.8	
Effective Green, g (s)	15.7	9.1		49.9	39.3	102.5	24.7	24.7	61.5	10.1	38.8	
Actuated g/C Ratio	0.15	0.09		0.49	0.38	1.00	0.24	0.24	0.60	0.10	0.38	
Clearance Time (s)	5.0	5.0		5.0	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	3.0	3.0	
Lane Grp Cap (vph)	177	308		715	721	1553	76	436	842	338	651	
v/s Ratio Prot	0.03	0.06		c0.31	c0.34			0.19	0.05	0.09	c0.35	
v/s Ratio Perm	0.05			0.11		c0.49	0.17		0.03			
v/c Ratio	0.51	0.73		0.87	0.90	0.49	0.70	0.80	0.14	0.87	0.92	
Uniform Delay, d1	38.9	45.5		22.0	29.7	0.0	35.5	36.6	9.0	45.6	30.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.5	8.7		11.3	13.8	1.1	24.3	9.8	0.1	21.1	18.6	
Delay (s)	41.4	54.2		33.3	43.5	1.1	59.8	46.4	9.0	66.7	49.0	
Level of Service	D	D		C	D	A	E	D	A	E	D	
Approach Delay (s)		50.7			24.5			35.1			54.8	
Approach LOS		D			C			D			D	

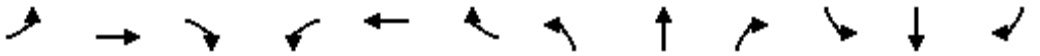
Intersection Summary			
HCM Average Control Delay	35.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	102.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	ø9
Lane Configurations											
Volume (vph)	185	661	179	200	591	28	441	598	648	512	
Lane Group Flow (vph)	201	745	195	217	642	30	479	650	704	689	
Turn Type	pm+pt		pm+pt		Free	Perm		pm+ov	Prot		
Protected Phases	1	6	5	2			8	5	7	4	9
Permitted Phases	6		2		Free	8		8			
Detector Phase	1	6	5	2		8	8	5	7	4	
Switch Phase											
Minimum Initial (s)	4.0	7.0	4.0	7.0		3.0	3.0	4.0	4.0	3.0	4.0
Minimum Split (s)	12.0	12.0	12.0	12.0		12.0	12.0	12.0	12.0	12.0	25.0
Total Split (s)	18.0	24.0	13.0	19.0	0.0	33.0	33.0	13.0	25.0	58.0	25.0
Total Split (%)	15.0%	20.0%	10.8%	15.8%	0.0%	27.5%	27.5%	10.8%	20.8%	48.3%	21%
Yellow Time (s)	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag		Lag	Lag	Lead	Lead		
Lead-Lag Optimize?											
Recall Mode	None	None	None	None		None	None	None	None	None	None
v/c Ratio	0.63	0.98	0.84	0.73	0.40	0.16	0.87	0.71	0.96	0.73	
Control Delay	37.3	67.7	59.2	57.1	0.8	32.4	52.5	11.9	64.7	24.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	37.3	67.7	59.2	57.1	0.8	32.4	52.5	11.9	64.7	24.6	
Queue Length 50th (ft)	89	233	85	126	0	13	268	84	214	274	
Queue Length 95th (ft)	#224	#491	#264	#318	0	47	#614	234	#453	#712	
Internal Link Dist (ft)		345		114			1633			620	
Turn Bay Length (ft)	150				350	50		260	350		
Base Capacity (vph)	330	764	233	298	1599	184	550	917	734	939	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.61	0.98	0.84	0.73	0.40	0.16	0.87	0.71	0.96	0.73	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 100
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 304: Canton Street & University Ave





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	185	661	25	179	200	591	28	441	598	648	512	121
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	14	12	12	12	12	12	12	12	12	11	12
Total Lost time (s)	4.0	4.0		4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00	0.97	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1711	3775		1752	1881	1599	1480	1881	1583	3467	1712	
Flt Permitted	0.25	1.00		0.25	1.00	1.00	0.40	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	459	3775		464	1881	1599	627	1881	1583	3467	1712	
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)	201	718	27	195	217	642	30	479	650	704	557	132
RTOR Reduction (vph)	0	2	0	0	0	0	0	0	275	0	6	0
Lane Group Flow (vph)	201	743	0	195	217	642	30	479	375	704	683	0
Heavy Vehicles (%)	2%	1%	8%	3%	1%	1%	22%	1%	2%	1%	4%	5%
Bus Blockages (#/hr)	0	1	0	0	0	0	0	0	0	0	0	0
Turn Type	pm+pt			pm+pt		Free	Perm		pm+ov	Prot		
Protected Phases	1	6		5	2			8	5	7	4	
Permitted Phases	6			2		Free	8		8			
Actuated Green, G (s)	31.6	19.2		23.0	14.9	101.6	28.3	28.3	36.4	20.2	53.5	
Effective Green, g (s)	33.3	20.2		25.0	15.9	101.6	29.3	29.3	38.4	21.2	54.5	
Actuated g/C Ratio	0.33	0.20		0.25	0.16	1.00	0.29	0.29	0.38	0.21	0.54	
Clearance Time (s)	5.0	5.0		5.0	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	3.0	3.0	
Lane Grp Cap (vph)	316	751		230	294	1599	181	542	598	723	918	
v/s Ratio Prot	c0.08	c0.20		c0.08	0.12			c0.25	0.06	c0.20	0.40	
v/s Ratio Perm	0.12			0.13		c0.40	0.05		0.18			
v/c Ratio	0.64	0.99		0.85	0.74	0.40	0.17	0.88	0.63	0.97	0.74	
Uniform Delay, d1	26.8	40.6		33.8	40.9	0.0	27.0	34.5	25.8	39.9	18.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.2	29.7		24.0	9.3	0.8	0.4	15.7	2.1	26.9	3.3	
Delay (s)	31.0	70.3		57.8	50.2	0.8	27.5	50.2	27.8	66.8	21.5	
Level of Service	C	E		E	D	A	C	D	C	E	C	
Approach Delay (s)		61.9			21.5			37.1			44.4	
Approach LOS		E			C			D			D	

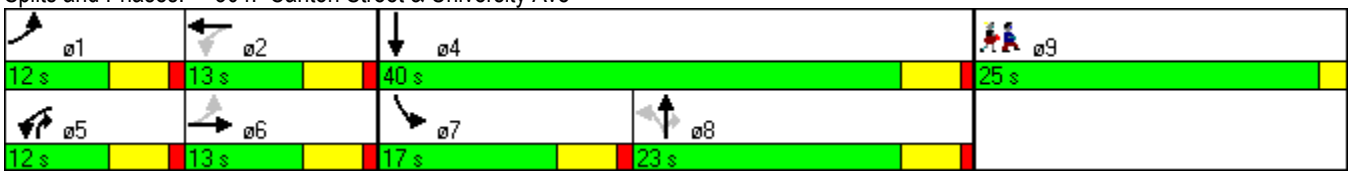
Intersection Summary			
HCM Average Control Delay	40.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	101.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	ø9
Lane Configurations											
Volume (vph)	110	146	119	105	537	9	381	108	429	372	
Lane Group Flow (vph)	120	173	129	114	584	10	414	117	466	520	
Turn Type	pm+pt		pm+pt		Free	Perm		pm+ov	Prot		
Protected Phases	1	6	5	2			8	5	7	4	9
Permitted Phases	6		2		Free	8		8			
Detector Phase	1	6	5	2		8	8	5	7	4	
Switch Phase											
Minimum Initial (s)	4.0	7.0	4.0	7.0		3.0	3.0	4.0	4.0	3.0	4.0
Minimum Split (s)	12.0	12.0	12.0	12.0		12.0	12.0	12.0	12.0	12.0	25.0
Total Split (s)	12.0	13.0	12.0	13.0	0.0	23.0	23.0	12.0	17.0	40.0	25.0
Total Split (%)	13.3%	14.4%	13.3%	14.4%	0.0%	25.6%	25.6%	13.3%	18.9%	44.4%	28%
Yellow Time (s)	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag		Lag	Lag	Lead	Lead		
Lead-Lag Optimize?											
Recall Mode	None	None	None	None		None	None	None	None	None	None
v/c Ratio	0.34	0.36	0.37	0.36	0.37	0.05	0.79	0.16	0.71	0.57	
Control Delay	24.0	30.7	24.7	34.6	0.6	23.9	38.1	3.0	35.8	15.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	24.0	30.7	24.7	34.6	0.6	23.9	38.1	3.0	35.8	15.9	
Queue Length 50th (ft)	34	31	37	42	0	3	147	0	88	113	
Queue Length 95th (ft)	105	80	111	#129	0	19	#433	19	#230	363	
Internal Link Dist (ft)		347		114			1635			620	
Turn Bay Length (ft)	150				350	50		260	350		
Base Capacity (vph)	361	490	345	313	1599	204	527	747	652	920	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.33	0.35	0.37	0.36	0.37	0.05	0.79	0.16	0.71	0.57	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 69.7
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 304: Canton Street & University Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	110	146	13	119	105	537	9	381	108	429	372	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	14	12	12	12	12	12	12	12	12	11	12
Total Lost time (s)	4.0	4.0		4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00	0.97	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1728	3679		1736	1900	1599	1480	1900	1538	3433	1733	
Flt Permitted	0.68	1.00		0.56	1.00	1.00	0.47	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1243	3679		1021	1900	1599	734	1900	1538	3433	1733	
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)	120	159	14	129	114	584	10	414	117	466	404	116
RTOR Reduction (vph)	0	7	0	0	0	0	0	0	72	0	9	0
Lane Group Flow (vph)	120	166	0	129	114	584	10	414	45	466	511	0
Heavy Vehicles (%)	1%	3%	8%	4%	0%	1%	22%	0%	5%	2%	2%	4%
Turn Type	pm+pt			pm+pt		Free	Perm		pm+ov	Prot		
Protected Phases	1	6		5	2			8	5	7	4	
Permitted Phases	6			2		Free	8		8			
Actuated Green, G (s)	14.6	9.0		17.6	10.5	72.3	18.4	18.4	25.5	12.2	35.6	
Effective Green, g (s)	16.6	10.0		19.6	11.5	72.3	19.4	19.4	27.5	13.2	36.6	
Actuated g/C Ratio	0.23	0.14		0.27	0.16	1.00	0.27	0.27	0.38	0.18	0.51	
Clearance Time (s)	5.0	5.0		5.0	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	3.0	3.0	
Lane Grp Cap (vph)	330	509		357	302	1599	197	510	585	627	877	
v/s Ratio Prot	0.03	0.05		0.04	0.06			c0.22	0.01	c0.14	0.29	
v/s Ratio Perm	0.05			0.06		c0.37	0.01		0.02			
v/c Ratio	0.36	0.33		0.36	0.38	0.37	0.05	0.81	0.08	0.74	0.58	
Uniform Delay, d1	23.1	28.1		20.8	27.2	0.0	19.6	24.7	14.3	27.9	12.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.7	0.4		0.6	0.8	0.6	0.1	9.5	0.1	4.8	1.0	
Delay (s)	23.7	28.5		21.4	28.0	0.6	19.7	34.3	14.3	32.7	13.5	
Level of Service	C	C		C	C	A	B	C	B	C	B	
Approach Delay (s)		26.5			7.7			29.7			22.6	
Approach LOS		C			A			C			C	

Intersection Summary			
HCM Average Control Delay	19.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	72.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			