



Town of Belmont
Zoning Board of Appeals

RECEIVED
TOWN CLERK
BELMONT, MA

2017 NOV 16 AM 11:45

APPLICATION FOR A SPECIAL PERMIT

Date: November 6, 2017

Zoning Board of Appeals
Homer Municipal Building
19 Moore Street
Belmont, MA 02478

To Whom It May Concern:

Pursuant to the provisions of Massachusetts General Laws, Chapter 40A, Section 9, as amended, and the Zoning By-Laws of the Town of Belmont, I/we the undersigned, being the owner(s) of a certain parcel of land (with the buildings thereon) situated on 344 Pleasant Street/Road, hereby apply to your Board for a **SPECIAL PERMIT** for the erection or alteration on said premises or the use thereof under the applicable Section of the Zoning By-Law of said Town for _____
the change of use to operate a Dunkin Donuts Restaurant in 1,500 square feet of
retail space with 15 seats. This is an amended application pursuant to remand
from the Superior Court.

on the ground that the same will be in harmony with the general purpose and intent of said Zoning By-Law.

Signature of Petitioner

Nicholas Leo (Jm)

Print Name

Nicholas Leo/Patriot Donuts, LLC

Address

517 Concord Avenue

Cambridge, MA 02138

Daytime Telephone Number

(617) 962-2020

By its attorneys,

Joseph M. Noone
Joseph M. Noone, Esquire
AVERY, DOOLEY & NOONE, LLP
3 Brighton Street
Belmont, MA 02478
(617) 489-5300

December 6, 2005

STATEMENT OF APPLICANT, PATRIOT DONUTS, LLC,
FOR 344 PLEASANT STREET, BELMONT, MA

1. History of Proposal and Revisions

Patriot Donuts, LLC, seeks a special permit to operate a Dunkin Donuts at 344 Pleasant Street. On October 10, 2017, the Planning Board issued its decision granting site plan review for the construction of a new building consisting of 3,516 square feet. Previously, on January 11, 2016, the Applicant's original application for a special permit was denied by a vote of 3-2 in favor of the use. Although a majority of the ZBA voted in favor of the application, the special permit was not granted. The Applicant appealed the decision to Superior Court and an order of remand was issued by the Superior Court for the Board to reconsider the amended application due to the fact that a more extensive traffic study was conducted and filed with the appeal, a proposed significant reduction in the size of the Dunkin Donuts restaurant and number of seats, and the verification that only one (1) parking space was required for the environmental remediation equipment.

Belmont Pleasant Street, LLC is the owner of the property located at 344 Pleasant Street, Belmont, MA. Vincent and Nicholas Leo are the principals of Belmont Pleasant Street, LLC and Patriot Donuts, LLC.

Currently at 344 Pleasant Street, an automobile service station operates. For many years, a gas station and automotive repair service station operated until the property sustained environmental contamination. In July 2014, Belmont Pleasant Street, LLC acquired the property.

344-350 Pleasant Street is a corner lot parcel, consisting of 15,510 square feet, and is located in an LB3 zone.

As demonstrated in this amended application, the proposed use of a Dunkin Donuts will be a significant betterment to the Town and will greatly outweigh any perceived adverse impact, warranting the granting of the special permit.

2. Description of Dunkin Donuts Proposal

In accordance with the Site Plan approval, the existing structure will be demolished and a new building will be constructed containing a gross floor area of 3,516 square feet. The lot coverage will be 23%, which is a reduction from the existing 27% lot coverage (35% lot coverage is permitted in an LB3 District under By-Law Section 4.2.1.). Even though he could build a structure 8% larger under the zoning by-law, the Applicant has chosen to build a smaller structure to minimize the impact on the abutting residential properties.

The building will have three retail spaces consisting of 1,500 square feet, 1,001 square feet and 746 square feet. There will be 269 square feet of common space used for restrooms.

The Applicant, Patriot Donuts, LLC, seeks a special permit to operate a Dunkin Donuts in the space consisting of 1,500 square feet. The original application for a special permit involved occupancy of a retail space consisting of 2,014 square feet. The reduced size of the Dunkin Donuts by 514 square feet to 1,500 square feet constitutes a 26% percent reduction in size. Furthermore, the number of seats is reduced to 15 seats from the original proposal containing 21 seats, resulting in a 29% percent reduction. During the warmer months, the Applicant will have 8 outdoor seats. (Twenty outdoor seats are permitted as of right per section 5.1.2(d).)

The site will have 21 parking spaces and one loading zone for the handicap space. Zoning By-Law Section 5.1.2(d) requires one parking space for every two restaurant seats. The Dunkin Donuts requires 8 parking spaces based upon the 15 seats. Previously, the Zoning Board relied upon a statement from an abutter that 3 parking spaces would be utilized for the environmental remediation equipment. Per the site LSP, Kevin Trainer, only one (1) parking space will be utilized during the remediation process after the site is developed. (See Remediation Plan, **Exhibit B**, and Letter from LSP, **Exhibit K**.)

The building's exterior will have a brick veneer façade, EFS crown molding, gooseneck lighting, and fabric awnings. Exterior seating and tables might be utilized.

Site access will be provided via curb cuts on both Pleasant Street and Brighton Street. These curb cuts will provide access to a ground level parking area at grade with the building. One of the three existing curb cuts on Pleasant Street will be eliminated. The curb cut on Brighton Street will be moved southerly and will be reduced to 25.44 feet wide, as compared to the existing 64-foot-wide curb cut. The reduction in size and relocation of the Brighton Street curb cut is safer for pedestrians, as the entrance/exit is moved further away from the intersection. The curb cut on Pleasant Street will be reduced to 38.4 feet wide. A site distance analysis was carried out at the proposed location for the curb cuts to ensure safe movements entering and exiting the site.

3. Special Permit Criteria

A. LOCATION

Storm Water Management

The Applicant has commissioned a preliminary storm water study based upon the proposed building consisting of 3,516 square feet. The subject site area is 15,510 square feet. The proposed project reduces total site impervious from 90% to 87%, thereby naturally reducing storm water runoff rates and volumes. Runoff to the abutter (Design Point 1) is significantly reduced in the proposed condition. Additionally, runoff is collected and routed, underground, to a recharge infiltration field, rather than sheet flowing across public sidewalks, which can result in icy conditions. The storm water plan was reviewed and approved by the Office of Community Development and the Planning Board.

Traffic

There will be no adverse traffic impact created by the proposed use. As part of the appeal process and the application for Site Plan review, the applicant commissioned a Traffic Impact and Access Study prepared by Design Consultants, Inc. (See **Exhibit G** and **Exhibit H**.) Exhibit H addresses specific questions raised by the Planning Board after submission of the original site plan review application. With the original application, only a Trip Generation Study was submitted per the recommendation of OCD staff.

The more in depth Traffic Impact and Access Study of February 2017, further confirms the findings reached the traffic count filed with the original application. The traffic engineers conclude that the proposed redevelopment at 344 Pleasant Street that includes a Dunkin Donuts will have no detrimental impact on surrounding traffic networks and will not result in a change of the level of service at the Pleasant and Brighton intersection.

The additional traffic analysis performed considered two alternative scenarios of tenants at the proposed development. Alternative One, consisting of a neighborhood restaurant and two other retail spaces, is expected to generate zero (0) net new-vehicle trips during both the morning and evening peak hours. Alternative Two, consisting of a Dunkin Donuts and two other retail spaces, is expected to generate four (4) net new-vehicle trips during the morning peak hour and 14 fewer (zero (0) net) new vehicle-trips during the evening peak hour as compared to the prior use of a gas station.

Over 22,300 vehicles travel on Pleasant Street on a daily basis. During the peak morning hour, 1722 vehicles travel through Pleasant Street and Brighton Street. The four (4) net new vehicle-trips in the morning peak hour will add 0.2% more trips to the existing trips at the intersection of Pleasant Street and Brighton Street. The less than one percentage increase of vehicular trips generated from the site is insignificant and will have no detrimental impact on surrounding traffic networks and will not adversely impact the level of service.

B. ACTIVITY TYPE AND MIX

The property is located in a business district and abuts other commercial properties and businesses. The building and the proposed use are in character and scale with the existing commercial buildings. The development of the site will greatly enhance the appearance of the site and neighborhood and will bring needed vitality to this business district. As stated previously, the size of the building is 8% percent smaller than what the zoning permits on the lot.

Hours of Operation

The hours of operation of the Dunkin Donuts will be 6:00 a.m. to 11:00 p.m. The hours of operation of the tenants in the other retail spaces is unknown at the present time due to the fact that tenants are not yet secured.

Deliveries

Deliveries will generally be made at non-peak hours. However, there will be an early morning delivery for donuts that are made offsite. All of the bakery items are made offsite and delivered to the property. There will be limited baking of items onsite, as most items are pre-made. There will be no frying of goods at the premises.

Trash

Trash pickup will occur three (3) times per week. The trash dumpster will be contained in a fenced-in enclosure. The dumpster itself will be located 10 feet from the rear lot line. The parking lot and landscape areas will be cleaned on a daily basis.

Number of Employees

The number of employees working a shift will be between 1 to 6 persons. Most employees will utilize public transportation to get to work or will be able to walk to work.

Signage

The Applicant will erect signage over each of the entrances to the property in conformity with the size requirements of the by-law. The applicant will seek a special permit to erect a free-standing monument sign to be located on the westerly side of the lot that will be perpendicular to Pleasant Street.

C. VISUAL CONCERNS

Building Location and Appearance

The existing building is a pre-existing, non-conforming building because the rear portion of the building is situated only 4 feet from the property line. The applicant originally desired to renovate the existing structure. However, at the urging of the OCD, the location of the proposed new building will be moved closer to Pleasant Street so as to eliminate parking at the front of the property so as to create a more visually attractive site. The rear of the building will now be situated 57 feet from the rear lot line making for a more attractive site, and provides the residential property owners greater privacy. Per the request of the abutters, the rear lot line will be fenced so that the parking areas will not be visible by the residential abutters.

The new building will greatly improve the current appearance of the site. The building's exterior will have a brick veneer façade, EFS crown molding, gooseneck lighting, and fabric awnings. The new building will significantly upgrade the visual appearance of the site by eliminating the existing structure which is tired and unappealing. The new building will greatly improve and enhance the appearance of the neighborhood.

A dumpster will be located within a 6-foot-high, white, vinyl fence. As many as possible of the existing trees in this area will be kept so as to provide additional buffering to the residential neighbors. The trash pickup will occur no less than two times per week during normal business hours. The parking lot and landscape areas will be cleaned on a daily basis.

The transformer will be located on a pad adjacent to the dumpster. The location of the dumpster and transformer were relocated on the site after consultation with the abutters.

Landscaping

The property will be landscaped as demonstrated on the landscape plan submitted herewith. The landscaping will consist of 20 evergreen trees – arborvitae; 11 deciduous and ornamental trees; 81 shrubs consisting of fothergilla, rhododendron, juniper, inkberry, and yews; and 82 perennials, ground cover or grasses. Per the request of the abutters, as many as possible of the existing trees on the rear of the property will be kept. The property will be landscaped in accordance with the site plan review approval requirements.

D. ACCESS

Site Access and Parking

The parking lot, consisting of 21 parking spaces, conforms with Section 5.1 of the By-Law.

Site access will be provided via curb cuts on both Pleasant Street and Brighton Street. These curb cuts will provide access to a ground level parking area at grade with the building. One of the three existing curb cuts on Pleasant Street will be eliminated. The curb cut on Brighton Street will be moved southerly and be reduced to 23.56 feet wide, as compared to the existing 64-foot-wide curb cut. The reduction in size and relocation of the Brighton Street curb cut is safer for pedestrians as the entrance/exit is moved further away from the intersection. The curb cut on Pleasant Street will be reduced to 38.4 feet wide. The traffic study included a site distance analysis at the proposed location for the curb cuts to ensure safe movements entering and exiting the site.

E. PROCESS

This project commenced two years ago, and the applicant originally planned on renovating the existing building. However, based upon meetings with the direct abutters and the suggestion of the Office of Community Development, the decision was made to construct a new building closer to Pleasant Street. In addition, several meetings were held with the immediate abutters to discuss the project. In these meetings, the topics discussed were the existing trees on the rear lot line, the location of the dumpster and transformer, lighting, new landscaping and potential uses. Based upon these discussions, the applicant agreed to try to keep as many of the existing trees as possible, relocate the dumpster and transformer from the rear lot line and to relocate and improve the monitoring devices for the environmental cleanup.

For the site plan review, a neighborhood meeting was hosted on May 9, 2017 and was attended by seven (7) neighbors and abutters. A prior meeting occurred in 2016 which was attended by over thirty (30) neighbors. Based upon the input received from the Office of Community Development and neighbors, the plans were modified to accommodate most, if not all, of the requested changes.

Moreover, at the time of the original application, the Applicant secured over 500 signatures in support of a Dunkin Donuts at the location.

4. Information about Applicants

The Leos own and operate several Dunkin Donut stores in the local area. Vincent Leo and his three sons are the owners of the business. Vincent Leo is an Italian immigrant and is an example of an American success story. Mr. Leo started working at Dunkin Donuts in an entry level position and rose to become the successful owner of several locations. His sons are now involved in the business too, with Nicholas serving as the primary manager for the ownership entity.

Since the 1980s, the Leo family has operated all of their stores in a neat and professional manner so that they are an asset to the neighborhood and town. The Leos are constantly making sure that their properties and businesses do not negatively impact their abutters. Examples of the properties are located in Fresh Pond, Massachusetts Avenue, Cambridge, Medford Square and Woburn Center. Each of those properties were constructed in a manner to be consistent with the existing architecture and surrounding properties. Each of the buildings is first class in their appearance, inside and out.

In addition, the Leos are active in the communities in which they operate their stores and are generous to local youth sports teams and other charitable entities.

5. Conclusion

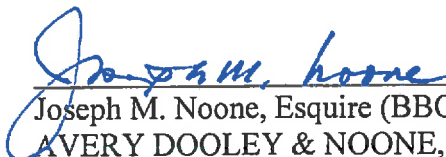
The Applicant's proposal will greatly improve a very visible location in the Town. The new building and reconfiguration of the site will make the area more welcoming to pedestrians and the neighborhood, while providing needed services to the area and additional tax revenue to the town with very little, if any, impact upon town services.

The Applicant respectfully requests the Zoning Board of Appeal to approve the resubmitted application for a special permit to operate the Dunkin Donuts restaurant.

Thank you for your time and consideration.

PATRIOT DONUTS, LLC

By its attorneys,



Joseph M. Noone, Esquire (BBO #559644)

AVERY DOOLEY & NOONE, LLP

3 Brighton Street

Belmont, MA 02478

(617) 489-5300

jnoone@averydooley.com

APPLICANT'S LIST OF EXHIBITS
344 PLEASANT STREET, BELMONT, MA

Exhibit A	Site Plan C1.0, dated 11/15/16
Exhibit B	Remedial Equipment Plan, dated 2/16/17
Exhibit C	Landscape Plan L1.0, dated 4/8/15
Exhibit D	Floor Plan A-1, dated 10/13/17
Exhibit E	Exterior Elevations A-2, dated 10/13/17
Exhibit F	Color Exterior Renderings
Exhibit G	Traffic Impact & Access Study prepared by Design Consultants, Inc., revised February 2017
Exhibit H	Supplemental Traffic Memo prepared by Design Consultants, Inc., dated October 19, 2017
Exhibit I	Parking Memo prepared by Design Consultants, Inc., dated August 1, 2017
Exhibit J	Environmental Parking Memo prepared by GeoInsight, dated October 13, 2017
Exhibit K	Environmental Memo prepared by LSP Kevin D. Trainer of GeoInsight, dated July 18, 2017

EXHIBIT A

344 PLEASANT STREET
BELMONT, MA
ZONING REVIEW

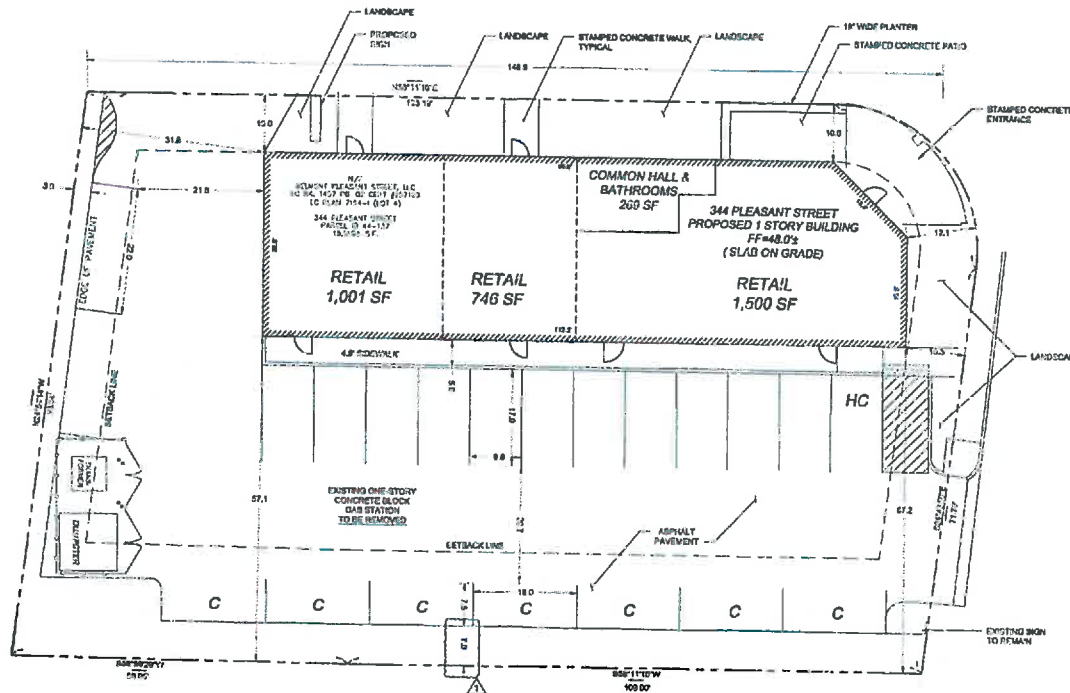
ITEM	
ZONING DISTRICT	LOCAL BUSINESS 2
EXISTING USE	SERVICE STATION
PROPOSED USE	COMMERCIAL
LOT SIZE	12,516 ± S.F.

DIMENSIONAL REGULATIONS
SECTION 4.2

LOCAL BUSINESS 2 ZONE	REQUIRED	EXISTING	PROPOSED
LOT AREA	N/A	12,516 ± S.F.	12,516 ± S.F.
LOT FRONTAGE	30 FT	148.9 FT	148.9 FT
FLOOR AREA RATIO	1.05 MAX	0.13	0.25
LOT COVERAGE	35%	23%	23%
OPEN SPACE	N/A	N/A	N/A
FRONT SETBACK	10 FT	47.8 FT	10 FT
SIDE SETBACK	0 FT	23.1 FT	10.3 FT
REAR SETBACK	0 FT	N/A (OWNER LPS)	31.8 FT
REAR SETBACK	20 FT	4.0 FT	57.1 FT
BUILDING HEIGHT	28	15.1 FT	23 FT
STORIES	2 MAX	2	2
3 STORY CALCULATION	N/A	N/A	N/A

CORNER LOT - HAS TWO FRONT YARDS AND ONE SIDE YARD, PER "SETBACK" DEFINITION (SECTION 1.4 OF BELMONT ZONING BYLAW, APPROVED 9/24/2014)

ZONING INFORMATION PROVIDED BY ARCHITECT.



LOCUS FILE INFORMATION

344 PLEASANT STREET
OWNER: BELMONT PLEASANT STREET, LLC
DEED REFERENCE: LC EN. 1457 PG. 02 CERT #257109
PLAN REFERENCE: LC PLAN 7164-1
ASSESSOR: PARCEL ID 44-137

NOTES

1. THE PURPOSE OF THIS PLAN IS TO SHOW THE EXISTING BUILDING AND PROPOSED SITE IMPROVEMENTS ON THE LOCUS PROPERTY. THE PROPERTY LINES SHOWN ON THIS PLAN ARE THE RESULT OF AN ON-THE-GROUND INSTRUMENT SURVEY PERFORMED BETWEEN JULY 29, 2014 & FEBRUARY 8, 2015, BY DESIGN CONSULTANTS, INC.
2. ADJUTERS INFORMATION WAS TAKEN FROM WOODSEX COUNTY REGISTRY OF DEEDS INFORMATION ON JULY 28, 2014.
3. TO THE BEST OF MY PROFESSIONAL KNOWLEDGE, INFORMATION, AND BELIEF, THIS PLAN CONFORMS TO THE TECHNICAL AND PROCEDURAL STANDARDS FOR THE PRACTICE OF LAND SURVEYING IN THE COMMONWEALTH OF MASSACHUSETTS.
4. I CERTIFY THAT THE EXISTING BUILDING SHOWN IS APPROXIMATELY LOCATED ON THE GROUND AS SHOWN.
5. PROPERTY IS LOCATED IN ZONE X FLOOD ZONE, PER FEMA MAP NO. 25017C0418C WITH AN EFFECTIVE DATE OF JUNE 4, 2010.
6. NO PUBLIC SHADE TREES ARE LOCATED WITHIN THE LIMITS OF THE PROPERTY FRONTAGE OF THE SUBJECT PROPERTY.

P.L.S. BRIAN B. DONOHUE, P.L.S. MASS. REGISTRATION NO. 47592
DATE: October 13, 2017



1" = 10'

OWNER: BELMONT PLEASANT STREET, LLC
LOC. HOUSE NO. 344 PLEASANT ST
LOT NO. 44-137
APP. NO.
DATE
SCALE: 1" = 10'

CLIENT: BELMONT PLEASANT STREET, LLC
117 CONCORD AVENUE
CHAMBERLAIN, MA 02142

PROJECT NAME: 344 PLEASANT STREET
BELMONT, MA

PROJECT NO.

REV	DESCRIPTION	DATE
1	LANDSCAPE	10/11/17

DATE: 10/11/17

PROPOSED PLOT PLAN

C1.0

DATE: 10/11/17

SCALE: 1" = 10'

EXHIBIT B

EXHIBIT C

EXHIBIT D

CONTRACTOR'S NOTES

1. Check verify all dimensions in the field.
2. Must obtain all required permits.
3. Must carry comprehensive and liability insurance.
4. Must perform all work in accordance w/ building codes.
5. Must provide materials for production only.
6. Must do in the CONTRACT within 15 minutes.



I	REVISIONS	DATE
0	VARIOUS CHANGES	08/10/2018
1	VARIOUS CHANGES	09/10/2018

<p>1. NAME OF THE PARTY OR ORGANIZATION</p> <p>2. ADDRESS</p> <p>3. CITY</p> <p>4. STATE</p> <p>5. ZIP CODE</p> <p>6. PHONE NUMBER</p> <p>7. FAX NUMBER</p> <p>8. E-MAIL ADDRESS</p> <p>9. WEBSITE ADDRESS</p> <p>10. OTHER CONTACT INFORMATION</p>	
<p>11. NAME OF THE PERSON TO WHOM THE CONTRIBUTION IS BEING MADE</p> <p>12. ADDRESS</p> <p>13. CITY</p> <p>14. STATE</p> <p>15. ZIP CODE</p> <p>16. PHONE NUMBER</p> <p>17. FAX NUMBER</p> <p>18. E-MAIL ADDRESS</p> <p>19. WEBSITE ADDRESS</p> <p>20. OTHER CONTACT INFORMATION</p>	

**MILTAVARES**
ARCHITECTS

200 Broadway Suite 101 Lynnfield, MA 01940
Phone: 781-595-0400 Fax: 781-595-8200
Email: info@christianbook.com

PATRIOT DONUTS LLC
PC: 353936

DUNKIN' DONUTS
344 PLEASANT ST.
BELMONT, MA

Spring 2011

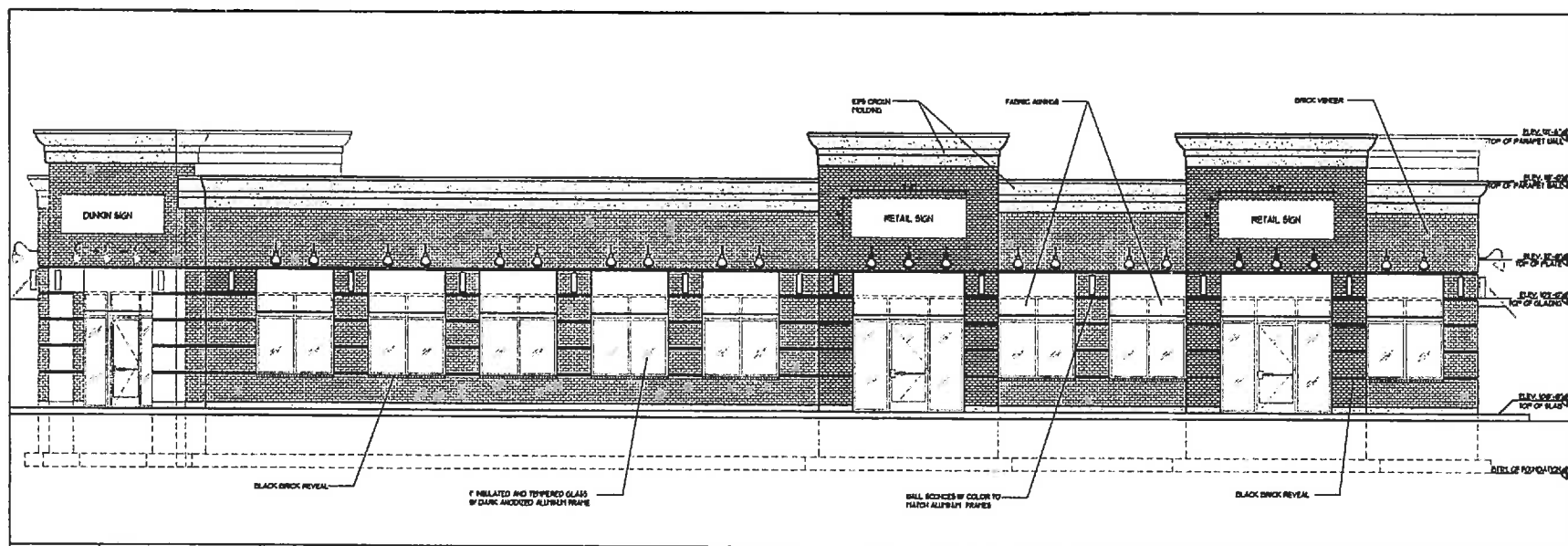
FLOOR PLAN

NAME	GIVEN
ISSUE DATE	10/13/2017
ISSUED BY	JT/AM
ISSUED BY	HUT
ISSUE #	28-23

A-1

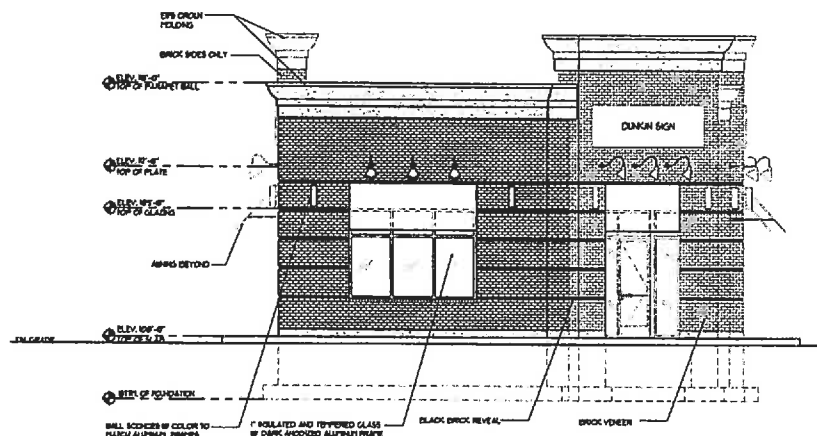
A-1

EXHIBIT E



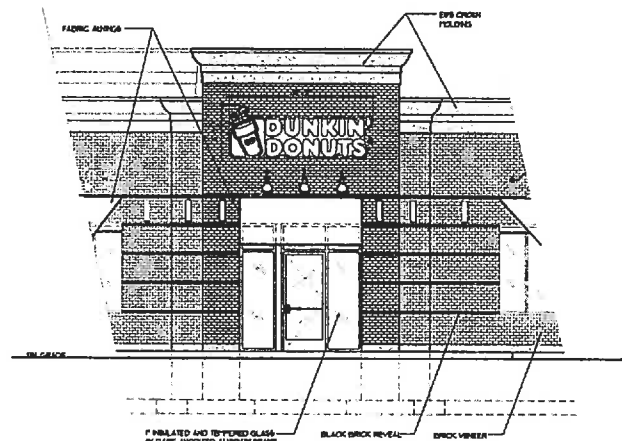
FRONT ELEVATION @ PLEASANT ST.

1/4" x 1/4"



LEFT SIDE ELEVATION (DEVELOPED)

2
1/4" x 1'-0"



DUNKIN' MONOLITH

3

CONTRACTOR'S NOTES

1. Shall verify all dimensions in the field.
2. Shall obtain all required permits.
3. Shall carry comprehensive and liability insurance.
4. Shall perform all work in accordance with building codes.
5. Shall protect hazardous live pedestrian safety.
6. Shall do all the necessary clearing to maintain structures during construction.



#	REVISIONS	DATE

MILTAVARES
ARCHITECTS

220 Broadway Suite 124 Springfield, MA 01104
Phone: 781-595-6400 Fax: 781-595-8300
E-mail: info@hbs.com

Page 100

PATRIOT DONUTS LLC
PC: 353936

DUNKIN' DONUTS
344 PLEASANT ST.
BELMONT, MA

1. *Journal of the American Medical Association*, 2000; 284: 1039-1044.

1. *Journal of the American Medical Association*, 1997; 277: 1033-1036.

• *Journal of Management Education* 32(10):1039-1050

EXTERIOR

ELEVATIONS

1

GIVEN

12/03/2011

12474 42

11/BA A-2

MJT

98-21

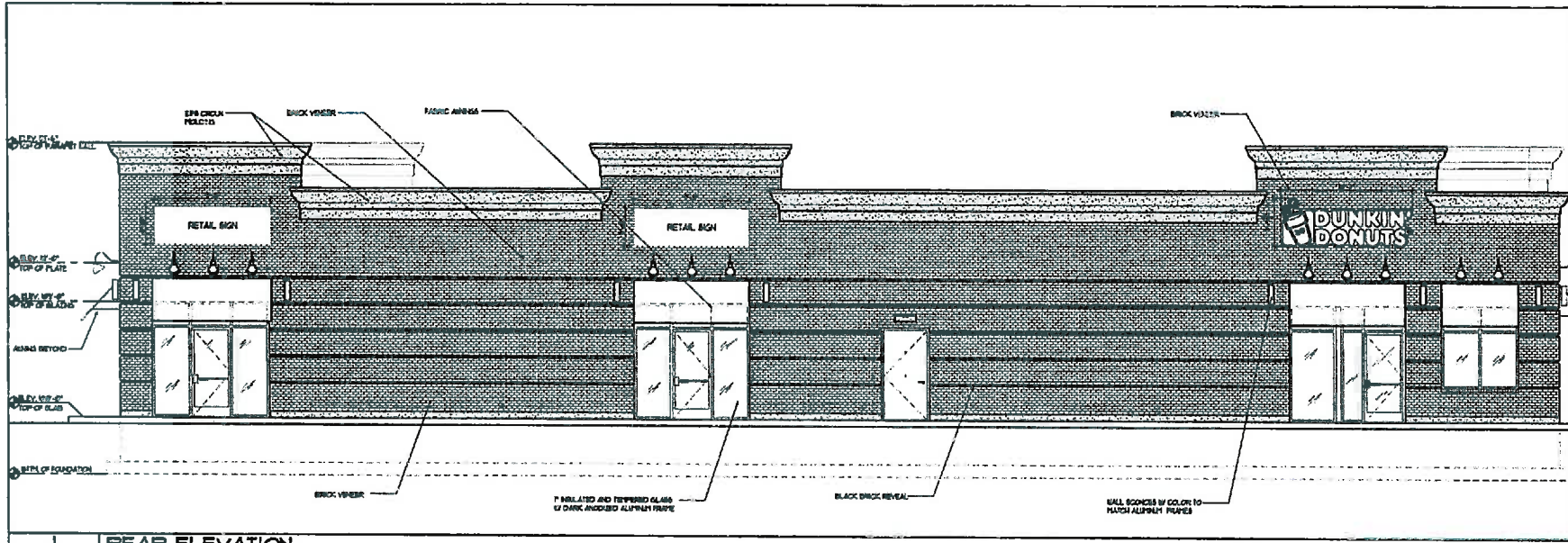
1043

1

1

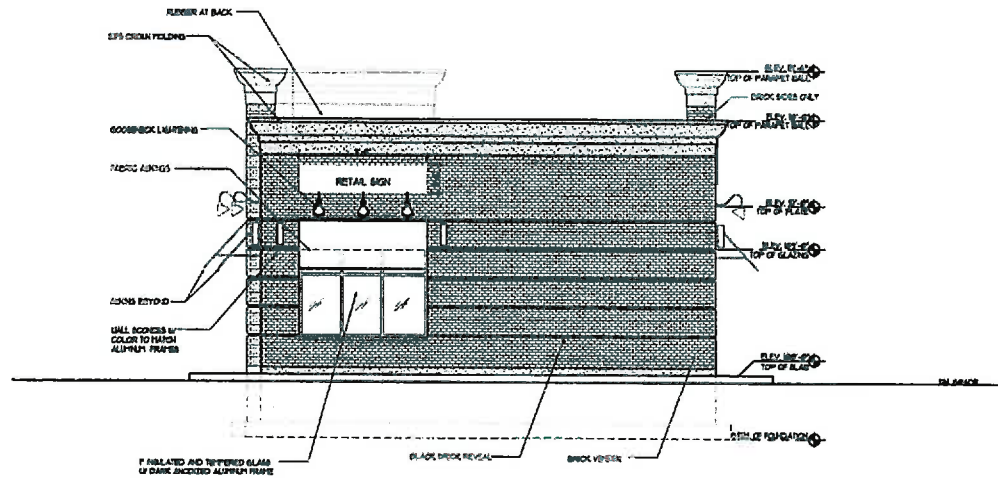
1

100



REAR ELEVATION

1/4" = 1' - 0"



RIGHT SIDE ELEVATION

1/4" = 1' - 0"

- CONTRACTOR'S NOTES**
1. Match existing conditions to the field.
 2. Match existing conditions to the field.
 3. Match existing conditions to the field.
 4. Match existing conditions to the field.
 5. Match existing conditions to the field.
 6. Match existing conditions to the field.



REVISIONS	DATE



M. J. TAVARES ARCHITECTS
 220 Broadway Suite 1201 Lynn, MA 01904
 Phone: 781-955-9400 Fax: 781-955-6388
 Email: info@mjta.com

PATRIOT DONUTS LLC
 PC: 353936

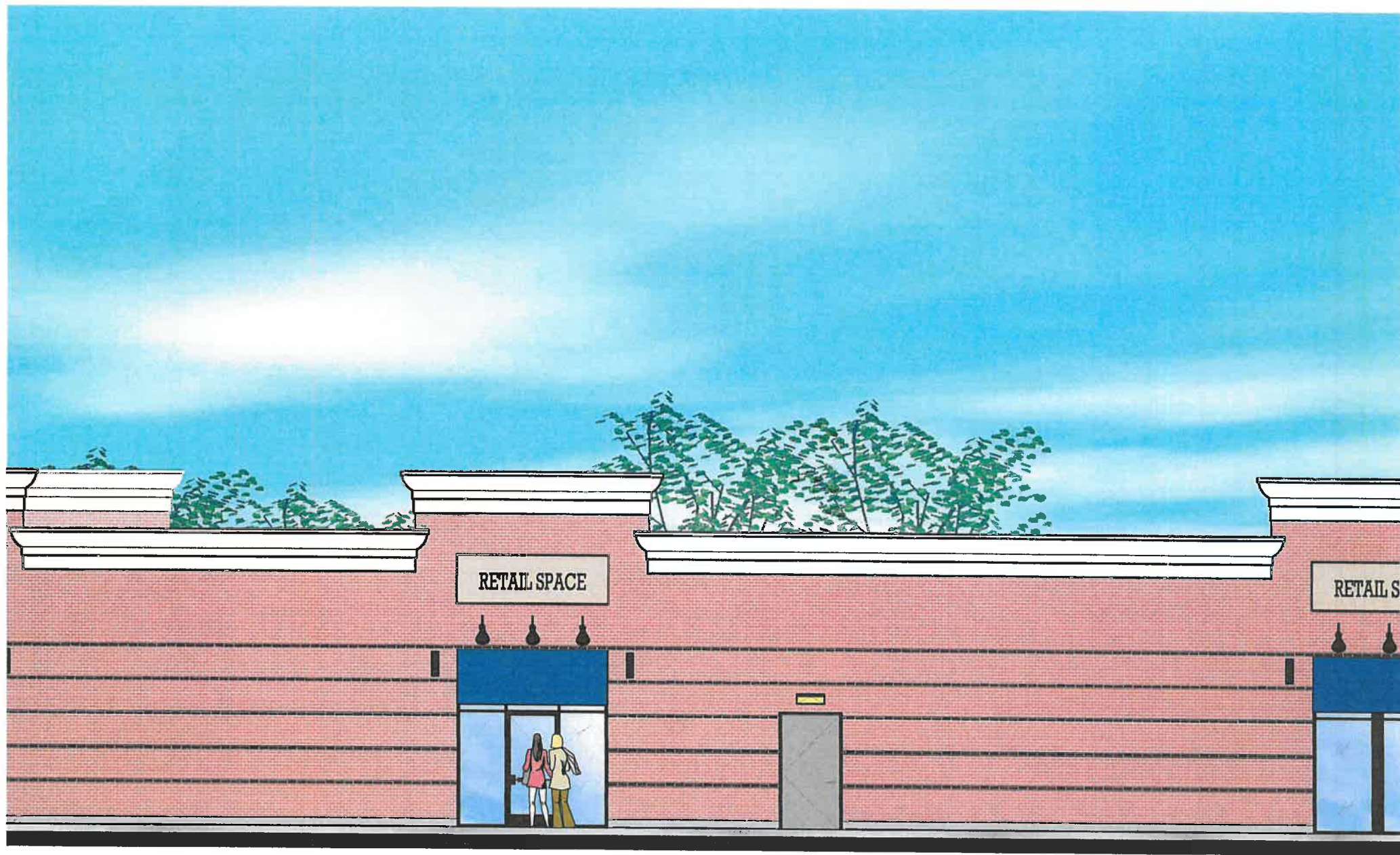
DUNKIN' DONUTS
 344 PLEASANT ST.
 BELMONT, MA

EXTERIOR ELEVATIONS

GIVEN	
BY	
DATE	
BY	
DATE	
BY	
DATE	

A-2.1

EXHIBIT F



T, MA



7, MA



IT, MA



IT, MA

EXHIBIT G

344 Pleasant Street
Belmont, Massachusetts

Traffic Impact & Access Study

Belmont Pleasant Street LLC
517 Concord Ave
Cambridge MA 02138



Prepared by:
Design Consultants, Inc.

October 2016
Revised February 2017

TABLE OF CONTENTS

EXECUTIVE SUMMARY	5
Study Area	5
Safety Analysis.....	5
Capacity Analysis	6
Conclusion	8
A. EXISTING CONDITIONS	9
A1. STUDY AREA	9
A2. STUDY ROADWAYS	9
A3. STUDY INTERSECTIONS	12
A4. MULTI-MODAL TRANSPORTATION.....	12
B. TRAFFIC VOLUME.....	15
B1. EXISTING TRAFFIC COUNTS	15
B2. SEASONAL ADJUSTMENT	15
B3. YEAR 2023 NO-BUILD CONDITIONS	16
Regional Growth Rate	16
B4. TRIP GENERATION	19
Site Generated Trips.....	19
B5. TRIP DISTRIBUTION AND ASSIGNMENT	26
B6. YEAR 2023 BUILD CONDITIONS.....	26
C. SAFETY ANALYSIS	31
C1. CRASH DATA AND ANALYSIS	31
C2. SIGHT DISTANCE ANALYSIS.....	34
D. CAPACITY ANALYSIS	35
D1. TRAFFIC ANALYSIS CRITERIA	35
D2. EXISTING CONDITIONS INTERSECTION ANALYSIS	36
D3. 2023 NO-BUILD CONDITIONS INTERSECTION ANALYSIS	38
D4. 2023 BUILD CONDITIONS INTERSECTION ANALYSIS.....	39
E. CONCLUSIONS	42
 APPENDICES	
<i>APPENDIX A – TRAFFIC COUNTS.....</i>	<i>43</i>
<i>APPENDIX B – MULTI-MODAL TRANSPORTATION.....</i>	<i>44</i>
<i>APPENDIX C – HISTORICAL DATA.....</i>	<i>45</i>
<i>APPENDIX D – TRIP GENERATION.....</i>	<i>46</i>
<i>APPENDIX E – SAFETY ANALYSIS</i>	<i>47</i>
<i>APPENDIX F – CAPACITY ANALYSIS.....</i>	<i>48</i>

LIST OF FIGURES

<i>Figure A1: Locus Map</i>	11
<i>Figure A2: Study Intersections</i>	14
<i>Figure B1: Year 2016 Existing Traffic Volumes</i>	17
<i>Figure B2: Year 2023 No-Build Traffic Volumes</i>	18
<i>Figure B3: Dunkin Donuts Locations within a 5-Mile Radius</i>	21
<i>Figure B4: Trip Distribution</i>	27
<i>Figure B5: Project Trips</i>	28
<i>Figure B6: Year 2023 Future Traffic Volumes – Restaurant</i>	29
<i>Figure B7: Year 2023 Future Traffic Volumes – Dunkin Donuts</i>	30

LIST OF TABLES

<i>Table A1: Level-of-Service Summary – Neighborhood Restaurant Alternative</i>	7
<i>Table A2: Level-of-Service Summary – Dunkin Donuts Alternative</i>	8
<i>Table B1: ATR Data Summary</i>	15
<i>Table B2: Trip Generation Calculations – Neighborhood Restaurant</i>	19
<i>Table B3: Trip Generation Calculations – Apparel Store</i>	19
<i>Table B4: Trip Generation Calculations – Hair Salon</i>	20
<i>Table B5: Trip Generation Calculations – Summary of Land Uses</i>	20
<i>Table B6: Trip Generation Calculations – Coffee/Donut Shop w/out DriveThru</i>	22
<i>Table B7: Trip Generation Calculations – Apparel Store</i>	22
<i>Table B8: Trip Generation Calculations – Hair Salon</i>	22
<i>Table B9: Trip Generation Calculations – Summary of Land Uses</i>	22
<i>Table B10: Summary Comparisons of Alternative One and Alternative Two</i>	23
<i>Table B11: Preliminary Trip Generation Calculations – Gasoline/Service Station</i>	23
<i>Table B12: Trip Generation Calculations – Prior Land Use vs. Proposed Land Uses with Neighborhood Restaurant</i>	24
<i>Table B13: Trip Generation Calculations – Prior Land Use vs. Proposed Land Uses with Dunkin Donuts Restaurant</i>	24
<i>Table B13: Mode Split Data for Residents of Belmont</i>	25
<i>Table B14: Adjusted Net Trip Generation – Three Land Uses including a Dunkin Donuts Restaurant</i>	25
<i>Table C1: MassDOT Intersection Crash Conditions</i>	32
<i>Table C2: MassDOT Intersection Crash Types</i>	33
<i>Table C3: MassDOT Intersection Crash Rates</i>	33

<i>Table C4: AASHTO Minimum Recommended ISD for Uncontrolled Intersections.....</i>	<i>34</i>
<i>Table C5: Measured ISD.....</i>	<i>35</i>
<i>Table D1: Intersection LOS Thresholds.....</i>	<i>36</i>
<i>Table D2: 2016 Existing Conditions LOS</i>	<i>37</i>
<i>Table D3: 2023 No-Build Conditions LOS</i>	<i>39</i>
<i>Table D4: 2023 Build Conditions LOS – Neighborhood Restaurant Alternative</i>	<i>40</i>
<i>Table D5: 2023 Build Conditions LOS – Dunkin Donuts Restaurant Alternative</i>	<i>41</i>

EXECUTIVE SUMMARY

Design Consultants, Inc. (DCI) has prepared this Traffic Impact and Access Study (TIAS) to analyze the impact of the proposed commercial development at 344 Pleasant Street on surrounding traffic operations in Belmont, Massachusetts. This TIAS is a revision to the previously prepared October 2016 TIAS. The site is bordered by Pleasant Street in the north, Brighton Street in the east, and residences and commercial spaces in the south and west. Land use surrounding the site is mixed-use that is both commercial and residential. The proposed project will demolish the existing building to construct a new commercial building which be occupied by either a Dunkin Donuts restaurant and two other retail spaces, or a Neighborhood Restaurant and two other retail spaces. According to the Institute of Transportation Engineers (ITE), Neighborhood Restaurant's are "restaurants that serves lunch and dinner...may also be open for breakfast...and typically do not take reservations." The Dunkin Donuts or the Neighborhood Restaurant will occupy 1,500 square feet, while the two other retail spaces will occupy a combined 1,747 square feet. There will also be an additional 269 square feet on the first floor that will act as a common space and bathrooms to be shared between the three different land uses. Site access will be provided via curb cuts on both Pleasant Street and Brighton Street. These curb cuts will provide access to a ground level parking area at grade with the building, providing 20 parking spaces. A sight distance analysis was carried out at the proposed locations for the Pleasant Street and Brighton Street curb cuts to ensure safe movements entering and exiting the site.

A safety analysis of the most recent three years of crash data was completed to point out possible existing safety issues within the study area that may need to be addressed as part of the traffic study. It was determined that none of the study intersections analyzed had crash rates above district or State averages. Capacity analyses of 2016 Existing, 2023 No-Build, and 2023 Build traffic conditions were carried out to assess the impact that the new development at 344 Pleasant Street will have on local traffic operations. The anticipated traffic impact due to this project is expected to be minimal and create no greater impact than the prior land use. Therefore no mitigation is proposed.

Study Area

The following three intersections in Belmont were examined in this traffic study:

- Pleasant Street and Brighton Street
- Brighton Street and Cross Street
- Pleasant Street and Lake Street/Frontage Road

Each of the study intersections is highlighted relative to the project site in Figure A2. See Section A for detailed descriptions of existing conditions.

Safety Analysis

Crash data from the Massachusetts Department of Transportation (MassDOT) was analyzed from years 2011 to 2013. The data was analyzed to determine trends in location, manner of collision, and weather in order to point out high crash locations and analyze possible causation if necessary.

None of the intersections studied have crash rates above District 4 or State averages. Based on this analysis, there are no major safety issues with existing conditions or intersection geometries that need to be addressed as part of this traffic study. Detailed safety analyses and crash data is contained in Section C. As part of the safety analysis, a sight distance analysis was carried out for the proposed driveway locations on Pleasant Street and Brighton Street. Minimum recommended sight distance set forth by The American Association of State Highway and Transportation Officials (AASHTO) is met by the locations of the proposed driveways.

Capacity Analysis

For each intersection, capacity analyses were carried out under three scenarios: 2016 Existing Conditions, No-Build in year 2023, and Build in year 2023, all of which are explained later in this report.

MassDOT Transportation Impact Assessment (TIA) Guidelines require a 7-year planning horizon. The Existing Conditions Analysis is based on current traffic counts carried out in the study area, the results of which were adjusted and calibrated to reflect a typical day on the calendar. The 2023 No-Build scenario takes adjusted existing traffic volumes, applies a conservative regional growth rate, and adds any area specific traffic due to development. The 2023 Build scenario adds the predicted site specific traffic volumes to the 2023 No-Build scenario. Detailed breakdowns of each of these scenarios are included in Section B of this report.

Level of Service (LOS) is a term used to qualitatively measure performance of traffic conditions of each intersection and is explained further in the body of this study. A comparison showing the results of the capacity analyses are shown in Tables A1 and A2.

Table A1: Level-of-Service Summary – Neighborhood Restaurant Alternative

ID	East-West Road	North-South Road	Lane	Existing		No-Build*		Build - Restaurant Alternative	
				AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
1	Pleasant Street	Lake Street/ Frontage Road	SB L	E	D	E	D	E	D
			SB T	E	D	E	D	E	D
			SB R	C	C	C	B	C	B
			NB L	D	D	D	D	D	D
			NB R	B	E	B	E	B	E
			EB TR	C	C	C	C	C	C
			WB L	C	B	B	B	B	B
			WB T	B	B	B	B	B	B
			Overall	C	C	C	C	C	C
2	Pleasant Street	Brighton Street	SB LTR	B	B	B	B	B	B
			NB LT	B	B	B	B	B	B
			NB R	A	A	A	A	A	A
			EB LTR	C	C	C	C	C	C
			WB L	E	F	E	F	E	F
			WB TR	C	B	B	B	B	B
			Overall	C	E	C	E	C	E
3	Brighton Street	Cross Street	SB LTR	B	B	B	B	B	B
			NB LTR	B	E	B	D	B	D
			EB LTR	C	D	C	D	C	D
			WB LTR	F	F	F	F	F	F
			Overall	D	F	D	D	D	D

*Any Improvements to No-Build Conditions are due to the MassDOT requirement of using a 0.92 Peak Hour Factor for future conditions.

Table A2: Level-of-Service Summary – Dunkin Donuts Alternative

ID	East-West Road	North-South Road	Lane	Existing		No-Build*		Build - Dunkin Donuts Alternative	
				AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
1	Pleasant Street	Lake Street/ Frontage Road	SB L	E	D	E	D	E	D
			SB T	E	D	E	D	E	D
			SB R	C	C	C	B	C	B
			NB L	D	D	D	D	D	D
			NB R	B	E	B	E	B	E
			EB TR	C	C	C	C	C	C
			WB L	C	B	B	B	B	B
			WB T	B	B	B	B	B	B
			Overall	C	C	C	C	C	C
2	Pleasant Street	Brighton Street	SB LTR	B	B	B	B	B	B
			NB LT	B	B	B	B	B	B
			NB R	A	A	A	A	A	A
			EB LTR	C	C	C	C	C	C
			WB L	E	F	E	F	E	F
			WB TR	C	B	B	B	B	B
			Overall	C	E	C	E	C	E
3	Brighton Street	Cross Street	SB LTR	B	B	B	B	B	B
			NB LTR	B	E	B	D	B	D
			EB LTR	C	D	C	D	C	D
			WB LTR	F	F	F	F	F	F
			Overall	D	F	D	D	D	D

*Any improvements to No-Build Conditions are due to the MassDOT requirement of using a 0.92 Peak Hour Factor for future conditions.

As can be seen from Tables A1 and A2, the proposed redevelopment at 344 Pleasant Street will have no detrimental impact on surrounding traffic networks. Zero movements degrade in Level of Service going from the No-Build to Build scenarios. The direct impact of the project on traffic conditions is reflected in the lack of change between the No-Build and Build scenarios. It will be shown in this report that the proposed redevelopment will have no negative impact on the surrounding traffic network. Given that there are no negative expected impacts, there is no mitigation needed proposed to alleviate changes in traffic operations.

Conclusion

From a safety perspective, data shows that all study intersections have below average crash rates, and the proposed driveway locations do not present any issues in terms of sight distance. A comparison of 2016 Existing, 2023 No-Build, and 2023 Build traffic conditions shows that there will be no detrimental impact due to the proposed development at 344 Pleasant Street. Therefore, no mitigation relating to traffic operations is proposed.

A. EXISTING CONDITIONS

A1. STUDY AREA

The study area is located in a commercial and residential area in Belmont. The site address is 344 Pleasant Street. The following three intersections were selected for analysis as part of this traffic impact study, and Figure A1 is a locus map, showing the study area relative to the larger transportation network:

- Pleasant Street and Brighton Street
- Brighton Street and Cross Street
- Pleasant Street and Lake Street/Frontage Road


A2. STUDY ROADWAYS

Pleasant Street is classified as an Urban Principal Arterial under Town of Belmont jurisdiction. It runs northwest-southeast through the study area, and carries one lane in each direction at the project location and two lanes in each direction just east of the project location. Pleasant Street is approximately 2.8 miles in length, and runs from its western limit at its intersection with Trapelo Road in Belmont, to its eastern limit at its intersection with Massachusetts Avenue in Arlington. Pleasant Street has a 29 to 39 foot curb to curb width in the vicinity of the study area. Parking is not allowed on either side of the street within the vicinity of the project area. Land use on Pleasant Street is mixed residential and commercial.

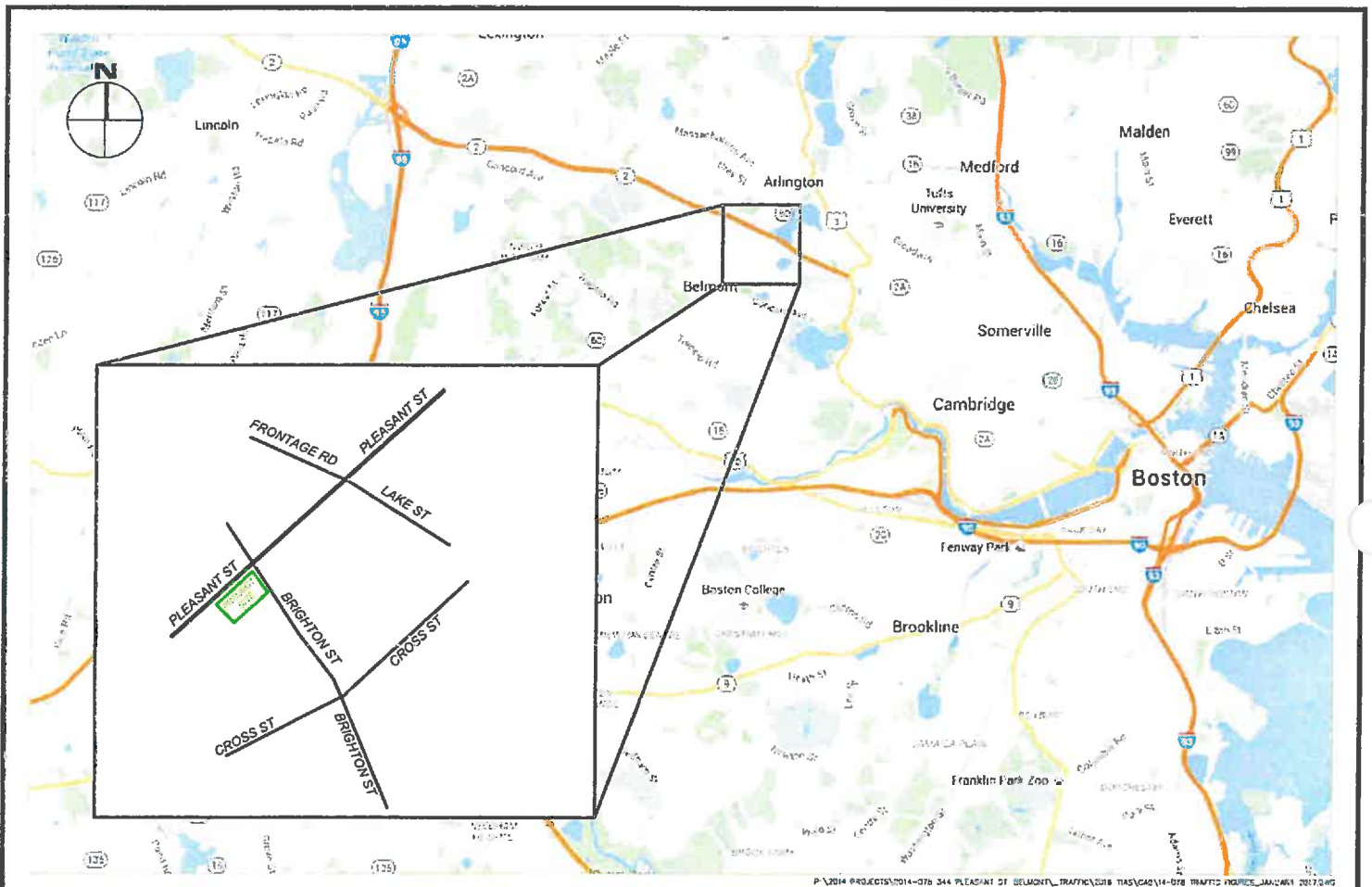
Brighton Street is classified as an Urban Minor Arterial under Town of Belmont jurisdiction. It runs southeast-northwest through the study area. It carries one travel lane in either direction, and parking is only allowed on-street north of its intersection with Pleasant Street. Land use along Brighton Street is both commercial and residential. Brighton Street is approximately 0.9 miles long. There are sidewalks provided on both sides of Brighton Street. There are no bike facilities on Brighton Street.

Lake Street is classified as an Urban Minor Arterial under Town of Belmont jurisdiction. It carries one lane in each direction, and is approximately 1.2 miles long. Land use is primarily residential. The posted speed limit is 30 miles per hour. There are no bike facilities on Lake Street.

Frontage Road is classified as an Urban Minor Arterial under Town of Belmont jurisdiction. It runs approximately 1.7 miles in a generally northwest-southeast direction. Frontage Road is one-way in the southeast direction from its intersection with Standish Road to its intersection with Pleasant Street. Frontage Road carries one left-turn only lane, one through-left turn lane, and one right-turn only slip lane in the study area. The speed limit on Frontage Road is 25 mph in the vicinity of the study area.



Cross Street is classified as an Urban Collector under Town of Belmont jurisdiction. It is approximately 0.9 miles long, spanning in a southwest-northeast direction to connect Channing Road and Lake Street. Cross Street carries one travel lane in both directions. Sidewalks are provided on the both sides of the road.



Design Consultants, Inc.
 Consulting Engineers and Surveyors
 120 MIDDLESEX AVENUE, SUITE 20
 SOMERVILLE, MA 02145
 (617) 776-3350
 Copyright 2015 Design Consultants, Inc.

**344 PLEASANT STREET
 BELMONT, MA**

Locus Map

PROJECT NO.: 2014-078

DATE: JANUARY 2017

SCALE: N.T.S.

Figure A1

A3. STUDY INTERSECTIONS

There are three intersections in this study. All of the study intersections are signalized. Figure A2 shows the study locations relative to the project site.

The intersection of **Pleasant Street and Brighton Street** is a four-way, signalized intersection. Pleasant Street runs northeast-southwest, and Brighton Street runs northwest-southeast. For vehicles, right turn on red is allowed for all movements, however it is prohibited during the all-pedestrian phase. There are crosswalks across all approaches at this intersection. Near the intersection, parking is prohibited on both roads. Sidewalks are located at all approaches to the intersection. The pedestrian phase is exclusive and provides protected crossings for Pleasant Street and Brighton Street.

The intersection of **Brighton Street and Cross Street** is a four-way, signalized intersection. Each approach carries one lane in either direction. There are crosswalks provided across all approaches, and the pedestrian phase is exclusive. Vehicles are permitted to make right turns on red at all times. There are sidewalks provided at each approach.

The intersection of **Pleasant Street and Lake Street/Frontage Road** is a four-way, signalized intersection. The Pleasant Street approach carries two lanes in the northeast direction, and two through lanes and a left-turn only lane in the southwest direction. The Lake Street approach carries a right-turn only and a left-turn only lane. The Frontage Road approach carries one left-turn only lane, a through-left lane, and a right-turn slip lane that operates under no control. Sidewalks are provided at all approaches to the intersection except the north side of Frontage Road. Crosswalks are present across the all approaches except across Pleasant Street north of the intersection.


A4. MULTI-MODAL TRANSPORTATION

MBTA Bus Service

In the vicinity of the project site, MBTA bus routes 62, 67, 76, 78, and 84 service the area. Most of these run along Frontage Road and Lake Street, with route 78 running closest to the project site. Detailed maps and schedules for each bus route are provided in Appendix B.

Route 62 provides service between the Bedford VA Hospital and Alewife Station. It runs for a stretch along Frontage Road and Lake Street, approximately 700 feet northeast of the project site. Route 62 runs at approximately 35 minute intervals.

Route 67 provides service between Lawrence Lane in Arlington to Alewife Station. It runs for a stretch along Frontage Road and Lake Street, approximately 700 feet northeast of the project site. Route 67 runs at approximately 30 minute intervals.



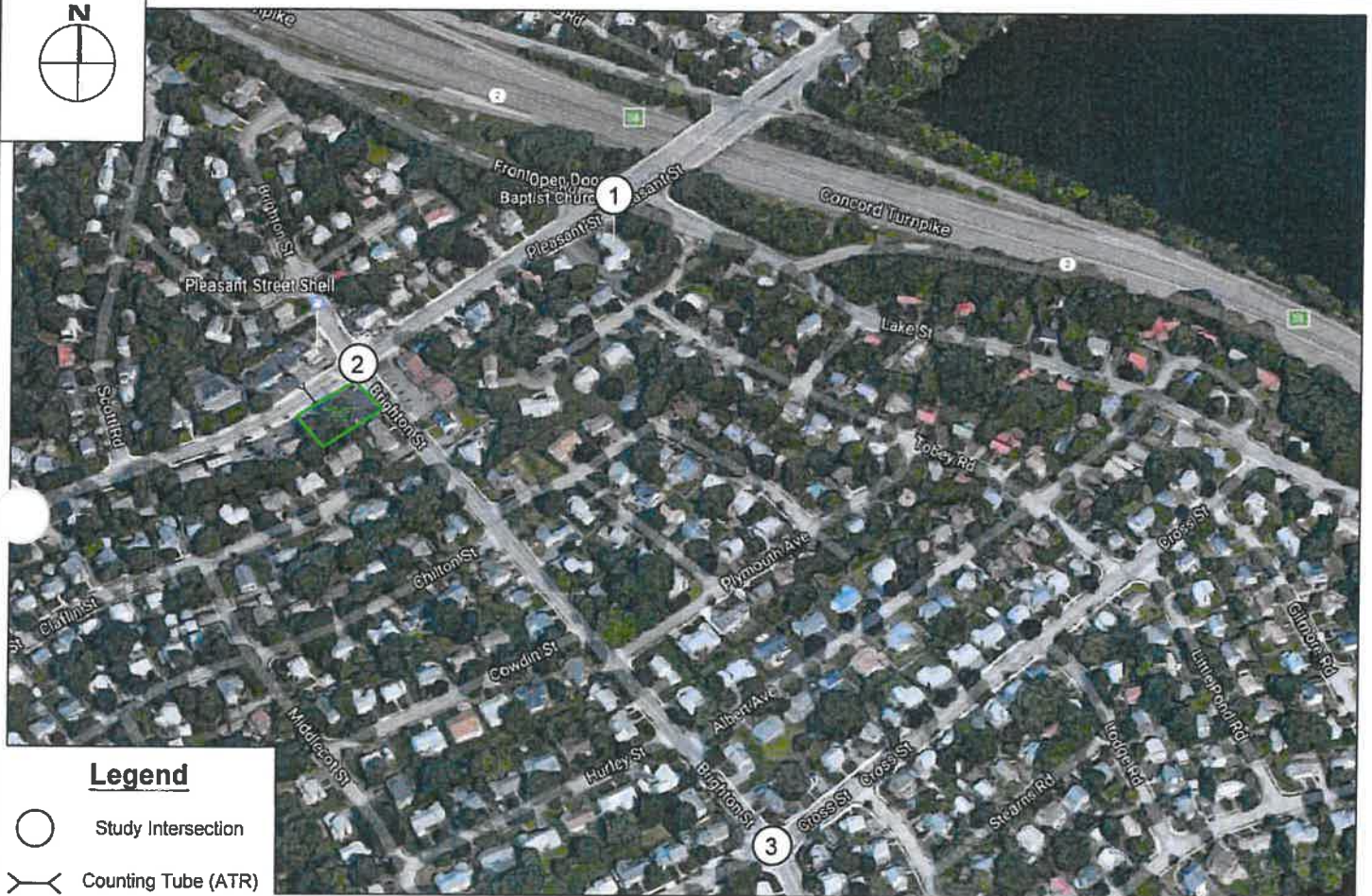
Route 76 provides service between Hanscom/Lincoln Labs and Alewife Station. It travels along Frontage Road and Lake Street, with the nearest stop approximately a 700 feet northeast of the project site. Route 76 runs at 20-40 minute intervals.

Route 78 provides service between Wadsworth Road in Arlington and Harvard Square in Cambridge. The route runs along Pleasant Street and Brighton Street, with a stop at the corner of the project site. Route 78 runs at 25-35 minute intervals.



Route 84 provides service between Wadsworth Road in Arlington and Alewife Station in Cambridge. In the vicinity of the project area, the route runs along Frontage Road and Lake Street. It runs at 30 minute intervals.

Pedestrian and Bicycle Facilities

For pedestrians, there are sidewalks provided along many of the streets in the project area and crosswalks are provided across most approaches at each intersection. Pedestrian signals are present at all intersections, and two of the three intersections provide an exclusive pedestrian phase when the signal is activated via push button by the pedestrian. There are no exclusive bicycle facilities in the vicinity of the project area.



Legend

-  Study Intersection
-  Counting Tube (ATR)

P:\2014 PROJECTS\2014-078 344 PLEASANT ST. BELMONT_TRAFFIC\2016 TIAS\CAD\14-078 TRAFFIC FIGURES_JANUARY 2017.DWG

Design Consultants, Inc.
 Consulting Engineers and Surveyors
 120 MIDDLESEX AVENUE, SUITE 20
 SOMERVILLE, MA 02145
 (617) 776-3350
 Copyright 2015 Design Consultants, Inc.

**344 PLEASANT STREET
 BELMONT, MA**

**Study
 Intersections**

PROJECT NO.: 2014-078

DATE: JANUARY 2017

SCALE: N.T.S.

Figure A2

B. TRAFFIC VOLUME

B1. EXISTING TRAFFIC COUNTS

DCI contracted with Transportation Data Corporation (TDC) to collect turning movement counts in March 2016. In order to provide accurate analysis for separate peak periods during the day, TDC and DCI collected two peak hours' data for both AM (7am to 9am) and PM (4pm to 6pm) peak periods on a typical weekday. The traffic counts collected were turning movements at the intersections of Pleasant Street and Brighton Street, Pleasant Street and Lake Street/Frontage Road, and Brighton Street and Cross Street.

In compliance with MassDOT Transportation Impact Assessment (TIA) Guidelines, TDC collected Automatic Traffic Recorder (ATR) counts through three consecutive days during a Tuesday to Thursday period in March 2016. The ATR collected traffic volume data, vehicular speed data, vehicle classification data, and the length of gaps in between vehicles. The counts are summarized in 15-minute, hourly, and daily intervals. Data was collected at the following location:

- Pleasant Street between Brighton Street and Lake Street/Frontage Road

The ATR data collected on Pleasant Street are summarized in Table B1. As indicated in Table B1, the average weekday daily traffic on Pleasant Street is 22,372 vehicles. The 85th percentile speed is defined as the speed at or below which 85% of the vehicles are travelling. Throughout an average weekday, the 85th percentile speed is 28 MPH and 33 MPH in the northbound and southbound directions, respectively. Complete traffic count data are provided in Appendix A.

Table B1: ATR Data Summary

Location	ADT	Weekday AM Peak Hour			Weekday PM Peak Hour		
		Volume	K	Peak Direction	Volume	K	Peak Direction
Pleasant Street Between Brighton Street and Lake Street	22372	1866	8%	63% SB	1833	8%	55% SB

B2. SEASONAL ADJUSTMENT

As per the MassDOT *Traffic Impact Assessment (TIA) Guidelines* and *Traffic and Safety Engineering 25% Design Submission Guidelines*, a seasonal factor was calculated to adjust the traffic counts to reflect average annual daily traffic conditions. By calculating monthly volumes from MassDOT Permanent Counting Station #4798 on Concord Turnpike (Route 2) westbound at the Pleasant Street on-ramp in North Waltham, it was determined that traffic levels in the vicinity of the project site are 1.16% lower in March when compared to the average monthly rate. In order to be more conservative, existing traffic volumes were increased by 1.16%. The resulting existing peak hour traffic volumes are shown in Figure B1. The detailed seasonal adjustment has been attached in Appendix C.

B3. YEAR 2023 NO-BUILD CONDITIONS

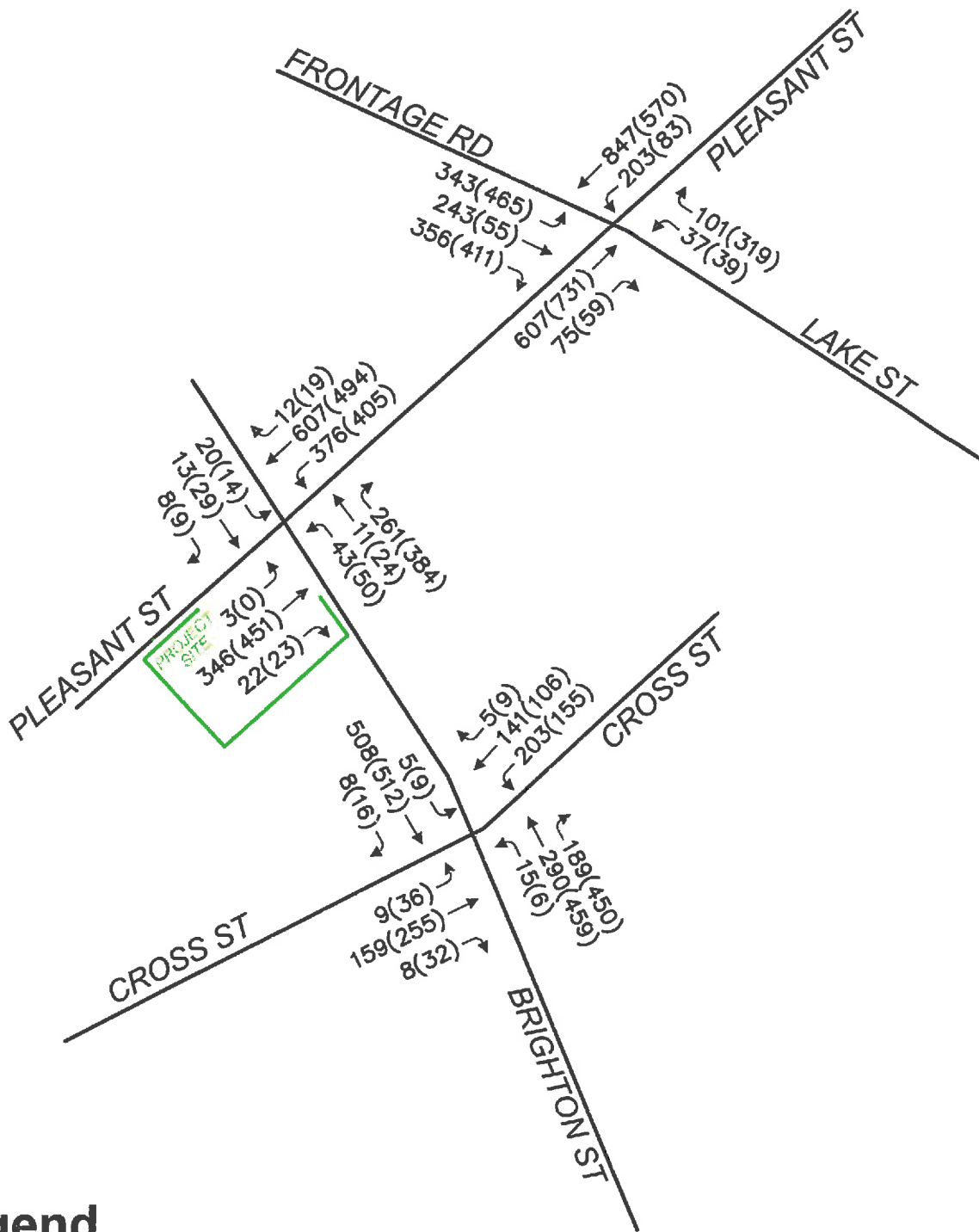
Traffic volumes in the study area were projected to the year 2023, which reflects a seven-year planning horizon from the existing year 2016, consistent with MassDOT's Traffic Impact Assessment (TIA) guidelines. The traffic conditions for the year 2023 under No-Build conditions were examined independent of the proposed project, including all existing traffic and new traffic.

Traffic growth occurs due to land development in the immediate area and the surrounding region. Two methods are typically employed to estimate this growth. The first method identifies planned and permitted developments in the vicinity of the study area. For these specific developments, traffic estimates are generated and assigned to the study network. The second method is to use an annual percentage increase in traffic growth, which is applied to all traffic volumes under study. This method generally covers traffic growth due to regional developments outside the study area or developments that are proposed but not yet permitted. As there are no other projects identified in the area that will affect traffic operations at the study intersections, only a regional growth rate was applied for the purpose of this report.

Regional Growth Rate

Based on discussions with the Boston Region Metropolitan Planning Organization known as the Central Transportation Planning Staff (CTPS), and traffic volume data compiled by MassDOT from count stations, an annual traffic growth rate for Belmont was chosen for analysis purposes. In order to provide an accurate and conservative analysis, a 0.002 percent compounded annual growth rate was used to account for general background traffic growth and development by others not yet identified. This number is based on the CTPS Long Range Transportation Plan published in 2011, and updated in 2013. The 0.002 percent growth rate was verified by the Director of Technical Services at MAPC in conjunction with the Travel Model Development and Transportation Systems Analysis divisions.

Figure B2 shows the traffic volumes for the year 2023 No-Build condition. These volumes include a conservative regional growth rate of 0.002% per year for Belmont, MA.



Legend

XX(YY) AM(PM) Existing Peak Hour Volumes

Design Consultants, Inc.
Consulting Engineers and Surveyors

120 MIDDLESEX AVENUE
SOMERVILLE, MA 02145
617-776-3350

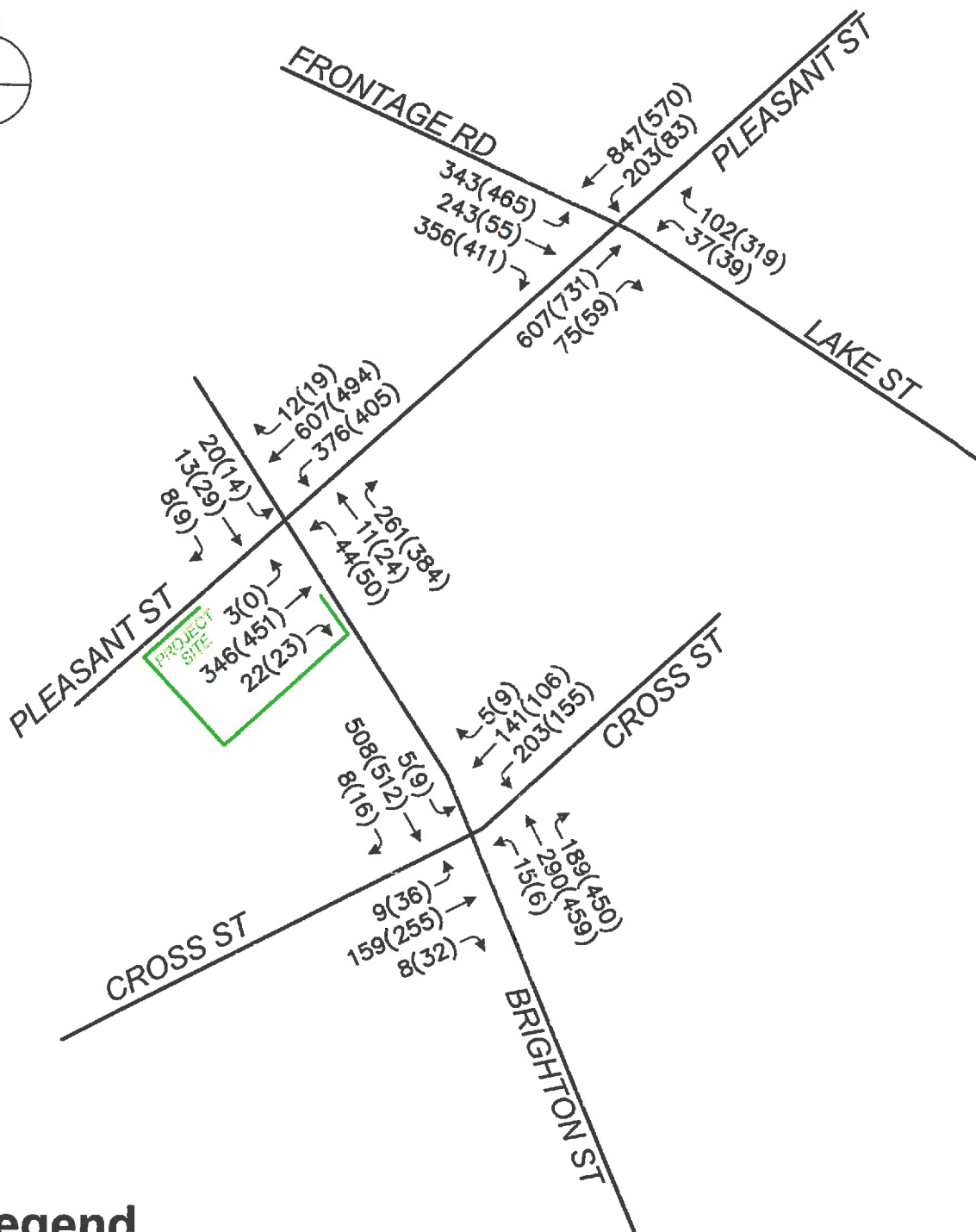
88 PLEASANT STREET
NEWBURYPORT, MA 01950
978-358-7173

**344 PLEASANT STREET
BELMONT, MA**

**Figure B1
2016 Existing
Traffic Volumes**

DATE: JAN. 2017

DCI PROJECT: 2014-078



Legend

xx(yy) AM(PM) No-Build Peak Hour Volumes

Design Consultants, Inc.

Consulting Engineers and Surveyors

120 MIDDLESEX AVENUE
SOMERVILLE, MA 02145
617-776-3250

68 PLEASANT STREET
NEWBURYPORT, MA 01950
978-358-7173

344 PLEASANT STREET
BELMONT, MA

Figure B2
2023 No-Build
Traffic Volumes

DATE: JAN. 2017

DCI PROJECT: 2014-078

B4. TRIP GENERATION

Site Generated Trips

For this study, there were two alternatives analyzed. Both alternatives consist of three commercial spaces that would occupy a total of 3,247 square feet of space. Additionally, both alternatives would consist of one of the retail spaces being a Hair Salon and one being an Apparel Store. Alternative One would consist of the third commercial space, a total of 1,500 square feet, being occupied by a Neighborhood Restaurant. Alternative Two would consist of the third commercial space, also 1,500 square feet, being occupied by a Dunkin Donuts restaurant. The trip generation for each alternative is shown below.

Neighborhood Restaurant (1,500 Square Feet) & Two Other Land Uses (1,747 Square Feet Total)

Alternative One is a Neighborhood Restaurant and two other land uses on the same property. The base trip generation rates used were taken from the *Trip Generation Manual, 9th Edition* published by the Institute of Transportation Engineers (ITE) in 2012. Land Use Codes 932, 876, and 918 were used for this alternative. Tables B2 to B4 show the trip generation calculations for each land use, and Table B5 summarizes the trip generation calculations.

Table B2: Trip Generation Calculations – Neighborhood Restaurant

Land Use Code: 932		
	AM Peak Hour	PM Peak Hour
Size (per 1000sqft)	1.500	1.500
multiply by	10.81	9.85
Total Trips	16	15
Deduct 43% Pass-By Trips in PM	16	8
AM Peak + PM Peak Trips	24	

Table B3: Trip Generation Calculations – Apparel Store

Land Use Code: 876		
	AM Peak Hour	PM Peak Hour
Size (per 1000sqft)	0.746	0.746
multiply by	1.00	3.83
Total Trips	1	3
AM Peak + PM Peak Trips	4	

Table B4: Trip Generation Calculations – Hair Salon

Land Use Code: 918		
	AM Peak Hour	PM Peak Hour
Size (per 1000sqft)	1.001	1.001
multiply by	1.21	1.45
Total Trips	1	1
AM Peak + PM Peak Trips	2	

Table B5: Trip Generation Calculations – Summary of Land Uses

Summary of Proposed Trips (Three Uses)		
	AM Peak Hour	PM Peak Hour
Total Trips	18	12
AM Peak + PM Peak Trips	30	

As shown in Table B5, the three land uses consisting of a Neighborhood Restaurant, Apparel Store, and Hair Salon is expected to generate 18 new trips during the morning peak hour and 12 new trips during the evening peak hour, for a total of 30 new trips during both peak hours combined. As per the *Trip Generation Handbook, 3rd Edition*, a 43% pass-by trip rate was applied to the Restaurant during the evening peak hour, thus reducing the number of trips generated by the proposed land use.

Dunkin Donuts (1,500 Square Feet) & Two Other Land Uses (1,747 Square Feet Total)

Alternative Two is a Dunkin Donuts and two other land uses on the same property. The base trip generation rates used were taken from the *Trip Generation Manual, 9th Edition* published by ITE in 2012. Land Use Codes (LUC) 936 – Coffee/Donut Shop without DriveThru Window, 876 – Apparel Store, and 918 – Hair Salon were used for this alternative, although they are subject to change. Pass-by trips played a large role in this scenario, as many trips to the Dunkin Donuts are expected to be pass-by trips. Pass-by trips are trips that are already in the traffic network, decide to stop at the location being studied, and then continue onto the traffic network. Pass-by trips are not new trips generated by the project, thus they are subtracted out from the generated vehicle-trips. One of the main reasons for deducting pass-by trips for this project is due to the high volume of Dunkin Donuts restaurants in the area. Figure B3 shows the location of Dunkin Donuts restaurants within a five-mile radius of the Project site. Consequently, many drivers do not have to go out of their way to visit a Dunkin Donuts, but rather are able to stop at one that is on the way to their destination, meaning they are already using the traffic network.

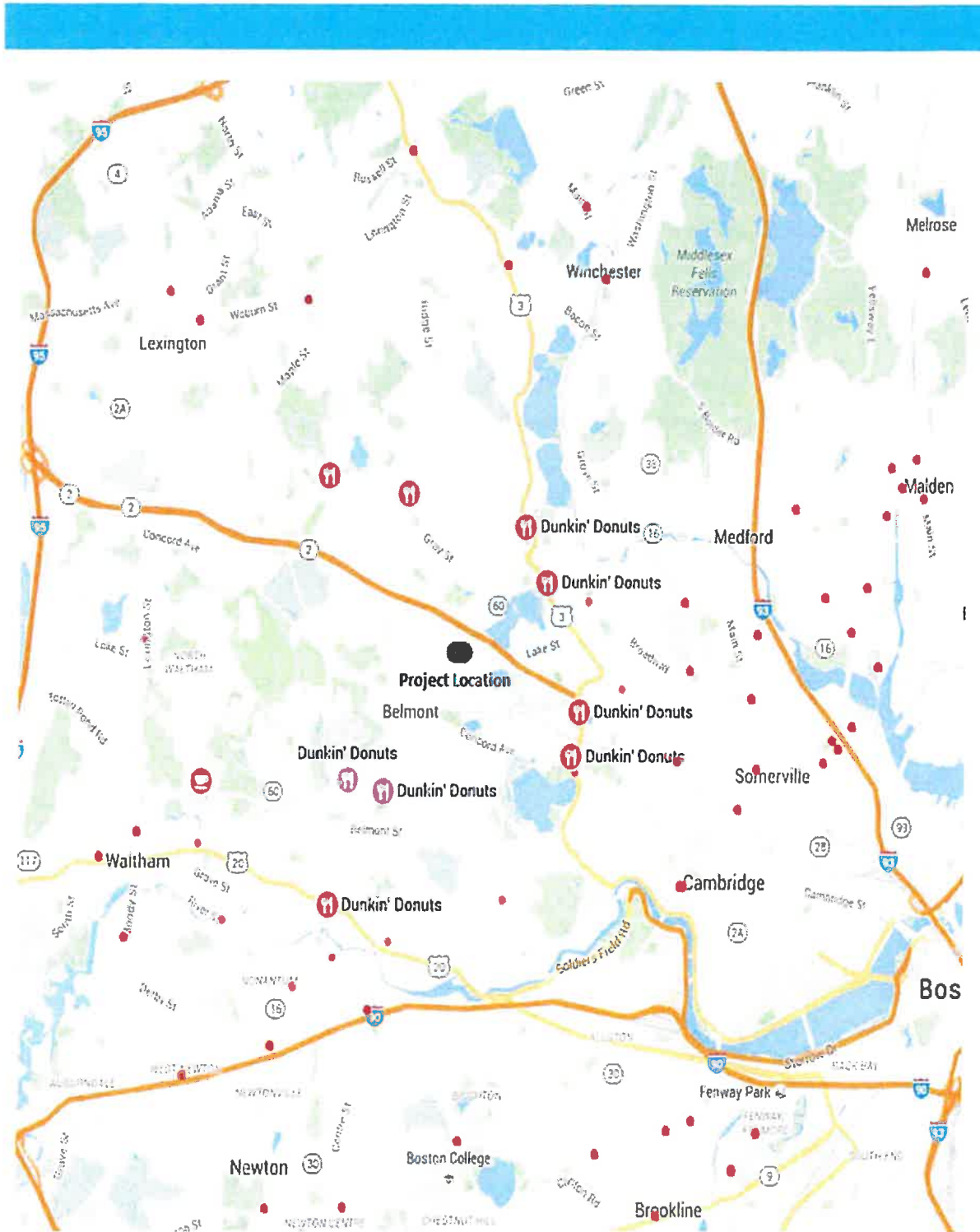


Figure B3: Dunkin Donuts Locations within a 5-Mile Radius

A 75% reduction for pass-by trips was estimated for LUC 936 – Coffee/Donut Shop without DriveThru based on the ITE *Trip Generation Handbook, 3rd Edition*. More trip generation information can be found in Tables B6 to B9.

Table B6: Trip Generation Calculations – Coffee/Donut Shop w/out DriveThru

Land Use Code: 936		
	AM Peak Hour	PM Peak Hour
Size (per 1000sqft)	1.500	1.500
multiply by	64.21	25.81
Total Trips	96	39
Deduct 75% Pass-By Trips	24	10
AM Peak + PM Peak Trips	34	

Table B7: Trip Generation Calculations – Apparel Store

Land Use Code: 876		
	AM Peak Hour	PM Peak Hour
Size (per 1000sqft)	0.746	0.746
multiply by	1.00	3.83
Total Trips	1	3
AM Peak + PM Peak Trips	4	

Table B8: Trip Generation Calculations – Hair Salon

Land Use Code: 918		
	AM Peak Hour	PM Peak Hour
Size (per 1000sqft)	1.001	1.001
multiply by	1.21	1.45
Total Trips	1	1
AM Peak + PM Peak Trips	2	

Table B9: Trip Generation Calculations – Summary of Land Uses

Summary of Proposed Trips (Three Uses)		
	AM Peak Hour	PM Peak Hour
Total Trips	26	14
AM Peak + PM Peak Trips	40	

As shown from Table B9, the three different land uses are expected to generate 26 trips during the morning peak hour and 14 trips during the evening peak hour, for a total of 40 trips during both peak hours combined.

A comparison of the two alternatives illustrates that Alternative One, with a 1,500 square foot Neighborhood Restaurant, is expected to generate fewer trips than Alternative Two, with a 1,500 square foot Dunkin Donuts. As shown in Table B10, Alternative One is expected to generate a

total of 30 trips during both the morning and evening peak hours combined, while Alternative Two is expected to generate a total of 40 trips during both the morning and evening peak hours combined. Alternative One would be expected to result in three fewer peak hour trips than Alternative Two.

Table B10: Summary Comparisons of Alternative One and Alternative Two

Comparison of Alternatives		
	Alternative One (incl. Restaurant)	Alternative Two (incl. Dunkin Donuts)
AM Peak Hour Trips	18	26
PM Peak Hour Trips	12	14
Total Trips	30	40

Comparison with Prior Land Use

There is a second comparison, which compares the prior use of the site with the proposed redevelopment. Land Use Code 945 – Gasoline/Service Station was used, and Table B11 summarizes the trip generation calculations. As with the Dunkin Donuts, many trips for a gas station are also considered to be pass-by trips. A pass-by trip percentage of 78% was used for the previous land use, taken from research of traffic at gas stations. The 78% reduction for pass-by trips for LUC 945 – Gasoline/Service Station is shown in Table B7.

Table B11: Preliminary Trip Generation Calculations – Gasoline/Service Station

Land Use Code: 945		
	AM Peak Hour	PM Peak Hour
Size (Vehicle Fueling Stations)	8.0	8.0
multiply by	12.58	15.65
Total Trips	100	126
Deduct 78% Pass-By Trips	22	28
AM Peak + PM Peak Trips	50	

As shown in Table B11, the prior land use generated 22 trips during the morning peak hour and 28 trips during the evening peak hour, for a total of 50 trips during the morning and evening peak hours combined. Tables B12 and B13 show a comparison in trips between the prior land use and the proposed alternatives.

Table B12: Trip Generation Calculations – Prior Land Use vs. Proposed Land Uses with Neighborhood Restaurant

Net New Trips		
	AM Peak Hour	PM Peak Hour
Prior Land Use	22	28
Proposed (incl. Restaurant)	18	12
Difference	-4	-16
AM + PM Peak Trips (Total Difference)	-20	

As shown in Table B12, the proposed land uses with a Neighborhood Restaurant is expected to generate four (4) fewer trips during the morning peak hour and sixteen (16) fewer trips during the evening peak hour. Both the four (4) fewer trips during the morning peak hour and the sixteen (16) trips during the evening peak hour are considered to be a net zero number of trips for further trip generation calculations.

Table B13: Trip Generation Calculations – Prior Land Use vs. Proposed Land Uses with Dunkin Donuts Restaurant

Net New Trips		
	AM Peak Hour	PM Peak Hour
Prior Land Use	22	28
Proposed (incl. Dunkin Donuts)	26	14
Difference	+4	-14
AM + PM Peak Trips (Total Difference)	-10	

As shown in Table B13, the proposed land uses with a Dunkin Donuts Restaurant is expected to generate four (4) more trips during the morning peak hour and fourteen (14) fewer trips during the evening peak hour. The four (4) trips during the morning peak hour will be used for further trip generation calculations and the fourteen (14) fewer trips during the evening peak hour are considered to be a net zero number of trips for further trip generation calculations. These trip rates are unadjusted, as they account for all trips. Non-vehicle trips were deducted from the base trips in the following steps.

Mode Share

ITE's Trip Generation methods are typically based on data from suburban developments with no nearby transit service and no appreciable share of people walking or bicycling to or from the site. Commuting characteristics were analyzed from the 2014 American Community Survey 5-Year Estimates. Census Data for Belmont was analyzed and used to estimate mode splits for journeys to work in the project area. Table B13 displays estimated mode splits.

Table B13: Mode Split Data for Residents of Belmont

MEANS OF TRANSPORTATION TO WORK	
Car, truck, or van	70.8%
Drove alone	63.2%
Carpooled:	7.6%
In 2-person carpool	6.3%
In 3-person carpool	0.8%
In 4 person carpool	0.5%
Public transportation (excluding taxicab)	14.7%
Bicycle	1.6%
Walked	2.3%
Other means	1.4%
Worked at home	9.2%

Based on the modal split data above, an Average Vehicle Occupancy (AVO) rate of 1.1 persons per vehicle was calculated. The AVO of 1.1 persons per vehicle was applied to the preliminary trip generation calculations to determine the total number of Person-Trips that are expected to be generated by the project. Then the number of non-vehicle trips was determined by multiplying the person-trips by the percentage expected to utilize transit, bicycling and walking to access the Project site. The US Census Journey to Work data for the Town of Belmont is attached in Appendix D.

Trip Generation Summary

The public transit, walking, and biking mode share from the US Census Data for Belmont was taken and applied to the total person trips. By applying this non-vehicular mode split to the Trip Generation calculations, the amount of expected vehicle traffic associated with the 344 Pleasant Street project is reduced. The resulting adjusted vehicular traffic on the surrounding roadways was estimated and is summarized in Table B14.

Table B14: Adjusted Net Trip Generation – Three Land Uses including a Dunkin Donuts Restaurant

	AM Peak Hour	PM Peak Hour
Base Trips	4	0
Total Person-Trips	4	0
Total Vehicle-Trips	3	0
Entering Vehicle-Trips	2	0
Exiting Vehicle-Trips	1	0
Total Public Transportation Trips	1	0
Total Bicycle Trips	0	0
Total Walking Trips	0	0

As indicated in Table B14, the project is expected to generate four (4) total net new trips during weekday morning peak hour and zero (0) net new total net trips during weekday evening peak hour. Generated vehicle-trips are expected to be three (3) during the morning peak hour and zero (0) during the evening peak hour. Given that there are 1,722 vehicle trips currently at the intersection of Pleasant Street and Brighton Street, the three (3) net new vehicle-trips in the morning peak hour will add 0.2% more trips to the existing trips at the intersection. Net new transit trips are expected to be two (2) during the morning peak hour and zero (0) during the evening peak hour. Net new pedestrian trips are expected to be zero (0) person-trips during both the morning and evening peak hours. It is estimated that there will be zero (0) net new bicycle trips generated during both the morning and evening peak hours.

As previously mentioned after Table B12, the proposed land uses with a Neighborhood Restaurant are expected to create a net zero number of trips during both the morning and evening peak hours as compared to the prior land use. As such, there will be zero additional vehicle-trips being added to the network, which will result in no impact to the traffic network.

B5. TRIP DISTRIBUTION AND ASSIGNMENT

DCI estimated the trip distribution of project generated traffic from the site into the study area. The directional distribution of this project generated traffic is based on existing travel patterns, which were observed during the initial data collection in March 2016.

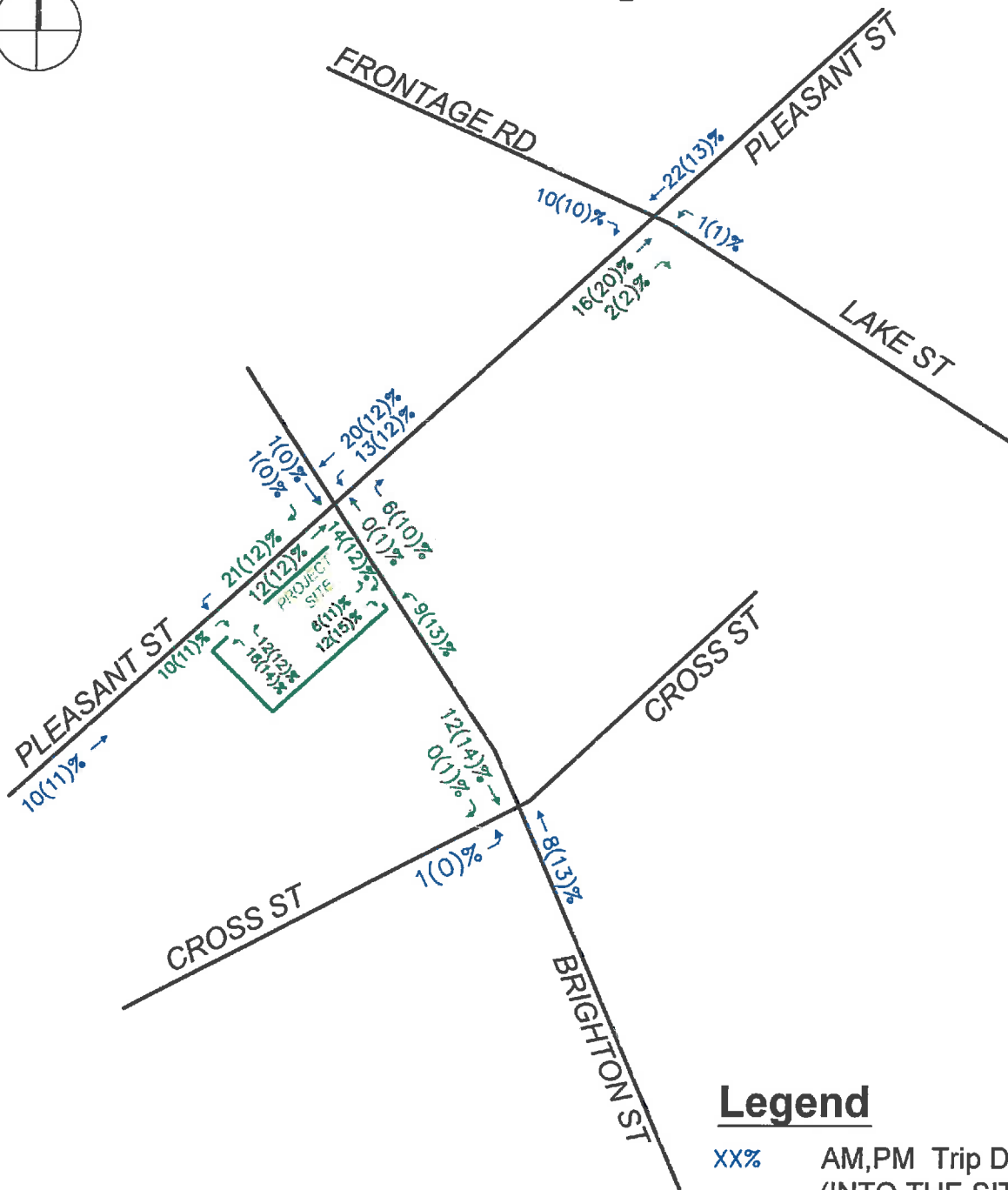
Furthermore, standard practice is to employ the same trip distribution and assignment percentages for both inbound and outbound movements, acknowledging that the trip counts are estimates at this time. This technique accounts for nuances in estimating the future numbers. These nuances can include proximity to the transportation and roadway network intricacies. The trip distribution for this project is shown graphically in Figure B4, and site specific project trips are shown in Figure B5.

B6. YEAR 2023 BUILD CONDITIONS

In order to analyze future traffic conditions following the completion of the 344 Pleasant Street commercial project in Belmont, the 2023 Build Scenario traffic volumes were calculated. The 2023 No-Build traffic volumes (Figure B2) were summed with the calculated site-generated trips (Figure B5). The resulting volumes are shown in Figure B6. These volumes were used to carry out intersection capacity analysis for future Build conditions.



Trip Distribution



Legend

- XX% AM, PM Trip Distribution (INTO THE SITE)
- XX% AM, PM Trip Distribution (OUT OF THE SITE)

Design Consultants, Inc.
Consulting Engineers and Surveyors

120 MIDDLESEX AVENUE
SOMERVILLE, MA 02145
617-778-3350

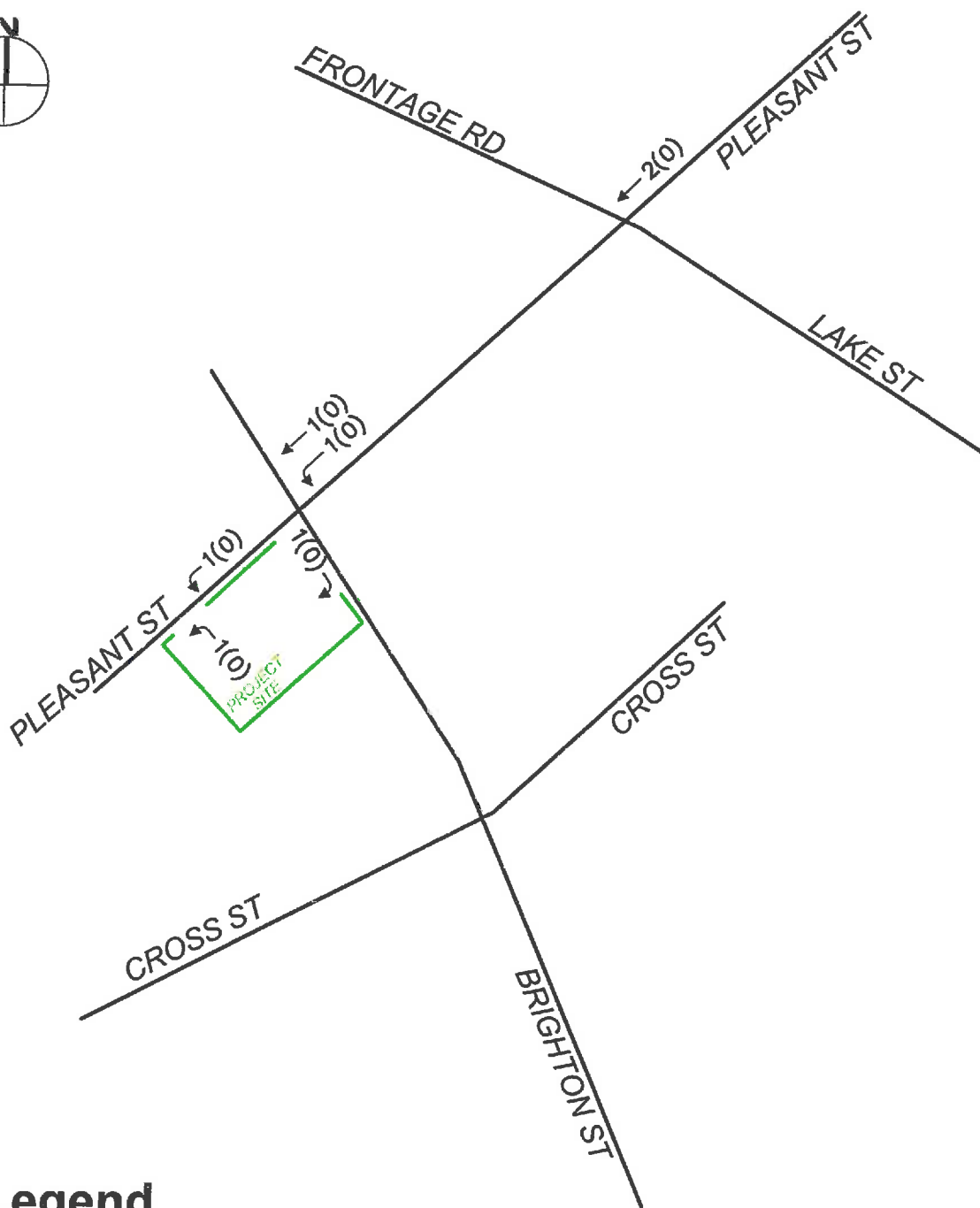
66 PLEASANT STREET
NEWBURYPORT, MA 01950
978-358-7173

344 PLEASANT STREET
BELMONT, MA

Figure B4
Trip Distribution

DATE: JAN. 2017

DCI PROJECT: 2014-078



Legend

xx(yy) AM(PM) Peak Hour Project Trips

Design Consultants, Inc.
Consulting Engineers and Surveyors

120 MIDDLESEX AVENUE
SOMERVILLE, MA 02145
617-778-3350

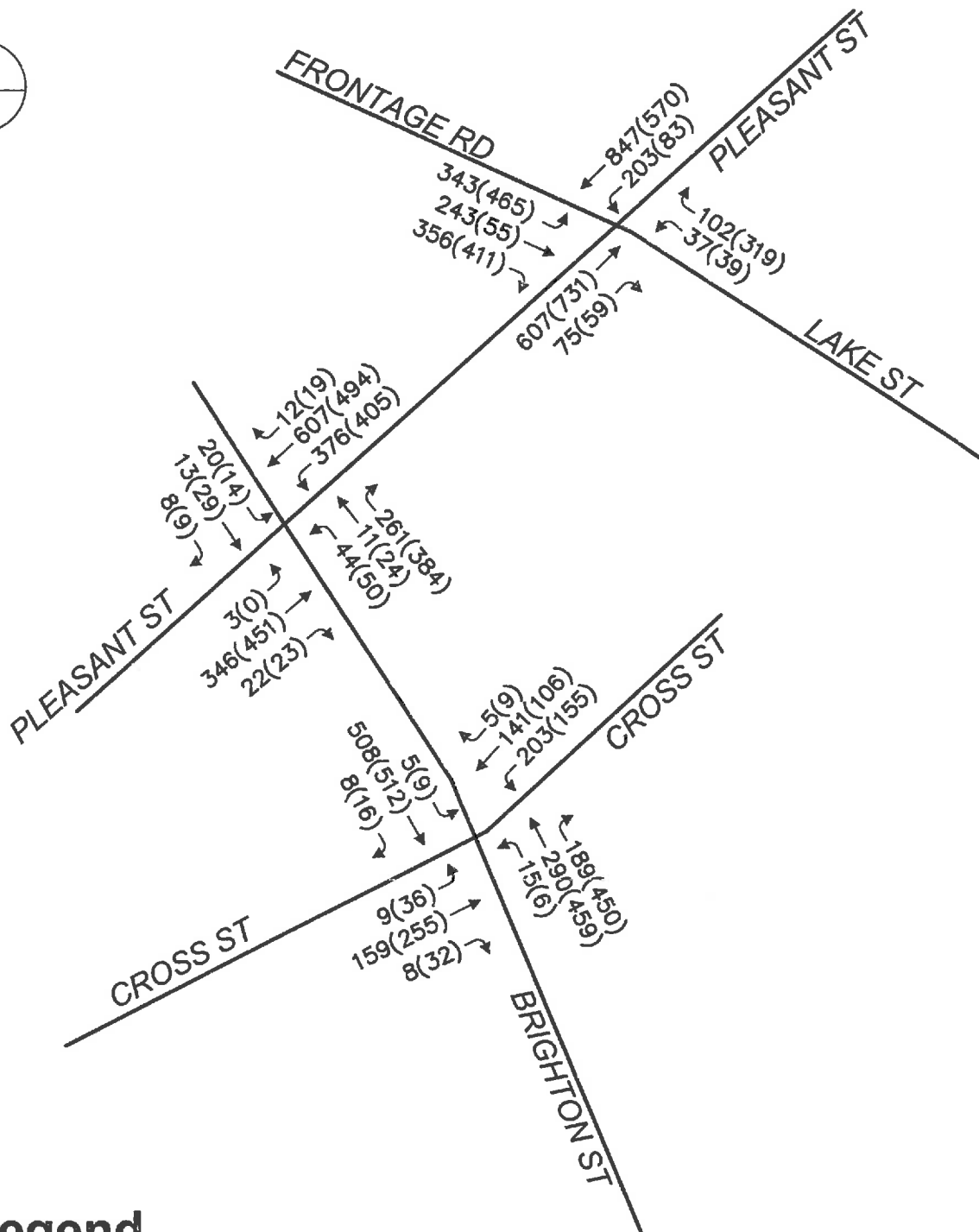
68 PLEASANT STREET
NEWBURYPORT, MA 01950
978-358-7173

344 PLEASANT STREET
BELMONT, MA

Figure B5
Project Trips

DATE: JAN. 2017

DCI PROJECT: 2014-078



Legend

xx(yy) AM(PM) Build Peak Hour Volumes

Design Consultants, Inc.

Consulting Engineers and Surveyors

120 MIDDLESEX AVENUE
SOMERVILLE, MA 02145
617-778-3350

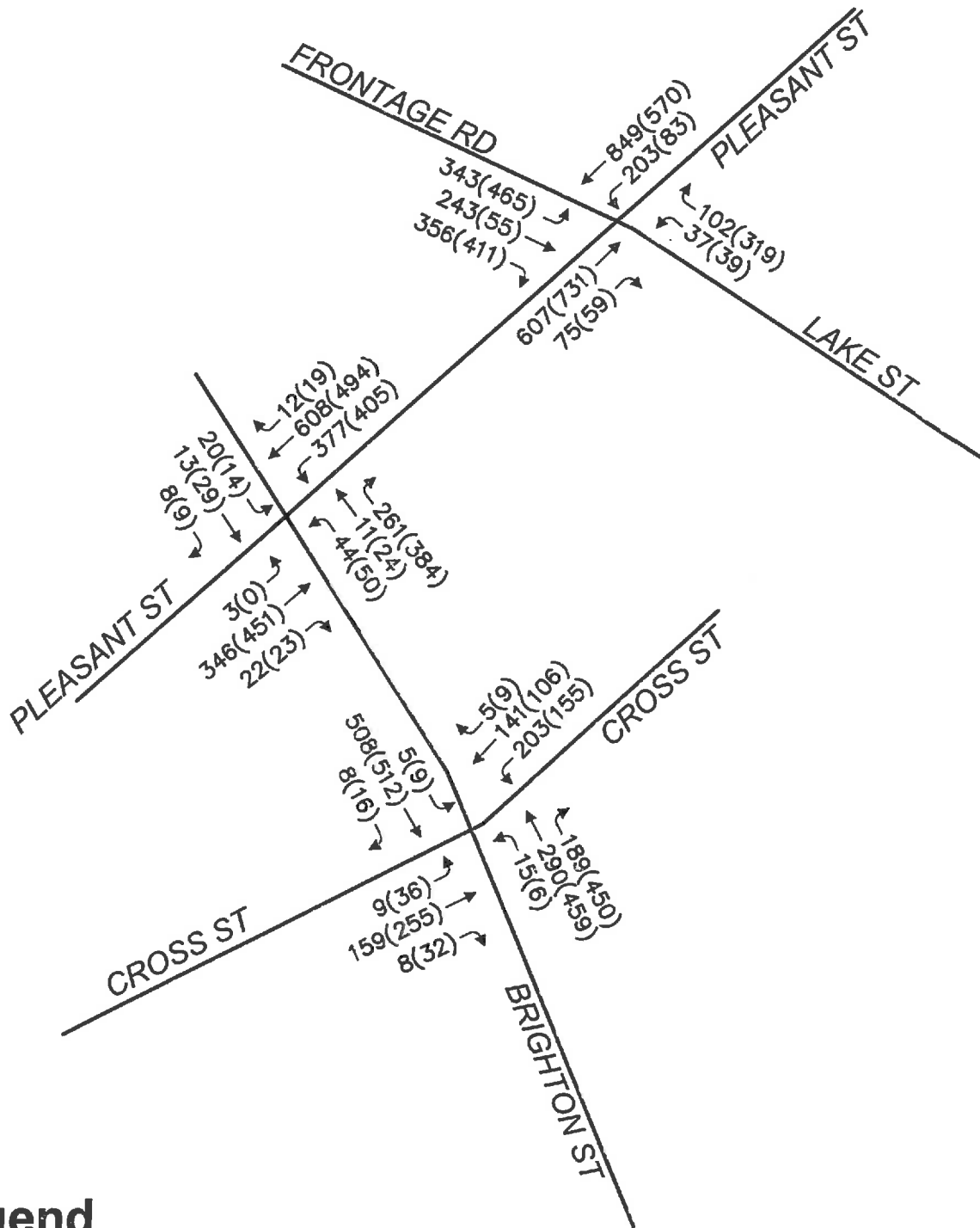
68 PLEASANT STREET
NEWMARKET, MA 01950
978-358-7173

344 PLEASANT STREET
BELMONT, MA

Figure B6
2023 Build
Traffic Volumes -
Restaurant

DATE: JAN. 2017

DCI PROJECT: 2014-078



Legend

xx(yy) AM(PM) Build Peak Hour Volumes

Design Consultants, Inc.
Consulting Engineers and Surveyors

120 MIDDLESEX AVENUE
SOMERVILLE, MA 02145
617-776-3350

66 PLEASANT STREET
NEWBURYPORT, MA 01950
978-358-7173

344 PLEASANT STREET
BELMONT, MA

Figure B7
2023 Build
Traffic Volumes -
Dunkin Donuts

DATE: JAN. 2017

DCI PROJECT: 2014-078

C. SAFETY ANALYSIS

C1. CRASH DATA AND ANALYSIS

Crash data from MassDOT for years 2011 through 2013 was reviewed within the jurisdiction of Belmont. These are the most recent years of data available through the MassDOT crash database. The MassDOT crash records offered the following information:

- Crash Location (General or Specific) / Direction of vehicle(s)
- Date / Time
- Roadway surface conditions / Light conditions / Weather conditions
- Crash Severity / Manner of Collision

While it may be assumed that all relevant crash attributes should be reported and provided in recordkeeping, a portion of the individual crash records have only partial information available. Among various reasons for this, missing crash information might be attributed to the type of police reports filled out and provided to MassDOT.

Locations of crashes in the area of the study intersections were general and approximated in many cases. This lack of specificity can hinder the engineer's ability to identify statistically significant trends and diagnose potential safety problems. However, combined with engineering judgement, the synthesized data has yielded a summary of crashes that may be used to speculate on a variety of general crash patterns.

The results of the State crash analysis are shown in Tables C1 and C2. The crash rates compared to average District 4 and State crash rates are shown in Table C3. Detailed crash analysis worksheets for each intersection for years 2011 to 2013 are contained in Appendix E.

Table C1: MassDOT Intersection Crash Conditions

<i>Year</i>	<i>Pleasant St & Brighton Street</i>	<i>Brighton St & Cross St</i>	<i>Pleasant St & Lake St/Frontage Rd</i>
2011	7	0	6
2012	2	0	5
2013	3	2	5
<i>Total</i>	<i>12</i>	<i>2</i>	<i>16</i>
<i>Crash Hour</i>	<i>0</i>	<i>0</i>	<i>0</i>
06:00AM to 10:00AM	3	2	1
10:00AM to 02:00PM	2	0	3
2:00PM to 06:00PM	5	0	8
06:00PM to 10:00PM	1	0	3
10:00PM to 02:00AM	1	0	0
02:00AM to 06:00AM	0	0	1
<i>Total</i>	<i>12</i>	<i>2</i>	<i>16</i>
<i>Light Conditions</i>	<i>0</i>	<i>0</i>	<i>0</i>
Daylight	9	2	8
Dawn	0	0	0
Dusk	1	0	4
Dark - lighted roadway	1	0	3
Dark - roadway not lighted	0	0	0
Dark	0	0	0
Other, unknown	1	0	1
<i>Total</i>	<i>12</i>	<i>2</i>	<i>16</i>
<i>Road Surface</i>	<i>0</i>	<i>0</i>	<i>0</i>
Dry	9	2	11
Wet	2	0	4
Snow	0	0	0
Ice	0	0	0
Sand, mud etc.	0	0	0
Water	0	0	0
Slush	0	0	0
Other, known	1	0	1
<i>Total</i>	<i>12</i>	<i>2</i>	<i>16</i>
<i>Weather</i>	<i>0</i>	<i>0</i>	<i>0</i>
Clear	8	2	10
Cloudy	1	0	2
Rain	2	0	3
Snow	0	0	0
Sleet, hail, freezing rain	0	0	0
Fog, smog, smoke	0	0	0
Severe crosswinds	0	0	0
Blowing sand, snow	0	0	0
Other, unknown	1	0	1
<i>Total</i>	<i>12</i>	<i>2</i>	<i>16</i>

Table C2: MassDOT Intersection Crash Types

	<i>Pleasant St & Brighton St</i>	<i>Brighton St & Cross St</i>	<i>Pleasant St & Lake St/Frontage Rd</i>
<i>Crash Severity</i>			
Property Damage Only	10	1	10
Non-fatal Injury	2	1	3
Fatal Injury	0	0	0
Not Reported, Unknown	0	0	3
<i>Total</i>	<i>12</i>	<i>2</i>	<i>16</i>
<i>Manner of Collision</i>			
Sideswipe, Same Direction	1	1	2
Sideswipe, Opposite Direction	0	0	1
Angle	7	1	7
Rear-end	3	0	4
Head-on	0	0	1
Single Vehicle	0	0	0
Other, not reported	1	0	1
<i>Total</i>	<i>12</i>	<i>2</i>	<i>16</i>

Table C3: MassDOT Intersection Crash Rates

	<i>Avg. Crashes per Year</i>	<i>Avg. Crash Rate (Crashes per MEV)</i>	<i>MassDOT D4 Avg. Crash Rate (Crashes per MEV)</i>	<i>Statewide Avg. Crash Rate (Crashes per MEV)</i>
<i>Pleasant St & Brighton St</i>	4.00	0.52	0.73	0.77
<i>Brighton St & Cross St</i>	0.67	0.08	0.73	0.77
<i>Pleasant St & Lake St/Frontage Rd</i>	5.33	0.47	0.73	0.77

Tables C1 through C3 are summarized below, and any notable trends or statistics from each intersection are pointed out.

The intersection of **Pleasant Street and Brighton Street** had twelve reported crashes over the three year study period. There were no fatal crashes, and 83% of crashes resulted in property damage only. The twelve crashes at this intersection resulted in an average of 4.00 crashes per year, and a crash rate of 0.52 crashes per million entering vehicles (MEV). This rate is below the District 4 and State averages for signalized intersections.

The intersection of **Brighton Street and Cross Street** had two reported crashes over the three year study period according to MassDOT crash records. Of these two crashes, one was a sideswipe in the same direction and one was an angled collision. One crash resulted in a non-fatal injury and the other resulted in property damage only, and there were no fatal collisions. The intersection of

Brighton Street and Cross Street had an average of 0.67 crashes per year, and a crash rate of 0.08 crashes per MEV. This rate is below the District 4 and State average for signalized intersections.

The intersection of **Pleasant Street and Lake Street/Frontage Road** had sixteen (16) reported crashes over the three year study period according to MassDOT crash records. Of the reported crashes, 63% resulted in property damage only and 19% resulted in non-fatal injuries, with zero reported crashes resulting in fatal injuries. The sixteen crashes at this intersection resulted in an average of 5.33 crashes per year, and a crash rate of 0.47 per million entering vehicles (MEV). This rate is below the District 4 and State averages for signalized intersections.

Based on a review of the most recent available three years of data from MassDOT, it was determined that the three study intersections do not have crash rates above the District 4 or State averages. Given this fact and the low injury rate, there are not any salient existing safety deficiencies at the study intersections that need to be addressed as part of this study.

C2. SIGHT DISTANCE ANALYSIS

Intersection Sight Distance

The location of the proposed site driveways on Pleasant Street and Brighton Street were evaluated for available intersection sight distance (ISD). The sight distance analysis was carried out to ensure sufficient sight distance for right-turn and left-turn maneuvers out of the site. The American Association of State Highway and Transportation Officials (AASHTO) required intersection sight distance requirements for various vehicle speeds are shown below in Table C4.

Table C4: AASHTO Minimum Recommended ISD for Uncontrolled Intersections

Design Speed (mph)	Intersection Sight Distance for Crossover, Right-Turn & Left-Turn Maneuvers (ft)
15	70
20	90
25	115
30	140
35	165
40	195
45	220
50	245

The posted speed limit on both Brighton Street and Pleasant Street is 30 miles per hour. For a right-turn or left-turn out of the driveway, the required sight distance is 140 feet. Based on on-site measurements, the available sight distance for the proposed driveways is shown below in Table C5.

Table C5: Measured ISD

	Intersection Sight Distance for Crossover, Right-Turn & Left-Turn Maneuvers (ft)	
	Southeast Driveway	Northwest Driveway
Required at 30mph	140	140
Measured	225	600

As shown in Table C5, the proposed site driveways at 344 Pleasant Street meets the AASHTO recommended sight distances for the right-turn maneuver. One of the three curb cuts will be closed as part of the redevelopment, and both proposed curb cuts will be a sufficient distance from the intersection to provide enough sight distance for drivers. These proposed changes will enhance the safety of the vehicles entering and exiting the project site. As proposed, the current plan does not require mitigation to improve intersection sight distance at the driveways for 344 Pleasant Street.

D. CAPACITY ANALYSIS

D1. TRAFFIC ANALYSIS CRITERIA

According to the TIA guidelines, both signalized intersection capacity analyses and stop- and yield-controlled intersection capacity analyses should be used for traffic impact studies. The Highway Capacity Manual (HCM) published by Transportation Research Board provides methodologies on how to calculate motor vehicle Level of Service (LOS), average delay, and volume-to-capacity ratios. Those terms are commonly used to measure performance levels for freeway sections, ramp junctions, weave sections, and intersections, both signalized and unsignalized.

Level of Service (LOS) is a term used to denote different operating conditions that occur under various traffic volume loads. It is a qualitative measure of the effect of a number of factors including geometrics, speed, travel delay, freedom to maneuver, and safety. The LOS is divided into a range of six letter grades, ranging from A to F, with A being the best and F the worst. LOS E and F are generally considered inadequate traffic operations in suburban and urban areas. The delay ranges differ slightly between unsignalized and signalized intersections due to driver expectations and behavior for each LOS. Table D1 summarizes the LOS criteria.

Table D1: Intersection LOS Thresholds

LOS	Signalized	Unsignalized
	Control Delay (sec/veh)	Control Delay (sec/veh)
A	0-10	0-10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50

In this study, intersection performance measures were calculated in the form of volume to capacity (v/c) ratio, average intersection delay, 95th percentile queue lengths, level-of-service (LOS) of overall intersection LOS and the LOS of each approach. *Synchro 9.0 was the software used to execute the intersection analysis.* *Synchro 9.0*, a software program from Trafficware, uses the methodologies and thresholds outlined within the HCM. This is the preferred and recommended software of MassDOT. Traffic volume represents the travel demand observed and capacity represents the amount of traffic the intersection can accommodate under prevailing conditions. A volume to capacity ratio that approaches or exceeds 1.0 indicates traffic congestion or poor operating conditions.

Three types of Synchro reports were created to analyze and compare intersection performance in this study:

- Main report – “Int: Lanes, Volumes, Timings”,
- Queuing Analysis Report
- HCM Unsignalized/Signalized Report.

In Synchro’s main report, LOS is estimated not by HCM formulas but by Synchro’s own formulas. For signalized intersections, LOS is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and lost travel time. The LOS for each movement is calculated by determining the length of gaps that are available in the conflicting traffic stream. For all future scenarios a peak hour factor of 0.92 was used, as per MassDOT guidelines.

In the HCM Unsignalized Report 95th percentile queue length is estimated. In Synchro 9, HCM 2000 reports and HCM 2010 reports are both available. Both of them use HCM methodology to measure the performance of the intersection.

D2. EXISTING CONDITIONS INTERSECTION ANALYSIS

The study intersections were analyzed for existing traffic conditions during the weekday morning and weekday evening peak hours. Existing intersection lane configurations and traffic control were modelled exactly the same as the current traffic operations which were field observed. The results of the existing conditions analysis are shown in Table D2. Detailed capacity analysis worksheets are included in Appendix F.

Table D2: 2016 Existing Conditions LOS

ID	East-West Road	North-South Road	Lane	Existing							
				AM Peak Hour				PM Peak Hour			
				v/c	Avg. delay / veh (s)	LOS	95th % Q (ft)	v/c	Avg. delay / veh (s)	LOS	95th % Q (ft)
1	Pleasant Street	Lake Street/ Frontage Road	SB L	0.87	59.3	E	#340	0.77	49.4	D	#291
			SB T	0.88	60.4	E	#355	0.80	52.1	D	175
			SB R	0.74	24.0	C	#201	0.81	24.8	C	#228
			NB L	0.22	40.7	D	52	0.31	42.4	D	51
			NB R	0.47	12.9	B	29	1.04	76.3	E	#257
			EB TR	0.50	21.5	C	208	0.54	21.6	C	250
			WB L	0.68	22.0	C	103	0.24	14.8	B	46
			WB T	0.47	13.9	B	209	0.31	12.1	B	130
			Overall		27.6	C			32.8	C	
2	Pleasant Street	Brighton Street	SB LTR	0.14	13.0	B	21	0.15	13.6	B	22
			NB LT	0.14	15.0	B	31	0.20	15.7	B	40
			NB R	0.38	4.1	A	43	0.52	4.5	A	52
			EB LTR	0.73	26.2	C	211	0.85	34.5	C	#337
			WB L	1.04	73.2	E	#251	1.58	>120	F	#348
			WB TR	0.84	23.7	C	292	0.60	14.2	B	222
			Overall		30.8	C			76.5	E	
3	Cross St	Brighton Street	SB LTR	0.57	15.1	B	374	0.69	18.6	B	399
			NB LTR	0.60	14.9	B	351	1.05	62.2	E	#957
			EB LTR	0.49	27.6	C	156	0.92	53.7	D	#398
			WB LTR	1.24	>120	F	#465	1.63	>120	F	#452
			Overall		48.3	D			84.9	F	

Volume-to-capacity (v/c), delay (seconds/veh), and Level of Service (LOS) obtained from HCM 2000 outputs in Synchro 9

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

= volume for 95th percentile cycle exceeds capacity. If the v/c for this movement is less than 1.0, the 95th percentile queue will rarely be exceeded. Queue shown is maximum after two cycles.

As shown in Table D2, almost all of the movements at the study intersections, and most of the intersections as a whole, currently operate under capacity and were found to have adequate levels of service. There are four movements that currently operate at an LOS of F, which are noted below.

Weekday Morning Peak Hour

Brighton Street at Cross Street

The westbound left-turn/through/right-turn movement operates at an LOS of F, with an average delay greater than 120 seconds per vehicle.

Weekday Evening Peak Hour

Pleasant Street at Brighton Street

The westbound left-turn movement operates at an LOS of F, with an average delay greater than 120 seconds per vehicle.

Brighton Street at Cross Street

The westbound left-turn/through/right-turn movement operates at an LOS of F, with an average delay greater than 120 seconds per vehicle.

The intersection overall operates at an LOS of F, with an average delay of 84.9 seconds per vehicle.

As shown in the capacity analysis for the 2016 Existing Conditions, two of the three study intersections and the majority of movements within these intersection operate at acceptable levels.

D3. 2023 NO-BUILD CONDITIONS INTERSECTION ANALYSIS

The study intersections were analyzed for estimated traffic conditions for year 2023 No-Build Conditions, during the weekday morning and weekday evening peak hours. Existing lane configurations and traffic control were assumed for this analysis. These traffic conditions utilize the 2023 No-Build volumes discussed in Section B3 and shown in Figure B3. The results of the 2023 No-Build analysis are shown in Table D3. Detailed capacity analysis worksheets are included in Appendix F.

Table D3: 2023 No-Build Conditions LOS

ID	East-West Road	North-South Road	Lane	No-Build*							
				AM Peak Hour				PM Peak Hour			
				v/c	Avg. delay / veh (s)	LOS	95th % Q (ft)	v/c	Avg. delay / veh (s)	LOS	95th % Q (ft)
1	Pleasant Street	Lake Street/ Frontage Road	SB L	0.85	56.9	E	#336	0.77	49.2	D	#290
			SB T	0.86	58.6	E	#347	0.76	48.6	D	#288
			SB R	0.75	24.8	C	#224	0.75	18.7	B	#183
			NB L	0.20	40.2	D	53	0.21	40.5	D	55
			NB R	0.41	12.9	B	48	0.98	61.9	E	#262
			EB TR	0.52	21.9	C	218	0.56	22.0	C	262
			WB L	0.61	18.6	B	104	0.27	12.3	B	47
			WB T	0.48	13.9	B	212	0.32	12.2	B	133
			Overall		27.0	C			29.2	C	
2	Pleasant Street	Brighton Street	SB LTR	0.09	12.3	B	27	0.10	12.6	B	33
			NB LT	0.12	14.8	B	37	0.16	15.2	B	47
			NB R	0.39	4.1	A	44	0.51	4.5	A	52
			EB LTR	0.65	22.7	C	204	0.82	32.1	C	#322
			WB L	0.98	56.0	E	#239	1.47	>120	F	#350
			WB TR	0.72	17.0	B	291	0.60	13.9	B	219
			Overall		24.6	C			66.4	E	
3	Cross St	Brighton Street	SB LTR	0.55	14.8	B	358	0.57	15.3	B	378
			NB LTR	0.55	13.9	B	325	1.00	48.5	D	#910
			EB LTR	0.38	25.8	C	158	0.73	36.3	D	#347
			WB LTR	1.10	108.5	F	#459	1.21	>120	F	#389
			Overall		37.0	D			51.7	D	

*Any improvements to No-Build Conditions are due to the MassDOT requirement of using a 0.92 Peak Hour Factor for future conditions.

Volume-to-capacity (v/c), delay (seconds/veh), and Level of Service (LOS) obtained from HCM 2000 outputs in Synchro 9

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

= volume for 95th percentile cycle exceeds capacity. If the v/c for this movement is less than 1.0, the 95th percentile queue will rarely be exceeded. Queue shown is maximum after two cycles.

As shown above, the northbound movement at the intersection of Cross Street and Brighton Street continues to operate at an LOS of F, as does the intersection as a whole. However, there was a decrease in delay for many of the movements. This drop in delay is due to the required MassDOT practice of using 0.92 for a peak hour factor for all future conditions. Since Synchro models are based on peak 15-minute flows, a higher peak hour factor relates to a decrease in delay for the peak periods. The expected impact due specifically to the proposed development at 344 Pleasant Street is reflected in any change from the 2023 No-Build scenario to the 2023 Build Scenario.

D4. 2023 BUILD CONDITIONS INTERSECTION ANALYSIS

The study intersections were analyzed for estimated traffic conditions for year 2023 Build Conditions, during the weekday morning and weekday evening peak hours. Existing lane configurations and traffic control were assumed for this analysis. These traffic conditions utilize the 2023 Build volumes discussed in Section B4 and shown in Figure B5. The results of the 2023 Build analyses are shown in Tables D4 and D5. Detailed capacity analysis worksheets are included in Appendix F.

Table D4: 2023 Build Conditions LOS – Neighborhood Restaurant Alternative

ID	East-West Road	North-South Road	Lane	Build - High-Turnover Restaurant Alternative							
				AM Peak Hour				PM Peak Hour			
				v/c	Avg. delay / veh (s)	LOS	95th % Q (ft)	v/c	Avg. delay / veh (s)	LOS	95th % Q (ft)
1	Pleasant Street	Lake Street/ Frontage Road	SB L	0.85	56.9	E	#336	0.77	49.2	D	#290
			SB T	0.86	58.6	E	#347	0.76	48.6	D	#288
			SB R	0.75	24.8	C	#224	0.75	18.7	B	#183
			NB L	0.20	40.2	D	53	0.21	40.5	D	55
			NB R	0.41	12.9	B	48	0.98	61.9	E	#262
			EB TR	0.52	21.9	C	218	0.56	22.0	C	262
			WB L	0.61	18.6	B	104	0.27	12.3	B	47
			WB T	0.48	13.9	B	212	0.32	12.2	B	133
			Overall		27.0	C			29.2	C	
2	Pleasant Street	Brighton Street	SB LTR	0.09	12.3	B	27	0.10	12.6	B	33
			NB LT	0.12	14.8	B	37	0.16	15.2	B	47
			NB R	0.39	4.1	A	44	0.51	4.5	A	52
			EB LTR	0.65	22.7	C	204	0.82	32.1	C	#322
			WB L	0.98	56.0	E	#239	1.47	>120	F	#350
			WB TR	0.72	17.0	B	291	0.60	13.9	B	219
			Overall		24.6	C			66.4	E	
3	Cross St	Brighton Street	SB LTR	0.55	14.8	B	358	0.57	15.3	B	378
			NB LTR	0.55	13.9	B	325	1.00	48.5	D	#910
			EB LTR	0.38	25.8	C	158	0.73	36.3	D	#347
			WB LTR	1.10	108.5	F	#459	1.21	>120	F	#389
			Overall		37.0	D			51.7	D	

Volume-to-capacity (v/c), delay (seconds/veh), and Level of Service (LOS) obtained from HCM 2000 outputs in Synchro 9

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

= volume for 95th percentile cycle exceeds capacity. If the v/c for this movement is less than 1.0, the 95th percentile queue will rarely be exceeded. Queue shown is maximum after two cycles.

As shown in Table D4, there are only minor increases in delay moving from the 2023 No-Build to 2023 Build conditions. During the morning peak hour, increases in delay are minimal. In the evening peak hour, there is no change in delay due to the fact that there are no new trips being added to the traffic network. Although some movements have a minimal increase in delay during the morning peak hour, zero movements decrease in level of service going into the Build conditions.

Table D5: 2023 Build Conditions LOS – Dunkin Donuts Restaurant Alternative

ID	East-West Road	North-South Road	Lane	Build - Dunkin Donuts Restaurant Alternative							
				AM Peak Hour				PM Peak Hour			
				v/c	Avg. delay / veh (s)	LOS	95th % Q (ft)	v/c	Avg. delay / veh (s)	LOS	95th % Q (ft)
1	Pleasant Street	Lake Street/ Frontage Road	SB L	0.85	56.9	E	#336	0.77	49.2	D	#290
			SB T	0.86	58.6	E	#347	0.76	48.6	D	#288
			SB R	0.75	24.8	C	#224	0.75	18.7	B	#183
			NB L	0.20	40.2	D	53	0.21	40.5	D	55
			NB R	0.41	12.9	B	48	0.98	61.9	E	#262
			EB TR	0.52	21.9	C	218	0.56	22.0	C	262
			WB L	0.61	18.6	B	104	0.27	12.3	B	47
			WB T	0.48	13.9	B	212	0.32	12.2	B	133
			Overall		27.0	C			29.2	C	
2	Pleasant Street	Brighton Street	SB LTR	0.09	12.3	B	27	0.10	12.6	B	33
			NB LT	0.12	14.8	B	37	0.16	15.2	B	47
			NB R	0.39	4.1	A	44	0.51	4.5	A	52
			EB LTR	0.65	22.7	C	204	0.82	32.1	C	#322
			WB L	0.98	56.5	E	#239	1.47	>120	F	#350
			WB TR	0.72	17.1	B	291	0.60	13.9	B	219
			Overall		24.7	C			66.4	E	
3	Cross St	Brighton Street	SB LTR	0.55	14.8	B	358	0.57	15.3	B	378
			NB LTR	0.55	13.9	B	325	1.00	48.5	D	#910
			EB LTR	0.38	25.8	C	158	0.73	36.3	D	#347
			WB LTR	1.10	108.5	F	#459	1.21	>120	F	#389
			Overall		37.0	D			51.7	D	

Volume-to-capacity (v/c), delay (seconds/veh), and Level of Service (LOS) obtained from HCM 2000 outputs in Synchro 9

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

= volume for 95th percentile cycle exceeds capacity. If the v/c for this movement is less than 1.0, the 95th percentile queue will rarely be exceeded. Queue shown is maximum after two cycles.

As shown in Table D5, there are no increases in delay moving from the 2023 No-Build to 2023 Build conditions. During both the morning and evening peak hours, there are no changes in delay due to the fact that there are no new trips being added to the traffic network.

Based on the trip generation calculations and operational analyses carried out, there will be no detrimental impact on the surrounding traffic network due to the redevelopment of 344 Pleasant Street.

E. CONCLUSIONS

This Traffic Impact & Access Study (TIAS) was prepared to analyze the traffic impact of the 344 Pleasant Street commercial project in Belmont, Massachusetts. Currently, the site has one commercial building. The proposed project will demolish the existing building to construct a new commercial building which be occupied by either a Dunkin Donuts restaurant and two other retail spaces, or a Neighborhood Restaurant and two other retail spaces. The Dunkin Donuts or the Neighborhood Restaurant will occupy 1,500 square feet, while the two other retail spaces will occupy a combined 1,747 square feet. There will also be an additional 269 square feet on the first floor that will act as a common space and bathrooms to be shared between the three different land uses. The site will be accessed via curb cuts on Pleasant Street and Brighton Street, which will provide access to a ground level parking area. There will be 20 at-grade parking spaces surrounding the building.

From a safety perspective, it was determined that there are no existing issues that need to be addressed as part of this study. The most recently available three years of crash data from MassDOT were reviewed for all three study intersections. None of the intersections were found to have a crash rate above the District 4 or State averages. Additionally, the locations of the proposed site driveways were analyzed for safe intersection sight distance. It was determined that the locations provide sufficient sight distance based on standards set forth by the American Association of State Highway and Transportation Officials (AASHTO).

Capacity analyses were carried out for the three study intersections, Pleasant Street and Brighton Street, Pleasant Street and Lake Street/Frontage Road, and Brighton Street and Cross Street, for 2016 Existing, 2023 No-Build, and 2023 Build conditions. Alternative One, consisting of a Neighborhood Restaurant and two other retail spaces, is expected to generated zero (0) net new vehicle-trips during both the morning and evening peak hours. Alternative Two, consisting of a Dunkin Donuts and two other retail spaces, is expected to generate three (3) net new vehicle-trips during the morning peak hour and zero (0) net new vehicle-trips during the evening peak hour. The three (3) net new vehicle-trips in the morning peak hour will add 0.2% more trips to the existing trips at the intersection of Pleasant Street and Brighton Street.

The capacity analyses show that no movements degrade in LOS going from the No-Build to Build scenarios. The impact of the project on traffic conditions is reflected in the lack of change in Level of Service between the No-Build and Build scenarios. Based on the trip generation and capacity analyses carried out, the proposed redevelopment of the site at 344 Pleasant Street will have no detrimental impact on surrounding traffic networks.

Given the lack of existing safety issues, acceptable location of the proposed site driveways, and lack of traffic impact the project is expected to have, there are no traffic mitigation measures proposed for this project. Based on the safety analyses and capacity analyses carried out for this study, the proposed redevelopment of 344 Pleasant Street will not have an adverse impact on the surrounding traffic network in Belmont.



APPENDIX A – TRAFFIC COUNTS

Transportation Data Corporation

Mario Perone, mperone1@verizon.net

tel (781) 587-0086 cell (781) 439-4999

N/S: Pleasant Street (Route 60)
E/W: Lake Street/Route 2 EB Off-Ramp
City, State: Belmont, MA
Client: DCI/S. Siragusa

File Name : 04705A
Site Code : 04705
Start Date : 3/29/2016
Page No : 1

Groups Printed- Cars & Peds - Trucks & Buses - Bikes by Direction

	Pleasant Street (Route 60) From North				Lake Street From East				Pleasant Street (Route 60) From South				Route 2 EB Off-Ramp (Exit 59) From West				Int. Total
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
07:00 AM	0	198	44	1	12	0	5	2	17	117	0	0	99	25	58	1	579
07:15 AM	0	173	42	0	27	0	9	3	20	127	0	1	96	49	84	1	632
07:30 AM	0	164	50	0	34	0	10	4	15	145	0	0	95	57	88	0	662
07:45 AM	0	193	49	0	26	0	8	3	20	150	0	0	87	65	95	1	697
Total	0	728	185	1	99	0	32	12	72	539	0	1	377	196	325	3	2570
08:00 AM	0	210	64	0	19	0	7	2	14	150	0	0	94	52	85	2	699
08:15 AM	0	210	43	0	34	0	11	1	18	146	0	1	92	62	75	1	694
08:30 AM	0	224	45	0	22	0	11	0	22	154	0	1	79	61	84	2	705
08:45 AM	0	171	43	0	34	0	11	0	16	126	0	1	68	50	77	0	597
Total	0	815	195	0	109	0	40	3	70	576	0	3	333	225	321	5	2695
Grand Total	0	1543	380	1	208	0	72	15	142	1115	0	4	710	421	646	8	5265
Apprch %	0	80.2	19.8	0.1	70.5	0	24.4	5.1	11.3	88.4	0	0.3	39.8	23.6	36.2	0.4	
Total %	0	29.3	7.2	0	4	0	1.4	0.3	2.7	21.2	0	0.1	13.5	8	12.3	0.2	
Cars & Peds	0	1528	373	1	203	0	70	15	140	1100	0	4	700	406	636	8	5184
% Cars & Peds	0	99	98.2	100	97.6	0	97.2	100	98.6	98.7	0	100	98.6	96.4	98.5	100	98.5
Trucks & Buses	0	9	5	0	4	0	0	0	1	14	0	0	10	15	10	0	68
% Trucks & Buses	0	0.6	1.3	0	1.9	0	0	0	0.7	1.3	0	0	1.4	3.6	1.5	0	1.3
Bikes by Direction	0	6	2	0	1	0	2	0	1	1	0	0	0	0	0	0	13
% Bikes by Direction	0	0.4	0.5	0	0.5	0	2.8	0	0.7	0.1	0	0	0	0	0	0	0.2

	Pleasant Street (Route 60) From North					Lake Street From East					Pleasant Street (Route 60) From South					Route 2 EB Off-Ramp 59) From West					(Exit
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	193	49	0	242	26	0	8	3	37	20	150	0	0	170	87	65	95	1	248	697
08:00 AM	0	210	64	0	274	19	0	7	2	28	14	150	0	0	164	94	52	85	2	233	699
08:15 AM	0	210	43	0	253	34	0	11	1	46	18	146	0	1	165	92	62	75	1	230	694
08:30 AM	0	224	45	0	269	22	0	11	0	33	22	154	0	1	177	79	61	84	2	226	705
Total Volume	0	837	201	0	1038	101	0	37	6	144	74	600	0	2	676	352	240	339	6	937	2795
% App. Total	0	80.6	19.4	0		70.1	0	25.7	4.2		10.9	88.8	0	0.3		37.6	25.6	36.2	0.6		
PHF	.000	.934	.785	.000	.947	.743	.000	.841	.500	.783	.841	.974	.000	.500	.955	.936	.923	.892	.750	.945	.991
Cars & Peds	0	826	197	0	1023	98	0	35	6	139	73	594	0	2	669	348	230	335	6	919	2750
% Cars & Peds	0	98.7	98.0	0	98.6	97.0	0	94.6	100	96.5	98.6	99.0	0	100	99.0	98.9	95.8	98.8	100	98.1	98.4
Trucks & Buses	0	5	3	0	8	2	0	0	0	2	0	6	0	0	6	4	10	4	0	18	34
% Trucks & Buses	0	0.6	1.5	0	0.8	2.0	0	0	0	1.4	0	1.0	0	0	0.9	1.1	4.2	1.2	0	1.9	1.2
Bikes by Direction	0	6	1	0	7	1	0	2	0	3	1	0	0	0	1	0	0	0	0	0	11
% Bikes by Direction	0	0.7	0.5	0	0.7	1.0	0	5.4	0	2.1	1.4	0	0	0	0.1	0	0	0	0	0	0.4

Transportation Data Corporation

Mario Perone, mperone1@verizon.net

tel (781) 587-0086 cell (781) 439-4999

N/S: Pleasant Street (Route 60)
E/W: Lake Street/Route 2 EB Off-Ramp
City, State: Belmont, MA
Client: DCI/S. Siragusa

File Name : 04705A
Site Code : 04705
Start Date : 3/29/2016
Page No : 1

Groups Printed- Cars & Peds

	Pleasant Street (Route 60) From North				Lake Street From East				Pleasant Street (Route 60) From South				Route 2 EB Off-Ramp (Exit 59) From West				Int. Total
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
07:00 AM	0	198	43	1	12	0	5	2	17	115	0	0	97	24	58	1	573
07:15 AM	0	173	42	0	26	0	9	3	19	124	0	1	95	47	83	1	623
07:30 AM	0	162	50	0	34	0	10	4	15	142	0	0	94	55	86	0	652
07:45 AM	0	191	47	0	25	0	8	3	20	149	0	0	86	63	94	1	687
Total	0	724	182	1	97	0	32	12	71	530	0	1	372	189	321	3	2535
08:00 AM	0	207	63	0	19	0	5	2	14	147	0	0	92	49	84	2	684
08:15 AM	0	206	43	0	32	0	11	1	17	144	0	1	91	60	74	1	681
08:30 AM	0	222	44	0	22	0	11	0	22	154	0	1	79	58	83	2	698
08:45 AM	0	169	41	0	33	0	11	0	16	125	0	1	66	50	74	0	586
Total	0	804	191	0	106	0	38	3	69	570	0	3	328	217	315	5	2649
Grand Total	0	1528	373	1	203	0	70	15	140	1100	0	4	700	406	636	8	5184
Apprch %	0	80.3	19.6	0.1	70.5	0	24.3	5.2	11.3	88.4	0	0.3	40	23.2	36.3	0.5	
Total %	0	29.5	7.2	0	3.9	0	1.4	0.3	2.7	21.2	0	0.1	13.5	7.8	12.3	0.2	

	Pleasant Street (Route 60) From North					Lake Street From East					Pleasant Street (Route 60) From South					Route 2 EB Off-Ramp (Exit 59) From West					Int. Total
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	191	47	0	238	25	0	8	3	36	20	149	0	0	169	86	63	94	1	244	687
08:00 AM	0	207	63	0	270	19	0	5	2	26	14	147	0	0	161	92	49	84	2	227	684
08:15 AM	0	206	43	0	249	32	0	11	1	44	17	144	0	1	162	91	60	74	1	226	681
08:30 AM	0	222	44	0	266	22	0	11	0	33	22	154	0	1	177	79	58	83	2	222	698
Total Volume	0	826	197	0	1023	98	0	35	6	139	73	594	0	2	669	348	230	335	6	919	2750
% App. Total	0	80.7	19.3	0		70.5	0	25.2	4.3		10.9	88.8	0	0.3		37.9	25	36.5	0.7		
PHF	.000	.930	.782	.000	.947	.766	.000	.795	.500	.790	.830	.964	.000	.500	.945	.946	.913	.891	.750	.942	.985

Transportation Data Corporation

Mario Perone, mperone1@verizon.net

tel (781) 587-0086 cell (781) 439-4999

N/S: Pleasant Street (Route 60)
E/W: Lake Street/Route 2 EB Off-Ramp
City, State: Belmont, MA
Client: DCI/S. Siragusa

File Name : 04705A
Site Code : 04705
Start Date : 3/29/2016
Page No : 1

Groups Printed- Trucks & Buses

	Pleasant Street (Route 60) From North				Lake Street From East				Pleasant Street (Route 60) From South				Route 2 EB Off-Ramp (Exit 59) From West				Int. Total
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
07:00 AM	0	0	1	0	0	0	0	0	0	2	0	0	2	1	0	0	6
07:15 AM	0	0	0	0	1	0	0	0	1	3	0	0	1	2	1	0	9
07:30 AM	0	2	0	0	0	0	0	0	0	2	0	0	1	2	2	0	9
07:45 AM	0	0	1	0	1	0	0	0	0	1	0	0	1	2	1	0	7
Total	0	2	2	0	2	0	0	0	1	8	0	0	5	7	4	0	31
08:00 AM	0	1	1	0	0	0	0	0	0	3	0	0	2	3	1	0	11
08:15 AM	0	2	0	0	1	0	0	0	0	2	0	0	1	2	1	0	9
08:30 AM	0	2	1	0	0	0	0	0	0	0	0	0	0	3	1	0	7
08:45 AM	0	2	1	0	1	0	0	0	0	1	0	0	2	0	3	0	10
Total	0	7	3	0	2	0	0	0	0	6	0	0	5	8	6	0	37
Grand Total	0	9	5	0	4	0	0	0	1	14	0	0	10	15	10	0	68
Apprch %	0	64.3	35.7	0	100	0	0	0	6.7	93.3	0	0	28.6	42.9	28.6	0	
Total %	0	13.2	7.4	0	5.9	0	0	0	1.5	20.6	0	0	14.7	22.1	14.7	0	

	Pleasant Street (Route 60) From North					Lake Street From East					Pleasant Street (Route 60) From South					Route 2 EB Off-Ramp (Exit 59) From West					Int. Total
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	1	1	0	2	0	0	0	0	0	0	3	0	0	3	2	3	1	0	6	11
08:15 AM	0	2	0	0	2	1	0	0	0	1	0	2	0	0	2	1	2	1	0	4	9
08:30 AM	0	2	1	0	3	0	0	0	0	0	0	0	0	0	0	0	3	1	0	4	7
08:45 AM	0	2	1	0	3	1	0	0	0	1	0	1	0	0	1	2	0	3	0	5	10
Total Volume	0	7	3	0	10	2	0	0	0	2	0	6	0	0	6	5	8	6	0	19	37
% App. Total	0	70	30	0	100	100	0	0	0	0	0	100	0	0	0	26.3	42.1	31.6	0		
PHF	.000	.875	.750	.000	.833	.500	.000	.000	.000	.500	.000	.500	.000	.000	.500	.625	.667	.500	.000	.792	.841

Transportation Data Corporation
 Mario Perone, mperone1@verizon.net
 tel (781) 587-0086 cell (781) 439-4999

N/S: Pleasant Street (Route 60)
 E/W: Lake Street/Route 2 EB Off-Ramp
 City, State: Belmont, MA
 Client: DCI/S. Siragusa

File Name : 04705A
 Site Code : 04705
 Start Date : 3/29/2016
 Page No : 1

Groups Printed- Bikes by Direction

	Pleasant Street (Route 60) From North				Lake Street From East				Pleasant Street (Route 60) From South				Route 2 EB Off-Ramp (Exit 59) From West				Int. Total
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
07:45 AM	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Total	0	2	1	0	0	0	0	0	0	1	0	0	0	0	0	0	4
08:00 AM	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	4
08:15 AM	0	2	0	0	1	0	0	0	1	0	0	0	0	0	0	0	4
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	4	1	0	1	0	2	0	1	0	0	0	0	0	0	0	9
Grand Total	0	6	2	0	1	0	2	0	1	1	0	0	0	0	0	0	13
Apprch %	0	75	25	0	33.3	0	66.7	0	50	50	0	0	0	0	0	0	
Total %	0	46.2	15.4	0	7.7	0	15.4	0	7.7	7.7	0	0	0	0	0	0	

	Pleasant Street (Route 60) From North					Lake Street From East					Pleasant Street (Route 60) From South					Route 2 EB Off-Ramp (Exit 59) From West					Int. Total
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
07:45 AM	0	2	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
08:00 AM	0	2	0	0	2	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	4
08:15 AM	0	2	0	0	2	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0	4
Total Volume	0	6	1	0	7	1	0	2	0	3	1	1	0	0	2	0	0	0	0	0	12
% App. Total	0	85.7	14.3	0		33.3	0	66.7	0		50	50	0	0		0	0	0	0		
PHF	.000	.750	.250	.000	.583	.250	.000	.250	.000	.375	.250	.250	.000	.000	.500	.000	.000	.000	.000	.000	.750

Transportation Data Corporation

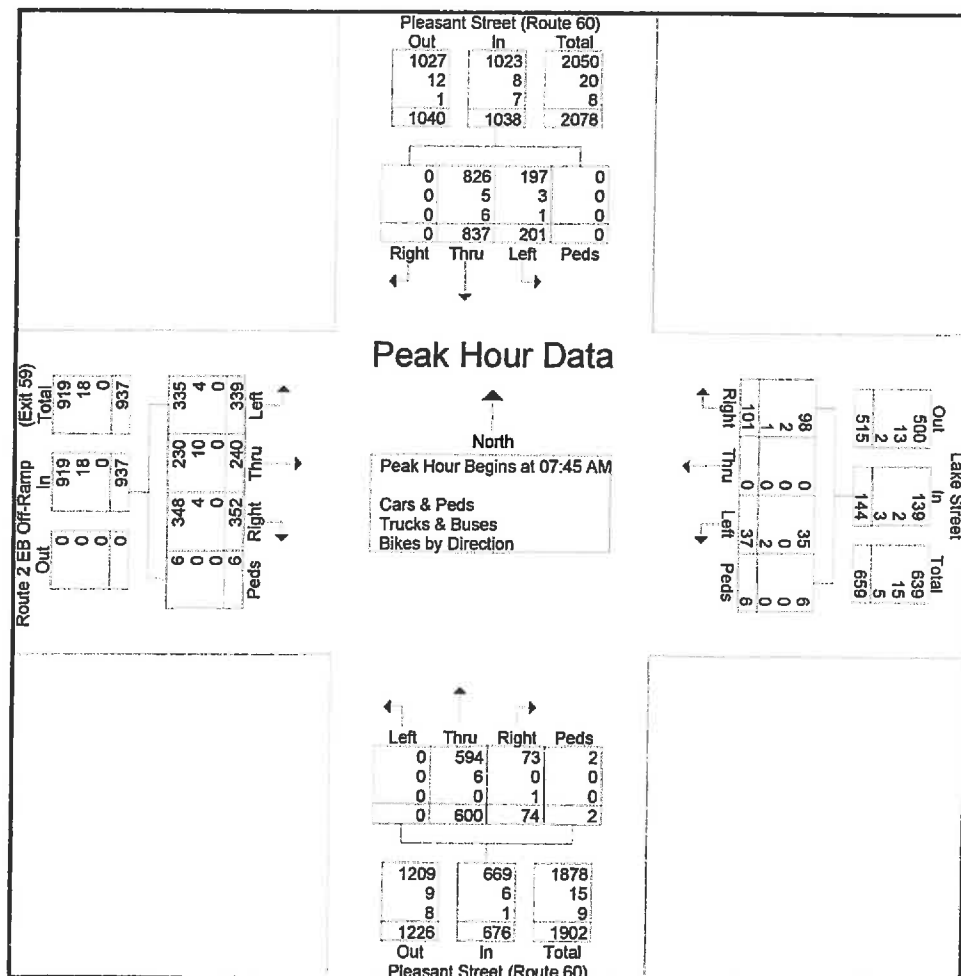
Mario Perone, mperone1@verizon.net

tel (781) 587-0086 cell (781) 439-4999

N/S: Pleasant Street (Route 60)
E/W: Lake Street/Route 2 EB Off-Ramp
City, State: Belmont, MA
Client: DCI/S. Siragusa

File Name : 04705A
Site Code : 04705
Start Date : 3/29/2016
Page No : 1

	Pleasant Street (Route 60) From North					Lake Street From East					Pleasant Street (Route 60) From South					Route 2 EB Off-Ramp (Exit 59) From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	193	49	0	242	26	0	8	3	37	20	150	0	0	170	87	65	95	1	248	697
08:00 AM	0	210	64	0	274	19	0	7	2	28	14	150	0	0	164	94	52	85	2	233	699
08:15 AM	0	210	43	0	253	34	0	11	1	46	18	146	0	1	165	92	62	75	1	230	694
08:30 AM	0	224	45	0	269	22	0	11	0	33	22	154	0	1	177	79	61	84	2	226	705
Total Volume	0	837	201	0	1038	101	0	37	6	144	74	600	0	2	676	352	240	339	6	937	2795
% App. Total	0	80.6	19.4	0		70.1	0	25.7	4.2		10.9	88.8	0	0.3		37.6	25.6	36.2	0.6		
PHF	.000	.934	.785	.000	.947	.743	.000	.841	.500	.783	.841	.974	.000	.500	.955	.936	.923	.892	.750	.945	.991
Cars & Peds	0	826	197	0	1023	98	0	35	6	139	73	594	0	2	669	348	230	335	6	919	2750
% Cars & Peds	0	98.7	98.0	0	98.6	97.0	0	94.6	100	96.5	98.6	99.0	0	100	99.0	98.9	95.8	98.8	100	98.1	98.4
Trucks & Buses	0	5	3	0	8	2	0	0	0	2	0	6	0	0	6	4	10	4	0	18	34
% Trucks & Buses	0	0.6	1.5	0	0.8	2.0	0	0	0	1.4	0	1.0	0	0	0.9	1.1	4.2	1.2	0	1.9	1.2
Bikes by Direction	0	6	1	0	7	1	0	2	0	3	1	0	0	0	1	0	0	0	0	0	11
% Bikes by Direction	0	0.7	0.5	0	0.7	1.0	0	5.4	0	2.1	1.4	0	0	0	0.1	0	0	0	0	0	0.4



Transportation Data Corporation

Mario Perone, mperone1@verizon.net

tel (781) 587-0086 cell (781) 439-4999

N/S: Pleasant Street (Route 60)
E/W: Lake Street/Route 2 EB Off-Ramp
City, State: Belmont, MA
Client: DCI/S. Siragusa

File Name : 04705AA
Site Code : 04705
Start Date : 3/29/2016
Page No : 1

Groups Printed- Cars & Peds - Trucks & Buses - Bikes by Direction

	Pleasant Street (Route 60) From North				Lake Street From East				Pleasant Street (Route 60) From South				Route 2 EB Off-Ramp (Exit 59) From West				Int. Total
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
04:00 PM	0	105	19	0	40	0	10	1	20	174	0	0	48	13	72	1	503
04:15 PM	0	128	20	0	59	0	6	0	21	211	0	0	60	6	94	0	605
04:30 PM	0	129	28	0	68	0	6	1	22	181	0	0	69	5	105	1	615
04:45 PM	0	119	23	0	72	0	3	1	19	190	0	0	79	15	124	0	645
Total	0	481	90	0	239	0	25	3	82	756	0	0	256	39	395	2	2368
05:00 PM	0	138	22	0	68	0	15	0	17	188	0	0	93	8	111	0	660
05:15 PM	0	150	20	0	65	0	10	3	15	176	0	0	99	7	121	1	667
05:30 PM	0	147	20	0	93	0	8	1	15	181	0	0	96	18	114	2	695
05:45 PM	0	128	20	0	89	0	6	1	11	178	0	1	118	21	114	2	689
Total	0	563	82	0	315	0	39	5	58	723	0	1	406	54	460	5	2711
Grand Total	0	1044	172	0	554	0	64	8	140	1479	0	1	662	93	855	7	5079
Apprch %	0	85.9	14.1	0	88.5	0	10.2	1.3	8.6	91.3	0	0.1	40.9	5.8	52.9	0.4	
Total %	0	20.6	3.4	0	10.9	0	1.3	0.2	2.8	29.1	0	0	13	1.8	16.8	0.1	
Cars & Peds	0	1037	167	0	550	0	64	8	138	1462	0	1	656	84	849	7	5023
% Cars & Peds	0	99.3	97.1	0	99.3	0	100	100	98.6	98.9	0	100	99.1	90.3	99.3	100	98.9
Trucks & Buses	0	6	5	0	4	0	0	0	2	14	0	0	6	9	6	0	52
% Trucks & Buses	0	0.6	2.9	0	0.7	0	0	0	1.4	0.9	0	0	0.9	9.7	0.7	0	1
Bikes by Direction	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	4
% Bikes by Direction	0	0.1	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.1

	Pleasant Street (Route 60) From North					Lake Street From East					Pleasant Street (Route 60) From South					Route 2 EB Off-Ramp (Exit 59) From West					Int. Total
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	138	22	0	160	68	0	15	0	83	17	188	0	0	205	93	8	111	0	212	660
05:15 PM	0	150	20	0	170	65	0	10	3	78	15	176	0	0	191	99	7	121	1	228	667
05:30 PM	0	147	20	0	167	93	0	8	1	102	15	181	0	0	196	96	18	114	2	230	695
05:45 PM	0	128	20	0	148	89	0	6	1	96	11	178	0	1	190	118	21	114	2	255	689
Total Volume	0	563	82	0	645	315	0	39	5	359	58	723	0	1	782	406	54	460	5	925	2711
% App. Total	0	87.3	12.7	0		87.7	0	10.9	1.4		7.4	92.5	0	0.1		43.9	5.8	49.7	0.5		
PHF	.000	.938	.932	.000	.949	.847	.000	.650	.417	.880	.853	.961	.000	.250	.954	.860	.643	.950	.625	.907	.975
Cars & Peds	0	559	81	0	640	313	0	39	5	357	57	720	0	1	778	403	48	457	5	913	2688
% Cars & Peds	0	99.3	98.8	0	99.2	99.4	0	100	100	99.4	98.3	99.6	0	100	99.5	99.3	88.9	99.3	100	98.7	99.2
Trucks & Buses	0	4	1	0	5	2	0	0	0	2	1	2	0	0	3	3	6	3	0	12	22
% Trucks & Buses	0	0.7	1.2	0	0.8	0.6	0	0	0	0.6	1.7	0.3	0	0	0.4	0.7	11.1	0.7	0	1.3	0.8
Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
% Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0.0

Transportation Data Corporation

Mario Perone, mperone1@verizon.net

tel (781) 587-0086 cell (781) 439-4999

N/S: Pleasant Street (Route 60)
E/W: Lake Street/Route 2 EB Off-Ramp
City, State: Belmont, MA
Client: DCI/S. Siragusa

File Name : 04705AA
Site Code : 04705
Start Date : 3/29/2016
Page No : 1

Groups Printed- Cars & Peds

	Pleasant Street (Route 60) From North				Lake Street From East				Pleasant Street (Route 60) From South				Route 2 EB Off-Ramp (Exit 59) From West				Int. Total
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
04:00 PM	0	104	18	0	40	0	10	1	20	170	0	0	47	13	71	1	495
04:15 PM	0	128	20	0	59	0	6	0	21	208	0	0	60	4	94	0	600
04:30 PM	0	127	27	0	68	0	6	1	22	178	0	0	68	5	103	1	606
04:45 PM	0	119	21	0	70	0	3	1	18	186	0	0	78	14	124	0	634
Total	0	478	86	0	237	0	25	3	81	742	0	0	253	36	392	2	2335
05:00 PM	0	138	22	0	68	0	15	0	17	186	0	0	93	6	111	0	656
05:15 PM	0	149	19	0	64	0	10	3	15	176	0	0	97	7	119	1	660
05:30 PM	0	145	20	0	93	0	8	1	14	180	0	0	95	16	114	2	688
05:45 PM	0	127	20	0	88	0	6	1	11	178	0	1	118	19	113	2	684
Total	0	559	81	0	313	0	39	5	57	720	0	1	403	48	457	5	2688
Grand Total	0	1037	167	0	550	0	64	8	138	1462	0	1	656	84	849	7	5023
Apprch %	0	86.1	13.9	0	88.4	0	10.3	1.3	8.6	91.3	0	0.1	41.1	5.3	53.2	0.4	
Total %	0	20.6	3.3	0	10.9	0	1.3	0.2	2.7	29.1	0	0	13.1	1.7	16.9	0.1	

	Pleasant Street (Route 60) From North					Lake Street From East					Pleasant Street (Route 60) From South					Route 2 EB Off-Ramp (Exit 59) From West					Int. Total
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	138	22	0	160	68	0	15	0	83	17	186	0	0	203	93	6	111	0	210	656
05:15 PM	0	149	19	0	168	64	0	10	3	77	15	176	0	0	191	97	7	119	1	224	660
05:30 PM	0	145	20	0	165	93	0	8	1	102	14	180	0	0	194	95	16	114	2	227	688
05:45 PM	0	127	20	0	147	88	0	6	1	95	11	178	0	1	190	118	19	113	2	252	684
Total Volume	0	559	81	0	640	313	0	39	5	357	57	720	0	1	778	403	48	457	5	913	2688
% App. Total	0	87.3	12.7	0		87.7	0	10.9	1.4		7.3	92.5	0	0.1		44.1	5.3	50.1	0.5		
PHF	.000	.938	.920	.000	.952	.841	.000	.650	.417	.875	.838	.968	.000	.250	.958	.854	.632	.960	.625	.906	.977

Transportation Data Corporation
 Mario Perone, mperone1@verizon.net
 tel (781) 587-0086 cell (781) 439-4999

N/S: Pleasant Street (Route 60)
 E/W: Lake Street/Route 2 EB Off-Ramp
 City, State: Belmont, MA
 Client: DCI/S. Siragusa

File Name : 04705AA
 Site Code : 04705
 Start Date : 3/29/2016
 Page No : 1

Groups Printed- Trucks & Buses

	Pleasant Street (Route 60) From North				Lake Street From East				Pleasant Street (Route 60) From South				Route 2 EB Off-Ramp (Exit 59) From West				Int. Total
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
04:00 PM	0	1	1	0	0	0	0	0	0	2	0	0	1	0	1	0	6
04:15 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	5
04:30 PM	0	1	1	0	0	0	0	0	0	3	0	0	1	0	2	0	8
04:45 PM	0	0	2	0	2	0	0	0	1	4	0	0	1	1	0	0	11
Total	0	2	4	0	2	0	0	0	1	12	0	0	3	3	3	0	30
05:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3
05:15 PM	0	1	1	0	1	0	0	0	0	0	0	0	2	0	2	0	7
05:30 PM	0	2	0	0	0	0	0	0	1	1	0	0	1	2	0	0	7
05:45 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	2	1	0	5
Total	0	4	1	0	2	0	0	0	1	2	0	0	3	6	3	0	22
Grand Total	0	6	5	0	4	0	0	0	2	14	0	0	6	9	6	0	52
Apprch %	0	54.5	45.5	0	100	0	0	0	12.5	87.5	0	0	28.6	42.9	28.6	0	
Total %	0	11.5	9.6	0	7.7	0	0	0	3.8	26.9	0	0	11.5	17.3	11.5	0	

	Pleasant Street (Route 60) From North					Lake Street From East					Pleasant Street (Route 60) From South					Route 2 EB Off-Ramp (Exit 59) From West					Int. Total
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	1	1	0	2	0	0	0	0	0	0	2	0	0	2	1	0	1	0	2	6
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	2	0	0	2	5
04:30 PM	0	1	1	0	2	0	0	0	0	0	0	3	0	0	3	1	0	2	0	3	8
04:45 PM	0	0	2	0	2	2	0	0	0	2	1	4	0	0	5	1	1	0	0	2	11
Total Volume	0	2	4	0	6	2	0	0	0	2	1	12	0	0	13	3	3	3	0	9	30
% App. Total	0	33.3	66.7	0		100	0	0	0		7.7	92.3	0	0		33.3	33.3	33.3	0		
PHF	.000	.500	.500	.000	.750	.250	.000	.000	.000	.250	.250	.750	.000	.000	.650	.750	.375	.375	.000	.750	.682

Transportation Data Corporation

Mario Perone, mperone1@verizon.net

tel (781) 587-0086 cell (781) 439-4999

N/S: Pleasant Street (Route 60)
E/W: Lake Street/Route 2 EB Off-Ramp
City, State: Belmont, MA
Client: DCI/S. Siragusa

File Name : 04705AA
Site Code : 04705
Start Date : 3/29/2016
Page No : 1

Groups Printed- Bikes by Direction

	Pleasant Street (Route 60) From North				Lake Street From East				Pleasant Street (Route 60) From South				Route 2 EB Off-Ramp (Exit 59) From West				Int. Total
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
04:00 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	3
05:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Grand Total	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	4
Apprch %	0	100	0	0	0	0	0	0	0	100	0	0	0	0	0	0	
Total %	0	25	0	0	0	0	0	0	0	75	0	0	0	0	0	0	

	Pleasant Street (Route 60) From North					Lake Street From East					Pleasant Street (Route 60) From South					Route 2 EB Off-Ramp (Exit 59) From West					Int. Total
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	3
% App. Total	0	100	0	0		0	0	0	0		0	100	0	0		0	0	0	0		
PHF	.000	.250	.000	.000	.250	.000	.000	.000	.000	.000	.000	.250	.000	.000	.250	.000	.000	.000	.000	.000	.375

Transportation Data Corporation

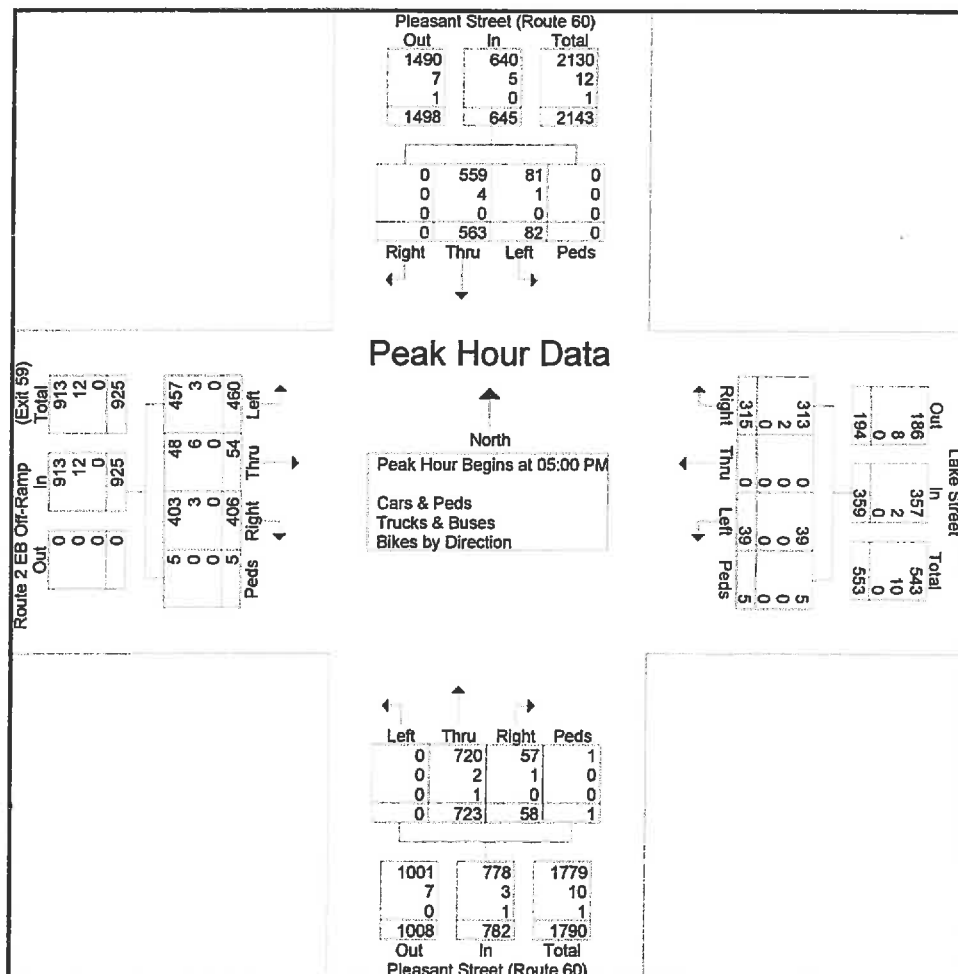
Mario Perone, mperone1@verizon.net

tel (781) 587-0086 cell (781) 439-4999

N/S: Pleasant Street (Route 60)
E/W: Lake Street/Route 2 EB Off-Ramp
City, State: Belmont, MA
Client: DCI/S. Siragusa

File Name : 04705AA
Site Code : 04705
Start Date : 3/29/2016
Page No : 1

	Pleasant Street (Route 60) From North					Lake Street From East					Pleasant Street (Route 60) From South					Route 2 EB Off-Ramp (Exit 59) From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	138	22	0	160	68	0	15	0	83	17	188	0	0	205	93	8	111	0	212	660
05:15 PM	0	150	20	0	170	65	0	10	3	78	15	176	0	0	191	99	7	121	1	228	667
05:30 PM	0	147	20	0	167	93	0	8	1	102	15	181	0	0	196	96	18	114	2	230	695
05:45 PM	0	128	20	0	148	89	0	6	1	96	11	178	0	1	190	118	21	114	2	255	689
Total Volume	0	563	82	0	645	315	0	39	5	359	58	723	0	1	782	406	54	460	5	925	2711
% App. Total	0	87.3	12.7	0		87.7	0	10.9	1.4		7.4	92.5	0	0.1		43.9	5.8	49.7	0.5		
PHF	.000	.938	.932	.000	.949	.847	.000	.650	.417	.880	.853	.961	.000	.250	.954	.860	.643	.950	.625	.907	.975
Cars & Peds	0	559	81	0	640	313	0	39	5	357	57	720	0	1	778	403	48	457	5	913	2688
% Cars & Peds	0	99.3	98.8	0	99.2	99.4	0	100	100	99.4	98.3	99.6	0	100	99.5	99.3	88.9	99.3	100	98.7	99.2
Trucks & Buses	0	4	1	0	5	2	0	0	0	2	1	2	0	0	3	3	6	3	0	12	22
% Trucks & Buses	0	0.7	1.2	0	0.8	0.6	0	0	0	0.6	1.7	0.3	0	0	0.4	0.7	11.1	0.7	0	1.3	0.8
Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
% Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0.0



/S: Brighton Street
 E/W: Pleasant Street
 City,State: Belmont, MA
 Client:



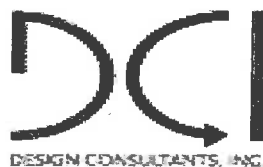
File Name :
 Site Code :
 Start Date : 3/17/2016
 Page No : 1

Groups Printed - Cars - Trucks

	Pleasant Street From West			Brighton Street From South			Pleasant Street From East			Brighton Street From North			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
7:00 AM	4	66	0	41	0	6	4	127	135	0	5	5	393
7:15 AM	4	110	0	48	2	15	6	134	81	3	6	4	413
7:30 AM	1	90	2	50	1	6	3	151	57	3	6	4	374
7:45 AM	5	67	0	59	4	8	2	159	98	3	1	7	413
Total	14	333	2	198	7	35	15	571	371	9	18	20	1593
8:00 AM	6	102	0	66	4	13	3	127	91	1	2	9	424
8:15 AM	6	67	0	63	2	7	3	132	89	2	2	3	376
8:30 AM	3	88	1	61	2	12	5	191	91	2	6	4	466
8:45 AM	7	85	2	68	3	11	1	150	101	3	3	4	438
Total	22	342	3	258	11	43	12	600	372	8	13	20	1704
Grand Total	36	675	5	456	18	78	27	1171	743	17	31	40	3297
Approach %	5.03%	94.27%	0.70%	82.61%	3.26%	14.13%	1.39%	60.33%	38.28%	19.32%	35.23%	45.45%	
Total %	1.09%	20.47%	0.15%	13.83%	0.55%	2.37%	0.82%	35.52%	22.54%	0.52%	0.94%	1.21%	

	Pleasant Street From West			Brighton Street From South			Pleasant Street From East			Brighton Street From North			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Peak Hour Analysis From 7:00 AM to 8:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 8:00 AM													
8:00 AM	6	102	0	66	4	13	3	127	91	1	2	9	424
8:15 AM	6	67	0	63	2	7	3	132	89	2	2	3	376
8:30 AM	3	88	1	61	2	12	5	191	91	2	6	4	466
8:45 AM	7	85	2	68	3	11	1	150	101	3	3	4	438
Total Volume	22	342	3	258	11	43	12	600	372	8	13	20	1704
% App. Total	5.99%	93.19%	0.82%	82.69%	3.53%	13.78%	1.22%	60.98%	37.80%	19.51%	31.71%	48.78%	
PHF	0.786	0.838	0.375	0.949	0.688	0.827	0.600	0.785	0.921	0.667	0.542	0.556	0.914
Cars	22	340	3	256	11	42	12	596	369	8	12	19	1690
% Cars	#####	99.42%	#####	99.22%	#####	97.67%	#####	99.33%	99.19%	#####	92.31%	95.00%	99.18%
Trucks	0	2	0	2	0	1	0	4	3	0	1	1	14
% Trucks	0.00%	0.58%	0.00%	0.78%	0.00%	2.33%	0.00%	0.67%	0.81%	0.00%	7.69%	5.00%	0.82%

N/S: Brighton Street
E/W: Pleasant Street
City, State: Belmont, MA
Client:



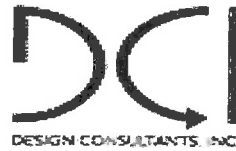
File Name :
Site Code :
Start Date : 3/16/2016
Page No : 1

Groups Printed - Cars - Trucks

	Pleasant Street From West			Brighton Street From South			Pleasant Street From East			Brighton Street From North			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
4:00 PM	9	112	1	76	7	15	4	115	61	0	1	2	403
4:15 PM	3	122	0	90	6	8	3	94	76	1	3	2	408
4:30 PM	8	131	1	90	5	12	7	110	83	4	6	3	460
4:45 PM	4	96	0	77	7	8	4	101	79	1	11	7	395
Total	24	461	2	333	25	43	18	420	299	6	21	14	1666
5:00 PM	2	113	0	97	4	10	3	119	112	2	6	4	472
5:15 PM	3	98	0	91	9	14	6	121	86	2	3	3	436
5:30 PM	4	117	0	88	5	9	6	115	97	3	5	4	453
5:45 PM	14	118	0	104	6	16	4	133	105	2	15	3	520
Total	23	446	0	380	24	49	19	488	400	9	29	14	1881
Grand Total	47	907	2	713	49	92	37	908	699	15	50	28	3547
Approach %	4.92%	94.87%	0.21%	83.49%	5.74%	10.77%	2.25%	55.23%	42.52%	16.13%	53.76%	30.11%	
Total %	1.33%	25.57%	0.06%	20.10%	1.38%	2.59%	1.04%	25.60%	19.71%	0.42%	1.41%	0.79%	

	Pleasant Street From West			Brighton Street From South			Pleasant Street From East			Brighton Street From North			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Peak Hour Analysis From 4:00 PM to 5:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 5:00 PM													
5:00 PM	2	113	0	97	4	10	3	119	112	2	6	4	472
5:15 PM	3	98	0	91	9	14	6	121	86	2	3	3	436
5:30 PM	4	117	0	88	5	9	6	115	97	3	5	4	453
5:45 PM	14	118	0	104	6	16	4	133	105	2	15	3	520
Total Volume	23	446	0	380	24	49	19	488	400	9	29	14	1881
% App. Total	4.90%	95.10%	0.00%	83.89%	5.30%	10.82%	2.09%	53.80%	44.10%	17.31%	55.77%	26.92%	
PHF	0.411	0.945	0.000	0.913	0.667	0.766	0.792	0.917	0.893	0.750	0.483	0.875	0.904
Cars	23	445	0	379	24	49	19	486	398	9	29	14	1875
% Cars	#####	99.78%	#####	99.74%	#####	#####	#####	99.59%	99.50%	#####	#####	#####	99.68%
Trucks	0	1	0	1	0	0	0	2	2	0	0	0	6
% Trucks	0.00%	0.22%	0.00%	0.26%	0.00%	0.00%	0.00%	0.41%	0.50%	0.00%	0.00%	0.00%	0.32%

N/S: Brighton Street
E/W: Cross Street
City/State: Belmont, MA
Client:



File Name :
Site Code :
Start Date : 3/24/2016
Page No : 1

Groups Printed - Cars - Trucks

Start Time	Cross Street From West			Brighton Street From South			Cross Street From East			Brighton Street From North			Int. Total
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
7:00 AM	1	16	0	18	41	2	2	33	54	1	116	1	285
7:15 AM	0	25	2	34	50	2	6	44	50	0	110	1	324
7:30 AM	2	17	5	40	61	1	2	30	50	1	97	1	307
7:45 AM	2	32	4	52	82	4	0	37	48	3	114	2	380
Total	5	90	11	144	234	9	10	144	202	5	437	5	1296
8:00 AM	3	24	3	35	60	4	3	40	53	2	122	1	350
8:15 AM	1	53	2	57	74	2	1	33	51	0	139	2	415
8:30 AM	2	48	0	43	71	5	1	29	49	3	127	0	378
8:45 AM	2	31	2	46	68	4	2	38	48	3	123	1	368
Total	8	156	7	181	273	15	7	140	201	8	511	4	1511
Grand Total	13	246	18	325	507	24	17	284	403	13	948	9	2807
Approach %	4.69%	88.81%	6.50%	37.97%	59.23%	2.80%	2.41%	40.34%	57.24%	1.34%	97.73%	0.93%	
Total %	0.46%	8.76%	0.64%	11.58%	18.06%	0.86%	0.61%	10.12%	14.36%	0.46%	33.77%	0.32%	

	Cross Street From West			Brighton Street From South			Cross Street From East			Brighton Street From North			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Peak Hour Analysis From 7:00 AM to 8:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 8:00 AM													
7:45 AM	2	32	4	52	82	4	0	37	48	3	114	2	380
8:00 AM	3	24	3	35	60	4	3	40	53	2	122	1	350
8:15 AM	1	53	2	57	74	2	1	33	51	0	139	2	415
8:30 AM	2	48	0	43	71	5	1	29	49	3	127	0	378
Total Volume	8	157	9	187	287	15	5	139	201	8	502	5	1523
% App. Total	4.60%	90.23%	5.17%	38.24%	58.69%	3.07%	1.45%	40.29%	58.26%	1.55%	97.48%	0.97%	
PHF	0.667	0.741	0.563	0.820	0.875	0.750	0.417	0.869	0.948	0.667	0.903	0.625	0.917
Cars	8	156	0.001	186	284	15	5	139	201	8	501	5	1517
% Cars	100.0%	99.36%	0.00%	99.47%	0.00%	100.0%	0.00%	100.0%	100.0%	100.0%	99.80%	100.0%	99.61%
Trucks	0	1	0	1	3	0	0	0	0	0	1	0	6
% Trucks	0.00%	0.64%	0.00%	0.53%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.20%	0.00%	0.39%

N/S: Brighton Street
E/W: Cross Street
City, State: Belmont, MA
Client:



File Name :
Site Code :
Start Date : 3/23/2016
Page No : 1

Groups Printed - Cars - Trucks

Start Time	Cross Street From West			Brighton Street From South			Cross Street From East			Brighton Street From North			Int. Total
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
4:00 PM	9	43	0	111	87	5	2	11	19	2	67	1	357
4:15 PM	2	49	3	105	106	2	6	18	16	5	86	2	400
4:30 PM	5	68	2	93	108	3	2	20	20	3	98	3	425
4:45 PM	6	47	4	84	92	4	1	22	27	4	82	1	374
Total	22	207	9	393	393	14	11	71	82	14	333	7	1556
5:00 PM	5	66	5	114	106	2	2	20	23	3	104	2	452
5:15 PM	5	77	5	111	110	1	2	28	38	4	127	1	509
5:30 PM	7	60	11	130	124	1	2	27	50	2	157	4	575
5:45 PM	15	49	15	90	114	2	3	30	42	7	118	2	487
Total	32	252	36	445	454	6	9	105	153	16	506	9	2023
Grand Total	54	459	45	838	847	20	20	176	235	30	839	16	3579
Approach %	9.68%	82.26%	8.06%	49.15%	49.68%	1.17%	4.64%	40.84%	54.52%	3.39%	94.80%	1.81%	
Total %	1.51%	12.82%	1.26%	23.41%	23.67%	0.56%	0.56%	4.92%	6.57%	0.84%	23.44%	0.45%	

	Cross Street From West			Brighton Street From South			Cross Street From East			Brighton Street From North			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Peak Hour Analysis From 4:00 PM to 5:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 5:00 PM													
5:00 PM	5	66	5	114	106	2	2	20	23	3	104	2	452
5:15 PM	5	77	5	111	110	1	2	28	38	4	127	1	509
5:30 PM	7	60	11	130	124	1	2	27	50	2	157	4	575
5:45 PM	15	49	15	90	114	2	3	30	42	7	118	2	487
Total Volume	32	252	36	445	454	6	9	105	153	16	506	9	2023
% App. Total	10.00%	78.75%	11.25%	49.17%	50.17%	0.66%	3.37%	39.33%	57.30%	3.01%	95.29%	1.69%	
PHF	0.533	0.818	0.600	0.856	0.915	0.750	0.750	0.875	0.765	0.571	0.806	0.563	0.880
Cars	32	252	36	443	453	6	9	105	153	16	504	9	2018
% Cars	100.0%	100.0%	0.00%	99.55%	0.00%	100%	0.00%	100.0%	100.0%	100.0%	99.60%	100.0%	99.75%
Trucks	0	0	0	2	1	0	0	0	0	0	2	0	5
% Trucks	0.00%	0.00%	0.00%	0.45%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.40%	0.00%	0.25%

Transportation Data Corporation
Mario Perone, mperone1@verizon.net
tel (781) 587-0086 cell (781) 439-4999

Page 1

Pleasant Street (Route 60)
 south of Lake Street
 City, State: Belmont, MA
 Client: DCI/S. Siragusa
 Northbound

04705Aspeed
 Site Code: 04705

Start Time	15	16	21	26	31	36	41	46	51	56	61	66	71	Total
03/29/16	0	0	6	24	8	6	0	0	0	0	0	0	0	44
01:00	0	0	8	10	5	2	0	0	0	0	0	0	0	25
02:00	0	1	4	13	5	3	0	0	0	0	0	0	0	26
03:00	1	2	2	8	1	0	0	0	0	0	0	0	0	14
04:00	0	1	4	3	6	2	0	0	0	0	0	0	0	16
05:00	0	1	21	45	15	2	2	0	0	0	0	0	0	86
06:00	7	6	77	122	27	6	0	0	0	0	0	0	0	245
07:00	12	55	270	238	34	3	0	0	0	0	0	0	0	612
08:00	63	116	289	168	28	1	0	0	0	0	0	0	0	665
09:00	14	60	179	204	44	2	0	0	0	0	0	0	0	503
10:00	17	28	181	200	47	3	0	0	0	0	0	0	0	476
11:00	5	53	220	176	28	2	0	0	0	0	0	0	0	484
12 PM	0	37	186	237	49	5	0	0	0	0	0	0	0	514
13:00	17	20	214	235	31	0	0	0	0	0	0	0	0	517
14:00	9	59	218	262	44	4	0	0	0	0	0	0	0	596
15:00	73	126	345	208	29	0	0	0	0	0	0	0	0	781
16:00	179	249	291	95	10	0	0	0	0	0	0	0	0	824
17:00	305	227	181	54	7	0	0	0	0	0	0	0	0	774
18:00	216	208	229	106	10	0	0	0	0	0	0	0	0	769
19:00	8	54	303	214	20	3	1	0	0	0	0	0	0	603
20:00	3	26	175	130	24	1	0	0	0	0	0	0	0	359
21:00	6	28	123	73	13	1	0	0	0	0	0	0	0	244
22:00	0	16	102	52	20	0	0	0	0	0	0	0	0	190
23:00	2	12	57	37	11	1	0	0	0	0	0	0	0	120
Total	937	1385	3685	2914	516	47	3	0	0	0	0	0	0	9487
Percent	9.9%	14.6%	38.8%	30.7%	5.4%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	

Daily

15th Percentile : 16 MPH
 50th Percentile : 23 MPH
 85th Percentile : 28 MPH
 95th Percentile : 30 MPH

Mean Speed(Average) : 23 MPH
 10 MPH Pace Speed : 21-30 MPH
 Number in Pace : 6599
 Percent in Pace : 69.6%
 Number of Vehicles > 30 MPH : 566
 Percent of Vehicles > 30 MPH : 6.0%

Transportation Data Corporation

Mario Perone, mperone1@verizon.net

tel (781) 587-0086 cell (781) 439-4999

Page 2

Pleasant Street (Route 60)

south of Lake Street

City, State: Belmont, MA

Client: DCI/S. Siragusa

Northbound

Start Time	15	16	21	26	31	36	41	46	51	56	61	66	71	Total
03/30/16	2	2	15	13	5	1	0	0	0	0	0	0	0	38
01:00	0	1	6	8	2	0	0	0	0	0	0	0	0	17
02:00	0	2	4	9	2	0	0	0	0	0	0	0	0	17
03:00	1	0	5	0	2	1	0	0	0	0	0	0	0	9
04:00	0	0	3	4	4	2	0	0	0	0	0	0	0	13
05:00	0	4	19	43	16	3	1	0	0	0	0	0	0	86
06:00	1	5	76	122	40	6	1	1	0	0	0	0	0	252
07:00	25	71	285	226	24	0	0	0	0	0	0	0	0	631
08:00	35	91	248	224	43	0	0	0	0	0	0	0	0	641
09:00	3	31	209	203	46	2	0	0	0	0	0	0	0	494
10:00	0	27	190	211	38	3	0	0	0	0	0	0	0	469
11:00	9	19	168	235	56	3	1	0	0	0	0	0	0	491
12 PM	3	32	174	262	40	2	1	0	0	0	0	0	0	514
13:00	97	108	195	128	18	0	0	0	0	0	0	0	0	546
14:00	100	137	252	107	21	1	0	0	0	0	0	0	0	618
15:00	73	140	304	242	39	1	0	0	0	0	0	0	0	799
16:00	47	122	331	220	27	1	0	0	0	0	0	0	0	748
17:00	136	204	317	102	15	1	0	0	0	0	0	0	0	775
18:00	134	170	286	145	12	0	0	0	0	0	0	0	0	747
19:00	10	52	266	221	25	4	0	0	0	0	0	0	0	578
20:00	20	10	110	181	22	1	0	0	0	0	0	0	0	344
21:00	1	3	98	144	28	4	0	0	0	0	0	0	0	278
22:00	0	7	61	89	23	2	1	0	0	0	0	0	0	183
23:00	0	3	36	58	22	5	0	0	0	0	0	0	0	124
Total	697	1241	3658	3197	570	43	5	1	0	0	0	0	0	9412
Percent	7.4%	13.2%	38.9%	34.0%	6.1%	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	

Daily

15th Percentile : 17 MPH
50th Percentile : 23 MPH
85th Percentile : 28 MPH
95th Percentile : 31 MPH

Mean Speed(Average) : 24 MPH
10 MPH Pace Speed : 21-30 MPH
Number in Pace : 6855
Percent in Pace : 72.8%
Number of Vehicles > 30 MPH : 619
Percent of Vehicles > 30 MPH : 6.6%

Transportation Data Corporation

Mario Perone, mperone1@verizon.net

tel (781) 587-0086 cell (781) 439-4999

Page 3

Pleasant Street (Route 60)

south of Lake Street

City, State: Belmont, MA

Client: DCI/S. Siragusa

Northbound

Start	1	16	21	26	31	36	41	46	51	56	61	66	71	Total
Time	15	20	25	30	35	40	45	50	55	60	65	70	75	
03/31/16	0	0	10	25	15	1	0	0	0	0	0	0	0	51
01:00	0	2	3	8	5	2	0	0	0	0	0	0	0	20
02:00	0	1	1	8	7	2	0	0	0	0	0	0	0	19
03:00	1	1	2	3	3	2	0	0	0	0	0	0	0	12
04:00	0	1	2	4	3	2	0	1	0	0	0	0	0	13
05:00	1	1	21	23	25	5	0	0	0	0	0	0	0	76
06:00	3	13	78	99	42	5	0	0	0	0	0	0	0	240
07:00	32	87	267	222	44	2	1	0	0	0	0	0	0	655
08:00	44	117	309	162	27	2	0	0	0	0	0	0	0	661
09:00	8	31	198	233	37	4	0	0	0	0	0	0	0	511
10:00	3	28	140	195	50	6	1	0	0	0	0	0	0	423
11:00	4	32	195	252	38	2	0	0	0	0	0	0	0	523
12 PM	8	42	201	218	44	7	0	0	0	0	0	0	0	520
13:00	12	50	234	254	28	1	0	0	0	0	0	0	0	579
14:00	19	65	302	203	41	2	0	0	0	0	0	0	0	632
15:00	173	182	265	161	17	0	0	0	0	0	0	0	0	798
16:00	100	192	300	173	10	2	0	0	0	0	0	0	0	777
17:00	387	237	126	45	2	0	0	0	0	0	0	0	0	797
18:00	136	104	263	175	12	0	0	0	0	0	0	0	0	690
19:00	11	72	298	207	21	0	0	0	0	0	0	0	0	609
20:00	0	7	167	182	39	2	0	0	0	0	0	0	0	397
21:00	0	0	106	162	28	7	0	1	0	0	0	0	0	304
22:00	0	3	42	93	27	2	0	0	0	0	0	0	0	167
23:00	0	4	35	51	23	3	0	0	0	0	0	0	0	116
Total	942	1272	3565	3158	588	61	2	2	0	0	0	0	0	9590
Percent	9.8%	13.3%	37.2%	32.9%	6.1%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	

Daily

15th Percentile : 16 MPH
50th Percentile : 23 MPH
85th Percentile : 28 MPH
95th Percentile : 31 MPH

Mean Speed(Average) : 23 MPH
10 MPH Pace Speed : 21-30 MPH
Number in Pace : 6723
Percent in Pace : 70.1%
Number of Vehicles > 30 MPH : 653
Percent of Vehicles > 30 MPH : 6.8%

Grand
Total

2576	3898	10908	9269	1674	151	10	3	0	0	0	0	0	0	28489
------	------	-------	------	------	-----	----	---	---	---	---	---	---	---	-------

Overall

15th Percentile : 17 MPH
50th Percentile : 23 MPH
85th Percentile : 28 MPH
95th Percentile : 31 MPH

Mean Speed(Average) : 23 MPH
10 MPH Pace Speed : 21-30 MPH
Number in Pace : 20177
Percent in Pace : 70.8%
Number of Vehicles > 30 MPH : 1838
Percent of Vehicles > 30 MPH : 6.5%

Transportation Data Corporation

Mario Perone, mperone1@verizon.net

tel (781) 587-0086 cell (781) 439-4999

Page 4

Pleasant Street (Route 60)

south of Lake Street

City, State: Belmont, MA

Client: DCI/S. Siragusa

Southbound

Start	1	16	21	26	31	36	41	46	51	56	61	66	71	Total
Time	15	20	25	30	35	40	45	50	55	60	65	70	75	
03/29/16	0	0	0	22	17	11	1	0	0	0	0	0	0	51
01:00	0	1	2	8	7	3	0	0	0	0	0	0	0	21
02:00	0	0	1	4	5	1	0	1	0	0	0	0	0	12
03:00	0	1	1	3	6	4	2	0	0	0	0	0	0	17
04:00	0	0	2	11	21	12	0	1	0	0	0	0	0	47
05:00	0	1	15	56	85	29	6	0	0	0	0	0	0	192
06:00	58	95	174	291	191	45	4	1	0	0	0	0	0	859
07:00	82	143	321	392	149	36	5	1	0	0	0	0	0	1129
08:00	184	241	267	249	112	17	0	0	0	0	0	0	0	1070
09:00	72	91	190	306	255	57	5	1	0	0	0	0	0	977
10:00	24	54	132	241	194	54	6	0	0	0	0	0	0	705
11:00	22	23	92	226	180	46	6	0	0	0	0	0	0	595
12 PM	14	40	125	228	171	38	5	0	0	0	0	0	0	621
13:00	12	24	93	226	189	49	6	0	0	0	0	0	0	599
14:00	17	37	111	278	208	56	5	1	0	0	0	0	0	713
15:00	24	60	124	292	204	48	6	0	1	0	0	0	0	759
16:00	36	77	146	253	211	66	8	0	0	0	0	0	0	797
17:00	103	183	251	271	134	25	3	0	0	0	0	0	0	970
18:00	59	95	228	282	161	44	3	1	0	0	0	0	0	873
19:00	10	37	94	224	172	35	6	0	0	0	0	0	0	578
20:00	0	9	70	160	108	14	3	0	0	0	0	0	0	364
21:00	1	5	55	143	117	23	2	0	0	0	0	0	0	346
22:00	0	5	36	87	85	17	1	0	0	0	0	0	0	231
23:00	0	3	15	37	40	9	1	0	0	0	0	0	0	105
Total	718	1225	2545	4290	3022	739	84	7	1	0	0	0	0	12631
Percent	5.7%	9.7%	20.1%	34.0%	23.9%	5.9%	0.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	

Daily

15th Percentile : 19 MPH
50th Percentile : 27 MPH
85th Percentile : 33 MPH
95th Percentile : 36 MPH

Mean Speed(Average) : 27 MPH

10 MPH Pace Speed : 26-35 MPH

Number in Pace : 7312

Percent in Pace : 57.9%

Number of Vehicles > 30 MPH : 3853

Percent of Vehicles > 30 MPH : 30.5%

Transportation Data Corporation

Mario Perone, mperone1@verizon.net

tel (781) 587-0086 cell (781) 439-4999

Page 5

Pleasant Street (Route 60)

south of Lake Street

City, State: Belmont, MA

Client: DCI/S. Siragusa

Southbound

04705Aspeed

Site Code: 04705

Start	1	16	21	26	31	36	41	46	51	56	61	66	71	Total
Time	15	20	25	30	35	40	45	50	55	60	65	70	75	
03/30/16	1	1	6	9	21	3	0	0	0	0	0	0	0	41
01:00	0	0	4	12	3	1	0	0	0	0	0	0	0	20
02:00	0	2	2	5	4	3	0	0	0	0	0	0	0	16
03:00	0	0	0	4	2	7	0	0	0	0	0	0	0	13
04:00	0	0	3	11	14	9	3	1	0	0	0	0	0	41
05:00	0	1	14	53	101	22	9	1	0	0	0	0	0	201
06:00	73	144	214	270	174	35	5	1	0	0	0	0	0	916
07:00	126	188	270	321	153	33	3	0	0	0	0	0	0	1094
08:00	156	272	306	239	78	8	1	0	0	0	0	0	0	1060
09:00	80	143	235	328	205	36	4	0	0	0	0	0	0	1031
10:00	59	90	161	247	174	48	3	1	0	0	0	0	0	783
11:00	13	44	112	248	174	32	9	0	0	0	0	0	0	632
12 PM	27	54	119	229	147	30	3	1	0	0	0	0	0	610
13:00	23	45	133	242	154	26	1	0	0	0	0	0	0	624
14:00	30	39	150	252	168	31	0	2	0	0	0	0	0	672
15:00	21	43	144	334	204	46	3	0	0	0	0	0	0	795
16:00	64	84	179	310	200	41	5	0	0	0	0	0	0	883
17:00	108	160	269	303	140	29	4	0	0	0	0	0	0	1013
18:00	77	124	237	271	156	36	2	0	0	0	0	0	0	903
19:00	17	17	81	186	154	42	8	0	0	0	0	0	0	505
20:00	13	40	71	160	109	29	2	0	0	0	0	0	0	424
21:00	1	0	54	123	122	27	4	0	0	0	0	0	0	331
22:00	1	0	19	80	83	11	4	0	0	0	0	0	0	198
23:00	0	1	9	37	36	10	1	0	0	0	0	0	0	94
Total	890	1492	2792	4274	2776	595	74	7	0	0	0	0	0	12900
Percent	6.9%	11.6%	21.6%	33.1%	21.5%	4.6%	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	

Daily

15th Percentile : 18 MPH
50th Percentile : 26 MPH
85th Percentile : 32 MPH
95th Percentile : 35 MPH

Mean Speed(Average) : 26 MPH
10 MPH Pace Speed : 21-30 MPH
Number in Pace : 7066
Percent in Pace : 54.8%
Number of Vehicles > 30 MPH : 3452
Percent of Vehicles > 30 MPH : 26.8%

Transportation Data Corporation

Mario Perone, mperone1@verizon.net

tel (781) 587-0086 cell (781) 439-4999

Page 6

Pleasant Street (Route 60)

south of Lake Street

City, State: Belmont, MA

Client: DCI/S. Siragusa

Southbound

04705Aspeed

Site Code: 04705

Start Time	1	16	21	26	31	36	41	46	51	56	61	66	71	Total
	15	20	25	30	35	40	45	50	55	60	65	70	75	
03/31/16	0	0	4	16	15	4	0	0	0	0	0	0	0	39
01:00	0	0	1	3	6	5	0	0	0	0	0	0	0	15
02:00	0	0	3	3	2	1	0	0	0	0	0	0	0	9
03:00	0	0	1	7	4	4	0	0	0	0	0	0	0	16
04:00	0	0	2	9	18	10	6	2	0	0	0	0	0	47
05:00	0	0	15	65	87	30	10	1	0	0	0	0	0	208
06:00	55	84	181	300	254	58	11	1	0	0	0	0	0	944
07:00	137	194	316	312	138	25	6	0	0	0	0	0	0	1128
08:00	114	191	314	293	143	24	4	1	0	0	0	0	0	1084
09:00	62	105	193	328	210	42	6	0	0	0	0	0	0	946
10:00	26	41	130	243	215	63	4	0	0	0	0	0	0	722
11:00	13	18	135	261	198	39	1	1	0	0	0	0	0	666
12 PM	12	30	104	232	179	43	5	0	0	0	0	0	0	605
13:00	9	30	117	268	188	44	10	1	0	0	0	0	0	667
14:00	48	64	161	278	166	49	6	1	0	0	0	0	0	773
15:00	49	95	195	276	182	39	4	0	0	0	0	0	0	840
16:00	51	78	195	320	197	33	6	0	0	0	0	0	0	880
17:00	123	204	289	277	121	24	2	0	0	0	0	0	0	1040
18:00	58	90	217	310	179	39	0	1	0	0	0	0	0	894
19:00	14	44	107	217	131	32	4	0	0	0	0	0	0	549
20:00	4	16	68	156	109	24	4	0	0	0	0	0	0	381
21:00	2	14	53	122	113	16	3	0	0	0	0	0	0	323
22:00	0	3	23	79	77	23	4	1	0	0	0	0	0	210
23:00	0	2	15	42	37	11	1	0	0	0	0	0	0	108
Total	777	1303	2839	4417	2969	682	97	10	0	0	0	0	0	13094
Percent	5.9%	10.0%	21.7%	33.7%	22.7%	5.2%	0.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	

Daily

15th Percentile : 19 MPH
50th Percentile : 26 MPH
85th Percentile : 33 MPH
95th Percentile : 35 MPH

Mean Speed(Average) : 27 MPH
10 MPH Pace Speed : 26-35 MPH
Number in Pace : 7386
Percent in Pace : 56.4%
Number of Vehicles > 30 MPH : 3758
Percent of Vehicles > 30 MPH : 28.7%

Grand Total	2385	4020	8176	12981	8767	2016	255	24	1	0	0	0	0	38625
-------------	------	------	------	-------	------	------	-----	----	---	---	---	---	---	-------

Overall

15th Percentile : 19 MPH
50th Percentile : 26 MPH
85th Percentile : 33 MPH
95th Percentile : 35 MPH

Mean Speed(Average) : 26 MPH
10 MPH Pace Speed : 26-35 MPH
Number in Pace : 21748
Percent in Pace : 56.3%
Number of Vehicles > 30 MPH : 11063
Percent of Vehicles > 30 MPH : 28.6%

Transportation Data Corporation

Mario Perone, mperone1@verizon.net

tel (781) 587-0086 cell (781) 439-4999

Page 1

Pleasant Street (Route 60)

south of Lake Street

City, State: Belmont, MA

Client: DCI/S. Siragusa

04705Avolume

Site Code: 04705

Start Time	29-Mar-16 Tue	NB		SB		Combined		30-Mar Wed	NB		SB		Combined	
		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00		12	123	16	161	28	284		14	122	9	152	23	274
12:15		9	116	8	144	17	260		12	147	14	149	26	296
12:30		14	127	15	150	29	277		8	116	10	165	18	281
12:45		9	148	12	166	21	314		4	129	8	144	12	273
01:00		8	139	10	156	18	295		5	114	4	150	9	264
01:15		8	116	4	138	12	254		5	140	9	157	14	297
01:30		5	129	4	145	9	274		4	144	5	164	9	308
01:45		4	133	3	160	7	293		3	148	2	153	5	301
02:00		6	128	2	167	8	295		5	151	4	147	9	298
02:15		4	139	3	172	7	311		8	139	5	172	13	311
02:30		7	154	3	173	10	327		2	156	6	176	8	332
02:45		9	175	4	201	13	376		2	172	1	177	3	349
03:00		5	180	2	179	7	359		2	177	1	186	3	363
03:15		1	201	3	198	4	399		3	209	3	190	6	399
03:30		4	196	4	179	8	375		2	205	5	220	7	425
03:45		4	204	8	203	12	407		2	208	4	199	6	407
04:00		1	188	8	174	9	362		2	163	3	180	5	343
04:15		2	216	10	199	12	415		1	191	10	190	11	381
04:30		5	209	17	221	22	430		7	208	13	232	20	440
04:45		8	211	12	203	20	414		3	186	15	281	18	467
05:00		11	210	19	245	30	455		16	205	17	265	33	470
05:15		20	182	37	249	57	431		17	205	29	231	46	436
05:30		19	190	53	233	72	423		18	179	62	246	80	425
05:45		36	192	83	243	119	435		35	186	93	271	128	457
06:00		42	187	114	228	156	415		33	194	112	243	145	437
06:15		41	208	177	233	218	441		44	194	207	246	251	440
06:30		64	180	266	210	330	390		75	199	275	217	350	416
06:45		98	194	302	202	400	396		100	160	322	197	422	357
07:00		134	187	286	170	420	357		127	171	270	177	397	348
07:15		156	151	280	179	436	330		169	147	285	132	454	279
07:30		156	141	292	119	448	260		181	144	259	98	440	242
07:45		166	124	271	110	437	234		154	116	280	98	434	214
08:00		156	117	307	105	463	222		179	94	270	148	449	242
08:15		180	88	306	79	486	167		163	109	287	107	450	216
08:30		174	86	276	97	450	183		128	69	283	70	411	139
08:45		155	68	181	83	336	151		171	72	220	99	391	171
09:00		157	68	233	95	390	163		159	83	257	89	416	172
09:15		118	58	249	91	367	149		123	61	278	104	401	165
09:30		122	63	229	93	351	156		113	69	245	65	358	134
09:45		106	55	266	67	372	122		99	65	251	73	350	138
10:00		121	73	197	72	318	145		115	62	242	56	357	118
10:15		126	44	180	65	306	109		105	41	201	42	306	83
10:30		113	37	148	44	261	81		117	46	173	42	290	88
10:45		116	36	180	50	296	86		132	34	167	58	299	92
11:00		129	43	167	39	296	82		129	38	160	37	289	75
11:15		105	34	140	21	245	55		105	36	143	22	248	58
11:30		119	23	140	19	259	42		141	32	173	19	314	51
11:45		131	20	148	26	279	46		116	18	156	16	272	34
Total		3196	6291	5675	6956	8871	13247		3158	6254	5848	7052	9006	13306
Day Total		9487		12631		22118			9412		12900		22312	
% Total		14.4%	28.4%	25.7%	31.4%				14.2%	28.0%	26.2%	31.6%		
Peak	-	07:45	04:15	07:30	05:00	07:45	05:00	-	07:15	04:30	06:30	04:45	07:15	04:30
Vol.	-	676	846	1176	970	1836	1744	-	683	804	1152	1023	1777	1813
P.H.F.		0.939	0.979	0.958	0.974	0.944	0.958		0.943	0.962	0.894	0.910	0.979	0.964

Mario Perone, mperone1@verizon.net
tel (781) 587-0086 cell (781) 439-4999

Pleasant Street (Route 60)
south of Lake Street
City, State: Belmont, MA
Client: DCI/S. Siragusa

04705A volume
Site Code: 04705

Start Time	31-Mar-16		NB		SB		Combined		01-Apr	NB		SB		Combined	
	Thu		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.		Fri	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00			16	117	15	160	31	277		*	*	*	*	*	*
12:15			15	137	9	144	24	281		*	*	*	*	*	*
12:30			11	113	9	170	20	283		*	*	*	*	*	*
12:45			9	153	6	131	15	284		*	*	*	*	*	*
01:00			7	146	4	175	11	321		*	*	*	*	*	*
01:15			5	151	4	173	9	324		*	*	*	*	*	*
01:30			4	129	3	152	7	281		*	*	*	*	*	*
01:45			4	153	4	166	8	319		*	*	*	*	*	*
02:00			5	127	0	162	5	289		*	*	*	*	*	*
02:15			5	167	2	179	7	346		*	*	*	*	*	*
02:30			2	151	4	207	6	358		*	*	*	*	*	*
02:45			7	187	3	225	10	412		*	*	*	*	*	*
03:00			2	180	2	202	4	382		*	*	*	*	*	*
03:15			5	208	2	211	7	419		*	*	*	*	*	*
03:30			4	207	3	230	7	437		*	*	*	*	*	*
03:45			1	203	9	197	10	400		*	*	*	*	*	*
04:00			2	175	8	206	10	381		*	*	*	*	*	*
04:15			1	187	11	190	12	377		*	*	*	*	*	*
04:30			6	213	15	243	21	456		*	*	*	*	*	*
04:45			4	202	13	241	17	443		*	*	*	*	*	*
05:00			16	187	25	239	41	428		*	*	*	*	*	*
05:15			18	211	42	257	60	468		*	*	*	*	*	*
05:30			16	199	56	271	72	470		*	*	*	*	*	*
05:45			26	200	85	273	111	473		*	*	*	*	*	*
06:00			32	176	124	239	156	415		*	*	*	*	*	*
06:15			39	164	215	259	254	423		*	*	*	*	*	*
06:30			84	188	262	213	346	401		*	*	*	*	*	*
06:45			85	162	343	183	428	345		*	*	*	*	*	*
07:00			131	189	292	163	423	352		*	*	*	*	*	*
07:15			174	145	296	161	470	306		*	*	*	*	*	*
07:30			171	154	271	111	442	265		*	*	*	*	*	*
07:45			179	121	269	114	448	235		*	*	*	*	*	*
08:00			183	93	286	109	469	202		*	*	*	*	*	*
08:15			163	101	275	108	438	209		*	*	*	*	*	*
08:30			139	105	266	73	405	178		*	*	*	*	*	*
08:45			176	98	257	91	433	189		*	*	*	*	*	*
09:00			143	75	253	85	396	160		*	*	*	*	*	*
09:15			129	82	242	87	371	169		*	*	*	*	*	*
09:30			126	86	234	80	360	166		*	*	*	*	*	*
09:45			113	61	217	71	330	132		*	*	*	*	*	*
10:00			107	41	207	54	314	95		*	*	*	*	*	*
10:15			115	44	176	57	291	101		*	*	*	*	*	*
10:30			111	52	173	50	284	102		*	*	*	*	*	*
10:45			90	30	166	49	256	79		*	*	*	*	*	*
11:00			128	32	156	41	284	73		*	*	*	*	*	*
11:15			146	30	159	25	305	55		*	*	*	*	*	*
11:30			126	31	161	21	287	52		*	*	*	*	*	*
11:45			123	23	191	21	314	44		*	*	*	*	*	*
Total			3204	6386	5825	7269	9029	13655		0	0	0	0	0	0
Day Total			9590		13094		22684			0	0	0	0	0	0
% Total			14.1%	28.2%	25.7%	32.0%				0.0%	0.0%	0.0%	0.0%		
Peak	-	07:15	04:30	06:45	05:30	07:15	05:00		-	-	-	-	-	-	-
Vol.	-	707	813	1202	1042	1829	1837		-	-	-	-	-	-	-
P.H.F.		0.966	0.954	0.876	0.954	0.973	0.971								
ADT	ADT	22.371	AADT		22.371										

Mario Perone, mperone1@verizon.net
tel (781) 587-0086 cell (781) 439-4999

Page 1

Pleasant Street (Route 60)
south of Lake Street
City, State: Belmont, MA
Client: DCI/S. Siragusa

04705A volume
Site Code: 04705

Start Time	29-Mar-16 Tue	NB		Hour Totals		SB		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		12	123			16	161				
12:15		9	116			8	144				
12:30		14	127			15	150				
12:45		9	148	44	514	12	166	51	621	95	1135
01:00		8	139			10	156				
01:15		8	116			4	138				
01:30		5	129			4	145				
01:45		4	133	25	517	3	160	21	599	46	1116
02:00		6	128			2	167				
02:15		4	139			3	172				
02:30		7	154			3	173				
02:45		9	175	26	596	4	201	12	713	38	1309
03:00		5	180			2	179				
03:15		1	201			3	198				
03:30		4	196			4	179				
03:45		4	204	14	781	8	203	17	759	31	1540
04:00		1	188			8	174				
04:15		2	216			10	199				
04:30		5	209			17	221				
04:45		8	211	16	824	12	203	47	797	63	1621
05:00		11	210			19	245				
05:15		20	182			37	249				
05:30		19	190			53	233				
05:45		36	192	86	774	83	243	192	970	278	1744
06:00		42	187			114	228				
06:15		41	208			177	233				
06:30		64	180			266	210				
06:45		98	194	245	769	302	202	859	873	1104	1642
07:00		134	187			286	170				
07:15		156	151			280	179				
07:30		156	141			292	119				
07:45		166	124	612	603	271	110	1129	578	1741	1181
08:00		156	117			307	105				
08:15		180	88			306	79				
08:30		174	86			276	97				
08:45		155	68	665	359	181	83	1070	364	1735	723
09:00		157	68			233	95				
09:15		118	58			249	91				
09:30		122	63			229	93				
09:45		106	55	503	244	266	67	977	346	1480	590
10:00		121	73			197	72				
10:15		126	44			180	65				
10:30		113	37			148	44				
10:45		116	36	476	190	180	50	705	231	1181	421
11:00		129	43			167	39				
11:15		105	34			140	21				
11:30		119	23			140	19				
11:45		131	20	484	120	148	26	595	105	1079	225
Total		3196	6291			5675	6956			8871	13247
Combined Total			9487				12631				2

Mario Perone, mperone1@verizon.net
tel (781) 587-0086 cell (781) 439-4999

Pleasant Street (Route 60)
south of Lake Street
City, State: Belmont, MA
Client: DCI/S. Siragusa

04705A volume
Site Code: 04705

Start Time	30-Mar-16 Wed	NB		Hour Totals		SB		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		14	122			9	152				
12:15		12	147			14	149				
12:30		8	116			10	165				
12:45		4	129	38	514	8	144	41	610	79	1124
01:00		5	114			4	150				
01:15		5	140			9	157				
01:30		4	144			5	164				
01:45		3	148	17	546	2	153	20	624	37	1170
02:00		5	151			4	147				
02:15		8	139			5	172				
02:30		2	156			6	176				
02:45		2	172	17	618	1	177	16	672	33	1290
03:00		2	177			1	186				
03:15		3	209			3	190				
03:30		2	205			5	220				
03:45		2	208	9	799	4	199	13	795	22	1594
04:00		2	163			3	180				
04:15		1	191			10	190				
04:30		7	208			13	232				
04:45		3	186	13	748	15	281	41	883	54	1631
05:00		16	205			17	265				
05:15		17	205			29	231				
05:30		18	179			62	246				
05:45		35	186	86	775	93	271	201	1013	287	1788
06:00		33	194			112	243				
06:15		44	194			207	246				
06:30		75	199			275	217				
06:45		100	160	252	747	322	197	916	903	1168	1650
07:00		127	171			270	177				
07:15		169	147			285	132				
07:30		181	144			259	98				
07:45		154	116	631	578	280	98	1094	505	1725	1083
08:00		179	94			270	148				
08:15		163	109			287	107				
08:30		128	69			283	70				
08:45		171	72	641	344	220	99	1060	424	1701	768
09:00		159	83			257	89				
09:15		123	61			278	104				
09:30		113	69			245	65				
09:45		99	65	494	278	251	73	1031	331	1525	609
10:00		115	62			242	56				
10:15		105	41			201	42				
10:30		117	46			173	42				
10:45		132	34	469	183	167	58	783	198	1252	381
11:00		129	38			160	37				
11:15		105	36			143	22				
11:30		141	32			173	19				
11:45		116	18	491	124	156	16	632	94	1123	218
Total		3158	6254			5848	7052			9006	13306
Combined Total			9412				12900				223

Transportation Data Corporation

Mario Perone, mperone1@verizon.net

tel (781) 587-0086 cell (781) 439-4999

Page 3

Pleasant Street (Route 60)

south of Lake Street

City, State: Belmont, MA

Client: DCI/S. Siragusa

04705A volume

Site Code: 04705

Start Time	31-Mar-16 Thu	NB		Hour Totals		SB		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		16	117			15	160				
12:15		15	137			9	144				
12:30		11	113			9	170				
12:45		9	153	51	520	6	131	39	605	90	1125
01:00		7	146			4	175				
01:15		5	151			4	173				
01:30		4	129			3	152				
01:45		4	153	20	579	4	166	15	666	35	1245
02:00		5	127			0	162				
02:15		5	167			2	179				
02:30		2	151			4	207				
02:45		7	187	19	632	3	225	9	773	28	1405
03:00		2	180			2	202				
03:15		5	208			2	211				
03:30		4	207			3	230				
03:45		1	203	12	798	9	197	16	840	28	1638
04:00		2	175			8	206				
04:15		1	187			11	190				
04:30		6	213			15	243				
04:45		4	202	13	777	13	241	47	880	60	1657
05:00		16	187			25	239				
05:15		18	211			42	257				
05:30		16	199			56	271				
05:45		26	200	76	797	85	273	208	1040	284	1837
06:00		32	176			124	239				
06:15		39	164			215	259				
06:30		84	188			262	213				
06:45		85	162	240	690	343	183	944	894	1184	1584
07:00		131	189			292	163				
07:15		174	145			296	161				
07:30		171	154			271	111				
07:45		179	121	655	609	269	114	1128	549	1783	1158
08:00		183	93			286	109				
08:15		163	101			275	108				
08:30		139	105			266	73				
08:45		176	98	661	397	257	91	1084	381	1745	778
09:00		143	75			253	85				
09:15		129	82			242	87				
09:30		126	86			234	80				
09:45		113	61	511	304	217	71	946	323	1457	627
10:00		107	41			207	54				
10:15		115	44			176	57				
10:30		111	52			173	50				
10:45		90	30	423	167	166	49	722	210	1145	377
11:00		128	32			156	41				
11:15		146	30			159	25				
11:30		126	31			161	21				
11:45		123	23	523	116	191	21	667	108	1190	224
Total		3204	6386			5825	7269			9029	13655
Combined Total		9590				13094				22684	
Percentage	0.0%										
Total Percent		9558	18931			17348	21277			26906	40208
		33.5%	66.5%			44.9%	55.1%			40.1%	59.9%
ADT	ADT 22,371		AADT 22,371								

Mario Perone, mperone1@verizon.net
tel (781) 587-0086 cell (781) 439-4999

Page 1

Pleasant Street (Route 60)
south of Lake Street
City, State: Belmont, MA
Client: DCI/S. Siragusa

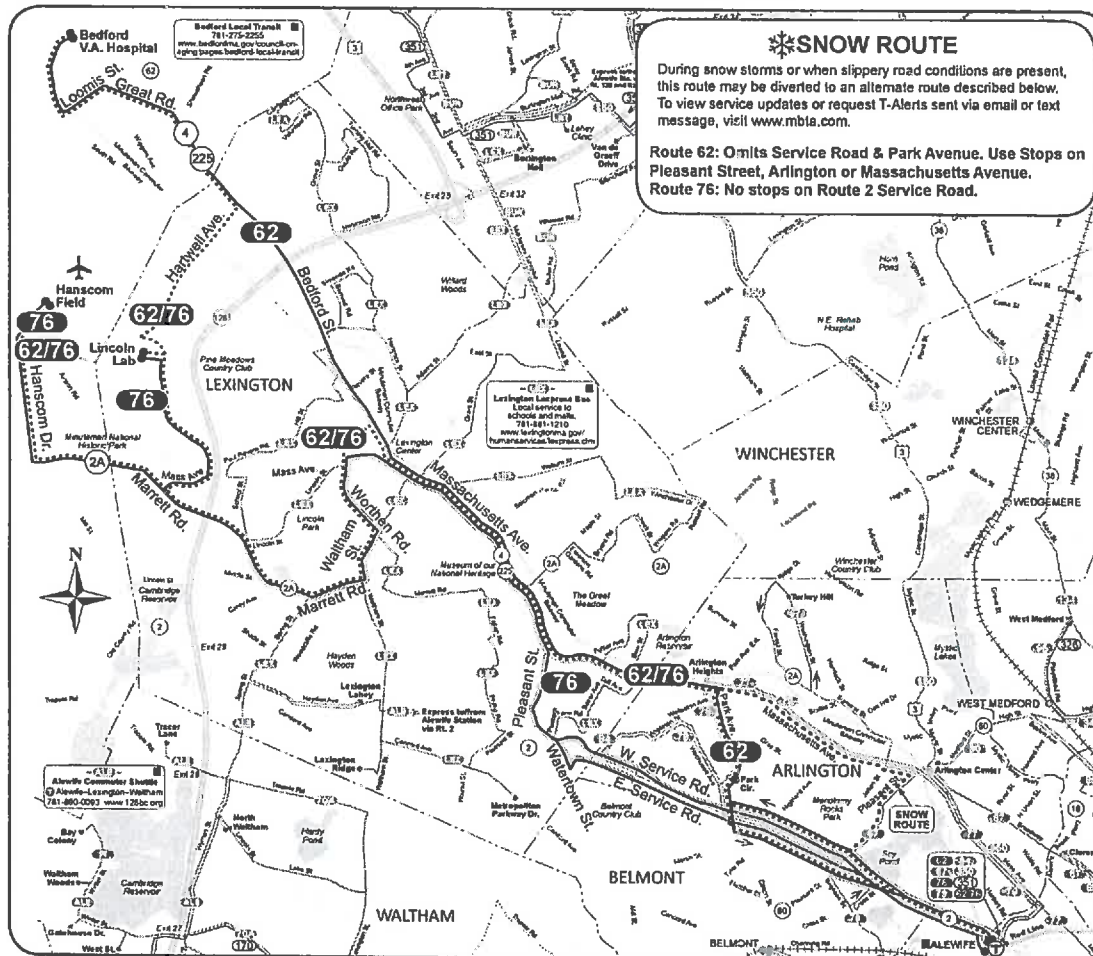
04705AVOLUME
Site Code: 04705

[illegible]



APPENDIX B – MULTI-MODAL TRANSPORTATION

Route 62 Bedford VA Hospital - Alewife Station
Route 76 Hanscom/Lincoln Lab - Alewife Station



62•76

Winter December 31, 2016 - March 24, 2017

62 Bedford VA Hospital-Alewife Station
76 Hanscom/Lincoln Lab-Alewife Sta.

Serving
 Bedford Center

tional Heritage Museum
 ttle Green



T Massachusetts Bay Transportation Authority **massDOT**
 Massachusetts Department of Transportation

Informati

62 & 76

Weekday

Inbound					Outbound				
Leave VA Hospital	Leave Lincoln Lab	Arrive Civil Air Terminal	Lv/Arrive Lexington Center	Arrive Alewife Station	Leave Alewife Station	Arrive Lexington Center	Arrive Civil Air Terminal	Arrive Lincoln Lab	Arrive VA Hospital
76	6:00A	6:07A	6:22A	6:37A	62 b 5:47A	6:03A	.....	.....
62 b 6:24A	6:38	6:56	76 6:05	6:20	.....	6:34A
62	6:50	7:13	62 6:10	6:29	.....	6:45A
76	6:40	6:47	7:03	7:25	76 6:20	6:35	.....	6:49
62 6:52	7:11	7:36	62 6:40	6:59	.....	7:15
76	7:00	7:08	7:26	7:48	76 7:00	7:15	.....	7:29
62	7:30	7:58	62 7:10	7:29	.....	7:48
62 7:20	7:39	8:04	76 7:30	7:45	.....	7:59
62	7:50	8:18	62 7:45	8:06	.....	8:25
76	7:35	7:43	8:01	8:23	76 8:00	8:18	.....	8:34
62 7:55	8:14	8:39	62 8:15	8:37	.....	8:55
76	8:11	8:19	8:37	8:59	76 8:30	8:48	.....	9:04
62 8:32	8:51	9:10	62 9:00	9:19	.....	9:37
76	8:41	8:49	9:05	9:20	76 9:30	9:46	.....	10:00
62 9:05	9:23	9:42	62 9:55	10:14	.....	10:32
76	9:11	9:18	9:33	9:48	76 10:30	10:46	.....	11:00
62 9:45	10:04	10:24	62 10:55	11:14	.....	11:32
76	10:11	10:18	10:33	10:48	76 11:30	11:46	.....	12:00N
62 10:45	11:05	11:25	62 11:55	12:14P	.....	12:32P
76	11:11	11:18	11:33	11:48	76 12:30P	12:46P	1:00P	1:10P
62 11:45	12:05P	12:25P	62 12:55	1:14	.....	1:33
76	12:11P	12:18P	12:33P	12:47P	76 1:30	1:46	2:00	2:10
62 12:45P	1:05	1:25	62 1:55	2:15	.....	2:36
76	1:18	.....	1:32	1:47	76 2:30	2:47	3:06	3:18
62 1:45	2:05	2:25	62 3:00	3:25	.....	3:45
76	2:20	.....	2:35	2:53	76 3:30	3:48	4:09	4:24
62 2:45	3:05	3:26	62 3:45	4:10	.....	4:33
76	3:23	.....	3:38	3:58	76 4:05	4:25	4:46	5:00
62 3:50	4:08	4:29	62 4:10	4:35	.....	4:58
76	4:33	.....	4:48	5:11	76 4:40	4:59	5:16	5:28
62 4:35	4:53	5:19	62 4:50	5:14	.....	5:35
76	5:05	.....	5:20	5:39	76 5:05	5:28	5:45	5:57
62 5:05	5:23	5:50	62 c 5:15	5:42	.....	.....
62	5:47	6:05	62 5:25	5:49	.....	6:10
76	5:40	.....	5:55	6:14	76 5:35	5:58	6:12	6:21
62 5:55	6:11	6:28	62 5:47	6:10	.....	6:30
76	6:10	.....	6:25	6:40	62 c 5:59	6:21	.....	.....
62 6:25	6:41	6:58	76 6:10	6:30	6:44	6:53
76	6:36	.....	6:47	7:01	62 6:20	6:41	.....	7:01
62 6:44	7:00	7:17	76 6:45	7:05	7:19	7:28
76	7:03	.....	7:14	7:28	62 b 7:10	7:30	.....	.....
62 7:15	7:31	7:43	76 f 7:35	7:53	.....	.....
76	7:35	.....	7:46	8:00	62 b 8:05	8:23	.....	.....
62 b 7:55	8:05	8:19	76 f 8:35	8:53	.....	.....
76	f 8:05	.....	8:11	8:25	76 9:35	9:50	10:01	10:10
62 b 8:40	8:50	9:04				
76	f 9:05	.....	9:11	9:25				
76	10:15	.....	10:26	10:39				

Route 76 indicated by shaded areas

62 & 76

Saturday

Inbound				Outbound			
Leave VA Hospital	Arrive Civil Air Terminal	Arrive Lexington Center	Arrive Alewife Station	Leave Alewife Station	Arrive Lexington Center	Arrive Civil Air Terminal	Arrive VA Hospital
8:00A	8:19A	8:37A	8:52A	7:00A	7:16A	7:29A	7:48A
9:10	9:29	9:47	10:02	8:00	8:18	8:31	8:52
10:20	10:39	10:57	11:12	9:10	9:28	9:41	10:02
11:30	11:49	12:07P	12:26P	10:20	10:40	10:54	11:17
				11:30	11:50	12:04P	12:27P
12:40P	12:59P	1:16P	1:34P	12:40P	1:00P	1:14P	1:36P
1:50	2:09	2:26	2:44	1:50	2:07	2:21	2:44
3:00	3:19	3:36	3:53	3:00	3:19	3:33	3:56
4:00	4:19	4:35	4:54	4:00	4:18	4:30	4:52
5:00	5:19	5:34	5:50	5:00	5:18	5:30	5:52
6:00	6:17	6:32	6:47	6:00	6:18	6:30	6:50
7:00	7:17	7:31	7:47	7:00	7:18	7:30	7:50
8:00	8:18	8:31	8:47				

b - To/from Bedford Center. Does NOT serve VA Hospital.

c - To Lexington Center

f - Operates between Five Forks and Alewife Station and does NOT serve Lincoln Lab or Hanscom Civil Air Terminal.

NOTE: No Saturday service on Bedford Street between Lexington Center and Hartwell Avenue. All Saturday service operates via Arlington Heights.

 All buses are accessible to persons with disabilities

ROUTE 76 NOTE:

For AM weekday outbound service to Hanscom Civil Air Terminal, stay on bus at Lincoln Lab. In the PM the bus will serve Hanscom then Lincoln Lab.

Route 62 & 76
Bedford VA
Hospital or
Hanscom/
Lincoln Lab-
Alewife Station

Fare	Local Bus	Bus + Bus	Rapid Transit	Bus + Rapid Transit
CharlieCard	\$1.70	\$1.70	\$2.25	\$2.25
CharlieTicket	\$2.00	\$2.00	\$2.75	\$4.75
Cash-on-Board	\$2.00	\$4.00	\$2.75	\$4.75
Student*	\$0.85	\$0.85	\$1.10	\$1.10
Senior/TAP**	\$0.85	\$0.85	\$1.10	\$1.10

VALID PASSES: LinkPass (\$84.50/mo.); Local Bus (\$55/mo.); *Student LinkPass (\$30.00/mo.); **Senior/TAP LinkPass (\$30/mo.); and express bus, commuter rail, and boat passes.

FREE FARES: Children 11 and under ride free when accompanied by an adult; Blind Access CharlieCard holders ride free and if using a guide, the guide rides free.

* Requires Student CharlieCard, available to students through participating middle schools and high schools.

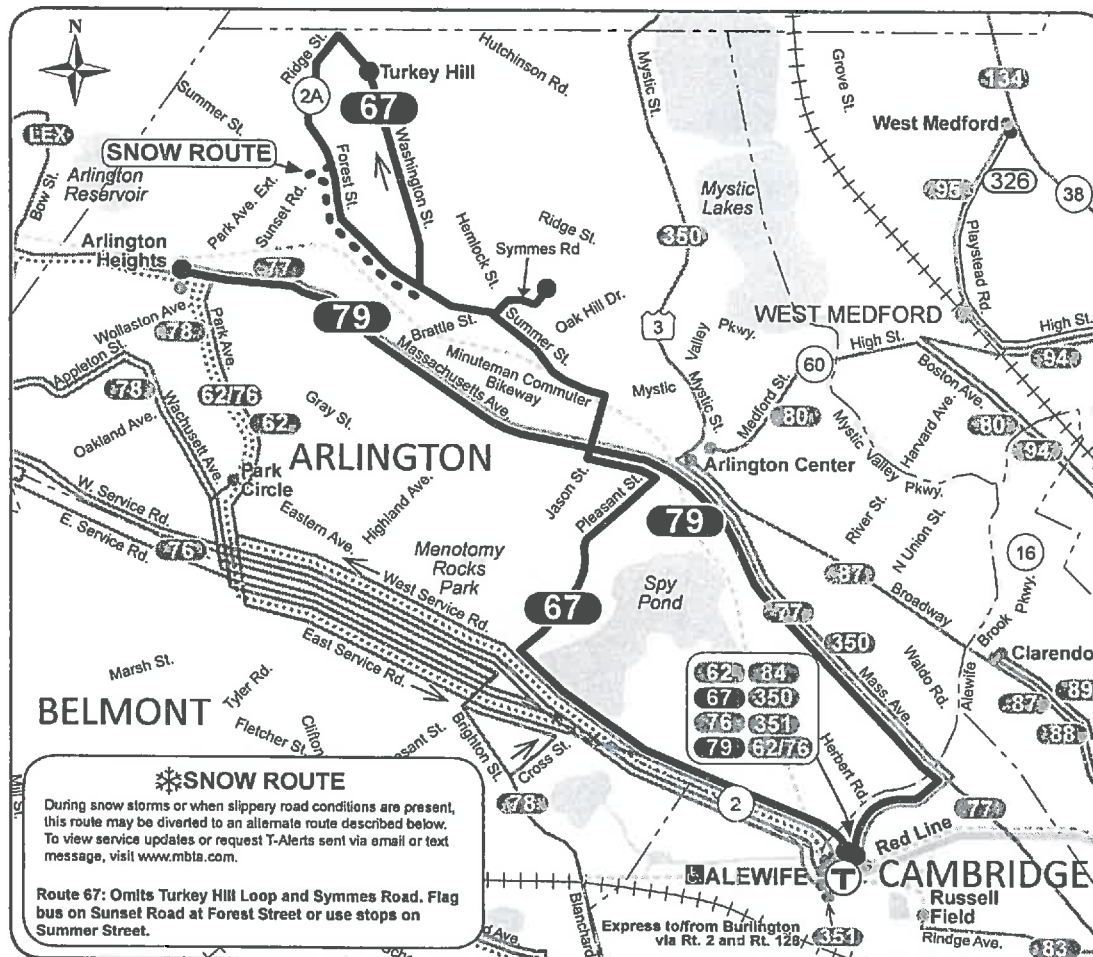
** Requires Senior/TAP CharlieCard, available to Medicare cardholders, seniors 65+, and persons with disabilities.

Winter 2017 Holidays

January 2: see Sunday January 18 & February 20: see Saturday

No service
on Sunday

Route 67 Turkey Hill - Alewife Station
Route 79 Arlington Heights - Alewife Station



schedule change

67•79

Winter December 31, 2016 - March 24, 2017

67 Turkey Hill-AlewifcStation
79 Arlington Heights-AlewifcStation

Serving
Arlington High School



T Massachusetts Bay
Transportation Authority *massDOT*
Massachusetts Department of Transportation

Informati

67

Weekday

Inbound			Outbound		
Leave Turkey Hill	Arrive Arlington Center	Arrive Alewife Station	Leave Alewife Station	Arrive Arlington Center	Arrive Turkey Hill
6:18A	6:25A	6:34A	5:53A	6:00A	6:13A
6:52	6:59	7:10	6:26	6:33	6:46
7:25	7:34	7:48	6:59	7:06	7:19
7:52	8:01	8:15	7:26	7:33	7:47
8:19	8:28	8:43	7:53	8:00	8:14
8:46	8:53	9:05	8:23	8:30	8:42
9:10	9:17	9:27	8:47	8:54	9:06
10:00	10:07	10:17	9:37	9:44	9:56
10:50	10:57	11:07	10:27	10:34	10:46
11:40	11:47	11:56	11:17	11:24	11:36
12:30P	12:37P	12:46P	12:07P	12:14P	12:26P
1:20	1:27	1:36	12:57	1:04	1:16
2:10	2:17	2:26	1:42	1:49	2:01
3:00	3:07	3:16	2:32	2:41	2:54
3:50	3:57	4:06	3:22	3:31	3:44
4:40	4:47	4:56	4:12	4:21	4:34
5:08	5:16	5:26	4:44	4:55	5:08
5:35	5:43	5:53	5:11	5:22	5:35
6:03	6:11	6:21	5:38	5:49	6:02
6:31	6:37	6:46	6:05	6:16	6:29
6:56	7:02	7:11	6:33	6:41	6:54
7:35	7:41	7:49	7:15	7:23	7:35
8:18	8:24	8:32	7:58	8:05	8:16

Service Note: Route 67
Serves Symmes Road OUTBOUND ONLY.

Route 67
Turkey Hill-Alewife Station

79

Weekday

Inbound			Outbound		
Leave Arlington Heights	Arrive Arlington Center	Arrive Alewife Station	Leave Alewife Station	Arrive Arlington Center	Arrive Arlington Heights
6:40A	6:46A	6:57A	7:00A	7:08A	7:19A
7:00	7:06	7:17	7:20	7:28	7:39
7:20	7:26	7:41	7:45	7:53	8:04
7:45	7:52	8:08	8:10	8:18	8:29
8:10	8:17	8:33	8:35	8:43	8:54
8:35	8:42	8:58	9:00	9:08	9:19
9:00	9:05	9:15	9:50	9:57	10:06
9:25	9:30	9:40	10:40	10:47	10:56
10:15	10:20	10:30	11:30	11:37	11:46
11:05	11:10	11:20			
11:55	12:00N	12:10P			
12:45P	12:50P	1:00P	12:20P	12:27P	12:37P
1:35	1:40	1:50	1:10	1:17	1:27
2:25	2:30	2:42	2:00	2:07	2:17
s 2:35	2:41	2:55	2:25	2:32	2:42
s 2:45	2:51	3:05	2:45	2:52	3:02
2:55	3:01	3:13	3:05	3:12	3:22
s 2:55	3:01	3:15	3:30	3:37	3:47
3:15	3:21	3:33	3:50	3:57	4:07
3:35	3:41	3:53	4:10	4:17	4:27
3:55	4:01	4:13	4:30	4:40	4:50
4:15	4:21	4:33	4:50	5:00	5:10
4:35	4:41	4:53	5:10	5:20	5:30
4:55	5:01	5:13	5:30	5:42	5:53
5:15	5:21	5:33	5:50	6:02	6:13
5:40	5:46	5:58	6:10	6:22	6:32
6:05	6:11	6:23	6:30	6:41	6:50
6:35	6:41	6:53	7:00	7:11	7:20
7:25	7:29	7:38	7:45	7:51	7:58
8:05	8:09	8:18	8:30	8:36	8:43
8:50	8:54	9:03	9:10	9:16	9:23
9:30	9:34	9:43	9:50	9:56	10:03

s - Leaves from Massachusetts Avenue at Appleton Street and does NOT run during school vacation

Route 79
Arlington Heights-Alewife Station

No service on weekends.

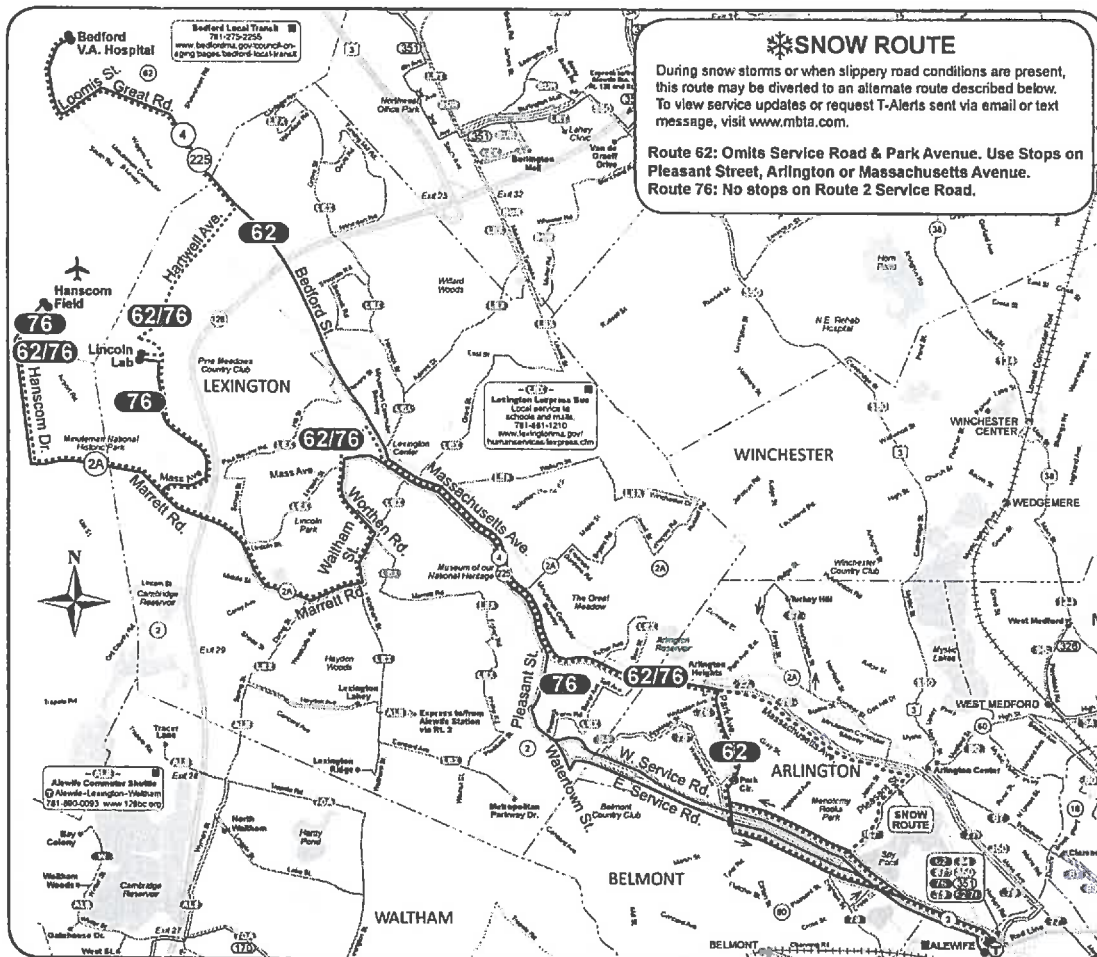
 All buses are accessible to persons with disabilities

Fare	Local Bus	Bus + Bus	Rapid Transit	Bus + Rapid Transit
CharlieCard	\$1.70	\$1.70	\$2.25	\$2.25
CharlieTicket	\$2.00	\$2.00	\$2.75	\$4.75
Cash-on-Board	\$2.00	\$4.00	\$2.75	\$4.75
Student*	\$0.85	\$0.85	\$1.10	\$1.10
Senior/TAP**	\$0.85	\$0.85	\$1.10	\$1.10

VALID PASSES: LinkPass (\$84.50/mo.); Local Bus (\$55/mo.); *Student LinkPass (\$30.00/mo.); **Senior/TAP LinkPass (\$30/mo.); and express bus, commuter rail, and boat passes.
FREE FARES: Children 11 and under ride free when accompanied by an adult; Blind Access CharlieCard holders ride free and if using a guide, the guide rides free.
* Requires Student CharlieCard, available to students through participating middle schools and high schools.
** Requires Senior/TAP CharlieCard, available to Medicare cardholders, seniors 65+, and persons with disabilities.

Winter 2017 Holidays
January 2: see Sunday January 16 & February 20: see Saturday

Route 62 Bedford VA Hospital - Alewife Station
Route 76 Hanscom/Lincoln Lab - Alewife Station



62•76

Winter December 31, 2016 - March 24, 2017

62 Bedford VA Hospital-Alewife Station
76 Hanscom/Lincoln Lab-Alewife Sta.

Serving
Bedford Center

tional Heritage Museum
ttle Green



T Massachusetts Bay Transportation Authority **massDOT**
 Massachusetts Department of Transportation
 Information

62 & 76

Weekday

Inbound					Outbound				
Leave VA Hospital	Leave Lincoln Lab	Arrive Civil Air Terminal	Lv/Arrive Lexington Center	Arrive Alewife Station	Leave Alewife Station	Arrive Lexington Center	Arrive Civil Air Terminal	Arrive Lincoln Lab	Arrive VA Hospital
76	.....	6:00A	6:07A	6:22A	6:37A	62 b 5:47A	6:03A	.....	.....
62 b 6:24A	.....	.....	.....	6:38	6:56	76	6:05	6:20	.....
62	.....	.....	.....	6:50	7:13	62	6:10	6:29	.....
76	.....	6:40	6:47	7:03	7:25	76	6:20	6:35	.....
62	6:52	.....	.....	7:11	7:36	62	6:40	6:59	.....
76	.....	7:00	7:08	7:26	7:48	76	7:00	7:15	.....
62	.....	.....	.....	7:30	7:58	62	7:10	7:29	.....
62	7:20	.....	.....	7:39	8:04	76	7:30	7:45	.....
62	.....	.....	.....	7:50	8:18	62	7:45	8:06	.....
76	.....	7:35	7:43	8:01	8:23	76	8:00	8:18	.....
62	7:55	.....	.....	8:14	8:39	62	8:15	8:37	.....
76	.....	8:11	8:19	8:37	8:59	76	8:30	8:48	.....
62	8:32	.....	.....	8:51	9:10	62	9:00	9:19	.....
76	.....	8:41	8:49	9:05	9:20	76	9:30	9:46	.....
62	9:05	.....	.....	9:23	9:42	62	9:55	10:14	.....
76	.....	9:11	9:18	9:33	9:48	76	10:30	10:46	.....
62	9:45	.....	.....	10:04	10:24	62	10:55	11:14	.....
76	.....	10:11	10:18	10:33	10:48	76	11:30	11:46	.....
62	10:45	.....	.....	11:05	11:25	62	11:55	12:14P	.....
76	.....	11:11	11:18	11:33	11:48	76	12:30P	12:46P	.....
62	11:45	.....	.....	12:05P	12:25P	62	12:55	1:14	.....
76	.....	12:11P	12:18P	12:33P	12:47P	76	1:30	1:46	.....
62	12:45P	.....	.....	1:05	1:25	62	1:55	2:15	.....
76	.....	1:18	.....	1:32	1:47	76	2:30	2:47	.....
62	1:45	.....	.....	2:05	2:25	62	3:00	3:25	.....
76	.....	2:20	.....	2:35	2:53	76	3:30	3:48	.....
62	2:45	.....	.....	3:05	3:26	62	3:45	4:10	.....
76	.....	3:23	.....	3:38	3:58	76	4:05	4:25	.....
62	3:50	.....	.....	4:08	4:29	62	4:10	4:35	.....
76	.....	4:33	.....	4:48	5:11	76	4:40	4:59	.....
62	4:35	.....	.....	4:53	5:19	62	4:50	5:14	.....
76	.....	5:05	.....	5:20	5:39	76	5:05	5:28	.....
62	5:05	.....	.....	5:23	5:50	62	5:15	5:42	.....
76	.....	5:40	.....	5:47	6:05	62	5:25	5:49	.....
62	5:55	.....	.....	5:55	6:14	76	5:35	5:58	.....
76	.....	6:10	.....	6:11	6:28	62	5:47	6:10	.....
62	6:25	.....	.....	6:25	6:40	62	5:59	6:21	.....
76	.....	6:36	.....	6:41	6:58	76	6:10	6:30	.....
62	6:44	.....	.....	6:47	7:01	62	6:20	6:41	.....
76	.....	7:03	.....	7:00	7:17	76	6:45	7:05	.....
62	7:15	.....	.....	7:14	7:28	62	7:10	7:30	.....
76	.....	7:35	.....	7:31	7:43	76	7:35	7:53	.....
62	7:55	.....	.....	7:46	8:00	62	8:05	8:23	.....
76	.....	f 8:05	.....	8:05	8:19	76	8:35	8:53	.....
62	8:40	.....	.....	8:11	8:25	76	9:35	9:50	.....
76	.....	f 9:05	.....	8:50	9:04	.....	.....	10:01	10:10
62	.....	10:15	.....	9:11	9:25	.....	.....	.....	.....
76	.....	.....	.....	10:26	10:39	.....	.....	.....	.....

Route 76 indicated by shaded areas

62 & 76

Saturday

Inbound				Outbound			
Leave VA Hospital	Arrive Civil Air Terminal	Arrive Lexington Center	Arrive Alewife Station	Leave Alewife Station	Arrive Lexington Center	Arrive Civil Air Terminal	Arrive VA Hospital
8:00A	8:19A	8:37A	8:52A	7:00A	7:16A	7:29A	7:48A
9:10	9:29	9:47	10:02	8:00	8:18	8:31	8:52
10:20	10:39	10:57	11:12	9:10	9:28	9:41	10:02
11:30	11:49	12:07P	12:26P	10:20	10:40	10:54	11:17
.....	.....	.....	.....	11:30	11:50	12:04P	12:27P
12:40P	12:59P	1:16P	1:34P	12:40P	1:00P	1:14P	1:36P
1:50	2:09	2:26	2:44	1:50	2:07	2:21	2:44
3:00	3:19	3:36	3:53	3:00	3:19	3:33	3:56
4:00	4:19	4:35	4:54	4:00	4:18	4:30	4:52
5:00	5:19	5:34	5:50	5:00	5:18	5:30	5:52
6:00	6:17	6:32	6:47	6:00	6:18	6:30	6:50
7:00	7:17	7:31	7:47	7:00	7:18	7:30	7:50
8:00	8:18	8:31	8:47	.....	.....	.....	.....

b - To/from Bedford Center. Does NOT serve VA Hospital.

c - To Lexington Center

f - Operates between Five Forks and Alewife Station and does NOT serve Lincoln Lab or Hanscom Civil Air Terminal.

NOTE: No Saturday service on Bedford Street between Lexington Center and Hartwell Avenue. All Saturday service operates via Arlington Heights.

 All buses are accessible to persons with disabilities

ROUTE 76 NOTE:

For AM weekday outbound service to Hanscom Civil Air Terminal, stay on bus at Lincoln Lab. In the PM the bus will serve Hanscom then Lincoln Lab.

Route 62 & 76
Bedford VA
Hospital or
Hanscom/
Lincoln Lab-
Alewife Station

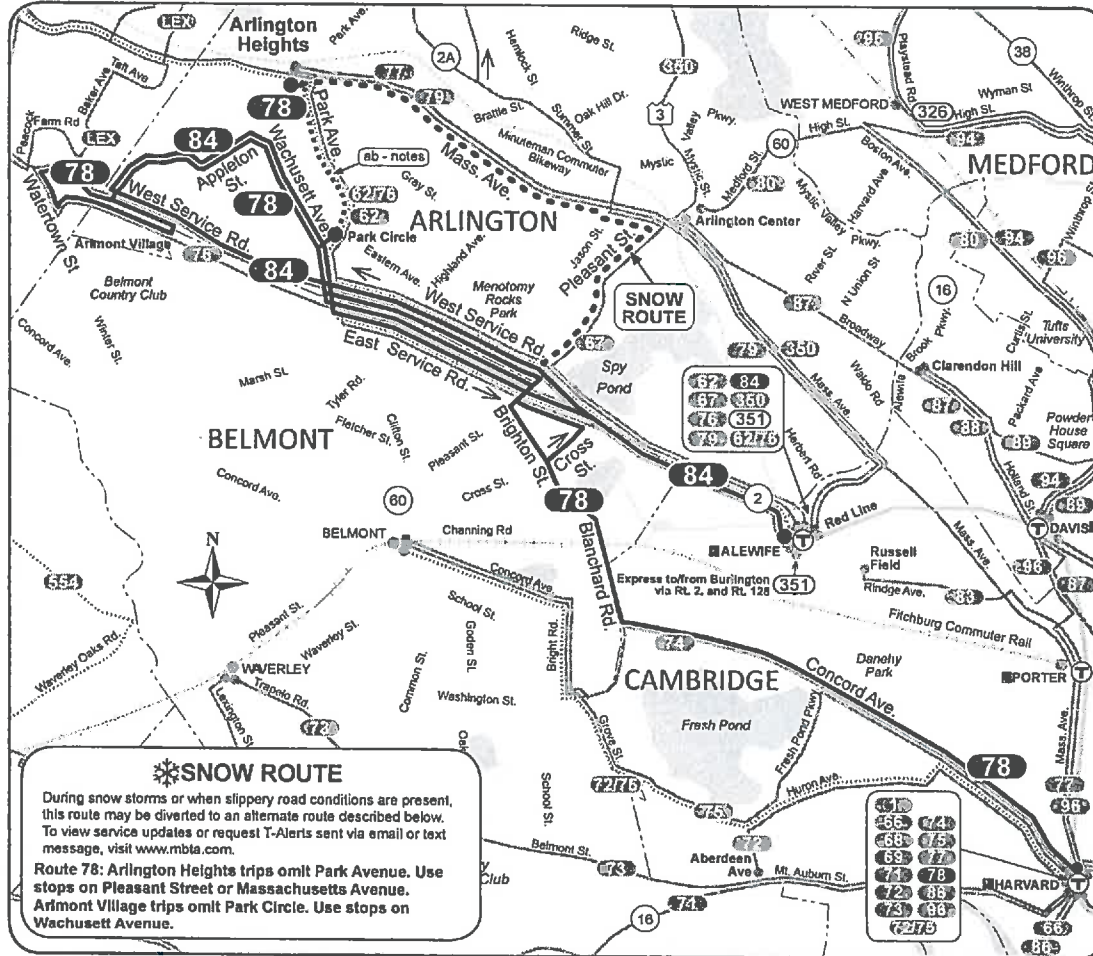
Fare	Local Bus	Bus + Bus	Rapid Transit	Bus + Rapid Transit
CharlieCard	\$1.70	\$1.70	\$2.25	\$2.25
CharlieTicket	\$2.00	\$2.00	\$2.75	\$4.75
Cash-on-Board	\$2.00	\$4.00	\$2.75	\$4.75
Student*	\$0.85	\$0.85	\$1.10	\$1.10
Senior/TAP**	\$0.85	\$0.85	\$1.10	\$1.10

VALID PASSES: UnkPass (\$84.50/mo.); Local Bus (\$55/mo.); *Student UnkPass (\$30.00/mo.); **Senior/TAP UnkPass (\$30/mo.); and express bus, commuter rail, and boat passes.
FREE FARES: Children 11 and under ride free when accompanied by an adult; Blind Access CharlieCard holders ride free and if using a guide, the guide rides free.
* Requires Student CharlieCard, available to students through participating middle schools and high schools.
** Requires Senior/TAP CharlieCard, available to Medicare cardholders, seniors 65+, and persons with disabilities.

Winter 2017 Holidays
January 2: see Sunday January 16 & February 20: see Saturday

No service on Sunday

Route 78 Arlmont Village - Harvard Station
Route 84 Arlmont Village - Alewife Station



78•84

Winter December 31, 2016 - March 24, 2017

78 Arlmont Village-Harvard Station
84 Arlmont Village-Alewife Station

Serving
Park Circle



78 Weekday					
Inbound			Outbound		
Leave Arlmont Village	Arrive Pleasant Street	Arrive Harvard Station	Leave Harvard Station Upper Busway	Arrive Pleasant Street	Arrive Arlmont Village
5:42A	5:50A	6:06A	5:55A	6:10A	6:22A
6:07	6:15	6:31	6:20	6:35	6:47
6:32	6:40	7:02	b 6:45	7:01	7:07
6:57	7:05	7:27	b 7:10	7:26	7:33
a 7:15	7:22	7:48	b 7:35	7:54	8:02
a 7:34	7:41	8:06	b 8:00	8:19	8:27
a 7:53	8:00	8:31	8:25	8:45	8:56
a 8:12	8:18	8:49	9:00	9:17	9:28
a 8:37	8:43	9:07	9:35	9:52	10:03
9:02	9:10	9:28	10:10	10:27	10:38
9:35	9:43	10:02	10:45	11:02	11:13
10:10	10:17	10:37	11:20	11:37	11:48
10:45	10:52	11:12	11:55	12:13P	12:26P
11:20	11:27	11:47			
11:55	12:02P	12:22P			
12:30P	12:37P	12:57P	12:30P	12:49P	1:02P
1:05	1:12	1:32	1:05	1:24	1:37
1:40	1:47	2:07	1:40	1:59	2:12
2:15	2:22	2:42	2:15	2:34	2:47
2:50	2:57	3:18	2:50	3:09	3:22
3:25	3:33	3:54	3:25	3:42	3:55
3:55	4:03	4:24	b 4:00	4:23	4:36
4:25	4:33	4:54	b 4:25	4:48	5:01
a 4:40	4:45	5:04	b 4:50	5:13	5:26
a 5:05	5:10	5:29	b 5:15	5:38	5:51
a 5:30	5:35	5:54	b 5:40	6:03	6:16
a 5:55	6:00	6:19	b 6:05	6:28	6:41
6:11	6:17	6:33	6:30	6:47	7:00
a 6:20	6:25	6:44	6:55	7:10	7:22
6:35	6:41	6:57	7:25	7:39	7:51
a 6:45	6:50	7:09	7:55	8:09	8:21
7:10	7:16	7:33	8:30	8:44	8:56
8:05	8:11	8:26	9:30	9:44	9:56
9:05	9:11	9:26	10:30	10:44	10:56
10:05	10:11	10:26	11:30	11:44	11:56
11:05	11:11	11:26	12:30A	12:44A	12:56A
12:05A	12:11A	12:24A			

a - From Arlington Heights, does NOT serve Arlmont Village
b - To Arlington Heights, does NOT serve Arlmont Village

78 Saturday					
Inbound			Outbound		
Leave Arlmont Village	Arrive Pleasant Street	Arrive Harvard Station	Leave Harvard Station Upper Busway	Arrive Pleasant Street	Arrive Arlmont Village
7:00A	7:06A	7:23A	6:27A	6:38A	6:51A
8:00	8:06	8:23	7:27	7:38	7:51
9:00	9:06	9:23	8:27	8:38	8:51
10:00	10:06	10:23	9:30	9:41	9:54
11:00	11:06	11:23	10:30	10:41	10:54
			11:30	11:42	11:55
12:00N	12:07P	12:25P	12:30P	12:42P	12:55P
1:00	1:07	1:25	1:30	1:43	1:56
2:00	2:07	2:25	2:30	2:43	2:56
3:00	3:07	3:25	3:30	3:43	3:57
4:00	4:07	4:25	4:30	4:43	4:57
5:00	5:06	5:24	5:30	5:43	5:57
6:00	6:06	6:24	6:30	6:43	6:57
7:05	7:11	7:29	7:35	7:48	8:02
8:05	8:11	8:29	8:35	8:48	9:02
9:05	9:11	9:29	9:35	9:47	10:01
10:05	10:11	10:27	10:35	10:47	11:01
11:05	11:11	11:25	11:35	11:45	11:58
12:05A	12:11A	12:25A	12:35A	12:45A	12:58A

78 Sunday					
Inbound			Outbound		
Leave Arlmont Village	Arrive Pleasant Street	Arrive Harvard Station	Lv/Arvard Station Upper Busway	Arrive Pleasant Street	Arrive Arlmont Village
6:40A	6:47A	7:00A	6:10A	6:21A	6:32A
7:40	7:47	8:00	7:10	7:22	7:33
8:40	8:48	9:02	8:10	8:22	8:33
9:40	9:47	10:04	9:10	9:22	9:33
10:40	10:47	11:04	10:10	10:22	10:33
11:40	11:48	12:05P	11:10	11:22	11:34
12:40P	12:48P	1:05P	12:10P	12:24P	12:35P
1:40	1:48	2:05	1:10	1:24	1:35
2:40	2:47	3:04	2:10	2:24	2:35
3:40	3:47	4:04	3:10	3:24	3:35
4:40	4:47	5:04	4:10	4:25	4:37
5:40	5:47	6:02	5:10	5:25	5:37
6:40	6:47	7:02	6:10	6:23	6:35
7:40	7:46	8:00	7:10	7:23	7:35
8:40	8:46	9:00	8:10	8:23	8:35
9:40	9:47	10:00	9:10	9:23	9:35
10:40	10:47	11:00	10:10	10:23	10:35
11:40	11:47	12:00M	11:10	11:23	11:34
12:40A	12:46A	12:57A	12:10A	12:22A	12:34A

Harvard Station: buses depart from the upper busway.





84 Weekday					
Inbound			Outbound		
Leave Arlmont Village	Arrive Pleasant Street	Arrive Alewife Station	Leave Alewife Station	Arrive Pleasant Street	Arrive Arlmont Village
6:44A	6:53A	6:57A	7:04A	7:08A	7:12A
7:14	7:24	7:31	7:34	7:38	7:42
7:44	7:54	8:01	8:04	8:08	8:12
8:14	8:24	8:31	8:34	8:37	8:41
8:44	8:54	9:00			
4:10P	4:16P	4:21P	3:58P	4:02P	4:08P
4:46	4:53	4:59	4:33	4:37	4:43
5:20	5:27	5:33	5:07	5:11	5:17
5:37	5:45	5:51	5:24	5:28	5:35
5:54	6:03	6:07	5:41	5:45	5:52
6:47	6:55	6:58	5:58	6:02	6:09
			6:20	6:24	6:31
			6:35	6:39	6:46

No Route 84 service on weekends.

NOTE: Buses arrive at Park Circle approximately 4 minutes after leaving Arlmont Village

Route 78 & 84 Arlmont Village-Harvard Station or Alewife Station

 All buses are accessible to persons with disabilities

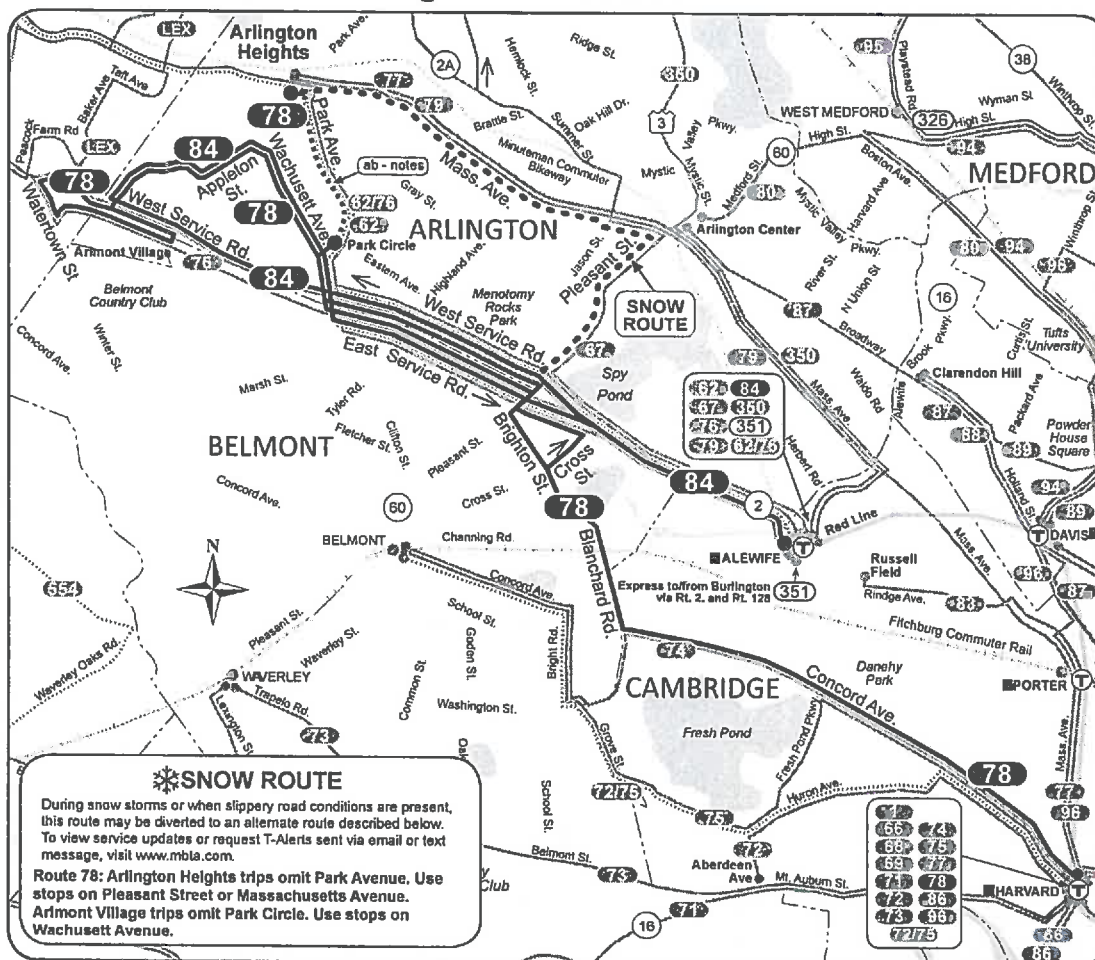
				
Fare	Local Bus	Bus + Bus	Rapid Transit	Bus + Rapid Transit
CharlieCard	\$1.70	\$1.70	\$2.25	\$2.25
CharlieTicket	\$2.00	\$2.00	\$2.75	\$4.75
Cash-on-Board	\$2.00	\$4.00	\$2.75	\$4.75
Student*	\$0.85	\$0.85	\$1.10	\$1.10
Senior/TAP**	\$0.85	\$0.85	\$1.10	\$1.10

VALID PASSES: LinkPass (\$84.50/mo.); Local Bus (\$55/mo.); *Student LinkPass (\$30.00/mo.); **Senior/TAP LinkPass (\$30/mo.); and express bus, commuter rail, and boat passes.
FREE FARES: Children 11 and under ride free when accompanied by an adult; Blind Access CharlieCard holders ride free and if using a guide, the guide rides free.
* Requires Student CharlieCard, available to students through participating middle schools and high schools.
** Requires Senior/TAP CharlieCard, available to Medicare cardholders, seniors 65+, and persons with disabilities.

Winter 2017 Holidays

January 2: see Sunday January 16 & February 20: see Saturday

Route 78 Arlmont Village - Harvard Station
Route 84 Arlmont Village - Alewife Station



78•84

Winter December 31, 2016 - March 24, 2017

78 Arlmont Village-Harvard Station
84 Arlmont Village-Alewife Station

Serving
Park Circle



T Massachusetts Bay Transportation Authority **massDOT**
 Massachusetts Department of Transportation

Information

78 Weekday					
Inbound			Outbound		
Leave Arlmont Village	Arrive Pleasant Street	Arrive Harvard Station	Leave Harvard Station Upper Busway	Arrive Pleasant Street	Arrive Arlmont Village
5:42A	5:50A	6:06A	5:55A	6:10A	6:22A
6:07	6:15	6:31	6:20	6:35	6:47
6:32	6:40	7:02	b 6:45	7:01	7:07
6:57	7:05	7:27	b 7:10	7:26	7:33
a 7:15	7:22	7:48	b 7:35	7:54	8:02
a 7:34	7:41	8:06	b 8:00	8:19	8:27
a 7:53	8:00	8:31	8:25	8:45	8:56
a 8:12	8:18	8:49	9:00	9:17	9:28
a 8:37	8:43	9:07	9:35	9:52	10:03
9:02	9:10	9:28	10:10	10:27	10:38
9:35	9:43	10:02	10:45	11:02	11:13
10:10	10:17	10:37	11:20	11:37	11:48
10:45	10:52	11:12	11:55	12:13P	12:26P
11:20	11:27	11:47			
11:55	12:02P	12:22P			
12:30P	12:37P	12:57P	12:30P	12:49P	1:02P
1:05	1:12	1:32	1:05	1:24	1:37
1:40	1:47	2:07	1:40	1:59	2:12
2:15	2:22	2:42	2:15	2:34	2:47
2:50	2:57	3:18	3:25	3:42	3:55
3:25	3:33	3:54	b 4:00	4:23	4:36
4:05	4:13	4:34	b 4:25	4:48	5:01
a 4:40	4:45	5:04	b 4:50	5:13	5:26
a 5:05	5:10	5:29	b 5:15	5:38	5:51
a 5:30	5:35	5:54	b 5:40	6:03	6:16
a 5:55	6:00	6:19	b 6:05	6:28	6:41
6:11	6:17	6:33	6:30	6:47	7:00
a 6:20	6:25	6:44	6:55	7:10	7:22
6:35	6:41	6:57	7:25	7:39	7:51
a 6:45	6:50	7:09	7:55	8:09	8:21
7:10	7:16	7:33	8:30	8:44	8:56
8:05	8:11	8:26	9:30	9:44	9:56
9:05	9:11	9:26	10:30	10:44	10:56
10:05	10:11	10:26	11:30	11:44	11:56
11:05	11:11	11:26	12:30A	12:44A	12:56A
12:05A	12:11A	12:24A			

a - From Arlington Heights, does NOT serve Arlmont Village
b - To Arlington Heights, does NOT serve Arlmont Village

78 Saturday					
Inbound			Outbound		
Leave Arlmont Village	Arrive Pleasant Street	Arrive Harvard Station	Leave Harvard Station Upper Busway	Arrive Pleasant Street	Arrive Arlmont Village
7:00A	7:06A	7:23A	6:27A	6:38A	6:51A
8:00	8:06	8:23	7:27	7:38	7:51
9:00	9:06	9:23	8:27	8:38	8:51
10:00	10:06	10:23	9:30	9:41	9:54
11:00	11:06	11:23	10:30	10:41	10:54
			11:30	11:42	11:55
12:00N	12:07P	12:25P	12:30P	12:42P	12:55P
1:00	1:07	1:25	1:30	1:43	1:56
2:00	2:07	2:25	2:30	2:43	2:56
3:00	3:07	3:25	3:30	3:43	3:57
4:00	4:07	4:25	4:30	4:43	4:57
5:00	5:06	5:24	5:30	5:43	5:57
6:00	6:06	6:24	6:30	6:43	6:57
7:05	7:11	7:29	7:35	7:48	8:02
8:05	8:11	8:29	8:35	8:48	9:02
9:05	9:11	9:29	9:35	9:47	10:01
10:05	10:11	10:27	10:35	10:47	11:01
11:05	11:11	11:25	11:35	11:45	11:58
12:05A	12:11A	12:25A	12:35A	12:45A	12:58A

78 Sunday					
Inbound			Outbound		
Leave Arlmont Village	Arrive Pleasant Street	Arrive Harvard Station	Leave Harvard Station Upper Busway	Arrive Pleasant Street	Arrive Arlmont Village
6:40A	6:47A	7:00A	6:10A	6:21A	6:32A
7:40	7:47	8:00	7:10	7:22	7:33
8:40	8:48	9:02	8:10	8:22	8:33
9:40	9:47	10:04	9:10	9:22	9:33
10:40	10:47	11:04	10:10	10:22	10:33
11:40	11:48	12:05P	11:10	11:22	11:34
12:40P	12:48P	1:05P	12:10P	12:24P	12:35P
1:40	1:48	2:05	1:10	1:24	1:35
2:40	2:47	3:04	2:10	2:24	2:35
3:40	3:47	4:04	3:10	3:24	3:35
4:40	4:47	5:04	4:10	4:25	4:37
5:40	5:47	6:02	5:10	5:25	5:37
6:40	6:47	7:02	6:10	6:23	6:35
7:40	7:46	8:00	7:10	7:23	7:35
8:40	8:46	9:00	8:10	8:23	8:35
9:40	9:47	10:00	9:10	9:23	9:35
10:40	10:47	11:00	10:10	10:23	10:35
11:40	11:47	12:00M	11:10	11:23	11:34
12:40A	12:46A	12:57A	12:10A	12:22A	12:34A

Harvard Station: buses depart from the upper busway.





84 Weekday					
Inbound			Outbound		
Leave Arlmont Village	Arrive Pleasant Street	Arrive Alewife Station	Leave Alewife Station	Arrive Pleasant Street	Arrive Arlmont Village
6:44A	6:53A	6:57A	7:04A	7:08A	7:12A
7:14	7:24	7:31	7:34	7:38	7:42
7:44	7:54	8:01	8:04	8:08	8:12
8:14	8:24	8:31	8:34	8:37	8:41
8:44	8:54	9:00			
4:10P	4:16P	4:21P	3:58P	4:02P	4:08P
4:46	4:53	4:59	4:33	4:37	4:43
5:20	5:27	5:33	5:07	5:11	5:17
5:37	5:45	5:51	5:24	5:28	5:35
5:54	6:03	6:07	5:41	5:45	5:52
6:47	6:55	6:58	5:58	6:02	6:09
			6:20	6:24	6:31
			6:35	6:39	6:46

No Route 84 service on weekends.

NOTE: Buses arrive at Park Circle approximately 4 minutes after leaving Arlmont Village

Route 78 & 84 Arlmont Village-Harvard Station or Alewife Station

 All buses are accessible to persons with disabilities

Fare	   			
	Local Bus	Bus + Bus	Rapid Transit	Bus + Rapid Transit
CharlieCard	\$1.70	\$1.70	\$2.25	\$2.25
CharlieTicket	\$2.00	\$2.00	\$2.75	\$4.75
Cash-on-Board	\$2.00	\$4.00	\$2.75	\$4.75
Student*	\$0.85	\$0.85	\$1.10	\$1.10
Senior/TAP**	\$0.85	\$0.85	\$1.10	\$1.10

VALID PASSES: LinkPass (\$84.50/mo.); Local Bus (\$55/mo.); *Student LinkPass (\$30.00/mo.); **Senior/TAP LinkPass (\$30/mo.); and express bus, commuter rail, and boat passes.

FREE FARES: Children 11 and under ride free when accompanied by an adult; Blind Access CharlieCard holders ride free and if using a guide, the guide rides free. * Requires Student CharlieCard, available to students through participating middle schools and high schools.

** Requires Senior/TAP CharlieCard, available to Medicare cardholders, seniors 65+, and persons with disabilities.

Winter 2017 Holidays
January 2: see Sunday January 16 & February 20: see Saturday

APPENDIX C – HISTORICAL DATA

Count Station 4798 Concord Turnpike Westbound

Year 2010-2012

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
64970	68755	72584	74766	79351	78867	72373	72956	75363	77253	73963	70071

73439 Monthly Avg.

Mar. Avg. 72584
 Total Avg. 73439 0.9884 0.0116
 (Plus 1.16%)



APPENDIX D – TRIP GENERATION



S0801

COMMUTING CHARACTERISTICS BY SEX

2010-2014 American Community Survey 5-Year Estimates

Supporting documentation on code lists, subject definitions, data accuracy, and statistical testing can be found on the American Community Survey website in the Data and Documentation section.

Sample size and data quality measures (including coverage rates, allocation rates, and response rates) can be found on the American Community Survey website in the Methodology section.

Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, it is the Census Bureau's Population Estimates Program that produces and disseminates the official estimates of the population for the nation, states, counties, cities and towns and estimates of housing units for states and counties.

Subject	Belmont CDP, Massachusetts				
	Total		Male		Female
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate
Workers 16 years and over	12,564	+/-418	6,493	+/-299	6,071
MEANS OF TRANSPORTATION TO WORK					
Car, truck, or van	70.8%	+/-2.5	69.7%	+/-3.3	72.1%
Drove alone	63.2%	+/-2.6	62.8%	+/-3.4	63.6%
Carpooled	7.6%	+/-1.7	6.8%	+/-1.7	8.5%
In 2-person carpool	6.3%	+/-1.4	5.3%	+/-1.3	7.3%
In 3-person carpool	0.8%	+/-0.6	0.9%	+/-0.7	0.8%
In 4-or-more person carpool	0.5%	+/-0.4	0.7%	+/-0.7	0.3%
Workers per car, truck, or van	1.06	+/-0.01	1.06	+/-0.02	1.07
Public transportation (excluding taxicab)	14.7%	+/-1.9	14.8%	+/-2.4	14.5%
Walked	2.3%	+/-0.6	1.9%	+/-0.8	2.7%
Bicycle	1.6%	+/-0.6	2.4%	+/-0.9	0.7%
Taxicab, motorcycle, or other means	1.4%	+/-0.8	1.6%	+/-1.2	1.2%
Worked at home	9.2%	+/-1.3	9.7%	+/-1.9	8.7%
PLACE OF WORK					
Worked in state of residence	99.4%	+/-0.3	99.2%	+/-0.5	99.7%
Worked in county of residence	69.0%	+/-2.3	67.4%	+/-3.2	70.6%
Worked outside county of residence	30.5%	+/-2.3	31.8%	+/-3.1	29.1%
Worked outside state of residence	0.6%	+/-0.3	0.8%	+/-0.5	0.3%
Living in a place					
Living in a place	100.0%	+/-0.3	100.0%	+/-0.5	100.0%
Worked in place of residence	20.6%	+/-2.3	18.9%	+/-3.1	22.5%
Worked outside place of residence	79.4%	+/-2.3	81.1%	+/-3.1	77.5%
Not living in a place	0.0%	+/-0.3	0.0%	+/-0.5	0.0%
Living in 12 selected states					
Living in 12 selected states	100.0%	+/-0.3	100.0%	+/-0.5	100.0%
Worked in minor civil division of residence	20.6%	+/-2.3	18.9%	+/-3.1	22.5%
Worked outside minor civil division of residence	79.4%	+/-2.3	81.1%	+/-3.1	77.5%
Not living in 12 selected states	0.0%	+/-0.3	0.0%	+/-0.5	0.0%
Workers 16 years and over who did not work at home	11,402	+/-396	5,862	+/-293	5,540
TIME LEAVING HOME TO GO TO WORK					
12:00 a.m. to 4:59 a.m.	1.0%	+/-0.5	1.2%	+/-0.8	0.8%
5:00 a.m. to 5:29 a.m.	1.3%	+/-0.7	1.8%	+/-1.0	0.7%

Subject	Belmont CDP, Massachusetts				
	Total		Male		Female
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate
5:30 a.m. to 5:59 a.m.	1.3%	+/-0.6	2.1%	+/-1.0	0.5%
6:00 a.m. to 6:29 a.m.	5.6%	+/-1.3	7.0%	+/-2.0	4.0%
6:30 a.m. to 6:59 a.m.	4.8%	+/-0.8	5.0%	+/-1.2	4.6%
7:00 a.m. to 7:29 a.m.	16.5%	+/-1.7	18.6%	+/-2.6	14.2%
7:30 a.m. to 7:59 a.m.	17.2%	+/-1.9	18.1%	+/-2.7	16.1%
8:00 a.m. to 8:29 a.m.	18.6%	+/-2.7	16.7%	+/-2.9	20.5%
8:30 a.m. to 8:59 a.m.	11.6%	+/-1.7	11.0%	+/-2.0	12.2%
9:00 a.m. to 11:59 p.m.	22.2%	+/-2.5	18.3%	+/-3.0	26.3%
TRAVEL TIME TO WORK					
Less than 10 minutes	9.5%	+/-1.6	8.1%	+/-2.1	11.0%
10 to 14 minutes	10.6%	+/-1.6	10.6%	+/-2.0	10.6%
15 to 19 minutes	11.3%	+/-1.5	9.0%	+/-1.9	13.7%
20 to 24 minutes	14.1%	+/-1.7	11.9%	+/-2.1	16.5%
25 to 29 minutes	7.5%	+/-1.5	8.0%	+/-2.1	7.0%
30 to 34 minutes	19.3%	+/-1.8	20.7%	+/-2.6	17.8%
35 to 44 minutes	9.9%	+/-1.5	12.0%	+/-2.1	7.6%
45 to 59 minutes	10.7%	+/-1.6	11.1%	+/-2.0	10.2%
60 or more minutes	7.1%	+/-1.2	8.6%	+/-1.7	5.5%
Mean travel time to work (minutes)	27.6	+/-1.1	29.0	+/-1.2	26.1
VEHICLES AVAILABLE					
Workers 16 years and over in households	12,560	+/-420	6,490	+/-299	6,070
No vehicle available	1.1%	+/-0.6	0.8%	+/-0.6	1.4%
1 vehicle available	25.2%	+/-2.7	24.3%	+/-3.1	26.3%
2 vehicles available	52.4%	+/-3.7	52.6%	+/-3.8	52.2%
3 or more vehicles available	21.3%	+/-3.2	22.4%	+/-3.4	20.1%
PERCENT IMPUTED					
Means of transportation to work	5.1%	(X)	(X)	(X)	(X)
Private vehicle occupancy	6.4%	(X)	(X)	(X)	(X)
Place of work	6.5%	(X)	(X)	(X)	(X)
Time leaving home to go to work	12.6%	(X)	(X)	(X)	(X)
Travel time to work	6.9%	(X)	(X)	(X)	(X)
Vehicles available	0.7%	(X)	(X)	(X)	(X)

Subject	Belmont CDP, Massachusetts Female Margin of Error
Workers 16 years and over	+/-309
MEANS OF TRANSPORTATION TO WORK	
Car, truck, or van	+/-3.1
Drove alone	+/-3.1
Carpooled	+/-2.1
In 2-person carpool	+/-1.9
In 3-person carpool	+/-0.6
In 4-or-more person carpool	+/-0.3
Workers per car, truck, or van	+/-0.02
Public transportation (excluding taxicab)	+/-2.5
Walked	+/-1.1
Bicycle	+/-0.5
Taxicab, motorcycle, or other means	+/-0.9
Worked at home	+/-1.7
PLACE OF WORK	
Worked in state of residence	+/-0.4
Worked in county of residence	+/-2.8
Worked outside county of residence	+/-2.8
Worked outside state of residence	+/-0.4
LIVING IN A PLACE	
Living in a place	+/-0.6
Worked in place of residence	+/-2.9
Worked outside place of residence	+/-2.9
Not living in a place	+/-0.6
LIVING IN 12 SELECTED STATES	
Living in 12 selected states	+/-0.6
Worked in minor civil division of residence	+/-2.9
Worked outside minor civil division of residence	+/-2.9
Living in 12 selected states	+/-0.6
Workers 16 years and over who did not work at home	+/-305
TIME LEAVING HOME TO GO TO WORK	
12:00 a.m. to 4:59 a.m.	+/-0.6
5:00 a.m. to 5:29 a.m.	+/-0.6
5:30 a.m. to 5:59 a.m.	+/-0.5
6:00 a.m. to 6:29 a.m.	+/-1.5
6:30 a.m. to 6:59 a.m.	+/-1.2
7:00 a.m. to 7:29 a.m.	+/-2.4
7:30 a.m. to 7:59 a.m.	+/-2.5
8:00 a.m. to 8:29 a.m.	+/-3.6
8:30 a.m. to 8:59 a.m.	+/-2.5
9:00 a.m. to 11:59 p.m.	+/-3.4
TRAVEL TIME TO WORK	
Less than 10 minutes	+/-2.2
10 to 14 minutes	+/-2.3
15 to 19 minutes	+/-2.1
20 to 24 minutes	+/-2.5
25 to 29 minutes	+/-1.7
30 to 34 minutes	+/-2.8
35 to 44 minutes	+/-1.7
45 to 59 minutes	+/-2.1
60 or more minutes	+/-1.6
Average travel time to work (minutes)	+/-1.5
VEHICLES AVAILABLE	

Subject	Belmont CDP, Massachusetts
	Female
	Margin of Error
Workers 16 years and over in households	+/-310
No vehicle available	+/-0.9
1 vehicle available	+/-3.3
2 vehicles available	+/-4.2
3 or more vehicles available	+/-3.8
PERCENT IMPUTED	
Means of transportation to work	(X)
Private vehicle occupancy	(X)
Place of work	(X)
Time leaving home to go to work	(X)
Travel time to work	(X)
Vehicles available	(X)

Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. The value shown here is the 90 percent margin of error. The margin of error can be interpreted roughly as providing a 90 percent probability that the interval defined by the estimate minus the margin of error and the estimate plus the margin of error (the lower and upper confidence bounds) contains the true value. In addition to sampling variability, the ACS estimates are subject to nonsampling error (for a discussion of nonsampling variability, see Accuracy of the Data). The effect of nonsampling error is not represented in these tables.

The 12 selected states are Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Wisconsin.

Workers include members of the Armed Forces and civilians who were at work last week.

While the 2010-2014 American Community Survey (ACS) data generally reflect the February 2013 Office of Management and Budget (OMB) definitions of metropolitan and micropolitan statistical areas; in certain instances the names, codes, and boundaries of the principal cities shown in ACS tables may differ from the OMB definitions due to differences in the effective dates of the geographic entities.

Estimates of urban and rural population, housing units, and characteristics reflect boundaries of urban areas defined based on Census 2010 data. As a result, data for urban and rural areas from the ACS do not necessarily reflect the results of ongoing urbanization.

Source: U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates

Explanation of Symbols:

1. An '***' entry in the margin of error column indicates that either no sample observations or too few sample observations were available to compute a standard error and thus the margin of error. A statistical test is not appropriate.
2. An '-' entry in the estimate column indicates that either no sample observations or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest interval or upper interval of an open-ended distribution.
3. An '-' following a median estimate means the median falls in the lowest interval of an open-ended distribution.
4. An '+' following a median estimate means the median falls in the upper interval of an open-ended distribution.
5. An '****' entry in the margin of error column indicates that the median falls in the lowest interval or upper interval of an open-ended distribution. A statistical test is not appropriate.
6. An '*****' entry in the margin of error column indicates that the estimate is controlled. A statistical test for sampling variability is not appropriate.
7. An 'N' entry in the estimate and margin of error columns indicates that data for this geographic area cannot be displayed because the number of sample cases is too small.
8. An '(X)' means that the estimate is not applicable or not available.

Design Consultants, Inc.
 January 2017
 344 Pleasant Street Belmont, MA
 Preliminary Trip Generation Calculations
 Based on ITE's Trip Generation Manual, 9th Edition (2012)

MEANS OF TRANSPORTATION TO WORK	
Car, truck, or van	70.8%
Drove alone	63.2%
Carpooled:	7.6%
In 2-person carpool	6.3%
In 3-person carpool	0.8%
In 4 person carpool	0.5%
Public transportation (excluding taxicab)	14.7%
Bicycle	1.6%
Walked	2.3%
Other means	1.4%
Worked at home	9.2%

Average Vehicle Occupancy (AVO)			
# Occupants	Weight	mult. By	Product
Drove Alone	0.632	1	0.632
Carpool (2)	0.063	2	0.126
Carpool (3)	0.008	3	0.024
Carpool (4)	0.005	4	0.02
<i>Sums</i>	<i>0.708</i>		<i>0.802</i>
AVO (Sum of Products/Sum of Weights)			1.1



APPENDIX E – SAFETY ANALYSIS

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Belmont COUNT DATE : Mar-16

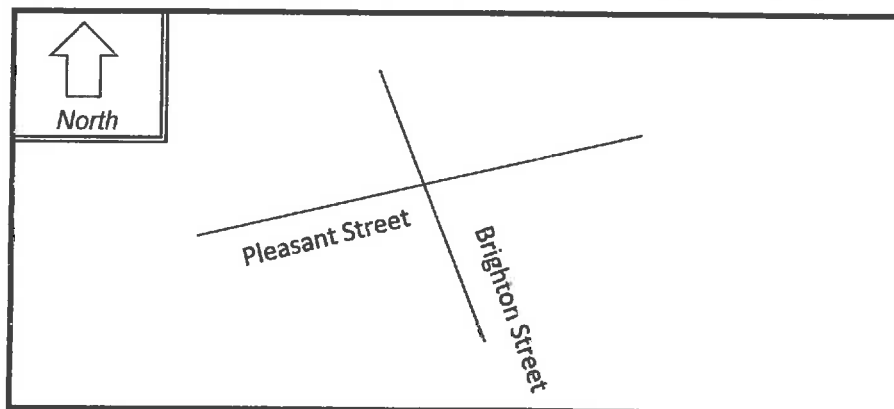
DISTRICT : 4 UNSIGNALIZED : ☐ SIGNALIZED : ☒

~ INTERSECTION DATA ~

MAJOR STREET : Pleasant Street

MINOR STREET(S) : Brighton Street

INTERSECTION
 DIAGRAM
 (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NEB	SWB	NWB	SEB		
PEAK HOURLY VOLUMES (PM) :	474	918	458	52		1,902

"K" FACTOR : 0.090 INTERSECTION ADT (V) = TOTAL DAILY
 APPROACH VOLUME : 21,133

TOTAL # OF CRASHES : 12 # OF YEARS : 3 AVERAGE # OF
 CRASHES PER YEAR (A) : 4.00

CRASH RATE CALCULATION :

0.52

RATE = $\frac{(A * 1,000,000)}{(V * 365)}$

Comments :

Project Title & Date: 344 Pleasant Street

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Belmont COUNT DATE : Mar-16

DISTRICT : 4 UNSIGNALIZED : ☐ SIGNALIZED : ☒

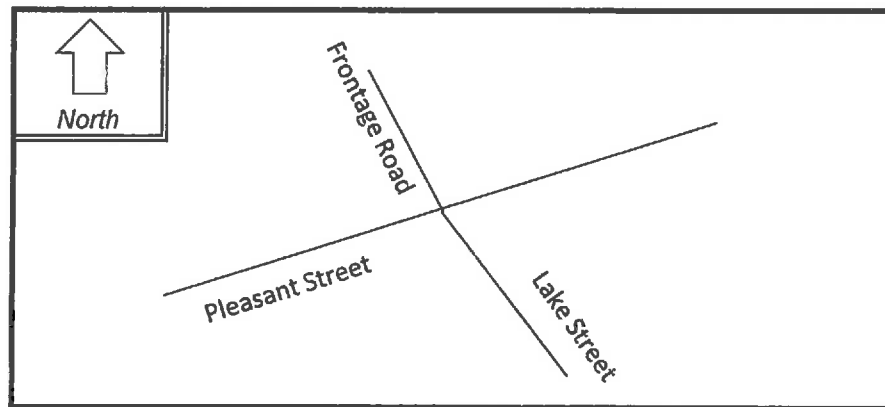
~ INTERSECTION DATA ~

MAJOR STREET : Pleasant Street

MINOR STREET(S) : Lake Street

Frontage Road

INTERSECTION
 DIAGRAM
 (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NEB	SWB	NWB	SEB		
PEAK HOURLY VOLUMES (PM) :	681	1,043	136	942		2,802

"K" FACTOR : 0.090 INTERSECTION ADT (V) = TOTAL DAILY APPROACH VOLUME : 31,133

TOTAL # OF CRASHES : 16 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (A) : 5.33

CRASH RATE CALCULATION :

0.47

$$\text{RATE} = \frac{(A * 1,000,000)}{(V * 365)}$$

Comments : _____

Project Title & Date : 344 Pleasant Street

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Belmont COUNT DATE : Mar-16

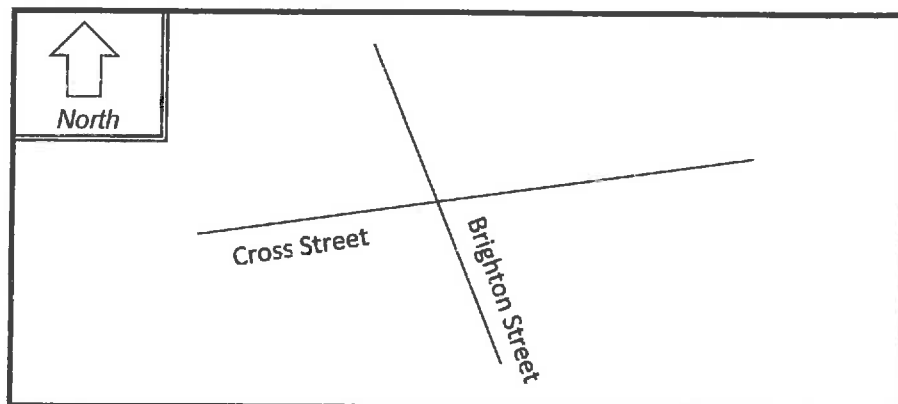
DISTRICT : 4 UNSIGNALIZED : ☐ SIGNALIZED : ☒

~ INTERSECTION DATA ~

MAJOR STREET : Brighton Street

MINOR STREET(S) : Cross Street

INTERSECTION
 DIAGRAM
 (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NEB	SWB	NWB	SEB		
PEAK HOURLY VOLUMES (PM) :	323	270	915	537		2,045

"K" FACTOR : INTERSECTION ADT (V) = TOTAL DAILY
 APPROACH VOLUME :

TOTAL # OF CRASHES : # OF
 YEARS : AVERAGE # OF
 CRASHES PER YEAR (A) :

CRASH RATE CALCULATION :

$$\text{RATE} = \frac{(A * 1,000,000)}{(V * 365)}$$



APPENDIX F – CAPACITY ANALYSIS

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

	↖	↘	↗	↙	↖	↘	↗	↙	↖	↘	↗	↙
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔	↔		↔		↔	↔	
Traffic Volume (vph)	20	13	8	43	11	261	3	346	22	376	607	12
Future Volume (vph)	20	13	8	43	11	261	3	346	22	376	607	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		200	0		0	0		0
Storage Lanes	0		0	0		1	0		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.977				0.850		0.992			0.996	
Flt Protected		0.976			0.963			0.999		0.950		
Satd. Flow (prot)	0	1723	0	0	1802	1599	0	1866	0	1787	1874	0
Flt Permitted		0.862			0.785			0.984		0.294		
Satd. Flow (perm)	0	1522	0	0	1469	1599	0	1838	0	553	1874	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12				275		4			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		233			1288			700			549	
Travel Time (s)		5.3			29.3			15.9			12.5	
Peak Hour Factor	0.56	0.54	0.67	0.83	0.69	0.95	0.38	0.84	0.79	0.92	0.79	0.60
Heavy Vehicles (%)	5%	8%	0%	2%	0%	1%	0%	1%	0%	1%	1%	0%
Adj. Flow (vph)	36	24	12	52	16	275	8	412	28	409	768	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	72	0	0	68	275	0	448	0	409	788	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	4		1	4	4	1	4		4	4	
Detector Template	Left			Left			Left					
Leading Detector (ft)	20	66		20	66	66	20	66		66	66	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	6	20	6		6	6	
Detector 1 Type	CI+Ex	CI+Ex		CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		20			20	20		20		20	20	
Detector 2 Size(ft)		6			6	6		6		6	6	
Detector 2 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Detector 3 Position(ft)		40			40	40		40		40	40	
Detector 3 Size(ft)		6			6	6		6		6	6	

Existing AM

Synchro 9 Report
Page 1

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Detector 3 Position(ft)	
Detector 3 Size(ft)	

Existing AM

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector 3 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 3 Channel												
Detector 3 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Detector 4 Position(ft)		60			60	60		60		60	60	
Detector 4 Size(ft)		6			6	6		6		6	6	
Detector 4 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 4 Channel												
Detector 4 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		9.5	20.0	
Total Split (s)	25.0	25.0		25.0	25.0	25.0	25.0	25.0		10.0	35.0	
Total Split (%)	32.5%	32.5%		32.5%	32.5%	32.5%	32.5%	32.5%		13.0%	45.5%	
Maximum Green (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		5.5	30.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		0.5	1.0	
Lost Time Adjust (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max	Max	Max	Max		None	Max	
Act Effct Green (s)		20.0			20.0	20.0		20.0		30.5	30.0	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.51	0.50	
v/c Ratio		0.14			0.14	0.38		0.73		1.04	0.84	
Control Delay		13.0			15.0	4.1		26.2		73.2	23.7	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		13.0			15.0	4.1		26.2		73.2	23.7	
LOS		B			B	A		C		E	C	
Approach Delay		13.0			6.2			26.2			40.6	
Approach LOS		B			A			C			D	

Intersection Summary

Area Type: Other

Cycle Length: 77

Actuated Cycle Length: 60

Natural Cycle: 80

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 30.8

Intersection Capacity Utilization 73.8%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service D

Splits and Phases: 3: Pleasant Street & Brighton Street

Ø1	Ø2	Ø4	Ø9
Ø6	Ø8		

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

Lane Group	Ø9
Detector 3 Type	
Detector 3 Channel	
Detector 3 Extend (s)	
Detector 4 Position(ft)	
Detector 4 Size(ft)	
Detector 4 Type	
Detector 4 Channel	
Detector 4 Extend (s)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	3.0
Minimum Split (s)	17.0
Total Split (s)	17.0
Total Split (%)	22%
Maximum Green (s)	13.0
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Queues

3: Pleasant Street & Brighton Street

01/09/2017

	↘	↖	↗	↙	↘	↙
Lane Group	SET	NWT	NWR	NET	SWL	SWT
Lane Group Flow (vph)	72	68	275	448	409	788
v/c Ratio	0.14	0.14	0.38	0.73	1.04	0.84
Control Delay	13.0	15.0	4.1	26.2	73.2	23.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.0	15.0	4.1	26.2	73.2	23.7
Queue Length 50th (ft)	15	17	0	138	~93	226
Queue Length 95th (ft)	21	31	43	211	#251	292
Internal Link Dist (ft)	153	1208		620		469
Turn Bay Length (ft)			200			
Base Capacity (vph)	515	489	716	615	394	938
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	0.14	0.14	0.38	0.73	1.04	0.84

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

3: Pleasant Street & Brighton Street

01/09/2017

















Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		👉			👉	👉		👉		👉	👉	
Traffic Volume (vph)	20	13	8	43	11	261	3	346	22	376	607	12
Future Volume (vph)	20	13	8	43	11	261	3	346	22	376	607	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.98			1.00	0.85		0.99		1.00	1.00	
Flt Protected		0.98			0.96	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1723			1802	1599		1865		1787	1874	
Flt Permitted		0.86			0.79	1.00		0.98		0.29	1.00	
Satd. Flow (perm)		1522			1469	1599		1836		554	1874	
Peak-hour factor, PHF	0.56	0.54	0.67	0.83	0.69	0.95	0.38	0.84	0.79	0.92	0.79	0.60
Adj. Flow (vph)	36	24	12	52	16	275	8	412	28	409	768	20
RTOR Reduction (vph)	0	8	0	0	0	183	0	3	0	0	1	0
Lane Group Flow (vph)	0	64	0	0	68	92	0	445	0	409	787	0
Heavy Vehicles (%)	5%	8%	0%	2%	0%	1%	0%	1%	0%	1%	1%	0%
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		20.0			20.0	20.0		20.0		30.0	30.0	
Effective Green, g (s)		20.0			20.0	20.0		20.0		30.0	30.0	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.50	0.50	
Clearance Time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		507			489	533		612		390	937	
v/s Ratio Prot										c0.10	0.42	
v/s Ratio Perm		0.04			0.05	c0.06		0.24		c0.43		
v/c Ratio		0.13			0.14	0.17		0.73		1.05	0.84	
Uniform Delay, d1		13.9			14.0	14.1		17.6		15.6	12.9	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.5			0.6	0.7		7.4		58.9	9.0	
Delay (s)		14.4			14.6	14.8		25.0		74.5	21.9	
Level of Service		B			B	B		C		E	C	
Approach Delay (s)		14.4			14.8			25.0			39.9	
Approach LOS		B			B			C			D	

Intersection Summary

HCM 2000 Control Delay	31.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	5	508	8	15	290	189	9	159	8	203	141	5
Future Volume (vph)	5	508	8	15	290	189	9	159	8	203	141	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.946			0.993			0.996	
Flt Protected		0.999			0.998			0.997			0.973	
Satd. Flow (prot)	0	1892	0	0	1787	0	0	1865	0	0	1841	0
Flt Permitted		0.993			0.975			0.968			0.601	
Satd. Flow (perm)	0	1881	0	0	1746	0	0	1810	0	0	1137	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			44			3			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1288			657			754			675	
Travel Time (s)		29.3			14.9			17.1			15.3	
Peak Hour Factor	0.63	0.90	0.67	0.75	0.88	0.82	0.56	0.74	0.67	0.95	0.87	0.42
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%
Parking (#/hr)			0									
Adj. Flow (vph)	8	564	12	20	330	230	16	215	12	214	162	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	584	0	0	580	0	0	243	0	0	388	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	3		1	3		1	3		1	3	
Detector Template	Left			Left			Left			Left		
Leading Detector (ft)	20	26		20	26		20	26		20	26	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		10			10			10			10	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Detector 3 Position(ft)		20			20			20			20	
Detector 3 Size(ft)		6			6			6			6	
Detector 3 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 3 Channel												

Existing AM

Synchro 9 Report
Page 7

Lane Group 09

Lane Configurations
Traffic Volume (vph)
Future Volume (vph)
Ideal Flow (vphpl)
Lane Util. Factor
Frt
Flt Protected
Satd. Flow (prot)
Flt Permitted
Satd. Flow (perm)
Right Turn on Red
Satd. Flow (RTOR)
Link Speed (mph)
Link Distance (ft)
Travel Time (s)
Peak Hour Factor
Heavy Vehicles (%)
Parking (#/hr)
Adj. Flow (vph)
Shared Lane Traffic (%)
Lane Group Flow (vph)
Enter Blocked Intersection
Lane Alignment
Median Width(ft)
Link Offset(ft)
Crosswalk Width(ft)
Two way Left Turn Lane
Headway Factor
Turning Speed (mph)
Number of Detectors
Detector Template
Leading Detector (ft)
Trailing Detector (ft)
Detector 1 Position(ft)
Detector 1 Size(ft)
Detector 1 Type
Detector 1 Channel
Detector 1 Extend (s)
Detector 1 Queue (s)
Detector 1 Delay (s)
Detector 2 Position(ft)
Detector 2 Size(ft)
Detector 2 Type
Detector 2 Channel
Detector 2 Extend (s)
Detector 3 Position(ft)
Detector 3 Size(ft)
Detector 3 Type
Detector 3 Channel

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector 3 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Detector Phase	6	6		2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	45.0	45.0		45.0	45.0		25.0	25.0		25.0	25.0	
Total Split (%)	47.9%	47.9%		47.9%	47.9%		26.6%	26.6%		26.6%	26.6%	
Maximum Green (s)	40.0	40.0		40.0	40.0		20.0	20.0		20.0	20.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effect Green (s)		40.4			40.4			20.2			20.2	
Actuated g/C Ratio		0.55			0.55			0.27			0.27	
v/c Ratio		0.57			0.60			0.49			1.24	
Control Delay		15.1			14.9			27.6			161.3	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		15.1			14.9			27.6			161.3	
LOS		B			B			C			F	
Approach Delay		15.1			14.9			27.6			161.3	
Approach LOS		B			B			C			F	

Intersection Summary

Area Type: Other

Cycle Length: 94

Actuated Cycle Length: 73.8

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.24

Intersection Signal Delay: 48.3






Intersection Capacity Utilization 77.6%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service D

Splits and Phases: 6: Cross Street & Brighton Street

 02	 04	 09
 06	 08	

Existing AM

Lane Group		Ø9
Detector 3 Extend (s)		
Turn Type		
Protected Phases		9
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)		4.0
Minimum Split (s)		19.0
Total Split (s)		24.0
Total Split (%)		26%
Maximum Green (s)		21.0
Yellow Time (s)		2.0
All-Red Time (s)		1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)		3.0
Recall Mode		None
Walk Time (s)		5.0
Flash Dont Walk (s)		11.0
Pedestrian Calls (#/hr)		3
Act Effect Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Intersection Summary		

Queues

6: Cross Street & Brighton Street

01/09/2017

	↘	↖	↗	↙
Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	584	580	243	388
v/c Ratio	0.57	0.60	0.49	1.24
Control Delay	15.1	14.9	27.6	161.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	15.1	14.9	27.6	161.3
Queue Length 50th (ft)	141	131	85	~207
Queue Length 95th (ft)	374	351	156	#465
Internal Link Dist (ft)	1208	577	674	595
Turn Bay Length (ft)				
Base Capacity (vph)	1029	974	497	312
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.57	0.60	0.49	1.24

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

6: Cross Street & Brighton Street






















01/09/2017

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		+			+			+			+	
Traffic Volume (vph)	5	508	8	15	290	189	9	159	8	203	141	5
Future Volume (vph)	5	508	8	15	290	189	9	159	8	203	141	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0			5.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.95			0.99			1.00	
Flt Protected		1.00			1.00			1.00			0.97	
Satd. Flow (prot)		1893			1788			1865			1841	
Flt Permitted		0.99			0.97			0.97			0.60	
Satd. Flow (perm)		1881			1746			1811			1137	
Peak-hour factor, PHF	0.63	0.90	0.67	0.75	0.88	0.82	0.56	0.74	0.67	0.95	0.87	0.42
Adj. Flow (vph)	8	564	12	20	330	230	16	215	12	214	162	12
RTOR Reduction (vph)	0	0	0	0	21	0	0	2	0	0	1	0
Lane Group Flow (vph)	0	584	0	0	559	0	0	241	0	0	387	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%
Parking (#/hr)			0									
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		40.4			40.4			20.2			20.2	
Effective Green, g (s)		40.4			40.4			20.2			20.2	
Actuated g/C Ratio		0.53			0.53			0.26			0.26	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		995			924			479			301	
v/s Ratio Prot												
v/s Ratio Perm		0.31			0.32			0.13			0.34	
v/c Ratio		0.59			0.61			0.50			1.28	
Uniform Delay, d1		12.2			12.4			23.8			28.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.5			2.9			3.7			150.8	
Delay (s)		14.8			15.4			27.5			178.8	
Level of Service		B			B			C			F	
Approach Delay (s)		14.8			15.4			27.5			178.8	
Approach LOS		B			B			C			F	
Intersection Summary												
HCM 2000 Control Delay		52.2				HCM 2000 Level of Service		D				
HCM 2000 Volume to Capacity ratio		0.80										
Actuated Cycle Length (s)		76.3				Sum of lost time (s)		13.0				
Intersection Capacity Utilization		77.6%				ICU Level of Service		D				
Analysis Period (min)		15										
c Critical Lane Group												

Lanes, Volumes, Timings

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	343	243	356	37	0	101	0	607	75	203	847	0
Future Volume (vph)	343	243	356	37	0	101	0	607	75	203	847	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor						0.99		1.00				
Frt			0.850			0.850		0.981				
Flt Protected	0.950	0.990		0.950						0.950		
Satd. Flow (prot)	1698	1728	1599	1805	0	1583	0	3502	0	1770	3574	0
Flt Permitted	0.950	0.990		0.950						0.245		
Satd. Flow (perm)	1698	1728	1599	1805	0	1561	0	3502	0	456	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			214			136		20				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		454			496			549			547	
Travel Time (s)		10.3			11.3			12.5			12.4	
Confl. Bikes (#/hr)						1			1			
Peak Hour Factor	0.89	0.92	0.94	0.84	0.25	0.74	0.25	0.97	0.84	0.79	0.93	0.25
Heavy Vehicles (%)	1%	4%	1%	0%	0%	2%	0%	1%	0%	2%	1%	0%
Adj. Flow (vph)	385	264	379	44	0	136	0	626	89	257	911	0
Shared Lane Traffic (%)	17%											
Lane Group Flow (vph)	320	329	379	44	0	136	0	715	0	257	911	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	2		1		2		2	1	
Detector Template												
Leading Detector (ft)	6	6	0	16		6		26		26	36	
Trailing Detector (ft)	0	0	0	0		0		0		0	30	
Detector 1 Position(ft)	0	0	0	0		0		0		0	30	
Detector 1 Size(ft)	6	6	20	6		6		6		6	6	
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 2 Position(ft)				10				20		20		
Detector 2 Size(ft)				6				6		6		
Detector 2 Type				CI+Ex				CI+Ex		CI+Ex		
Detector 2 Channel												
Detector 2 Extend (s)				0.0				0.0		0.0		
Turn Type	Split	NA	Perm	Prot		Perm		NA		pm+pt	NA	
Protected Phases	6	6		2				4		3	8	
Permitted Phases			6			2				8		

Existing AM

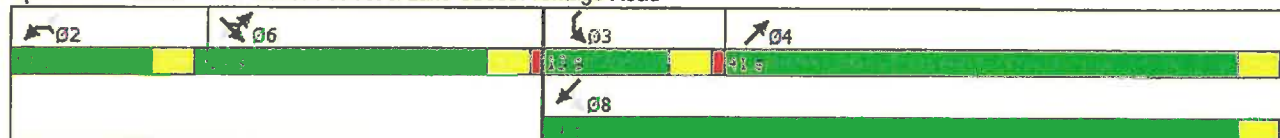
Synchro 9 Report
Page 13

9: Pleasant Street & Lake Street/Frontage Road

Intersection Summary

ICU Level of Service B









Splits and Phases: 9: Pleasant Street & Lake Street/Frontage Road



Queues

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

								
Lane Group	SEL	SET	SER	NWL	NWR	NET	SWL	SWT
Lane Group Flow (vph)	320	329	379	44	136	715	257	911
v/c Ratio	0.87	0.88	0.74	0.22	0.47	0.50	0.68	0.47
Control Delay	59.3	60.4	24.0	40.7	12.9	21.5	22.0	13.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.3	60.4	24.0	40.7	12.9	21.5	22.0	13.9
Queue Length 50th (ft)	190	195	88	24	0	156	75	161
Queue Length 95th (ft)	#340	#355	#201	52	29	208	103	209
Internal Link Dist (ft)		374				469		467
Turn Bay Length (ft)								
Base Capacity (vph)	369	375	515	196	290	1420	376	1942
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.87	0.88	0.74	0.22	0.47	0.50	0.68	0.47













Intersection Summary

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

HCM Signalized Intersection Capacity Analysis

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	343	243	356	37	0	101	0	607	75	203	847	0
Future Volume (vph)	343	243	356	37	0	101	0	607	75	203	847	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95	1.00	1.00		1.00		0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00		0.99		1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00		1.00		1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00		0.85		0.98		1.00	1.00	
Flt Protected	0.95	0.99	1.00	0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1698	1728	1599	1805		1561		3503		1770	3574	
Flt Permitted	0.95	0.99	1.00	0.95		1.00		1.00		0.25	1.00	
Satd. Flow (perm)	1698	1728	1599	1805		1561		3503		457	3574	
Peak-hour factor, PHF	0.89	0.92	0.94	0.84	0.25	0.74	0.25	0.97	0.84	0.79	0.93	0.25
Adj. Flow (vph)	385	264	379	44	0	136	0	626	89	257	911	0
RTOR Reduction (vph)	0	0	167	0	0	121	0	12	0	0	0	0
Lane Group Flow (vph)	320	329	212	44	0	15	0	703	0	257	911	0
Confl. Bikes (#/hr)						1			1			
Heavy Vehicles (%)	1%	4%	1%	0%	0%	2%	0%	1%	0%	2%	1%	0%
Turn Type	Split	NA	Perm	Prot		Perm		NA		pm+pt	NA	
Protected Phases	6	6		2				4		3	8	
Permitted Phases			6			2				8		
Actuated Green, G (s)	20.0	20.0	20.0	10.0		10.0		37.0		50.0	50.0	
Effective Green, g (s)	20.0	20.0	20.0	10.0		10.0		37.0		50.0	50.0	
Actuated g/C Ratio	0.22	0.22	0.22	0.11		0.11		0.40		0.54	0.54	
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	369	375	347	196		169		1408		376	1942	
v/s Ratio Prot	0.19	c0.19		c0.02				0.20		c0.07	0.25	
v/s Ratio Perm			0.13			0.01				c0.30		
v/c Ratio	0.87	0.88	0.61	0.22		0.09		0.50		0.68	0.47	
Uniform Delay, d1	34.7	34.8	32.5	37.5		36.9		20.6		13.0	12.9	
Progression Factor	1.00	1.00	1.00	1.00		1.00		1.00		1.00	1.00	
Incremental Delay, d2	23.0	23.9	7.8	2.6		1.0		1.3		5.1	0.2	
Delay (s)	57.7	58.8	40.2	40.1		37.9		21.8		18.1	13.0	
Level of Service	E	E	D	D		D		C		B	B	
Approach Delay (s)		51.6			38.4			21.8			14.2	
Approach LOS		D			D			C			B	

Intersection Summary

HCM 2000 Control Delay	29.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	92.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	14	29	9	50	24	384	0	451	23	405	494	19
Future Volume (vph)	14	29	9	50	24	384	0	451	23	405	494	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		200	0		0	0		0
Storage Lanes	0		0	0		1	0		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.982				0.850		0.986			0.994	
Flt Protected		0.991			0.969					0.950		
Satd. Flow (prot)	0	1849	0	0	1841	1599	0	1857	0	1770	1853	0
Flt Permitted		0.950			0.791					0.163		
Satd. Flow (perm)	0	1773	0	0	1503	1599	0	1857	0	304	1853	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10				422		7			3	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		233			1288			614			549	
Travel Time (s)		5.3			29.3			14.0			12.5	
Peak Hour Factor	0.88	0.48	0.75	0.77	0.67	0.91	0.25	0.95	0.41	0.89	0.92	0.79
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	2%	2%	0%
Adj. Flow (vph)	16	60	12	65	36	422	0	475	56	455	537	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	88	0	0	101	422	0	531	0	455	561	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	4		1	4	4	1	4		4	4	
Detector Template	Left			Left			Left					
Leading Detector (ft)	20	66		20	66	66	20	66		66	66	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	6	20	6		6	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		20			20	20		20		20	20	
Detector 2 Size(ft)		6			6	6		6		6	6	
Detector 2 Type		Cl+Ex			Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Detector 3 Position(ft)		40			40	40		40		40	40	
Detector 3 Size(ft)		6			6	6		6		6	6	

Existing PM

Synchro 9 Report
Page 1

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Detector 3 Position(ft)	
Detector 3 Size(ft)	

Existing PM

Synchro 9 Report
Page 2

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector 3 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 3 Channel												
Detector 3 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Detector 4 Position(ft)		60			60	60		60		60	60	
Detector 4 Size(ft)		6			6	6		6		6	6	
Detector 4 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 4 Channel												
Detector 4 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm		NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		9.5	20.0	
Total Split (s)	25.0	25.0		25.0	25.0	25.0	25.0	25.0		10.0	35.0	
Total Split (%)	32.5%	32.5%		32.5%	32.5%	32.5%	32.5%	32.5%		13.0%	45.5%	
Maximum Green (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		5.5	30.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		0.5	1.0	
Lost Time Adjust (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max	Max	Max	Max		Max	Max	
Act Effct Green (s)		20.0			20.0	20.0		20.0		30.5	30.0	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.51	0.50	
v/c Ratio		0.15			0.20	0.52		0.85		1.58	0.60	
Control Delay		13.6			15.7	4.5		34.5		295.1	14.2	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		13.6			15.7	4.5		34.5		295.1	14.2	
LOS		B			B	A		C		F	B	
Approach Delay		13.6			6.6			34.5			140.0	
Approach LOS		B			A			C			F	

Intersection Summary

Area Type: Other

Cycle Length: 77

Actuated Cycle Length: 60

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.58

Intersection Signal Delay: 76.5

Intersection Capacity Utilization 74.3%

Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service D

Splits and Phases: 3: Pleasant Street & Brighton Street

Ø1	Ø2	Ø4	Ø9
Ø6	Ø8		

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street







01/09/2017

Lane Group	Ø9
Detector 3 Type	
Detector 3 Channel	
Detector 3 Extend (s)	
Detector 4 Position(ft)	
Detector 4 Size(ft)	
Detector 4 Type	
Detector 4 Channel	
Detector 4 Extend (s)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	3.0
Minimum Split (s)	7.0
Total Split (s)	17.0
Total Split (%)	22%
Maximum Green (s)	13.0
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Queues

3: Pleasant Street & Brighton Street

01/09/2017

						
Lane Group	SET	NWT	NWR	NET	SWL	SWT
Lane Group Flow (vph)	88	101	422	531	455	561
v/c Ratio	0.15	0.20	0.52	0.85	1.58	0.60
Control Delay	13.6	15.7	4.5	34.5	295.1	14.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.6	15.7	4.5	34.5	295.1	14.2
Queue Length 50th (ft)	19	26	0	173	~194	133
Queue Length 95th (ft)	22	40	52	#337	#348	222
Internal Link Dist (ft)	153	1208		534		469
Turn Bay Length (ft)			200			
Base Capacity (vph)	597	501	814	623	288	928
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	0.15	0.20	0.52	0.85	1.58	0.60

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

3: Pleasant Street & Brighton Street

01/09/2017













Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔	↔		↔		↔	↔	
Traffic Volume (vph)	14	29	9	50	24	384	0	451	23	405	494	19
Future Volume (vph)	14	29	9	50	24	384	0	451	23	405	494	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.98			1.00	0.85		0.99		1.00	0.99	
Flt Protected		0.99			0.97	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1848			1841	1599		1856		1770	1852	
Flt Permitted		0.95			0.79	1.00		1.00		0.16	1.00	
Satd. Flow (perm)		1773			1503	1599		1856		304	1852	
Peak-hour factor, PHF	0.88	0.48	0.75	0.77	0.67	0.91	0.25	0.95	0.41	0.89	0.92	0.79
Adj. Flow (vph)	16	60	12	65	36	422	0	475	56	455	537	24
RTOR Reduction (vph)	0	7	0	0	0	281	0	5	0	0	2	0
Lane Group Flow (vph)	0	81	0	0	101	141	0	526	0	455	560	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	2%	2%	0%
Turn Type	Perm	NA		Perm	NA	Perm		NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		20.0			20.0	20.0		20.0		30.0	30.0	
Effective Green, g (s)		20.0			20.0	20.0		20.0		30.0	30.0	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.50	0.50	
Clearance Time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		591			501	533		618		286	926	
v/s Ratio Prot								0.28		c0.15	0.30	
v/s Ratio Perm		0.05			0.07	c0.09				c0.65		
v/c Ratio		0.14			0.20	0.26		0.85		1.59	0.60	
Uniform Delay, d1		14.0			14.3	14.6		18.6		12.8	10.7	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.5			0.9	1.2		13.8		281.9	2.9	
Delay (s)		14.5			15.2	15.8		32.5		294.6	13.7	
Level of Service		B			B	B		C		F	B	
Approach Delay (s)		14.5			15.7			32.5			139.5	
Approach LOS		B			B			C			F	

Intersection Summary

HCM 2000 Control Delay	78.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		⇄			⇄			⇄			⇄	
Traffic Volume (vph)	9	512	16	6	459	450	36	255	32	155	106	9
Future Volume (vph)	9	512	16	6	459	450	36	255	32	155	106	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.994			0.931			0.981			0.995	
Flt Protected		0.999						0.993			0.971	
Satd. Flow (prot)	0	1852	0	0	1743	0	0	1851	0	0	1836	0
Flt Permitted		0.970			0.995			0.913			0.392	
Satd. Flow (perm)	0	1798	0	0	1734	0	0	1702	0	0	741	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			69			8			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1288			399			384			425	
Travel Time (s)		29.3			9.1			8.7			9.7	
Peak Hour Factor	0.56	0.81	0.57	0.75	0.92	0.86	0.60	0.82	0.53	0.77	0.88	0.75
Heavy Vehicles (%)	0%	2%	0%	0%	1%	2%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	16	632	28	8	499	523	60	311	60	201	120	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	676	0	0	1030	0	0	431	0	0	333	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	3		1	3		1	3		1	3	
Detector Template	Left			Left			Left			Left		
Leading Detector (ft)	20	26		20	26		20	26		20	26	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		10			10			10			10	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Detector 3 Position(ft)		20			20			20			20	
Detector 3 Size(ft)		6			6			6			6	
Detector 3 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 3 Channel												
Detector 3 Extend (s)		0.0			0.0			0.0			0.0	

Existing PM

Synchro 9 Report
Page 7

Lane Group	ØØ
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Detector 3 Position(ft)	
Detector 3 Size(ft)	
Detector 3 Type	
Detector 3 Channel	
Detector 3 Extend (s)	

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

	↖	↘	↙	↗	↖	↘	↙	↗	↖	↘	↙	↗
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Detector Phase	6	6		2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	45.0	45.0		45.0	45.0		25.0	25.0		25.0	25.0	
Total Split (%)	47.9%	47.9%		47.9%	47.9%		26.6%	26.6%		26.6%	26.6%	
Maximum Green (s)	40.0	40.0		40.0	40.0		20.0	20.0		20.0	20.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		40.4			40.4			20.2			20.2	
Actuated g/C Ratio		0.55			0.55			0.27			0.27	
v/c Ratio		0.69			1.05			0.92			1.63	
Control Delay		18.6			62.2			53.7			330.2	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		18.6			62.2			53.7			330.2	
LOS		B			E			D			F	
Approach Delay		18.6			62.2			53.7			330.2	
Approach LOS		B			E			D			F	

Intersection Summary

Area Type: Other

Cycle Length: 94

Actuated Cycle Length: 73.8

Natural Cycle: 150

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.63

Intersection Signal Delay: 84.9

Intersection Capacity Utilization 99.7%

Analysis Period (min) 15

Intersection LOS: F

ICU Level of Service F

Splits and Phases: 6: Cross Street & Brighton Street

↖ 02	↗ 04	↙ 09
↘ 06	↖ 08	

Lane Group	Ø9
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	19.0
Total Split (s)	24.0
Total Split (%)	26%
Maximum Green (s)	21.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	3
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Queues

6: Cross Street & Brighton Street

01/09/2017

	↘	↖	↗	↙
Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	676	1030	431	333
v/c Ratio	0.69	1.05	0.92	1.63
Control Delay	18.6	62.2	53.7	330.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	18.6	62.2	53.7	330.2
Queue Length 50th (ft)	180	~400	173	~210
Queue Length 95th (ft)	399	#957	#398	#452
Internal Link Dist (ft)	1208	319	304	345
Turn Bay Length (ft)				
Base Capacity (vph)	984	979	471	204
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.69	1.05	0.92	1.63

















Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

6: Cross Street & Brighton Street

01/09/2017

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	9	512	16	6	459	450	36	255	32	155	106	9
Future Volume (vph)	9	512	16	6	459	450	36	255	32	155	106	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0			5.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.93			0.98			1.00	
Flt Protected		1.00			1.00			0.99			0.97	
Satd. Flow (prot)		1853			1743			1851			1835	
Flt Permitted		0.97			1.00			0.91			0.39	
Satd. Flow (perm)		1799			1735			1702			741	
Peak-hour factor, PHF	0.56	0.81	0.57	0.75	0.92	0.86	0.60	0.82	0.53	0.77	0.88	0.75
Adj. Flow (vph)	16	632	28	8	499	523	60	311	60	201	120	12
RTOR Reduction (vph)	0	1	0	0	32	0	0	6	0	0	1	0
Lane Group Flow (vph)	0	675	0	0	998	0	0	425	0	0	332	0
Heavy Vehicles (%)	0%	2%	0%	0%	1%	2%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		40.4			40.4			20.2			20.2	
Effective Green, g (s)		40.4			40.4			20.2			20.2	
Actuated g/C Ratio		0.53			0.53			0.26			0.26	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		952			918			450			196	
v/s Ratio Prot												
v/s Ratio Perm		0.37			c0.57			0.25			c0.45	
v/c Ratio		0.71			1.09			0.94			1.69	
Uniform Delay, d1		13.5			17.9			27.5			28.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		4.4			56.1			30.6			332.2	
Delay (s)		18.0			74.0			58.1			360.3	
Level of Service		B			E			E			F	
Approach Delay (s)		18.0			74.0			58.1			360.3	
Approach LOS		B			E			E			F	

Intersection Summary

HCM 2000 Control Delay	94.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	76.3	Sum of lost time (s)	13.0
Intersection Capacity Utilization	99.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↵	↶	↷	↵		↷		↶↵		↵	↶↷	
Traffic Volume (vph)	465	55	411	39	0	319	0	731	59	83	570	0
Future Volume (vph)	465	55	411	39	0	319	0	731	59	83	570	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor						0.99		1.00				
Frt			0.850			0.850		0.988				
Flt Protected	0.950	0.966		0.950						0.950		
Satd. Flow (prot)	1698	1677	1599	1805	0	1599	0	3555	0	1787	3574	0
Flt Permitted	0.950	0.966		0.950						0.238		
Satd. Flow (perm)	1698	1677	1599	1805	0	1577	0	3555	0	448	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			306			214		12				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		550			619			549			683	
Travel Time (s)		12.5			14.1			12.5			15.5	
Confl. Bikes (#/hr)						1			1			
Peak Hour Factor	0.95	0.64	0.86	0.65	0.25	0.85	0.25	0.96	0.85	0.93	0.94	0.25
Heavy Vehicles (%)	1%	11%	1%	0%	0%	1%	0%	0%	2%	1%	1%	0%
Adj. Flow (vph)	489	86	478	60	0	375	0	761	69	89	606	0
Shared Lane Traffic (%)	42%											
Lane Group Flow (vph)	284	291	478	60	0	375	0	830	0	89	606	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	2		1		2		2	1	
Detector Template												
Leading Detector (ft)	6	6	0	16		6		26		26	36	
Trailing Detector (ft)	0	0	0	0		0		0		0	30	
Detector 1 Position(ft)	0	0	0	0		0		0		0	30	
Detector 1 Size(ft)	6	6	20	6		6		6		6	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 2 Position(ft)				10				20		20		
Detector 2 Size(ft)				6				6		6		
Detector 2 Type				Cl+Ex				Cl+Ex		Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)				0.0				0.0		0.0		
Turn Type	Split	NA	Perm	Prot		Perm		NA		pm+pt	NA	
Protected Phases	6	6		2				4		3	8	
Permitted Phases			6			2				8		

Existing PM

Synchro 9 Report
Page 13

Lanes, Volumes, Timings

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Group												
Detector Phase	6	6	6	2		2		4		3	8	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0	10.0		10.0		15.0		9.0	15.0	
Minimum Split (s)	20.0	20.0	20.0	14.0		14.0		20.0		13.0	20.0	
Total Split (s)	24.0	24.0	24.0	14.0		14.0		41.0		13.0	54.0	
Total Split (%)	26.1%	26.1%	26.1%	15.2%		15.2%		44.6%		14.1%	58.7%	
Maximum Green (s)	20.0	20.0	20.0	10.0		10.0		37.0		9.0	50.0	
Yellow Time (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0		1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?								Yes		Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
Recall Mode	Max	Max	Max	Max		Max		Max		None	Max	
Walk Time (s)	5.0	5.0	5.0									
Flash Dont Walk (s)	11.0	11.0	11.0									
Pedestrian Calls (#/hr)	0	0	0									
Act Effct Green (s)	20.0	20.0	20.0	10.0		10.0		39.6		50.0	50.0	
Actuated g/C Ratio	0.22	0.22	0.22	0.11		0.11		0.43		0.54	0.54	
v/c Ratio	0.77	0.80	0.81	0.31		1.04		0.54		0.24	0.31	
Control Delay	49.4	52.1	24.8	42.4		76.3		21.6		14.8	12.1	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Total Delay	49.4	52.1	24.8	42.4		76.3		21.6		14.8	12.1	
LOS	D	D	C	D		E		C		B	B	
Approach Delay		39.0			71.6			21.6			12.4	
Approach LOS		D			E			C			B	

Intersection Summary

Area Type: Other

Cycle Length: 92

Actuated Cycle Length: 92

Natural Cycle: 70

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 32.8

Intersection Capacity Utilization 66.2%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C









Splits and Phases: 9: Pleasant Street & Lake Street/Frontage Road

Ø2	Ø6	Ø4	Ø3

Queues

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017













								
Lane Group	SEL	SET	SER	NWL	NWR	NET	SWL	SWT
Lane Group Flow (vph)	284	291	478	60	375	830	89	606
v/c Ratio	0.77	0.80	0.81	0.31	1.04	0.54	0.24	0.31
Control Delay	49.4	52.1	24.8	42.4	76.3	21.6	14.8	12.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.4	52.1	24.8	42.4	76.3	21.6	14.8	12.1
Queue Length 50th (ft)	164	169	95	33	~116	191	23	95
Queue Length 95th (ft)	#291	175	#228	51	#257	250	46	130
Internal Link Dist (ft)		470				469		603
Turn Bay Length (ft)								
Base Capacity (vph)	369	364	587	196	362	1536	374	1942
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.80	0.81	0.31	1.04	0.54	0.24	0.31

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis 9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	465	55	411	39	0	319	0	731	59	83	570	0
Future Volume (vph)	465	55	411	39	0	319	0	731	59	83	570	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95	1.00	1.00		1.00		0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00		0.99		1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00		1.00		1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00		0.85		0.99		1.00	1.00	
Flt Protected	0.95	0.97	1.00	0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1698	1677	1599	1805		1577		3553		1787	3574	
Flt Permitted	0.95	0.97	1.00	0.95		1.00		1.00		0.24	1.00	
Satd. Flow (perm)	1698	1677	1599	1805		1577		3553		447	3574	
Peak-hour factor, PHF	0.95	0.64	0.86	0.65	0.25	0.85	0.25	0.96	0.85	0.93	0.94	0.25
Adj. Flow (vph)	489	86	478	60	0	375	0	761	69	89	606	0
RTOR Reduction (vph)	0	0	240	0	0	191	0	7	0	0	0	0
Lane Group Flow (vph)	284	291	238	60	0	184	0	823	0	89	606	0
Confl. Bikes (#/hr)						1			1			
Heavy Vehicles (%)	1%	11%	1%	0%	0%	1%	0%	0%	2%	1%	1%	0%
Turn Type	Split	NA	Perm	Prot		Perm		NA		pm+pt	NA	
Protected Phases	6	6		2				4		3	8	
Permitted Phases			6			2				8		
Actuated Green, G (s)	20.0	20.0	20.0	10.0		10.0		39.6		50.8	50.8	
Effective Green, g (s)	20.0	20.0	20.0	10.0		10.0		39.6		50.8	50.8	
Actuated g/C Ratio	0.22	0.22	0.22	0.11		0.11		0.43		0.55	0.55	
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	365	361	344	194		169		1516		348	1956	
v/s Ratio Prot	0.17	c0.17		0.03				c0.23		0.02	c0.17	
v/s Ratio Perm			0.15			c0.12				0.12		
v/c Ratio	0.78	0.81	0.69	0.31		1.09		0.54		0.26	0.31	
Uniform Delay, d1	34.3	34.6	33.6	38.2		41.4		19.8		19.0	11.4	
Progression Factor	1.00	1.00	1.00	1.00		1.00		1.00		1.00	1.00	
Incremental Delay, d2	15.0	17.3	10.9	4.1		95.0		1.4		0.4	0.4	
Delay (s)	49.3	51.9	44.4	42.3		136.4		21.2		19.4	11.9	
Level of Service	D	D	D	D		F		C		B	B	
Approach Delay (s)		47.8			123.4			21.2			12.8	
Approach LOS		D			F			C			B	

Intersection Summary

HCM 2000 Control Delay	43.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	92.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Group												
Lane Configurations												
Traffic Volume (vph)	20	13	8	44	11	261	3	346	22	376	607	12
Future Volume (vph)	20	13	8	44	11	261	3	346	22	376	607	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		200	0		0	0		0
Storage Lanes	0		0	0		1	0		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.973				0.850		0.992			0.997	
Flt Protected		0.976			0.962					0.950		
Satd. Flow (prot)	0	1720	0	0	1799	1599	0	1867	0	1787	1876	0
Flt Permitted		0.885			0.797			0.995		0.325		
Satd. Flow (perm)	0	1559	0	0	1490	1599	0	1858	0	611	1876	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9				284		4			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		233			1288			461			549	
Travel Time (s)		5.3			29.3			10.5			12.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	8%	0%	2%	0%	1%	0%	1%	0%	1%	1%	0%
Adj. Flow (vph)	22	14	9	48	12	284	3	376	24	409	660	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	45	0	0	60	284	0	403	0	409	673	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	4		1	4	4	1	4		4	4	
Detector Template	Left			Left			Left					
Leading Detector (ft)	20	66		20	66	66	20	66		66	66	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	6	20	6		6	6	
Detector 1 Type	CI+Ex	CI+Ex		CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		20			20	20		20		20	20	
Detector 2 Size(ft)		6			6	6		6		6	6	
Detector 2 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Detector 3 Position(ft)		40			40	40		40		40	40	
Detector 3 Size(ft)		6			6	6		6		6	6	

No-Build AM

Synchro 9 Report
Page 1

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Detector 3 Position(ft)	
Detector 3 Size(ft)	

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Group												
Detector 3 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 3 Channel												
Detector 3 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Detector 4 Position(ft)		60			60	60		60		60	60	
Detector 4 Size(ft)		6			6	6		6		6	6	
Detector 4 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 4 Channel												
Detector 4 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		9.5	20.0	
Total Split (s)	25.0	25.0		25.0	25.0	25.0	25.0	25.0		10.0	35.0	
Total Split (%)	32.5%	32.5%		32.5%	32.5%	32.5%	32.5%	32.5%		13.0%	45.5%	
Maximum Green (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		5.5	30.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		0.5	1.0	
Lost Time Adjust (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max	Max	Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		20.0			20.0	20.0		20.0		30.5	30.0	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.51	0.50	
v/c Ratio		0.09			0.12	0.39		0.65		0.98	0.72	
Control Delay		12.3			14.8	4.1		22.7		56.0	17.0	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		12.3			14.8	4.1		22.7		56.0	17.0	
LOS		B			B	A		C		E	B	
Approach Delay		12.3			6.0			22.7			31.8	
Approach LOS		B			A			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 77

Actuated Cycle Length: 60

Natural Cycle: 80

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 24.6

Intersection Capacity Utilization 73.8%

Analysis Period (min) 15


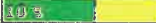



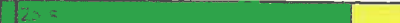






Intersection LOS: C

ICU Level of Service D

Lanes, Volumes, Timings
 3: Pleasant Street & Brighton Street

01/09/2017

Splits and Phases: 3: Pleasant Street & Brighton Street

 Ø1 	 Ø2 	 Ø4 	 Ø9 
 Ø6 	 Ø8 		

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street







01/09/2017

Lane Group		Ø9
Detector 3 Type		
Detector 3 Channel		
Detector 3 Extend (s)		
Detector 4 Position(ft)		
Detector 4 Size(ft)		
Detector 4 Type		
Detector 4 Channel		
Detector 4 Extend (s)		
Turn Type		
Protected Phases	9	
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	3.0	
Minimum Split (s)	17.0	
Total Split (s)	17.0	
Total Split (%)	22%	
Maximum Green (s)	13.0	
Yellow Time (s)	3.0	
All-Red Time (s)	1.0	
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	
Recall Mode	None	
Walk Time (s)	5.0	
Flash Dont Walk (s)	8.0	
Pedestrian Calls (#/hr)	0	
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Intersection Summary		

Queues

3: Pleasant Street & Brighton Street

01/09/2017

						
Lane Group	SET	NWT	NWR	NET	SWL	SWT
Lane Group Flow (vph)	45	60	284	403	409	673
v/c Ratio	0.09	0.12	0.39	0.65	0.98	0.72
Control Delay	12.3	14.8	4.1	22.7	56.0	17.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.3	14.8	4.1	22.7	56.0	17.0
Queue Length 50th (ft)	9	15	0	120	87	175
Queue Length 95th (ft)	27	37	44	204	#239	291
Internal Link Dist (ft)	153	1208		381		469
Turn Bay Length (ft)			200			
Base Capacity (vph)	525	496	722	622	418	939
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	0.09	0.12	0.39	0.65	0.98	0.72

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis

3: Pleasant Street & Brighton Street

01/09/2017

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		⇄			⇄	⇄		⇄		⇄	⇄	
Traffic Volume (vph)	20	13	8	44	11	261	3	346	22	376	607	12
Future Volume (vph)	20	13	8	44	11	261	3	346	22	376	607	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.97			1.00	0.85		0.99		1.00	1.00	
Flt Protected		0.98			0.96	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1720			1798	1599		1867		1787	1876	
Flt Permitted		0.89			0.80	1.00		1.00		0.33	1.00	
Satd. Flow (perm)		1560			1490	1599		1858		611	1876	
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)	22	14	9	48	12	284	3	376	24	409	660	13
RTOR Reduction (vph)	0	6	0	0	0	189	0	3	0	0	1	0
Lane Group Flow (vph)	0	39	0	0	60	95	0	400	0	409	672	0
Heavy Vehicles (%)	5%	8%	0%	2%	0%	1%	0%	1%	0%	1%	1%	0%
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		20.0			20.0	20.0		20.0		30.0	30.0	
Effective Green, g (s)		20.0			20.0	20.0		20.0		30.0	30.0	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.50	0.50	
Clearance Time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		520			496	533		619		413	938	
v/s Ratio Prot										c0.09	0.36	
v/s Ratio Perm		0.03			0.04	c0.06		0.22		c0.40		
v/c Ratio		0.07			0.12	0.18		0.65		0.99	0.72	
Uniform Delay, d1		13.7			13.9	14.2		17.0		15.6	11.7	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.3			0.5	0.7		5.2		41.9	4.7	
Delay (s)		14.0			14.4	14.9		22.2		57.6	16.4	
Level of Service		B			B	B		C		E	B	
Approach Delay (s)		14.0			14.8			22.2			31.9	
Approach LOS		B			B			C			C	

Intersection Summary

HCM 2000 Control Delay	26.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Group												
Lane Configurations												
Traffic Volume (vph)	5	508	8	15	290	189	9	159	8	203	141	5
Future Volume (vph)	5	508	8	15	290	189	9	159	8	203	141	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.998			0.948			0.994			0.998	
Flt Protected					0.999			0.997			0.972	
Satd. Flow (prot)	0	1896	0	0	1793	0	0	1866	0	0	1843	0
Flt Permitted		0.996			0.980			0.979			0.663	
Satd. Flow (perm)	0	1889	0	0	1758	0	0	1832	0	0	1257	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			41			2			1	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1288			399			384			425	
Travel Time (s)		29.3			9.1			8.7			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%
Adj. Flow (vph)	5	552	9	16	315	205	10	173	9	221	153	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	566	0	0	536	0	0	192	0	0	379	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	3		1	3		1	3		1	3	
Detector Template	Left			Left			Left			Left		
Leading Detector (ft)	20	26		20	26		20	26		20	26	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		10			10			10			10	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Detector 3 Position(ft)		20			20			20			20	
Detector 3 Size(ft)		6			6			6			6	
Detector 3 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 3 Channel												
Detector 3 Extend (s)		0.0			0.0			0.0			0.0	

No-Build AM

Synchro 9 Report
Page 8

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Detector 3 Position(ft)	
Detector 3 Size(ft)	
Detector 3 Type	
Detector 3 Channel	
Detector 3 Extend (s)	

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Group												
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Detector Phase	6	6		2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	45.0	45.0		45.0	45.0		25.0	25.0		25.0	25.0	
Total Split (%)	47.9%	47.9%		47.9%	47.9%		26.6%	26.6%		26.6%	26.6%	
Maximum Green (s)	40.0	40.0		40.0	40.0		20.0	20.0		20.0	20.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		40.4			40.4			20.2			20.2	
Actuated g/C Ratio		0.55			0.55			0.27			0.27	
v/c Ratio		0.55			0.55			0.38			1.10	
Control Delay		14.8			13.9			25.8			108.5	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.8			13.9			25.8			108.5	
LOS		B			B			C			F	
Approach Delay		14.8			13.9			25.8			108.5	
Approach LOS		B			B			C			F	

Intersection Summary

Area Type: Other

Cycle Length: 94

Actuated Cycle Length: 73.8

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.10

Intersection Signal Delay: 37.0

Intersection Capacity Utilization 77.6%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service D

Splits and Phases: 6: Cross Street & Brighton Street

Ø2	Ø4	Ø9
Ø6	Ø8	

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

Lane Group	Ø9
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	19.0
Total Split (s)	24.0
Total Split (%)	26%
Maximum Green (s)	21.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	3
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Queues

6: Cross Street & Brighton Street

01/09/2017

	↘	↖	↗	↙
Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	566	536	192	379
v/c Ratio	0.55	0.55	0.38	1.10
Control Delay	14.8	13.9	25.8	108.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	14.8	13.9	25.8	108.5
Queue Length 50th (ft)	135	116	65	~183
Queue Length 95th (ft)	358	325	158	#459
Internal Link Dist (ft)	1208	319	304	345
Turn Bay Length (ft)				
Base Capacity (vph)	1033	980	502	344
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.55	0.55	0.38	1.10

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis 6: Cross Street & Brighton Street

01/09/2017

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		⇄			⇄			⇄			⇄	
Traffic Volume (vph)	5	508	8	15	290	189	9	159	8	203	141	5
Future Volume (vph)	5	508	8	15	290	189	9	159	8	203	141	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0			5.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.95			0.99			1.00	
Flt Protected		1.00			1.00			1.00			0.97	
Satd. Flow (prot)		1895			1792			1866			1843	
Flt Permitted		1.00			0.98			0.98			0.66	
Satd. Flow (perm)		1889			1759			1831			1257	
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)	5	552	9	16	315	205	10	173	9	221	153	5
RTOR Reduction (vph)	0	0	0	0	19	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	566	0	0	517	0	0	191	0	0	378	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		40.4			40.4			20.2			20.2	
Effective Green, g (s)		40.4			40.4			20.2			20.2	
Actuated g/C Ratio		0.53			0.53			0.26			0.26	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1000			931			484			332	
v/s Ratio Prot												
v/s Ratio Perm		c0.30			0.29			0.10			c0.30	
v/c Ratio		0.57			0.56			0.39			1.14	
Uniform Delay, d1		12.1			12.0			23.0			28.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.3			2.4			2.4			92.7	
Delay (s)		14.4			14.3			25.4			120.7	
Level of Service		B			B			C			F	
Approach Delay (s)		14.4			14.3			25.4			120.7	
Approach LOS		B			B			C			F	

Intersection Summary

HCM 2000 Control Delay	39.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	76.3	Sum of lost time (s)	13.0
Intersection Capacity Utilization	77.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

	↖	↗	↘	↙	↖	↗	↘	↙	↖	↗	↘	↙
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↖	↗	↘	↙	↖	↗	↘	↙	↖	↗	↘	↙
Traffic Volume (vph)	343	243	356	37	0	102	0	607	75	203	849	0
Future Volume (vph)	343	243	356	37	0	102	0	607	75	203	849	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor						0.99		1.00				
Frt			0.850			0.850		0.983				
Flt Protected	0.950	0.991		0.950						0.950		
Satd. Flow (prot)	1698	1729	1599	1805	0	1583	0	3509	0	1770	3574	0
Flt Permitted	0.950	0.991		0.950						0.232		
Satd. Flow (perm)	1698	1729	1599	1805	0	1561	0	3509	0	432	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			217			111		17				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		268			533			549			471	
Travel Time (s)		6.1			12.1			12.5			10.7	
Confl. Bikes (#/hr)						1			1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	4%	1%	0%	0%	2%	0%	1%	0%	2%	1%	0%
Adj. Flow (vph)	373	264	387	40	0	111	0	660	82	221	923	0
Shared Lane Traffic (%)	16%											
Lane Group Flow (vph)	313	324	387	40	0	111	0	742	0	221	923	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	2		1		2		2	1	
Detector Template												
Leading Detector (ft)	6	6	0	16		6		26		26	36	
Trailing Detector (ft)	0	0	0	0		0		0		0	30	
Detector 1 Position(ft)	0	0	0	0		0		0		0	30	
Detector 1 Size(ft)	6	6	20	6		6		6		6	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 2 Position(ft)				10				20		20		
Detector 2 Size(ft)				6				6		6		
Detector 2 Type				Cl+Ex				Cl+Ex		Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)				0.0				0.0		0.0		
Turn Type	Split	NA	Prot	Prot		Perm		NA		pm+pt	NA	
Protected Phases	6	6	6	2				4		3	8	
Permitted Phases						2				8		

No-Build AM

Synchro 9 Report
Page 14

9: Pleasant Street & Lake Street/Frontage Road

Intersection Summary









ICU Level of Service B

Ø2	Ø6	Ø3	Ø4
		Ø8	

Queues

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

								
Lane Group	SEL	SET	SER	NWL	NWR	NET	SWL	SWT
Lane Group Flow (vph)	313	324	387	40	111	742	221	923
v/c Ratio	0.85	0.86	0.75	0.20	0.41	0.52	0.61	0.48
Control Delay	56.9	58.6	24.8	40.2	12.9	21.9	18.6	13.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.9	58.6	24.8	40.2	12.9	21.9	18.6	13.9
Queue Length 50th (ft)	185	192	91	22	0	164	63	163
Queue Length 95th (ft)	#336	#347	#224	53	48	218	104	212
Internal Link Dist (ft)		188				469		391
Turn Bay Length (ft)								
Base Capacity (vph)	369	375	517	196	268	1421	365	1942
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.86	0.75	0.20	0.41	0.52	0.61	0.48

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis 9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↰	↰	↰		↰		↰		↰	↰	
Traffic Volume (vph)	343	243	356	37	0	102	0	607	75	203	849	0
Future Volume (vph)	343	243	356	37	0	102	0	607	75	203	849	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95	1.00	1.00		1.00		0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00		0.99		1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00		1.00		1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00		0.85		0.98		1.00	1.00	
Flt Protected	0.95	0.99	1.00	0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1698	1729	1599	1805		1561		3511		1770	3574	
Flt Permitted	0.95	0.99	1.00	0.95		1.00		1.00		0.23	1.00	
Satd. Flow (perm)	1698	1729	1599	1805		1561		3511		433	3574	
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)	373	264	387	40	0	111	0	660	82	221	923	0
RTOR Reduction (vph)	0	0	170	0	0	99	0	10	0	0	0	0
Lane Group Flow (vph)	313	324	217	40	0	12	0	732	0	221	923	0
Confl. Bikes (#/hr)						1			1			
Heavy Vehicles (%)	1%	4%	1%	0%	0%	2%	0%	1%	0%	2%	1%	0%
Turn Type	Split	NA	Prot	Prot		Perm		NA		pm+pt	NA	
Protected Phases	6	6	6	2				4		3	8	
Permitted Phases						2				8		
Actuated Green, G (s)	20.0	20.0	20.0	10.0		10.0		37.0		50.0	50.0	
Effective Green, g (s)	20.0	20.0	20.0	10.0		10.0		37.0		50.0	50.0	
Actuated g/C Ratio	0.22	0.22	0.22	0.11		0.11		0.40		0.54	0.54	
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	369	375	347	196		169		1412		366	1942	
v/s Ratio Prot	0.18	c0.19	0.14	c0.02				0.21		c0.06	0.26	
v/s Ratio Perm						0.01				c0.27		
v/c Ratio	0.85	0.86	0.63	0.20		0.07		0.52		0.60	0.48	
Uniform Delay, d1	34.5	34.7	32.6	37.4		36.8		20.8		12.8	12.9	
Progression Factor	1.00	1.00	1.00	1.00		1.00		1.00		1.00	1.00	
Incremental Delay, d2	20.9	22.3	8.3	2.3		0.8		1.4		2.8	0.8	
Delay (s)	55.4	57.0	40.9	39.7		37.6		22.1		15.6	13.8	
Level of Service	E	E	D	D		D		C		B	B	
Approach Delay (s)		50.4			38.2			22.1			14.1	
Approach LOS		D			D			C			B	
Intersection Summary												
HCM 2000 Control Delay			29.4		HCM 2000 Level of Service					C		
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			92.0		Sum of lost time (s)				16.0			
Intersection Capacity Utilization			63.0%		ICU Level of Service				B			
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Group												
Lane Configurations												
Traffic Volume (vph)	14	29	9	50	24	384	0	451	23	405	494	19
Future Volume (vph)	14	29	9	50	24	384	0	451	23	405	494	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		200	0		0	0		0
Storage Lanes	0		0	0		1	0		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.976				0.850		0.993			0.994	
Flt Protected		0.987			0.967					0.950		
Satd. Flow (prot)	0	1730	0	0	1813	1599	0	1869	0	1787	1871	0
Flt Permitted		0.936			0.809					0.173		
Satd. Flow (perm)	0	1640	0	0	1517	1599	0	1869	0	325	1871	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10				417		3			3	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		233			1288			461			549	
Travel Time (s)		5.3			29.3			10.5			12.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	8%	0%	2%	0%	1%	0%	1%	0%	1%	1%	0%
Adj. Flow (vph)	15	32	10	54	26	417	0	490	25	440	537	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	57	0	0	80	417	0	515	0	440	558	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	4		1	4	4	1	4		4	4	
Detector Template	Left			Left			Left					
Leading Detector (ft)	20	66		20	66	66	20	66		66	66	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	6	20	6		6	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		20			20	20		20		20	20	
Detector 2 Size(ft)		6			6	6		6		6	6	
Detector 2 Type		Cl+Ex			Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Detector 3 Position(ft)		40			40	40		40		40	40	
Detector 3 Size(ft)		6			6	6		6		6	6	

No-Build PM

Synchro 9 Report
Page 1

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

Lane Group Ø9

Lane Configurations
Traffic Volume (vph)
Future Volume (vph)
Ideal Flow (vphpl)
Storage Length (ft)
Storage Lanes
Taper Length (ft)
Lane Util. Factor
Frt
Flt Protected
Satd. Flow (prot)
Flt Permitted
Satd. Flow (perm)
Right Turn on Red
Satd. Flow (RTOR)
Link Speed (mph)
Link Distance (ft)
Travel Time (s)
Peak Hour Factor
Heavy Vehicles (%)
Adj. Flow (vph)
Shared Lane Traffic (%)
Lane Group Flow (vph)
Enter Blocked Intersection
Lane Alignment
Median Width(ft)
Link Offset(ft)
Crosswalk Width(ft)
Two way Left Turn Lane
Headway Factor
Turning Speed (mph)
Number of Detectors
Detector Template
Leading Detector (ft)
Trailing Detector (ft)
Detector 1 Position(ft)
Detector 1 Size(ft)
Detector 1 Type
Detector 1 Channel
Detector 1 Extend (s)
Detector 1 Queue (s)
Detector 1 Delay (s)
Detector 2 Position(ft)
Detector 2 Size(ft)
Detector 2 Type
Detector 2 Channel
Detector 2 Extend (s)
Detector 3 Position(ft)
Detector 3 Size(ft)

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Group												
Detector 3 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 3 Channel												
Detector 3 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Detector 4 Position(ft)		60			60	60		60		60	60	
Detector 4 Size(ft)		6			6	6		6		6	6	
Detector 4 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 4 Channel												
Detector 4 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm		NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		9.5	20.0	
Total Split (s)	25.0	25.0		25.0	25.0	25.0	25.0	25.0		10.0	35.0	
Total Split (%)	32.5%	32.5%		32.5%	32.5%	32.5%	32.5%	32.5%		13.0%	45.5%	
Maximum Green (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		5.5	30.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		0.5	1.0	
Lost Time Adjust (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max	Max	Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		20.0			20.0	20.0		20.0		30.5	30.0	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.51	0.50	
v/c Ratio		0.10			0.16	0.51		0.82		1.47	0.60	
Control Delay		12.6			15.2	4.5		32.1		247.9	13.9	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		12.6			15.2	4.5		32.1		247.9	13.9	
LOS		B			B	A		C		F	B	
Approach Delay		12.6			6.2			32.1			117.1	
Approach LOS		B			A			C			F	

Intersection Summary

Area Type: Other

Cycle Length: 77

Actuated Cycle Length: 60

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.47

Intersection Signal Delay: 66.4

Intersection Capacity Utilization 74.3%

Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service D

No-Build PM




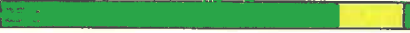








Synchro 9 Report
Page 3

Lanes, Volumes, Timings

3: Pleasant Street & Brighton Street

01/09/2017

Splits and Phases: 3: Pleasant Street & Brighton Street

 Ø1  10 s	 Ø2  25 s	 Ø4  25 s	 Ø9  12 s
 Ø6  35 s	 Ø8  25 s		

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street







01/09/2017

Lane Group	Ø9
Detector 3 Type	
Detector 3 Channel	
Detector 3 Extend (s)	
Detector 4 Position(ft)	
Detector 4 Size(ft)	
Detector 4 Type	
Detector 4 Channel	
Detector 4 Extend (s)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	3.0
Minimum Split (s)	17.0
Total Split (s)	17.0
Total Split (%)	22%
Maximum Green (s)	13.0
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	8.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Queues

3: Pleasant Street & Brighton Street

01/09/2017

						
Lane Group	SET	NWT	NWR	NET	SWL	SWT
Lane Group Flow (vph)	57	80	417	515	440	558
v/c Ratio	0.10	0.16	0.51	0.82	1.47	0.60
Control Delay	12.6	15.2	4.5	32.1	247.9	13.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.6	15.2	4.5	32.1	247.9	13.9
Queue Length 50th (ft)	11	20	0	167	~158	132
Queue Length 95th (ft)	33	47	52	#322	#350	219
Internal Link Dist (ft)	153	1208		381		469
Turn Bay Length (ft)			200			
Base Capacity (vph)	553	505	811	625	299	937
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.16	0.51	0.82	1.47	0.60

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

3: Pleasant Street & Brighton Street

01/09/2017

















Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔	↔		↔		↔	↔	
Traffic Volume (vph)	14	29	9	50	24	384	0	451	23	405	494	19
Future Volume (vph)	14	29	9	50	24	384	0	451	23	405	494	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.98			1.00	0.85		0.99		1.00	0.99	
Flt Protected		0.99			0.97	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1730			1813	1599		1870		1787	1871	
Flt Permitted		0.94			0.81	1.00		1.00		0.17	1.00	
Satd. Flow (perm)		1641			1517	1599		1870		326	1871	
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)	15	32	10	54	26	417	0	490	25	440	537	21
RTOR Reduction (vph)	0	7	0	0	0	278	0	2	0	0	2	0
Lane Group Flow (vph)	0	50	0	0	80	139	0	513	0	440	557	0
Heavy Vehicles (%)	5%	8%	0%	2%	0%	1%	0%	1%	0%	1%	1%	0%
Turn Type	Perm	NA		Perm	NA	Perm		NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		20.0			20.0	20.0		20.0		30.0	30.0	
Effective Green, g (s)		20.0			20.0	20.0		20.0		30.0	30.0	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.50	0.50	
Clearance Time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		547			505	533		623		296	935	
v/s Ratio Prot								0.27		c0.14	0.30	
v/s Ratio Perm		0.03			0.05	c0.09				c0.60		
v/c Ratio		0.09			0.16	0.26		0.82		1.49	0.60	
Uniform Delay, d1		13.8			14.1	14.6		18.4		12.9	10.7	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.3			0.7	1.2		11.7		236.1	2.8	
Delay (s)		14.1			14.7	15.8		30.1		249.0	13.5	
Level of Service		B			B	B		C		F	B	
Approach Delay (s)		14.1			15.6			30.1			117.3	
Approach LOS		B			B			C			F	

Intersection Summary

HCM 2000 Control Delay	68.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	9	512	16	6	459	450	36	255	32	155	106	9
Future Volume (vph)	9	512	16	6	459	450	36	255	32	155	106	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.934			0.987			0.995	
Flt Protected		0.999						0.994			0.972	
Satd. Flow (prot)	0	1891	0	0	1766	0	0	1849	0	0	1838	0
Flt Permitted		0.982			0.996			0.939			0.469	
Satd. Flow (perm)	0	1858	0	0	1759	0	0	1747	0	0	887	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			64			5			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1288			399			384			425	
Travel Time (s)		29.3			9.1			8.7			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%
Adj. Flow (vph)	10	557	17	7	499	489	39	277	35	168	115	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	584	0	0	995	0	0	351	0	0	293	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	3		1	3		1	3		1	3	
Detector Template	Left			Left			Left			Left		
Leading Detector (ft)	20	26		20	26		20	26		20	26	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		10			10			10			10	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Detector 3 Position(ft)		20			20			20			20	
Detector 3 Size(ft)		6			6			6			6	
Detector 3 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 3 Channel												
Detector 3 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Detector 3 Position(ft)	
Detector 3 Size(ft)	
Detector 3 Type	
Detector 3 Channel	
Detector 3 Extend (s)	

Lanes, Volumes, Timings

6: Cross Street & Brighton Street

01/09/2017

	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Detector Phase	6	6		2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	45.0	45.0		45.0	45.0		25.0	25.0		25.0	25.0	
Total Split (%)	47.9%	47.9%		47.9%	47.9%		26.6%	26.6%		26.6%	26.6%	
Maximum Green (s)	40.0	40.0		40.0	40.0		20.0	20.0		20.0	20.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		40.4			40.4			20.2			20.2	
Actuated g/C Ratio		0.55			0.55			0.27			0.27	
v/c Ratio		0.57			1.00			0.73			1.21	
Control Delay		15.3			48.5			36.3			153.2	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		15.3			48.5			36.3			153.2	
LOS		B			D			D			F	
Approach Delay		15.3			48.5			36.3			153.2	
Approach LOS		B			D			D			F	

Intersection Summary

Area Type: Other
 Cycle Length: 94
 Actuated Cycle Length: 73.8
 Natural Cycle: 150
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 1.21
 Intersection Signal Delay: 51.7
 Intersection Capacity Utilization 99.7%
 Analysis Period (min) 15

Intersection LOS: D
 ICU Level of Service F

Splits and Phases: 6: Cross Street & Brighton Street

02	04	09
06	08	

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

Lane Group	Ø9
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	19.0
Total Split (s)	24.0
Total Split (%)	26%
Maximum Green (s)	21.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	3
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Queues

6: Cross Street & Brighton Street

01/09/2017

	↘	↖	↗	↙
Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	584	995	351	293
v/c Ratio	0.57	1.00	0.73	1.21
Control Delay	15.3	48.5	36.3	153.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	15.3	48.5	36.3	153.2
Queue Length 50th (ft)	142	352	132	~152
Queue Length 95th (ft)	378	#910	#347	#389
Internal Link Dist (ft)	1208	319	304	345
Turn Bay Length (ft)				
Base Capacity (vph)	1017	991	481	243
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.57	1.00	0.73	1.21

















Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

6: Cross Street & Brighton Street

01/09/2017

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	9	512	16	6	459	450	36	255	32	155	106	9
Future Volume (vph)	9	512	16	6	459	450	36	255	32	155	106	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0			5.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.93			0.99			1.00	
Flt Protected		1.00			1.00			0.99			0.97	
Satd. Flow (prot)		1891			1765			1849			1839	
Flt Permitted		0.98			1.00			0.94			0.47	
Satd. Flow (perm)		1859			1759			1747			886	
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)	10	557	17	7	499	489	39	277	35	168	115	10
RTOR Reduction (vph)	0	1	0	0	30	0	0	4	0	0	1	0
Lane Group Flow (vph)	0	583	0	0	965	0	0	347	0	0	292	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		40.4			40.4			20.2			20.2	
Effective Green, g (s)		40.4			40.4			20.2			20.2	
Actuated g/C Ratio		0.53			0.53			0.26			0.26	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		984			931			462			234	
v/s Ratio Prot												
v/s Ratio Perm		0.31			c0.55			0.20			c0.33	
v/c Ratio		0.59			1.04			0.75			1.25	
Uniform Delay, d1		12.3			17.9			25.7			28.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.6			39.3			10.8			141.2	
Delay (s)		14.9			57.3			36.5			169.2	
Level of Service		B			E			D			F	
Approach Delay (s)		14.9			57.3			36.5			169.2	
Approach LOS		B			E			D			F	

Intersection Summary

HCM 2000 Control Delay	57.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	76.3	Sum of lost time (s)	13.0
Intersection Capacity Utilization	99.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	465	55	411	39	0	319	0	731	59	83	570	0
Future Volume (vph)	465	55	411	39	0	319	0	731	59	83	570	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor						0.99		1.00				
Frt			0.850			0.850		0.989				
Flt Protected	0.950	0.962		0.950						0.950		
Satd. Flow (prot)	1698	1708	1599	1805	0	1583	0	3532	0	1770	3574	0
Flt Permitted	0.950	0.962		0.950						0.195		
Satd. Flow (perm)	1698	1708	1599	1805	0	1561	0	3532	0	363	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			321			207		11				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		268			533			549			471	
Travel Time (s)		6.1			12.1			12.5			10.7	
Confl. Bikes (#/hr)						1			1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	4%	1%	0%	0%	2%	0%	1%	0%	2%	1%	0%
Adj. Flow (vph)	505	60	447	42	0	347	0	795	64	90	620	0
Shared Lane Traffic (%)	44%											
Lane Group Flow (vph)	283	282	447	42	0	347	0	859	0	90	620	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	2		1		2		2	1	
Detector Template												
Leading Detector (ft)	6	6	0	16		6		26		26	36	
Trailing Detector (ft)	0	0	0	0		0		0		0	30	
Detector 1 Position(ft)	0	0	0	0		0		0		0	30	
Detector 1 Size(ft)	6	6	20	6		6		6		6	6	
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 2 Position(ft)				10				20		20		
Detector 2 Size(ft)				6				6		6		
Detector 2 Type				CI+Ex				CI+Ex		CI+Ex		
Detector 2 Channel												
Detector 2 Extend (s)				0.0				0.0		0.0		
Turn Type	Split	NA	Prot	Prot		Perm		NA		pm+pt	NA	
Protected Phases	6	6	6	2				4		3	8	
Permitted Phases						2				8		

No-Build PM

Synchro 9 Report
Page 14

Lanes, Volumes, Timings

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	6	6	6	2		2		4		3	8	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0	10.0		10.0		15.0		9.0	15.0	
Minimum Split (s)	12.0	12.0	12.0	14.0		14.0		20.0		13.0	20.0	
Total Split (s)	24.0	24.0	24.0	14.0		14.0		41.0		13.0	54.0	
Total Split (%)	26.1%	26.1%	26.1%	15.2%		15.2%		44.6%		14.1%	58.7%	
Maximum Green (s)	20.0	20.0	20.0	10.0		10.0		37.0		9.0	50.0	
Yellow Time (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0		1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
Recall Mode	Max	Max	Max	Max		Max		Max		None	Max	
Act Effct Green (s)	20.0	20.0	20.0	10.0		10.0		39.6		50.0	50.0	
Actuated g/C Ratio	0.22	0.22	0.22	0.11		0.11		0.43		0.54	0.54	
v/c Ratio	0.77	0.76	0.75	0.21		0.98		0.56		0.27	0.32	
Control Delay	49.2	48.6	18.7	40.5		61.9		22.0		12.3	12.2	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Total Delay	49.2	48.6	18.7	40.5		61.9		22.0		12.3	12.2	
LOS	D	D	B	D		E		C		B	B	
Approach Delay		35.6			59.6			22.0			12.2	
Approach LOS		D			E			C			B	

Intersection Summary

Area Type: Other

Cycle Length: 92

Actuated Cycle Length: 92

Natural Cycle: 65

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 29.2

Intersection Capacity Utilization 66.2%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C









Splits and Phases: 9: Pleasant Street & Lake Street/Frontage Road

Ø2	Ø6	Ø3	Ø4
		Ø8	

Queues

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

								
Lane Group	SEL	SET	SER	NWL	NWR	NET	SWL	SWT
Lane Group Flow (vph)	283	282	447	42	347	859	90	620
v/c Ratio	0.77	0.76	0.75	0.21	0.98	0.56	0.27	0.32
Control Delay	49.2	48.6	18.7	40.5	61.9	22.0	12.3	12.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.2	48.6	18.7	40.5	61.9	22.0	12.3	12.2
Queue Length 50th (ft)	164	163	63	23	84	200	24	98
Queue Length 95th (ft)	#290	#288	#183	55	#262	262	47	133
Internal Link Dist (ft)		188				469		391
Turn Bay Length (ft)								
Base Capacity (vph)	369	371	598	196	354	1526	334	1942
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.76	0.75	0.21	0.98	0.56	0.27	0.32













Intersection Summary

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

HCM Signalized Intersection Capacity Analysis



















9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	465	55	411	39	0	319	0	731	59	83	570	0
Future Volume (vph)	465	55	411	39	0	319	0	731	59	83	570	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95	1.00	1.00		1.00		0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00		0.99		1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00		1.00		1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00		0.85		0.99		1.00	1.00	
Flt Protected	0.95	0.96	1.00	0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1698	1709	1599	1805		1561		3531		1770	3574	
Flt Permitted	0.95	0.96	1.00	0.95		1.00		1.00		0.19	1.00	
Satd. Flow (perm)	1698	1709	1599	1805		1561		3531		363	3574	
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)	505	60	447	42	0	347	0	795	64	90	620	0
RTOR Reduction (vph)	0	0	252	0	0	185	0	6	0	0	0	0
Lane Group Flow (vph)	283	282	195	42	0	162	0	853	0	90	620	0
Confl. Bikes (#/hr)						1			1			
Heavy Vehicles (%)	1%	4%	1%	0%	0%	2%	0%	1%	0%	2%	1%	0%
Turn Type	Split	NA	Prot	Prot		Perm		NA		pm+pt	NA	
Protected Phases	6	6	6	2				4		3	8	
Permitted Phases						2				8		
Actuated Green, G (s)	20.0	20.0	20.0	10.0		10.0		39.6		50.8	50.8	
Effective Green, g (s)	20.0	20.0	20.0	10.0		10.0		39.6		50.8	50.8	
Actuated g/C Ratio	0.22	0.22	0.22	0.11		0.11		0.43		0.55	0.55	
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	365	368	344	194		168		1506		307	1956	
v/s Ratio Prot	c0.17	0.17	0.12	0.02				c0.24		0.02	c0.17	
v/s Ratio Perm						c0.10				0.14		
v/c Ratio	0.78	0.77	0.57	0.22		0.97		0.57		0.29	0.32	
Uniform Delay, d1	34.3	34.2	32.5	37.8		41.2		20.1		12.0	11.5	
Progression Factor	1.00	1.00	1.00	1.00		1.00		1.00		1.00	1.00	
Incremental Delay, d2	14.8	14.1	6.6	2.5		61.0		1.5		0.5	0.4	
Delay (s)	49.1	48.3	39.2	40.4		102.3		21.7		12.6	11.9	
Level of Service	D	D	D	D		F		C		B	B	
Approach Delay (s)		44.5			95.6			21.7			12.0	
Approach LOS		D			F			C			B	
Intersection Summary												
HCM 2000 Control Delay		36.8			HCM 2000 Level of Service					D		
HCM 2000 Volume to Capacity ratio		0.65										
Actuated Cycle Length (s)		92.8							16.0			
Intersection Capacity Utilization		66.2%							C			
Analysis Period (min)		15										
c Critical Lane Group												

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	20	13	8	44	11	261	3	346	22	377	608	12
Future Volume (vph)	20	13	8	44	11	261	3	346	22	377	608	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		200	0		0	0		0
Storage Lanes	0		0	0		1	0		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.973				0.850		0.992			0.997	
Flt Protected		0.976			0.962					0.950		
Satd. Flow (prot)	0	1720	0	0	1799	1599	0	1867	0	1787	1876	0
Flt Permitted		0.885			0.797			0.995		0.325		
Satd. Flow (perm)	0	1559	0	0	1490	1599	0	1858	0	611	1876	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9				284		4			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		233			1288			461			549	
Travel Time (s)		5.3			29.3			10.5			12.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	8%	0%	2%	0%	1%	0%	1%	0%	1%	1%	0%
Adj. Flow (vph)	22	14	9	48	12	284	3	376	24	410	661	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	45	0	0	60	284	0	403	0	410	674	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	4		1	4	4	1	4		4	4	
Detector Template	Left			Left			Left					
Leading Detector (ft)	20	66		20	66	66	20	66		66	66	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	6	20	6		6	6	
Detector 1 Type	CI+Ex	CI+Ex		CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		20			20	20		20		20	20	
Detector 2 Size(ft)		6			6	6		6		6	6	
Detector 2 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Detector 3 Position(ft)		40			40	40		40		40	40	
Detector 3 Size(ft)		6			6	6		6		6	6	

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

Lane Group Ø9

Lane Configurations
Traffic Volume (vph)
Future Volume (vph)
Ideal Flow (vphpl)
Storage Length (ft)
Storage Lanes
Taper Length (ft)
Lane Util. Factor
Frt
Flt Protected
Satd. Flow (prot)
Flt Permitted
Satd. Flow (perm)
Right Turn on Red
Satd. Flow (RTOR)
Link Speed (mph)
Link Distance (ft)
Travel Time (s)
Peak Hour Factor
Heavy Vehicles (%)
Adj. Flow (vph)
Shared Lane Traffic (%)
Lane Group Flow (vph)
Enter Blocked Intersection
Lane Alignment
Median Width(ft)
Link Offset(ft)
Crosswalk Width(ft)
Two way Left Turn Lane
Headway Factor
Turning Speed (mph)
Number of Detectors
Detector Template
Leading Detector (ft)
Trailing Detector (ft)
Detector 1 Position(ft)
Detector 1 Size(ft)
Detector 1 Type
Detector 1 Channel
Detector 1 Extend (s)
Detector 1 Queue (s)
Detector 1 Delay (s)
Detector 2 Position(ft)
Detector 2 Size(ft)
Detector 2 Type
Detector 2 Channel
Detector 2 Extend (s)
Detector 3 Position(ft)
Detector 3 Size(ft)

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Group												
Detector 3 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 3 Channel												
Detector 3 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Detector 4 Position(ft)		60			60	60		60		60	60	
Detector 4 Size(ft)		6			6	6		6		6	6	
Detector 4 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 4 Channel												
Detector 4 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		9.5	20.0	
Total Split (s)	25.0	25.0		25.0	25.0	25.0	25.0	25.0		10.0	35.0	
Total Split (%)	32.5%	32.5%		32.5%	32.5%	32.5%	32.5%	32.5%		13.0%	45.5%	
Maximum Green (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		5.5	30.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		0.5	1.0	
Lost Time Adjust (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max	Max	Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		20.0			20.0	20.0		20.0		30.5	30.0	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.51	0.50	
v/c Ratio		0.09			0.12	0.39		0.65		0.98	0.72	
Control Delay		12.3			14.8	4.1		22.7		56.5	17.1	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		12.3			14.8	4.1		22.7		56.5	17.1	
LOS		B			B	A		C		E	B	
Approach Delay		12.3			6.0			22.7			32.0	
Approach LOS		B			A			C			C	

Intersection Summary






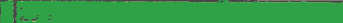






Area Type: Other
 Cycle Length: 77
 Actuated Cycle Length: 60
 Natural Cycle: 80
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.98
 Intersection Signal Delay: 24.7
 Intersection Capacity Utilization 73.9%
 Analysis Period (min) 15

Intersection LOS: C
 ICU Level of Service D

Lanes, Volumes, Timings
 3: Pleasant Street & Brighton Street

01/09/2017

Splits and Phases: 3: Pleasant Street & Brighton Street

 Ø1 	 Ø2 	 Ø4 	 Ø9  17 s
 Ø6 	 Ø8  25 s		

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

Lane Group Ø9

Detector 3 Type
Detector 3 Channel
Detector 3 Extend (s)
Detector 4 Position(ft)
Detector 4 Size(ft)
Detector 4 Type
Detector 4 Channel
Detector 4 Extend (s)
Turn Type
Protected Phases 9
Permitted Phases
Detector Phase
Switch Phase
Minimum Initial (s) 3.0
Minimum Split (s) 17.0
Total Split (s) 17.0
Total Split (%) 22%
Maximum Green (s) 13.0
Yellow Time (s) 3.0
All-Red Time (s) 1.0
Lost Time Adjust (s)
Total Lost Time (s)
Lead/Lag
Lead-Lag Optimize?
Vehicle Extension (s) 3.0
Recall Mode None
Walk Time (s) 5.0
Flash Dont Walk (s) 8.0
Pedestrian Calls (#/hr) 0
Act Effct Green (s)
Actuated g/C Ratio
v/c Ratio
Control Delay
Queue Delay
Total Delay
LOS
Approach Delay
Approach LOS

Intersection Summary

Queues

3: Pleasant Street & Brighton Street

01/09/2017

	↘	↖	↗	↙	↘	↙
Lane Group	SET	NWT	NWR	NET	SWL	SWT
Lane Group Flow (vph)	45	60	284	403	410	674
v/c Ratio	0.09	0.12	0.39	0.65	0.98	0.72
Control Delay	12.3	14.8	4.1	22.7	56.5	17.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.3	14.8	4.1	22.7	56.5	17.1
Queue Length 50th (ft)	9	15	0	120	87	175
Queue Length 95th (ft)	27	37	44	204	#239	291
Internal Link Dist (ft)	153	1208		381		469
Turn Bay Length (ft)			200			
Base Capacity (vph)	525	496	722	622	418	939
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	0.09	0.12	0.39	0.65	0.98	0.72

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis

3: Pleasant Street & Brighton Street

01/09/2017

















Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔	↔		↔		↔	↔	
Traffic Volume (vph)	20	13	8	44	11	261	3	346	22	377	608	12
Future Volume (vph)	20	13	8	44	11	261	3	346	22	377	608	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.97			1.00	0.85		0.99		1.00	1.00	
Flt Protected		0.98			0.96	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1720			1798	1599		1867		1787	1876	
Flt Permitted		0.89			0.80	1.00		1.00		0.33	1.00	
Satd. Flow (perm)		1560			1490	1599		1858		611	1876	
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)	22	14	9	48	12	284	3	376	24	410	661	13
RTOR Reduction (vph)	0	6	0	0	0	189	0	3	0	0	1	0
Lane Group Flow (vph)	0	39	0	0	60	95	0	400	0	410	673	0
Heavy Vehicles (%)	5%	8%	0%	2%	0%	1%	0%	1%	0%	1%	1%	0%
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		20.0			20.0	20.0		20.0		30.0	30.0	
Effective Green, g (s)		20.0			20.0	20.0		20.0		30.0	30.0	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.50	0.50	
Clearance Time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		520			496	533		619		413	938	
v/s Ratio Prot										c0.09	0.36	
v/s Ratio Perm		0.03			0.04	c0.06		0.22		c0.40		
v/c Ratio		0.07			0.12	0.18		0.65		0.99	0.72	
Uniform Delay, d1		13.7			13.9	14.2		17.0		15.7	11.7	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.3			0.5	0.7		5.2		42.5	4.7	
Delay (s)		14.0			14.4	14.9		22.2		58.2	16.4	
Level of Service		B			B	B		C		E	B	
Approach Delay (s)		14.0			14.8			22.2			32.2	
Approach LOS		B			B			C			C	

Intersection Summary

HCM 2000 Control Delay	26.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	5	508	8	15	290	189	9	159	8	203	141	5
Future Volume (vph)	5	508	8	15	290	189	9	159	8	203	141	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.998			0.948			0.994			0.998	
Flt Protected					0.999			0.997			0.972	
Satd. Flow (prot)	0	1896	0	0	1793	0	0	1866	0	0	1843	0
Flt Permitted		0.996			0.980			0.979			0.663	
Satd. Flow (perm)	0	1889	0	0	1758	0	0	1832	0	0	1257	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			41			2			1	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1288			399			384			425	
Travel Time (s)		29.3			9.1			8.7			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%
Adj. Flow (vph)	5	552	9	16	315	205	10	173	9	221	153	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	566	0	0	536	0	0	192	0	0	379	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	3		1	3		1	3		1	3	
Detector Template	Left			Left			Left			Left		
Leading Detector (ft)	20	26		20	26		20	26		20	26	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		10			10			10			10	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Detector 3 Position(ft)		20			20			20			20	
Detector 3 Size(ft)		6			6			6			6	
Detector 3 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 3 Channel												
Detector 3 Extend (s)		0.0			0.0			0.0			0.0	

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

Lane Group Ø9

Lane Configurations
Traffic Volume (vph)
Future Volume (vph)
Ideal Flow (vphpl)
Lane Util. Factor
Frt
Flt Protected
Satd. Flow (prot)
Flt Permitted
Satd. Flow (perm)
Right Turn on Red
Satd. Flow (RTOR)
Link Speed (mph)
Link Distance (ft)
Travel Time (s)
Peak Hour Factor
Heavy Vehicles (%)
Adj. Flow (vph)
Shared Lane Traffic (%)
Lane Group Flow (vph)
Enter Blocked Intersection
Lane Alignment
Median Width(ft)
Link Offset(ft)
Crosswalk Width(ft)
Two way Left Turn Lane
Headway Factor
Turning Speed (mph)
Number of Detectors
Detector Template
Leading Detector (ft)
Trailing Detector (ft)
Detector 1 Position(ft)
Detector 1 Size(ft)
Detector 1 Type
Detector 1 Channel
Detector 1 Extend (s)
Detector 1 Queue (s)
Detector 1 Delay (s)
Detector 2 Position(ft)
Detector 2 Size(ft)
Detector 2 Type
Detector 2 Channel
Detector 2 Extend (s)
Detector 3 Position(ft)
Detector 3 Size(ft)
Detector 3 Type
Detector 3 Channel
Detector 3 Extend (s)

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Group												
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Detector Phase	6	6		2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	45.0	45.0		45.0	45.0		25.0	25.0		25.0	25.0	
Total Split (%)	47.9%	47.9%		47.9%	47.9%		26.6%	26.6%		26.6%	26.6%	
Maximum Green (s)	40.0	40.0		40.0	40.0		20.0	20.0		20.0	20.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		40.4			40.4			20.2			20.2	
Actuated g/C Ratio		0.55			0.55			0.27			0.27	
v/c Ratio		0.55			0.55			0.38			1.10	
Control Delay		14.8			13.9			25.8			108.5	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.8			13.9			25.8			108.5	
LOS		B			B			C			F	
Approach Delay		14.8			13.9			25.8			108.5	
Approach LOS		B			B			C			F	

Intersection Summary

Area Type: Other

Cycle Length: 94

Actuated Cycle Length: 73.8

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.10

Intersection Signal Delay: 37.0

Intersection Capacity Utilization 77.6%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service D

Splits and Phases: 6: Cross Street & Brighton Street

02	04	09
35 s	25 s	34 s
06	08	
32 s	23 s	

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

Lane Group	Ø9
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	19.0
Total Split (s)	24.0
Total Split (%)	26%
Maximum Green (s)	21.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	3
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Queues

6: Cross Street & Brighton Street

01/09/2017

	↘	↖	↗	↙
Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	566	536	192	379
v/c Ratio	0.55	0.55	0.38	1.10
Control Delay	14.8	13.9	25.8	108.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	14.8	13.9	25.8	108.5
Queue Length 50th (ft)	135	116	65	~183
Queue Length 95th (ft)	358	325	158	#459
Internal Link Dist (ft)	1208	319	304	345
Turn Bay Length (ft)				
Base Capacity (vph)	1033	980	502	344
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.55	0.55	0.38	1.10

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

6: Cross Street & Brighton Street

01/09/2017

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		⬆			⬆			⬆			⬆	
Traffic Volume (vph)	5	508	8	15	290	189	9	159	8	203	141	5
Future Volume (vph)	5	508	8	15	290	189	9	159	8	203	141	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0			5.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.95			0.99			1.00	
Flt Protected		1.00			1.00			1.00			0.97	
Satd. Flow (prot)		1895			1792			1866			1843	
Flt Permitted		1.00			0.98			0.98			0.66	
Satd. Flow (perm)		1889			1759			1831			1257	
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)	5	552	9	16	315	205	10	173	9	221	153	5
RTOR Reduction (vph)	0	0	0	0	19	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	566	0	0	517	0	0	191	0	0	378	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		40.4			40.4			20.2			20.2	
Effective Green, g (s)		40.4			40.4			20.2			20.2	
Actuated g/C Ratio		0.53			0.53			0.26			0.26	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1000			931			484			332	
v/s Ratio Prot												
v/s Ratio Perm		c0.30			0.29			0.10			c0.30	
v/c Ratio		0.57			0.56			0.39			1.14	
Uniform Delay, d1		12.1			12.0			23.0			28.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.3			2.4			2.4			92.7	
Delay (s)		14.4			14.3			25.4			120.7	
Level of Service		B			B			C			F	
Approach Delay (s)		14.4			14.3			25.4			120.7	
Approach LOS		B			B			C			F	

Intersection Summary

HCM 2000 Control Delay	39.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	76.3	Sum of lost time (s)	13.0
Intersection Capacity Utilization	77.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↰	↰	↰	↰	↰	↰	↰	↰	↰	↰	↰
Traffic Volume (vph)	343	243	356	37	0	102	0	607	75	203	849	0
Future Volume (vph)	343	243	356	37	0	102	0	607	75	203	849	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor						0.99		1.00				
Frt			0.850			0.850		0.983				
Flt Protected	0.950	0.991		0.950						0.950		
Satd. Flow (prot)	1698	1729	1599	1805	0	1583	0	3509	0	1770	3574	0
Flt Permitted	0.950	0.991		0.950						0.232		
Satd. Flow (perm)	1698	1729	1599	1805	0	1561	0	3509	0	432	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			217			111		17				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		268			533			549			471	
Travel Time (s)		6.1			12.1			12.5			10.7	
Confl. Bikes (#/hr)						1			1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	4%	1%	0%	0%	2%	0%	1%	0%	2%	1%	0%
Adj. Flow (vph)	373	264	387	40	0	111	0	660	82	221	923	0
Shared Lane Traffic (%)	16%											
Lane Group Flow (vph)	313	324	387	40	0	111	0	742	0	221	923	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	2		1		2		2	1	
Detector Template												
Leading Detector (ft)	6	6	0	16		6		26		26	36	
Trailing Detector (ft)	0	0	0	0		0		0		0	30	
Detector 1 Position(ft)	0	0	0	0		0		0		0	30	
Detector 1 Size(ft)	6	6	20	6		6		6		6	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 2 Position(ft)				10				20		20		
Detector 2 Size(ft)				6				6		6		
Detector 2 Type				Cl+Ex				Cl+Ex		Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)				0.0				0.0		0.0		
Turn Type	Split	NA	Prot	Prot		Perm		NA		pm+pt	NA	
Protected Phases	6	6	6	2				4		3	8	
Permitted Phases						2				8		

Lanes, Volumes, Timings

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

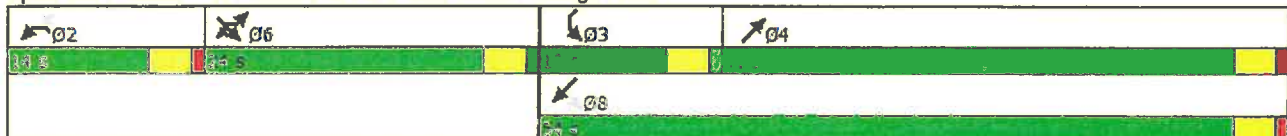
	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	6	6	6	2		2		4		3	8	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0	10.0		10.0		15.0		9.0	15.0	
Minimum Split (s)	12.0	12.0	12.0	14.0		14.0		20.0		13.0	20.0	
Total Split (s)	24.0	24.0	24.0	14.0		14.0		41.0		13.0	54.0	
Total Split (%)	26.1%	26.1%	26.1%	15.2%		15.2%		44.6%		14.1%	58.7%	
Maximum Green (s)	20.0	20.0	20.0	10.0		10.0		37.0		9.0	50.0	
Yellow Time (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0		1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
Recall Mode	Max	Max	Max	Max		Max		Max		None	Max	
Act Effct Green (s)	20.0	20.0	20.0	10.0		10.0		37.0		50.0	50.0	
Actuated g/C Ratio	0.22	0.22	0.22	0.11		0.11		0.40		0.54	0.54	
v/c Ratio	0.85	0.86	0.75	0.20		0.41		0.52		0.61	0.48	
Control Delay	56.9	58.6	24.8	40.2		12.9		21.9		18.6	13.9	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Total Delay	56.9	58.6	24.8	40.2		12.9		21.9		18.6	13.9	
LOS	E	E	C	D		B		C		B	B	
Approach Delay		45.3			20.1			21.9			14.8	
Approach LOS		D			C			C			B	

Intersection Summary

Area Type: Other
 Cycle Length: 92
 Actuated Cycle Length: 92
 Natural Cycle: 65
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.86
 Intersection Signal Delay: 27.0
 Intersection Capacity Utilization 63.0%
 Analysis Period (min) 15

Intersection LOS: C
 ICU Level of Service B









Splits and Phases: 9: Pleasant Street & Lake Street/Frontage Road



Queues

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

								
Lane Group	SEL	SET	SER	NWL	NWR	NET	SWL	SWT
Lane Group Flow (vph)	313	324	387	40	111	742	221	923
v/c Ratio	0.85	0.86	0.75	0.20	0.41	0.52	0.61	0.48
Control Delay	56.9	58.6	24.8	40.2	12.9	21.9	18.6	13.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.9	58.6	24.8	40.2	12.9	21.9	18.6	13.9
Queue Length 50th (ft)	185	192	91	22	0	164	63	163
Queue Length 95th (ft)	#336	#347	#224	53	48	218	104	212
Internal Link Dist (ft)		188				469		391
Turn Bay Length (ft)								
Base Capacity (vph)	369	375	517	196	268	1421	365	1942
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.86	0.75	0.20	0.41	0.52	0.61	0.48

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis 9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↰	↰	↰		↰		↰		↰	↰	
Traffic Volume (vph)	343	243	356	37	0	102	0	607	75	203	849	0
Future Volume (vph)	343	243	356	37	0	102	0	607	75	203	849	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95	1.00	1.00		1.00		0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00		0.99		1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00		1.00		1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00		0.85		0.98		1.00	1.00	
Flt Protected	0.95	0.99	1.00	0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1698	1729	1599	1805		1561		3511		1770	3574	
Flt Permitted	0.95	0.99	1.00	0.95		1.00		1.00		0.23	1.00	
Satd. Flow (perm)	1698	1729	1599	1805		1561		3511		433	3574	
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)	373	264	387	40	0	111	0	660	82	221	923	0
RTOR Reduction (vph)	0	0	170	0	0	99	0	10	0	0	0	0
Lane Group Flow (vph)	313	324	217	40	0	12	0	732	0	221	923	0
Confl. Bikes (#/hr)						1			1			
Heavy Vehicles (%)	1%	4%	1%	0%	0%	2%	0%	1%	0%	2%	1%	0%
Turn Type	Split	NA	Prot	Prot		Perm		NA		pm+pt	NA	
Protected Phases	6	6	6	2				4		3	8	
Permitted Phases						2				8		
Actuated Green, G (s)	20.0	20.0	20.0	10.0		10.0		37.0		50.0	50.0	
Effective Green, g (s)	20.0	20.0	20.0	10.0		10.0		37.0		50.0	50.0	
Actuated g/C Ratio	0.22	0.22	0.22	0.11		0.11		0.40		0.54	0.54	
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	369	375	347	196		169		1412		366	1942	
v/s Ratio Prot	0.18	c0.19	0.14	c0.02				0.21		c0.06	0.26	
v/s Ratio Perm						0.01				c0.27		
v/c Ratio	0.85	0.86	0.63	0.20		0.07		0.52		0.60	0.48	
Uniform Delay, d1	34.5	34.7	32.6	37.4		36.8		20.8		12.8	12.9	
Progression Factor	1.00	1.00	1.00	1.00		1.00		1.00		1.00	1.00	
Incremental Delay, d2	20.9	22.3	8.3	2.3		0.8		1.4		2.8	0.8	
Delay (s)	55.4	57.0	40.9	39.7		37.6		22.1		15.6	13.8	
Level of Service	E	E	D	D		D		C		B	B	
Approach Delay (s)		50.4			38.2			22.1			14.1	
Approach LOS		D			D			C			B	
Intersection Summary												
HCM 2000 Control Delay			29.4		HCM 2000 Level of Service					C		
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			92.0		Sum of lost time (s)				16.0			
Intersection Capacity Utilization			63.0%		ICU Level of Service				B			
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Group												
Lane Configurations		↔			↔	↔		↔		↔	↔	
Traffic Volume (vph)	20	13	8	44	11	261	3	346	22	376	607	12
Future Volume (vph)	20	13	8	44	11	261	3	346	22	376	607	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		200	0		0	0		0
Storage Lanes	0		0	0		1	0		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.973				0.850		0.992			0.997	
Flt Protected		0.976			0.962					0.950		
Satd. Flow (prot)	0	1720	0	0	1799	1599	0	1867	0	1787	1876	0
Flt Permitted		0.885			0.797			0.995		0.325		
Satd. Flow (perm)	0	1559	0	0	1490	1599	0	1858	0	611	1876	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9				284		4			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		233			1288			461			549	
Travel Time (s)		5.3			29.3			10.5			12.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	8%	0%	2%	0%	1%	0%	1%	0%	1%	1%	0%
Adj. Flow (vph)	22	14	9	48	12	284	3	376	24	409	660	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	45	0	0	60	284	0	403	0	409	673	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	4		1	4	4	1	4		4	4	
Detector Template	Left			Left			Left					
Leading Detector (ft)	20	66		20	66	66	20	66		66	66	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	6	20	6		6	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		20			20	20		20		20	20	
Detector 2 Size(ft)		6			6	6		6		6	6	
Detector 2 Type		Cl+Ex			Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Detector 3 Position(ft)		40			40	40		40		40	40	
Detector 3 Size(ft)		6			6	6		6		6	6	

Lanes, Volumes, Timings

3: Pleasant Street & Brighton Street

01/09/2017

Lane Group	Ø9
------------	----

Lane Configurations

Traffic Volume (vph)

Future Volume (vph)

Ideal Flow (vphpl)

Storage Length (ft)

Storage Lanes

Taper Length (ft)

Lane Util. Factor

Frt

Flt Protected

Satd. Flow (prot)

Flt Permitted

Satd. Flow (perm)

Right Turn on Red

Satd. Flow (RTOR)

Link Speed (mph)

Link Distance (ft)

Travel Time (s)

Peak Hour Factor

Heavy Vehicles (%)

Adj. Flow (vph)

Shared Lane Traffic (%)

Lane Group Flow (vph)

Enter Blocked Intersection

Lane Alignment

Median Width(ft)

Link Offset(ft)

Crosswalk Width(ft)

Two way Left Turn Lane

Headway Factor

Turning Speed (mph)

Number of Detectors

Detector Template

Leading Detector (ft)

Trailing Detector (ft)

Detector 1 Position(ft)

Detector 1 Size(ft)

Detector 1 Type

Detector 1 Channel

Detector 1 Extend (s)

Detector 1 Queue (s)

Detector 1 Delay (s)

Detector 2 Position(ft)

Detector 2 Size(ft)

Detector 2 Type

Detector 2 Channel

Detector 2 Extend (s)

Detector 3 Position(ft)

Detector 3 Size(ft)

Build AM_High-Turnover Restaurant

Synchro 9 Report
Page 2

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector 3 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 3 Channel												
Detector 3 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Detector 4 Position(ft)		60			60	60		60		60	60	
Detector 4 Size(ft)		6			6	6		6		6	6	
Detector 4 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 4 Channel												
Detector 4 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		9.5	20.0	
Total Split (s)	25.0	25.0		25.0	25.0	25.0	25.0	25.0		10.0	35.0	
Total Split (%)	32.5%	32.5%		32.5%	32.5%	32.5%	32.5%	32.5%		13.0%	45.5%	
Maximum Green (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		5.5	30.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		0.5	1.0	
Lost Time Adjust (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max	Max	Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		20.0			20.0	20.0		20.0		30.5	30.0	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.51	0.50	
v/c Ratio		0.09			0.12	0.39		0.65		0.98	0.72	
Control Delay		12.3			14.8	4.1		22.7		56.0	17.0	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		12.3			14.8	4.1		22.7		56.0	17.0	
LOS		B			B	A		C		E	B	
Approach Delay		12.3			6.0			22.7			31.8	
Approach LOS		B			A			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 77

Actuated Cycle Length: 60

Natural Cycle: 80

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 24.6

Intersection Capacity Utilization 73.8%

Analysis Period (min) 15







Intersection LOS: C

ICU Level of Service D

Lanes, Volumes, Timings 3: Pleasant Street & Brighton Street

01/09/2017

Splits and Phases: 3: Pleasant Street & Brighton Street

 Ø1	 Ø2	 Ø4	 Ø9
 Ø6	 Ø8		

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street







01/09/2017

Lane Group	Ø9
Detector 3 Type	
Detector 3 Channel	
Detector 3 Extend (s)	
Detector 4 Position(ft)	
Detector 4 Size(ft)	
Detector 4 Type	
Detector 4 Channel	
Detector 4 Extend (s)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	3.0
Minimum Split (s)	17.0
Total Split (s)	17.0
Total Split (%)	22%
Maximum Green (s)	13.0
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	8.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Queues

3: Pleasant Street & Brighton Street

01/09/2017

						
Lane Group	SET	NWT	NWR	NET	SWL	SWT
Lane Group Flow (vph)	45	60	284	403	409	673
v/c Ratio	0.09	0.12	0.39	0.65	0.98	0.72
Control Delay	12.3	14.8	4.1	22.7	56.0	17.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.3	14.8	4.1	22.7	56.0	17.0
Queue Length 50th (ft)	9	15	0	120	87	175
Queue Length 95th (ft)	27	37	44	204	#239	291
Internal Link Dist (ft)	153	1208		381		469
Turn Bay Length (ft)			200			
Base Capacity (vph)	525	496	722	622	418	939
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	0.09	0.12	0.39	0.65	0.98	0.72

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis

3: Pleasant Street & Brighton Street

01/09/2017

















Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔	↔		↔		↔	↔	
Traffic Volume (vph)	20	13	8	44	11	261	3	346	22	376	607	12
Future Volume (vph)	20	13	8	44	11	261	3	346	22	376	607	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.97			1.00	0.85		0.99		1.00	1.00	
Flt Protected		0.98			0.96	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1720			1798	1599		1867		1787	1876	
Flt Permitted		0.89			0.80	1.00		1.00		0.33	1.00	
Satd. Flow (perm)		1560			1490	1599		1858		611	1876	
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)	22	14	9	48	12	284	3	376	24	409	660	13
RTOR Reduction (vph)	0	6	0	0	0	189	0	3	0	0	1	0
Lane Group Flow (vph)	0	39	0	0	60	95	0	400	0	409	672	0
Heavy Vehicles (%)	5%	8%	0%	2%	0%	1%	0%	1%	0%	1%	1%	0%
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		20.0			20.0	20.0		20.0		30.0	30.0	
Effective Green, g (s)		20.0			20.0	20.0		20.0		30.0	30.0	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.50	0.50	
Clearance Time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		520			496	533		619		413	938	
v/s Ratio Prot										c0.09	0.36	
v/s Ratio Perm		0.03			0.04	c0.06		0.22		c0.40		
v/c Ratio		0.07			0.12	0.18		0.65		0.99	0.72	
Uniform Delay, d1		13.7			13.9	14.2		17.0		15.6	11.7	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.3			0.5	0.7		5.2		41.9	4.7	
Delay (s)		14.0			14.4	14.9		22.2		57.6	16.4	
Level of Service		B			B	B		C		E	B	
Approach Delay (s)		14.0			14.8			22.2			31.9	
Approach LOS		B			B			C			C	

Intersection Summary

HCM 2000 Control Delay	26.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	5	508	8	15	290	189	9	159	8	203	141	5
Future Volume (vph)	5	508	8	15	290	189	9	159	8	203	141	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.998			0.948			0.994			0.998	
Flt Protected					0.999			0.997			0.972	
Satd. Flow (prot)	0	1896	0	0	1793	0	0	1866	0	0	1843	0
Flt Permitted		0.996			0.980			0.979			0.663	
Satd. Flow (perm)	0	1889	0	0	1758	0	0	1832	0	0	1257	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			41			2			1	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1288			399			384			425	
Travel Time (s)		29.3			9.1			8.7			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%
Adj. Flow (vph)	5	552	9	16	315	205	10	173	9	221	153	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	566	0	0	536	0	0	192	0	0	379	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	3		1	3		1	3		1	3	
Detector Template	Left			Left			Left			Left		
Leading Detector (ft)	20	26		20	26		20	26		20	26	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		10			10			10			10	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Detector 3 Position(ft)		20			20			20			20	
Detector 3 Size(ft)		6			6			6			6	
Detector 3 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 3 Channel												
Detector 3 Extend (s)		0.0			0.0			0.0			0.0	

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

Lane Group Ø9

Lane Configurations
Traffic Volume (vph)
Future Volume (vph)
Ideal Flow (vphpl)
Lane Util. Factor
Frt
Flt Protected
Satd. Flow (prot)
Flt Permitted
Satd. Flow (perm)
Right Turn on Red
Satd. Flow (RTOR)
Link Speed (mph)
Link Distance (ft)
Travel Time (s)
Peak Hour Factor
Heavy Vehicles (%)
Adj. Flow (vph)
Shared Lane Traffic (%)
Lane Group Flow (vph)
Enter Blocked Intersection
Lane Alignment
Median Width(ft)
Link Offset(ft)
Crosswalk Width(ft)
Two way Left Turn Lane
Headway Factor
Turning Speed (mph)
Number of Detectors
Detector Template
Leading Detector (ft)
Trailing Detector (ft)
Detector 1 Position(ft)
Detector 1 Size(ft)
Detector 1 Type
Detector 1 Channel
Detector 1 Extend (s)
Detector 1 Queue (s)
Detector 1 Delay (s)
Detector 2 Position(ft)
Detector 2 Size(ft)
Detector 2 Type
Detector 2 Channel
Detector 2 Extend (s)
Detector 3 Position(ft)
Detector 3 Size(ft)
Detector 3 Type
Detector 3 Channel
Detector 3 Extend (s)

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Detector Phase	6	6		2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	45.0	45.0		45.0	45.0		25.0	25.0		25.0	25.0	
Total Split (%)	47.9%	47.9%		47.9%	47.9%		26.6%	26.6%		26.6%	26.6%	
Maximum Green (s)	40.0	40.0		40.0	40.0		20.0	20.0		20.0	20.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effect Green (s)		40.4			40.4			20.2			20.2	
Actuated g/C Ratio		0.55			0.55			0.27			0.27	
v/c Ratio		0.55			0.55			0.38			1.10	
Control Delay		14.8			13.9			25.8			108.5	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.8			13.9			25.8			108.5	
LOS		B			B			C			F	
Approach Delay		14.8			13.9			25.8			108.5	
Approach LOS		B			B			C			F	

Intersection Summary

Area Type: Other
 Cycle Length: 94
 Actuated Cycle Length: 73.8
 Natural Cycle: 90
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 1.10
 Intersection Signal Delay: 37.0
 Intersection Capacity Utilization 77.6%
 Analysis Period (min) 15

Intersection LOS: D
 ICU Level of Service D

Splits and Phases: 6: Cross Street & Brighton Street

← 02	↗ 04	↘ 09
→ 06	↖ 08	

Lane Group	Ø9
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	19.0
Total Split (s)	24.0
Total Split (%)	26%
Maximum Green (s)	21.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	3
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Queues

6: Cross Street & Brighton Street

01/09/2017

	↘	↖	↗	↙
Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	566	536	192	379
v/c Ratio	0.55	0.55	0.38	1.10
Control Delay	14.8	13.9	25.8	108.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	14.8	13.9	25.8	108.5
Queue Length 50th (ft)	135	116	65	~183
Queue Length 95th (ft)	358	325	158	#459
Internal Link Dist (ft)	1208	319	304	345
Turn Bay Length (ft)				
Base Capacity (vph)	1033	980	502	344
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.55	0.55	0.38	1.10

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis 6: Cross Street & Brighton Street

01/09/2017

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		⬆			⬆			⬆			⬆	
Traffic Volume (vph)	5	508	8	15	290	189	9	159	8	203	141	5
Future Volume (vph)	5	508	8	15	290	189	9	159	8	203	141	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0			5.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.95			0.99			1.00	
Flt Protected		1.00			1.00			1.00			0.97	
Satd. Flow (prot)		1895			1792			1866			1843	
Flt Permitted		1.00			0.98			0.98			0.66	
Satd. Flow (perm)		1889			1759			1831			1257	
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)	5	552	9	16	315	205	10	173	9	221	153	5
RTOR Reduction (vph)	0	0	0	0	19	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	566	0	0	517	0	0	191	0	0	378	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		40.4			40.4			20.2			20.2	
Effective Green, g (s)		40.4			40.4			20.2			20.2	
Actuated g/C Ratio		0.53			0.53			0.26			0.26	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1000			931			484			332	
v/s Ratio Prot												
v/s Ratio Perm		c0.30			0.29			0.10			c0.30	
v/c Ratio		0.57			0.56			0.39			1.14	
Uniform Delay, d1		12.1			12.0			23.0			28.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.3			2.4			2.4			92.7	
Delay (s)		14.4			14.3			25.4			120.7	
Level of Service		B			B			C			F	
Approach Delay (s)		14.4			14.3			25.4			120.7	
Approach LOS		B			B			C			F	

Intersection Summary

HCM 2000 Control Delay	39.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	76.3	Sum of lost time (s)	13.0
Intersection Capacity Utilization	77.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

	↖	↗	↘	↙	↕	↖	↗	↘	↙	↕	↖	↗
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↖	↗	↘	↙		↖		↗	↘	↙	↗	↘
Traffic Volume (vph)	343	243	356	37	0	102	0	607	75	203	849	0
Future Volume (vph)	343	243	356	37	0	102	0	607	75	203	849	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor						0.99		1.00				
Frt			0.850			0.850		0.983				
Flt Protected	0.950	0.991		0.950						0.950		
Satd. Flow (prot)	1698	1729	1599	1805	0	1583	0	3509	0	1770	3574	0
Flt Permitted	0.950	0.991		0.950						0.232		
Satd. Flow (perm)	1698	1729	1599	1805	0	1561	0	3509	0	432	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			217			111		17				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		268			533			549			471	
Travel Time (s)		6.1			12.1			12.5			10.7	
Confl. Bikes (#/hr)						1			1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	4%	1%	0%	0%	2%	0%	1%	0%	2%	1%	0%
Adj. Flow (vph)	373	264	387	40	0	111	0	660	82	221	923	0
Shared Lane Traffic (%)	16%											
Lane Group Flow (vph)	313	324	387	40	0	111	0	742	0	221	923	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	2		1		2		2	1	
Detector Template												
Leading Detector (ft)	6	6	0	16		6		26		26	36	
Trailing Detector (ft)	0	0	0	0		0		0		0	30	
Detector 1 Position(ft)	0	0	0	0		0		0		0	30	
Detector 1 Size(ft)	6	6	20	6		6		6		6	6	
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 2 Position(ft)				10				20		20		
Detector 2 Size(ft)				6				6		6		
Detector 2 Type				CI+Ex				CI+Ex		CI+Ex		
Detector 2 Channel												
Detector 2 Extend (s)				0.0				0.0		0.0		
Turn Type	Split	NA	Prot	Prot		Perm		NA		pm+pt	NA	
Protected Phases	6	6	6	2				4		3	8	
Permitted Phases						2				8		

Lanes, Volumes, Timings

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	6	6	6	2		2		4		3	8	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0	10.0		10.0		15.0		9.0	15.0	
Minimum Split (s)	12.0	12.0	12.0	14.0		14.0		20.0		13.0	20.0	
Total Split (s)	24.0	24.0	24.0	14.0		14.0		41.0		13.0	54.0	
Total Split (%)	26.1%	26.1%	26.1%	15.2%		15.2%		44.6%		14.1%	58.7%	
Maximum Green (s)	20.0	20.0	20.0	10.0		10.0		37.0		9.0	50.0	
Yellow Time (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0		1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
Recall Mode	Max	Max	Max	Max		Max		Max		None	Max	
Act Effct Green (s)	20.0	20.0	20.0	10.0		10.0		37.0		50.0	50.0	
Actuated g/C Ratio	0.22	0.22	0.22	0.11		0.11		0.40		0.54	0.54	
v/c Ratio	0.85	0.86	0.75	0.20		0.41		0.52		0.61	0.48	
Control Delay	56.9	58.6	24.8	40.2		12.9		21.9		18.6	13.9	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Total Delay	56.9	58.6	24.8	40.2		12.9		21.9		18.6	13.9	
LOS	E	E	C	D		B		C		B	B	
Approach Delay		45.3			20.1			21.9			14.8	
Approach LOS		D			C			C			B	

Intersection Summary

Area Type: Other
 Cycle Length: 92
 Actuated Cycle Length: 92
 Natural Cycle: 65
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.86
 Intersection Signal Delay: 27.0
 Intersection Capacity Utilization 63.0%
 Analysis Period (min) 15

Intersection LOS: C
 ICU Level of Service B









Splits and Phases: 9: Pleasant Street & Lake Street/Frontage Road

Ø2	Ø6	Ø3	Ø4
		Ø8	

Queues

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

								
Lane Group	SEL	SET	SER	NWL	NWR	NET	SWL	SWT
Lane Group Flow (vph)	313	324	387	40	111	742	221	923
v/c Ratio	0.85	0.86	0.75	0.20	0.41	0.52	0.61	0.48
Control Delay	56.9	58.6	24.8	40.2	12.9	21.9	18.6	13.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.9	58.6	24.8	40.2	12.9	21.9	18.6	13.9
Queue Length 50th (ft)	185	192	91	22	0	164	63	163
Queue Length 95th (ft)	#336	#347	#224	53	48	218	104	212
Internal Link Dist (ft)		188				469		391
Turn Bay Length (ft)								
Base Capacity (vph)	369	375	517	196	268	1421	365	1942
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.86	0.75	0.20	0.41	0.52	0.61	0.48

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017



















Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↱	↰	↰		↰		↰		↰	↰	
Traffic Volume (vph)	343	243	356	37	0	102	0	607	75	203	849	0
Future Volume (vph)	343	243	356	37	0	102	0	607	75	203	849	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95	1.00	1.00		1.00		0.95		1.00	0.95	
Flpb, ped/bikes	1.00	1.00	1.00	1.00		0.99		1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00		1.00		1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00		0.85		0.98		1.00	1.00	
Flt Protected	0.95	0.99	1.00	0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1698	1729	1599	1805		1561		3511		1770	3574	
Flt Permitted	0.95	0.99	1.00	0.95		1.00		1.00		0.23	1.00	
Satd. Flow (perm)	1698	1729	1599	1805		1561		3511		433	3574	
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)	373	264	387	40	0	111	0	660	82	221	923	0
RTOR Reduction (vph)	0	0	170	0	0	99	0	10	0	0	0	0
Lane Group Flow (vph)	313	324	217	40	0	12	0	732	0	221	923	0
Confl. Bikes (#/hr)						1			1			
Heavy Vehicles (%)	1%	4%	1%	0%	0%	2%	0%	1%	0%	2%	1%	0%
Turn Type	Split	NA	Prot	Prot		Perm		NA		pm+pt	NA	
Protected Phases	6	6	6	2				4		3	8	
Permitted Phases						2				8		
Actuated Green, G (s)	20.0	20.0	20.0	10.0		10.0		37.0		50.0	50.0	
Effective Green, g (s)	20.0	20.0	20.0	10.0		10.0		37.0		50.0	50.0	
Actuated g/C Ratio	0.22	0.22	0.22	0.11		0.11		0.40		0.54	0.54	
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	369	375	347	196		169		1412		366	1942	
v/s Ratio Prot	0.18	c0.19	0.14	c0.02				0.21		c0.06	0.26	
v/s Ratio Perm						0.01				c0.27		
v/c Ratio	0.85	0.86	0.63	0.20		0.07		0.52		0.60	0.48	
Uniform Delay, d1	34.5	34.7	32.6	37.4		36.8		20.8		12.8	12.9	
Progression Factor	1.00	1.00	1.00	1.00		1.00		1.00		1.00	1.00	
Incremental Delay, d2	20.9	22.3	8.3	2.3		0.8		1.4		2.8	0.8	
Delay (s)	55.4	57.0	40.9	39.7		37.6		22.1		15.6	13.8	
Level of Service	E	E	D	D		D		C		B	B	
Approach Delay (s)		50.4			38.2			22.1			14.1	
Approach LOS		D			D			C			B	

Intersection Summary

HCM 2000 Control Delay	29.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	92.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	14	29	9	50	24	384	0	451	23	405	494	19
Future Volume (vph)	14	29	9	50	24	384	0	451	23	405	494	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		200	0		0	0		0
Storage Lanes	0		0	0		1	0		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.976				0.850		0.993			0.994	
Flt Protected		0.987			0.967					0.950		
Satd. Flow (prot)	0	1730	0	0	1813	1599	0	1869	0	1787	1871	0
Flt Permitted		0.936			0.809					0.173		
Satd. Flow (perm)	0	1640	0	0	1517	1599	0	1869	0	325	1871	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10				417		3			3	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		233			1288			461			549	
Travel Time (s)		5.3			29.3			10.5			12.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	8%	0%	2%	0%	1%	0%	1%	0%	1%	1%	0%
Adj. Flow (vph)	15	32	10	54	26	417	0	490	25	440	537	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	57	0	0	80	417	0	515	0	440	558	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	4		1	4	4	1	4		4	4	
Detector Template	Left			Left			Left					
Leading Detector (ft)	20	66		20	66	66	20	66		66	66	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	6	20	6		6	6	
Detector 1 Type	CI+Ex	CI+Ex		CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		20			20	20		20		20	20	
Detector 2 Size(ft)		6			6	6		6		6	6	
Detector 2 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Detector 3 Position(ft)		40			40	40		40		40	40	
Detector 3 Size(ft)		6			6	6		6		6	6	

Build PM

Synchro 9 Report
Page 1

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

Lane Group Ø9


Lane Configurations
Traffic Volume (vph)
Future Volume (vph)
Ideal Flow (vphpl)
Storage Length (ft)
Storage Lanes
Taper Length (ft)
Lane Util. Factor
Frt
Flt Protected
Satd. Flow (prot)
Flt Permitted
Satd. Flow (perm)
Right Turn on Red
Satd. Flow (RTOR)
Link Speed (mph)
Link Distance (ft)
Travel Time (s)
Peak Hour Factor
Heavy Vehicles (%)
Adj. Flow (vph)
Shared Lane Traffic (%)
Lane Group Flow (vph)
Enter Blocked Intersection
Lane Alignment
Median Width(ft)
Link Offset(ft)
Crosswalk Width(ft)
Two way Left Turn Lane
Headway Factor
Turning Speed (mph)
Number of Detectors
Detector Template
Leading Detector (ft)
Trailing Detector (ft)
Detector 1 Position(ft)
Detector 1 Size(ft)
Detector 1 Type
Detector 1 Channel
Detector 1 Extend (s)
Detector 1 Queue (s)
Detector 1 Delay (s)
Detector 2 Position(ft)
Detector 2 Size(ft)
Detector 2 Type
Detector 2 Channel
Detector 2 Extend (s)
Detector 3 Position(ft)
Detector 3 Size(ft)

Build PM

Synchro 9 Report
Page 2

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector 3 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 3 Channel												
Detector 3 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Detector 4 Position(ft)		60			60	60		60		60	60	
Detector 4 Size(ft)		6			6	6		6		6	6	
Detector 4 Type		CI+Ex			CI+Ex	CI+Ex		CI+Ex		CI+Ex	CI+Ex	
Detector 4 Channel												
Detector 4 Extend (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm		NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		9.5	20.0	
Total Split (s)	25.0	25.0		25.0	25.0	25.0	25.0	25.0		10.0	35.0	
Total Split (%)	32.5%	32.5%		32.5%	32.5%	32.5%	32.5%	32.5%		13.0%	45.5%	
Maximum Green (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		5.5	30.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		0.5	1.0	
Lost Time Adjust (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max	Max	Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		20.0			20.0	20.0		20.0		30.5	30.0	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.51	0.50	
v/c Ratio		0.10			0.16	0.51		0.82		1.47	0.60	
Control Delay		12.6			15.2	4.5		32.1		247.9	13.9	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		12.6			15.2	4.5		32.1		247.9	13.9	
LOS		B			B	A		C		F	B	
Approach Delay		12.6			6.2			32.1			117.1	
Approach LOS		B			A			C			F	

Intersection Summary




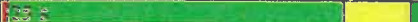








Area Type: Other
 Cycle Length: 77
 Actuated Cycle Length: 60
 Natural Cycle: 90
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 1.47
 Intersection Signal Delay: 66.4
 Intersection Capacity Utilization 74.3%
 Analysis Period (min) 15

Intersection LOS: E
 ICU Level of Service D

Lanes, Volumes, Timings
 3: Pleasant Street & Brighton Street

01/09/2017

Splits and Phases: 3: Pleasant Street & Brighton Street

 Ø1 	 Ø2 	 Ø4 	 Ø9 
 Ø6 	 Ø8 		

Lanes, Volumes, Timings
3: Pleasant Street & Brighton Street

01/09/2017

Lane Group Ø9

Detector 3 Type	
Detector 3 Channel	
Detector 3 Extend (s)	
Detector 4 Position(ft)	
Detector 4 Size(ft)	
Detector 4 Type	
Detector 4 Channel	
Detector 4 Extend (s)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	3.0
Minimum Split (s)	17.0
Total Split (s)	17.0
Total Split (%)	22%
Maximum Green (s)	13.0
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	8.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Queues

3: Pleasant Street & Brighton Street

01/09/2017

	↘	↖	↗	↙	↘	↙
Lane Group	SET	NWT	NWR	NET	SWL	SWT
Lane Group Flow (vph)	57	80	417	515	440	558
v/c Ratio	0.10	0.16	0.51	0.82	1.47	0.60
Control Delay	12.6	15.2	4.5	32.1	247.9	13.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.6	15.2	4.5	32.1	247.9	13.9
Queue Length 50th (ft)	11	20	0	167	~158	132
Queue Length 95th (ft)	33	47	52	#322	#350	219
Internal Link Dist (ft)	153	1208		381		469
Turn Bay Length (ft)			200			
Base Capacity (vph)	553	505	811	625	299	937
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.16	0.51	0.82	1.47	0.60



















Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

3: Pleasant Street & Brighton Street

01/09/2017













												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	14	29	9	50	24	384	0	451	23	405	494	19
Future Volume (vph)	14	29	9	50	24	384	0	451	23	405	494	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.98			1.00	0.85		0.99		1.00	0.99	
Flt Protected		0.99			0.97	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1730			1813	1599		1870		1787	1871	
Flt Permitted		0.94			0.81	1.00		1.00		0.17	1.00	
Satd. Flow (perm)		1641			1517	1599		1870		326	1871	
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)	15	32	10	54	26	417	0	490	25	440	537	21
RTOR Reduction (vph)	0	7	0	0	0	278	0	2	0	0	2	0
Lane Group Flow (vph)	0	50	0	0	80	139	0	513	0	440	557	0
Heavy Vehicles (%)	5%	8%	0%	2%	0%	1%	0%	1%	0%	1%	1%	0%
Turn Type	Perm	NA		Perm	NA	Perm		NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		20.0			20.0	20.0		20.0		30.0	30.0	
Effective Green, g (s)		20.0			20.0	20.0		20.0		30.0	30.0	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.50	0.50	
Clearance Time (s)		5.0			5.0	5.0		5.0		4.5	5.0	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		547			505	533		623		296	935	
v/s Ratio Prot								0.27		c0.14	0.30	
v/s Ratio Perm		0.03			0.05	c0.09				c0.60		
v/c Ratio		0.09			0.16	0.26		0.82		1.49	0.60	
Uniform Delay, d1		13.8			14.1	14.6		18.4		12.9	10.7	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.3			0.7	1.2		11.7		236.1	2.8	
Delay (s)		14.1			14.7	15.8		30.1		249.0	13.5	
Level of Service		B			B	B		C		F	B	
Approach Delay (s)		14.1			15.6			30.1			117.3	
Approach LOS		B			B			C			F	

Intersection Summary

HCM 2000 Control Delay	68.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		⇄			⇄			⇄			⇄	
Traffic Volume (vph)	9	512	16	6	459	450	36	255	32	155	106	9
Future Volume (vph)	9	512	16	6	459	450	36	255	32	155	106	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.934			0.987			0.995	
Flt Protected		0.999						0.994			0.972	
Satd. Flow (prot)	0	1891	0	0	1766	0	0	1849	0	0	1838	0
Flt Permitted		0.982			0.996			0.939			0.469	
Satd. Flow (perm)	0	1858	0	0	1759	0	0	1747	0	0	887	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			64			5			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1288			399			384			425	
Travel Time (s)		29.3			9.1			8.7			9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%
Adj. Flow (vph)	10	557	17	7	499	489	39	277	35	168	115	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	584	0	0	995	0	0	351	0	0	293	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	3		1	3		1	3		1	3	
Detector Template	Left			Left			Left			Left		
Leading Detector (ft)	20	26		20	26		20	26		20	26	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		10			10			10			10	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Detector 3 Position(ft)		20			20			20			20	
Detector 3 Size(ft)		6			6			6			6	
Detector 3 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 3 Channel												
Detector 3 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group Ø9

Lane Configurations
Traffic Volume (vph)
Future Volume (vph)
Ideal Flow (vphpl)
Lane Util. Factor
Frt
Flt Protected
Satd. Flow (prot)
Flt Permitted
Satd. Flow (perm)
Right Turn on Red
Satd. Flow (RTOR)
Link Speed (mph)
Link Distance (ft)
Travel Time (s)
Peak Hour Factor
Heavy Vehicles (%)
Adj. Flow (vph)
Shared Lane Traffic (%)
Lane Group Flow (vph)
Enter Blocked Intersection
Lane Alignment
Median Width(ft)
Link Offset(ft)
Crosswalk Width(ft)
Two way Left Turn Lane
Headway Factor
Turning Speed (mph)
Number of Detectors
Detector Template
Leading Detector (ft)
Trailing Detector (ft)
Detector 1 Position(ft)
Detector 1 Size(ft)
Detector 1 Type
Detector 1 Channel
Detector 1 Extend (s)
Detector 1 Queue (s)
Detector 1 Delay (s)
Detector 2 Position(ft)
Detector 2 Size(ft)
Detector 2 Type
Detector 2 Channel
Detector 2 Extend (s)
Detector 3 Position(ft)
Detector 3 Size(ft)
Detector 3 Type
Detector 3 Channel
Detector 3 Extend (s)

Lanes, Volumes, Timings
6: Cross Street & Brighton Street

01/09/2017

	↖	↗	↘	↙	↖	↗	↘	↙	↖	↗	↘	↙
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Detector Phase	6	6		2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	45.0	45.0		45.0	45.0		25.0	25.0		25.0	25.0	
Total Split (%)	47.9%	47.9%		47.9%	47.9%		26.6%	26.6%		26.6%	26.6%	
Maximum Green (s)	40.0	40.0		40.0	40.0		20.0	20.0		20.0	20.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		40.4			40.4			20.2			20.2	
Actuated g/C Ratio		0.55			0.55			0.27			0.27	
v/c Ratio		0.57			1.00			0.73			1.21	
Control Delay		15.3			48.5			36.3			153.2	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		15.3			48.5			36.3			153.2	
LOS		B			D			D			F	
Approach Delay		15.3			48.5			36.3			153.2	
Approach LOS		B			D			D			F	

Intersection Summary

Area Type: Other
 Cycle Length: 94
 Actuated Cycle Length: 73.8
 Natural Cycle: 150
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 1.21
 Intersection Signal Delay: 51.7
 Intersection Capacity Utilization 99.7%
 Analysis Period (min) 15

Intersection LOS: D
 ICU Level of Service F

Splits and Phases: 6: Cross Street & Brighton Street

↖ Ø2	↗ Ø4	↘ Ø9
↙ Ø6	↖ Ø8	

Lane Group Ø9	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	19.0
Total Split (s)	24.0
Total Split (%)	26%
Maximum Green (s)	21.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	3
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Queues

6: Cross Street & Brighton Street

01/09/2017

















	↘	↖	↗	↙
Lane Group	SET	NWT	NET	SWT
Lane Group Flow (vph)	584	995	351	293
v/c Ratio	0.57	1.00	0.73	1.21
Control Delay	15.3	48.5	36.3	153.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	15.3	48.5	36.3	153.2
Queue Length 50th (ft)	142	352	132	~152
Queue Length 95th (ft)	378	#910	#347	#389
Internal Link Dist (ft)	1208	319	304	345
Turn Bay Length (ft)				
Base Capacity (vph)	1017	991	481	243
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.57	1.00	0.73	1.21

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis 6: Cross Street & Brighton Street

01/09/2017

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	9	512	16	6	459	450	36	255	32	155	106	9
Future Volume (vph)	9	512	16	6	459	450	36	255	32	155	106	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0			5.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Flt		1.00			0.93			0.99			1.00	
Flt Protected		1.00			1.00			0.99			0.97	
Satd. Flow (prot)		1891			1765			1849			1839	
Flt Permitted		0.98			1.00			0.94			0.47	
Satd. Flow (perm)		1859			1759			1747			886	
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)	10	557	17	7	499	489	39	277	35	168	115	10
RTOR Reduction (vph)	0	1	0	0	30	0	0	4	0	0	1	0
Lane Group Flow (vph)	0	583	0	0	965	0	0	347	0	0	292	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		40.4			40.4			20.2			20.2	
Effective Green, g (s)		40.4			40.4			20.2			20.2	
Actuated g/C Ratio		0.53			0.53			0.26			0.26	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		984			931			462			234	
v/s Ratio Prot												
v/s Ratio Perm		0.31			c0.55			0.20			c0.33	
v/c Ratio		0.59			1.04			0.75			1.25	
Uniform Delay, d1		12.3			17.9			25.7			28.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.6			39.3			10.8			141.2	
Delay (s)		14.9			57.3			36.5			169.2	
Level of Service		B			E			D			F	
Approach Delay (s)		14.9			57.3			36.5			169.2	
Approach LOS		B			E			D			F	
Intersection Summary												
HCM 2000 Control Delay			57.6		HCM 2000 Level of Service					E		
HCM 2000 Volume to Capacity ratio			1.06									
Actuated Cycle Length (s)			76.3		Sum of lost time (s)					13.0		
Intersection Capacity Utilization			99.7%		ICU Level of Service					F		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↩	↩	↩	↩	↩	↩	↩	↩	↩	↩	↩	↩
Traffic Volume (vph)	465	55	411	39	0	319	0	731	59	83	570	0
Future Volume (vph)	465	55	411	39	0	319	0	731	59	83	570	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor						0.99		1.00				
Frt			0.850			0.850		0.989				
Flt Protected	0.950	0.962		0.950						0.950		
Satd. Flow (prot)	1698	1708	1599	1805	0	1583	0	3532	0	1770	3574	0
Flt Permitted	0.950	0.962		0.950						0.195		
Satd. Flow (perm)	1698	1708	1599	1805	0	1561	0	3532	0	363	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			321			207		11				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		268			533			549			471	
Travel Time (s)		6.1			12.1			12.5			10.7	
Confl. Bikes (#/hr)						1			1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	4%	1%	0%	0%	2%	0%	1%	0%	2%	1%	0%
Adj. Flow (vph)	505	60	447	42	0	347	0	795	64	90	620	0
Shared Lane Traffic (%)	44%											
Lane Group Flow (vph)	283	282	447	42	0	347	0	859	0	90	620	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	0	2		1		2		2	1	
Detector Template												
Leading Detector (ft)	6	6	0	16		6		26		26	36	
Trailing Detector (ft)	0	0	0	0		0		0		0	30	
Detector 1 Position(ft)	0	0	0	0		0		0		0	30	
Detector 1 Size(ft)	6	6	20	6		6		6		6	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Detector 2 Position(ft)				10				20		20		
Detector 2 Size(ft)				6				6		6		
Detector 2 Type				Cl+Ex				Cl+Ex		Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)				0.0				0.0		0.0		
Turn Type	Split	NA	Prot	Prot		Perm		NA		pm+pt	NA	
Protected Phases	6	6	6	2				4		3	8	
Permitted Phases						2				8		

Lanes, Volumes, Timings

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	6	6	6	2		2		4		3	8	
Switch Phase												
Minimum Initial (s)	8.0	8.0	8.0	10.0		10.0		15.0		9.0	15.0	
Minimum Split (s)	12.0	12.0	12.0	14.0		14.0		20.0		13.0	20.0	
Total Split (s)	24.0	24.0	24.0	14.0		14.0		41.0		13.0	54.0	
Total Split (%)	26.1%	26.1%	26.1%	15.2%		15.2%		44.6%		14.1%	58.7%	
Maximum Green (s)	20.0	20.0	20.0	10.0		10.0		37.0		9.0	50.0	
Yellow Time (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0		1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
Recall Mode	Max	Max	Max	Max		Max		Max		None	Max	
Act Effct Green (s)	20.0	20.0	20.0	10.0		10.0		39.6		50.0	50.0	
Actuated g/C Ratio	0.22	0.22	0.22	0.11		0.11		0.43		0.54	0.54	
v/c Ratio	0.77	0.76	0.75	0.21		0.98		0.56		0.27	0.32	
Control Delay	49.2	48.6	18.7	40.5		61.9		22.0		12.3	12.2	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0		0.0	0.0	
Total Delay	49.2	48.6	18.7	40.5		61.9		22.0		12.3	12.2	
LOS	D	D	B	D		E		C		B	B	
Approach Delay		35.6			59.6			22.0			12.2	
Approach LOS		D			E			C			B	

Intersection Summary

Area Type: Other
 Cycle Length: 92
 Actuated Cycle Length: 92
 Natural Cycle: 65
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.98
 Intersection Signal Delay: 29.2
 Intersection Capacity Utilization 66.2%
 Analysis Period (min) 15

Intersection LOS: C
 ICU Level of Service C









Splits and Phases: 9: Pleasant Street & Lake Street/Frontage Road

Ø2	Ø6	Ø3	Ø4
		Ø8	

Queues

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

								
Lane Group	SEL	SET	SER	NWL	NWR	NET	SWL	SWT
Lane Group Flow (vph)	283	282	447	42	347	859	90	620
v/c Ratio	0.77	0.76	0.75	0.21	0.98	0.56	0.27	0.32
Control Delay	49.2	48.6	18.7	40.5	61.9	22.0	12.3	12.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.2	48.6	18.7	40.5	61.9	22.0	12.3	12.2
Queue Length 50th (ft)	164	163	63	23	84	200	24	98
Queue Length 95th (ft)	#290	#288	#183	55	#262	262	47	133
Internal Link Dist (ft)		188				469		391
Turn Bay Length (ft)								
Base Capacity (vph)	369	371	598	196	354	1526	334	1942
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.76	0.75	0.21	0.98	0.56	0.27	0.32

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis

9: Pleasant Street & Lake Street/Frontage Road

01/09/2017

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↰	↰	↰		↰		↰		↰	↰	
Traffic Volume (vph)	465	55	411	39	0	319	0	731	59	83	570	0
Future Volume (vph)	465	55	411	39	0	319	0	731	59	83	570	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95	1.00	1.00		1.00		0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00		0.99		1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00		1.00		1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00		0.85		0.99		1.00	1.00	
Flt Protected	0.95	0.96	1.00	0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1698	1709	1599	1805		1561		3531		1770	3574	
Flt Permitted	0.95	0.96	1.00	0.95		1.00		1.00		0.19	1.00	
Satd. Flow (perm)	1698	1709	1599	1805		1561		3531		363	3574	
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)	505	60	447	42	0	347	0	795	64	90	620	0
RTOR Reduction (vph)	0	0	252	0	0	185	0	6	0	0	0	0
Lane Group Flow (vph)	283	282	195	42	0	162	0	853	0	90	620	0
Confl. Bikes (#/hr)						1			1			
Heavy Vehicles (%)	1%	4%	1%	0%	0%	2%	0%	1%	0%	2%	1%	0%
Turn Type	Split	NA	Prot	Prot		Perm		NA		pm+pt	NA	
Protected Phases	6	6	6	2				4		3	8	
Permitted Phases						2				8		
Actuated Green, G (s)	20.0	20.0	20.0	10.0		10.0		39.6		50.8	50.8	
Effective Green, g (s)	20.0	20.0	20.0	10.0		10.0		39.6		50.8	50.8	
Actuated g/C Ratio	0.22	0.22	0.22	0.11		0.11		0.43		0.55	0.55	
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	365	368	344	194		168		1506		307	1956	
v/s Ratio Prot	c0.17	0.17	0.12	0.02				c0.24		0.02	c0.17	
v/s Ratio Perm						c0.10				0.14		
v/c Ratio	0.78	0.77	0.57	0.22		0.97		0.57		0.29	0.32	
Uniform Delay, d1	34.3	34.2	32.5	37.8		41.2		20.1		12.0	11.5	
Progression Factor	1.00	1.00	1.00	1.00		1.00		1.00		1.00	1.00	
Incremental Delay, d2	14.8	14.1	6.6	2.5		61.0		1.5		0.5	0.4	
Delay (s)	49.1	48.3	39.2	40.4		102.3		21.7		12.6	11.9	
Level of Service	D	D	D	D		F		C		B	B	
Approach Delay (s)		44.5			95.6			21.7			12.0	
Approach LOS		D			F			C			B	
Intersection Summary												
HCM 2000 Control Delay			36.8		HCM 2000 Level of Service					D		
HCM 2000 Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			92.8		Sum of lost time (s)					16.0		
Intersection Capacity Utilization			66.2%		ICU Level of Service					C		
Analysis Period (min)			15									
c Critical Lane Group												

EXHIBIT H

MEMORANDUM

DCI JOB NO. 2014-078

TO: Belmont Pleasant Street LLC
517 Concord Avenue
Cambridge, MA 02138

FROM: Tom Bertulis, P.E., PTOE
Design Consultants, Inc.

SUBJECT: **Off-Street Parking Study**
344 Pleasant Street
Belmont, MA

DATE: October 19, 2017

As per a request from the client, Design Consultants, Inc. (DCI) undertook a parking study for the site located at 344 Pleasant Street ("Project") in Belmont, Massachusetts. The current site is a one-story commercial building and parking lot. The proposed redevelopment calls for the demolition of the existing building and the construction of a new building. After the redevelopment, twenty-one (21) parking spaces will be provided. During the remediation process, one (1) parking space will be lost, bringing the total to twenty (20) parking spaces.

There are two alternatives for the proposed redevelopment of the site. Alternative One would consist of two retail spaces with a combined 1,747 square feet, a 1,500 square foot Dunkin Donuts, and 269 square feet of common space for a total of 3,516 square feet. The proposed Dunkin Donuts will be providing fifteen (15) seats. Alternative Two would consist of one commercial space with a total of 3,516 square feet.

According to the Belmont Zoning Ordinance (BZO), Alternative One requires a total of 14.5 commercial parking spaces: one for every 250 square feet of retail space and one for every two seats inside the Dunkin Donuts. The required number of parking spaces for Alternative One is shown in Table 1.

Alternative Two requires 14.1 commercial parking spaces according to the BZO: one for every 250 square feet of commercial space. The one commercial space will be a total of 3,516 square feet. The required number of parking spaces for Alternative Two is shown in Table 2.

This memorandum serves to demonstrate that the twenty-one (21) parking spaces will provide sufficient parking for either alternative and that the building at 344 Pleasant Street will not generate more parking than what the proposed development will provide. The Project location is shown in Figure 1.

Table 1: Required Spaces According to the Belmont Zoning Ordinance (Alternative One)

Required Parking Spaces			
	15 seats	1,001 sq ft	746 sq ft
# of Commercial Units	1	1	1
# of Required Spaces (1 per 250 square feet)		4.0	3.0
# of Required Spaces (1 per 2 seats)	7.5		
Total Commercial Spaces Required	14.5		

Table 2: Required Spaces According to the Belmont Zoning Ordinance (Alternative Two)

Required Parking Spaces	
	3516 square feet
# of Commercial Units	1
# of Required Spaces (1 per 250 square feet)	14.1

Off-Street Parking

The off-street parking is accessed via two curb cuts and ramps: one from Pleasant Street and one from Brighton Street. As proposed, the site will be providing a total of twenty-one (21) parking spaces for the redevelopment. The parking lot layout is shown in Figure 3.

Existing Off-Street Parking Utilization for Alternative One

To determine the actual expected parking demand for Alternative One at the 344 Pleasant Street Project site, off-street parking surveys were conducted at three other similar commercial developments within the surrounding areas. One of the proposed commercial spaces will be a Dunkin Donuts restaurant, and the three locations below were Dunkin Donuts restaurants to be used for comparison. As shown in Figure 2, off-street parking utilization studies were carried out at the following locations:

- 1) 101 Broadway, Arlington, MA – 1 commercial unit; 14 parking spaces
- 2) 369 Massachusetts Avenue, Arlington, MA – 3 commercial units; 10 parking spaces
- 3) 2480 Massachusetts Avenue, Cambridge, MA – 1 commercial unit; 15 parking spaces

DCI recorded the number of available parking spaces in the parking lots during a typical Tuesday and typical Wednesday, during the AM peak hours. The parking data was collected during the following time periods, and the results of the parking surveys are summarized in Table 3.

Tuesday March 29, 2016 (7:00 to 8:00 AM)

Tuesday March 29, 2016 (8:10 to 9:10 AM)

Wednesday May 11, 2016 (7:00 to 8:00 AM)

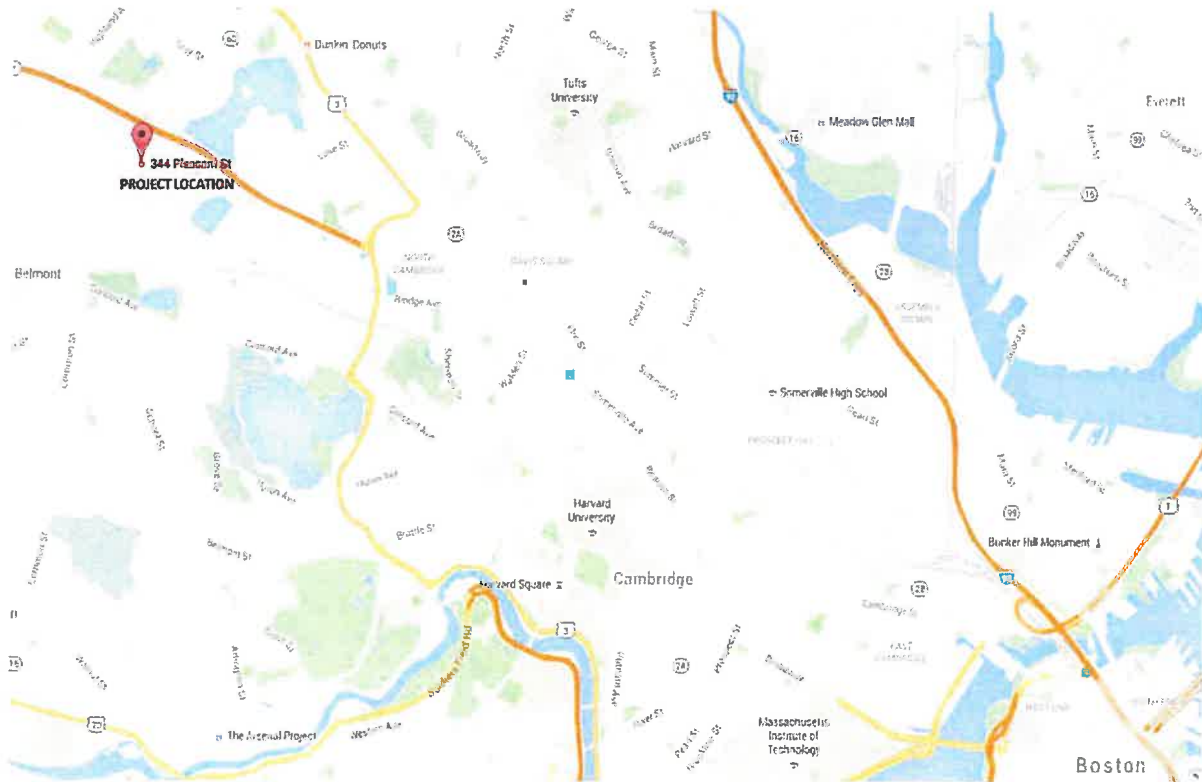


Figure 1: Project Location

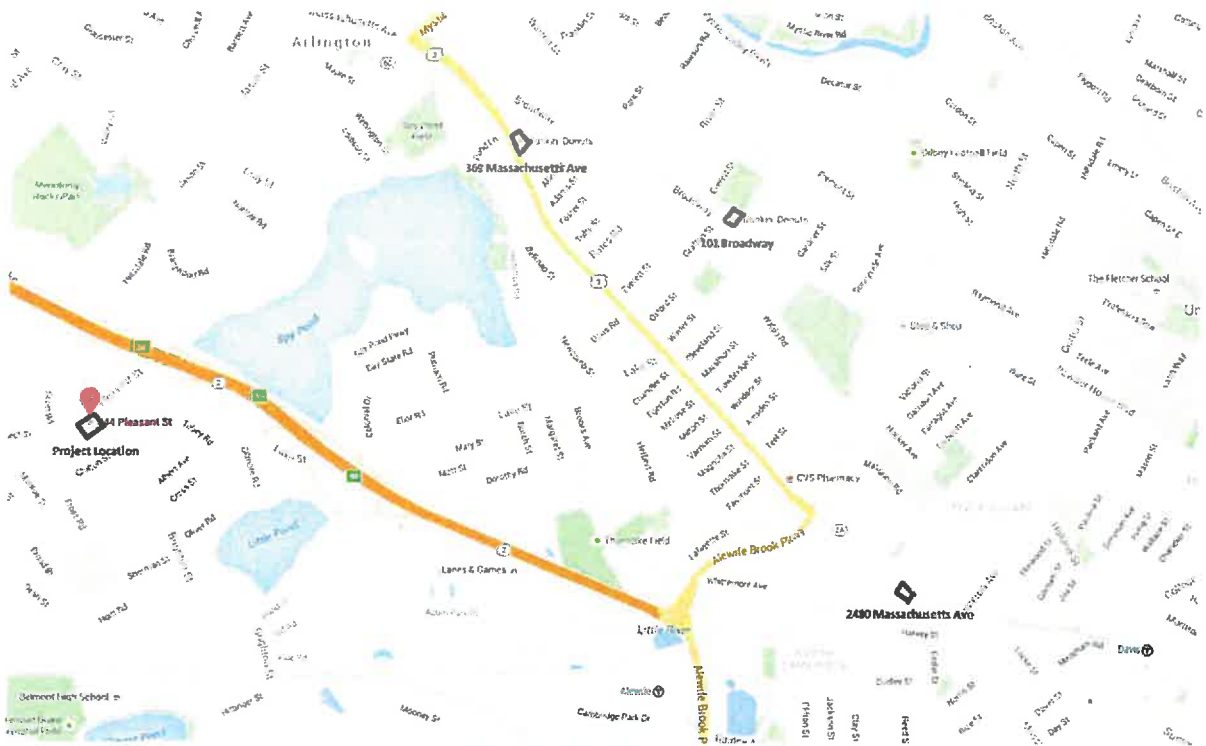


Figure 2: Study Locations

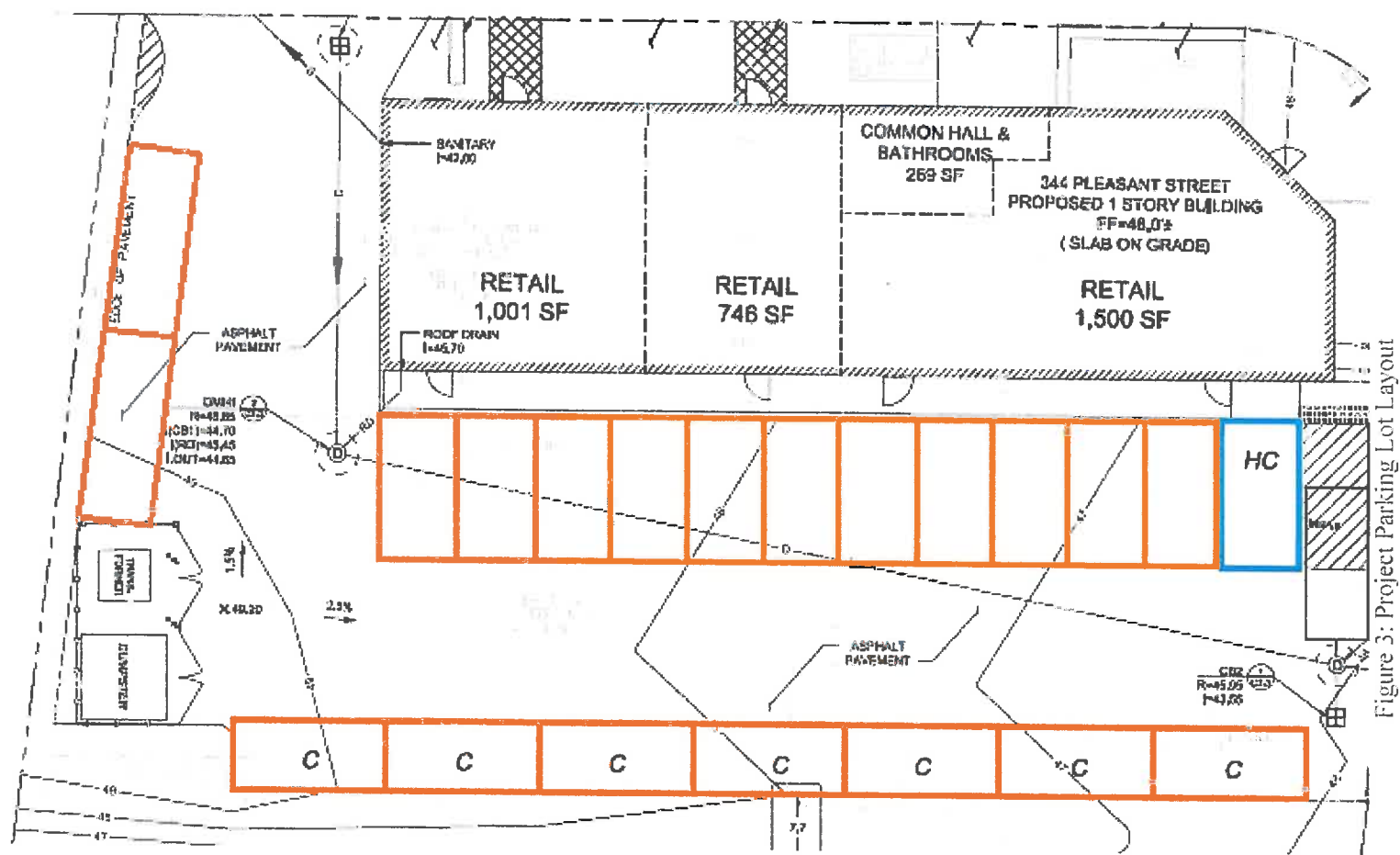


Table 3: Parking Survey Summary

Location	Size (# of seats)	Total Num. of On-Site Parking Spaces	Parking Utilization			
			Tuesday (AM)			
			7:00-7:15	7:15-7:30	7:30-7:45	7:45-8:00
101 Broadway	22	14	4	4	5	7
			Tuesday (AM)			
			8:10-8:25	8:25-8:40	8:40-8:55	8:55-9:10
369 Massachusetts Ave	16	10	7	6	7	9
			Thursday (AM)			
			7:00-7:15	7:15-7:30	7:30-7:45	7:45-8:00
2480 Massachusetts Ave	22	15	11	6	9	6
			0-15 MIN	15-30 MIN	30-45 MIN	45-60 MIN
101 Broadway Parking Utilization per Seat			0.18	0.18	0.23	0.32
369 Massachusetts Avenue Parking Utilization Rate per Seat			0.44	0.38	0.44	0.56
2480 Massachusetts Avenue Parking Utilization Rate per Seat			0.50	0.27	0.41	0.27
Average Parking Utilization Rate per Seat			0.37	0.28	0.36	0.38
Average Parking Utilization Rate per Seat (overall)			0.35			

As indicated in Table 3, the average overall parking demand at all three commercial sites is 0.35 parking spaces per seat every 15 minutes. Using this average rate, and knowing that the proposed redevelopment will consist of 15 seats, the Dunkin Donuts is expected to require 5.25 parking spaces every 15 minutes. Additionally, since Dunkin Donut restaurants are typically fast-serving and take-out restaurants, the parking turnover is high, meaning most vehicles will only be parked for a short amount of time. None of the study locations had more vehicles at any given time than parking spaces provided, meaning there were always spaces available for vehicles to park. Consequently, even with the 7.0 required parking spaces for the two other commercial uses, the twenty-one (21) parking spaces provided for the proposed redevelopment will provide sufficient parking to meet the demand. Even during the remediation process when one (1) parking space will be lost, the twenty (20) parking spaces will still be sufficient to meet the demand.

Mode Split and Vehicle Ownership Comparison

Commuting characteristics were analyzed from the 2010-2014 American Community Survey 5-Year Estimates. Zip Code 02478 Census Tract, which covers the Project site, was analyzed and used to estimate mode splits for journeys to work in the Project area. Figure 4 and Figure 5 show the average difference in mode split and vehicle ownership levels between the study areas of 344 Pleasant Street, the Town of Belmont, and the State of Massachusetts. Journey to Work data is attached in the Appendix.

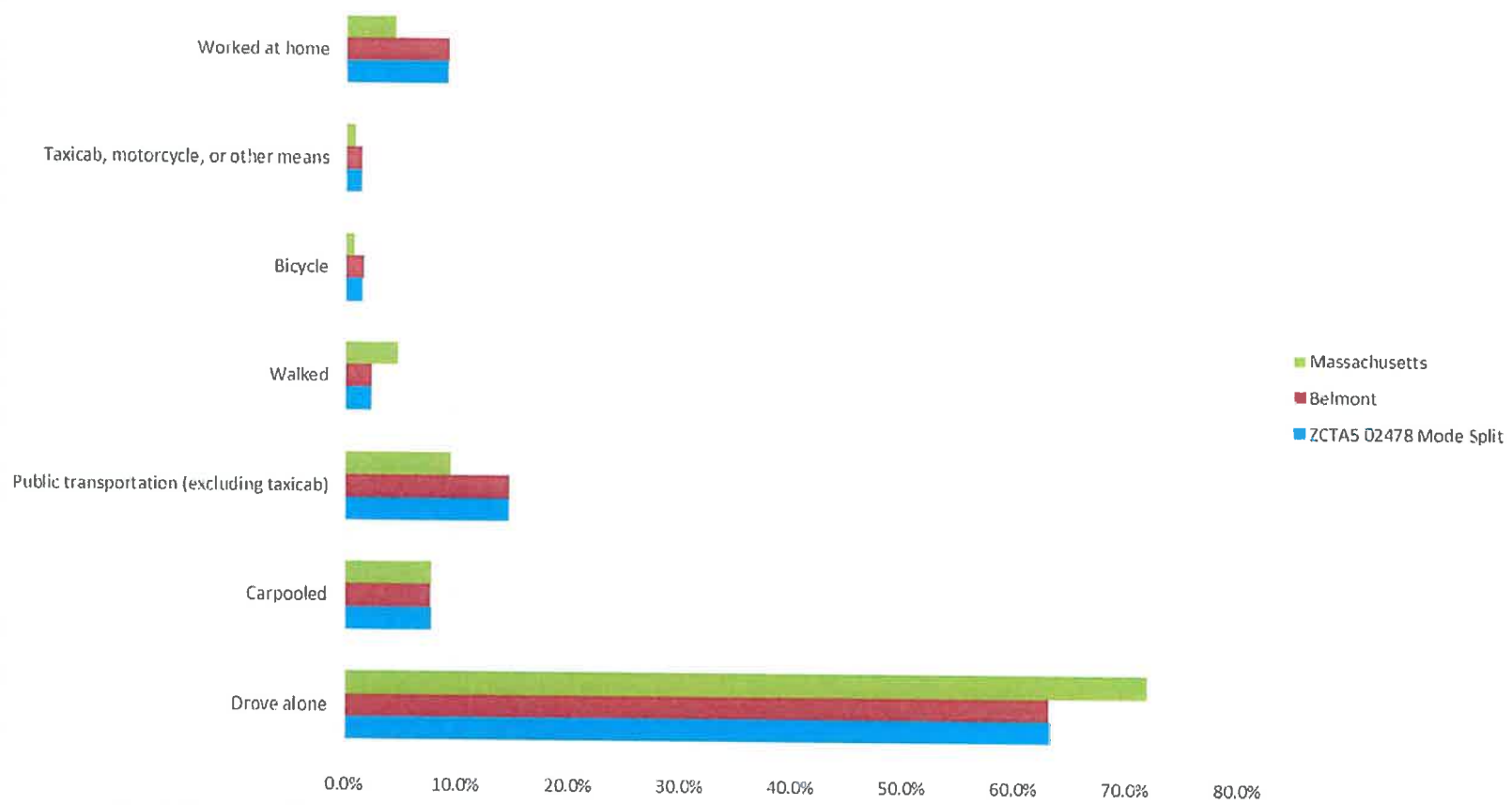


Figure 4: Mode Split Comparison

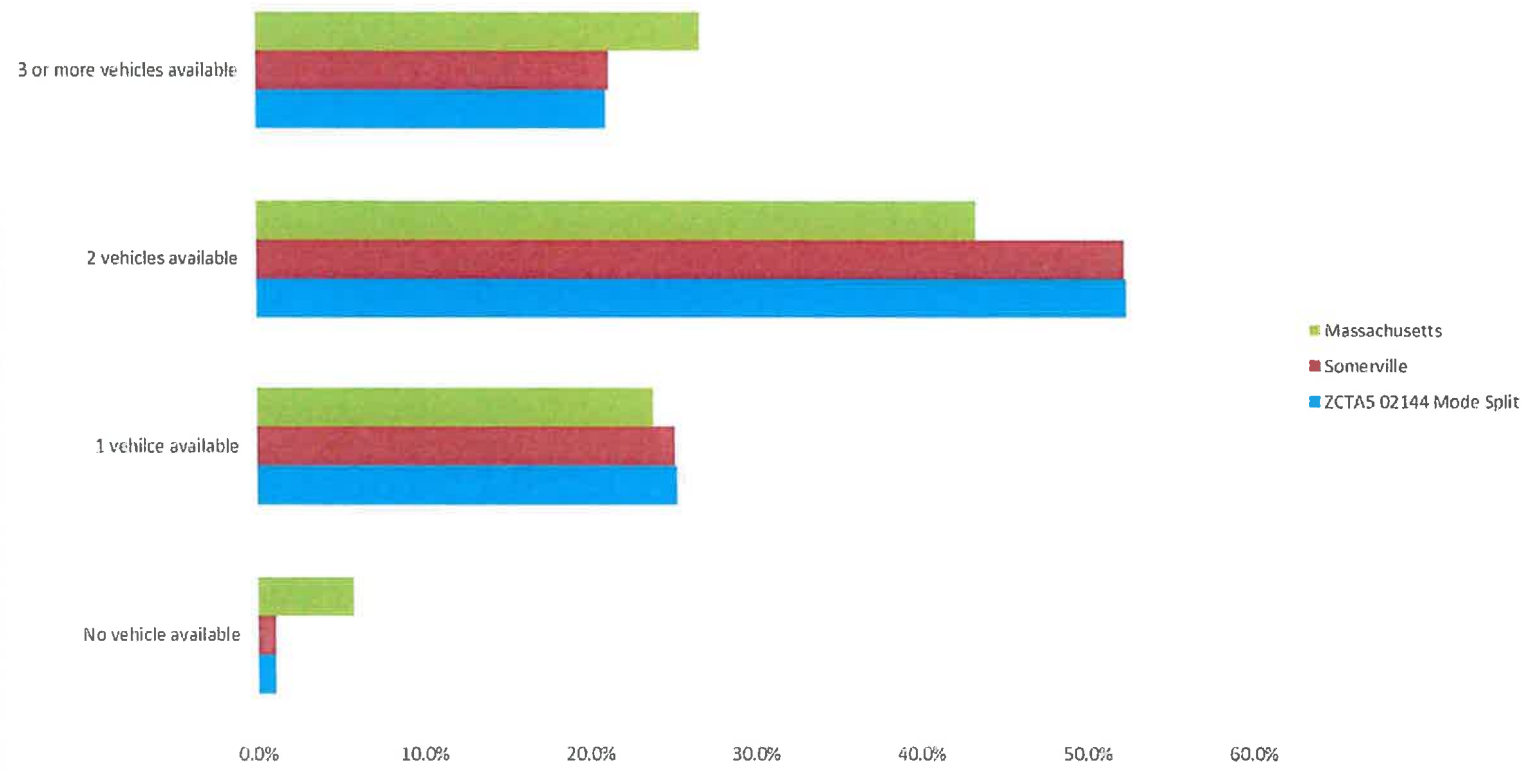


Figure 5: Vehicle Ownership Comparison

Proximity to Public Transit

In the vicinity of the Project site, MBTA bus routes 62, 67, 76, 78, and 84 service the area. Most of these run along Frontage Road and Lake Street, with route 78 running closest to the Project site.

Bus route 62 provides service between the Bedford VA Hospital and Alewife Station. It runs for a stretch along Frontage Road and Lake Street, approximately 700 feet east of the Project site. Route 62 runs at approximately 35 minute intervals. Bus route 67 provides service between Lawrence Lane in Arlington to Alewife Station. It runs for a stretch along Frontage Road and Lake Street, approximately 700 feet east of the Project site. Route 67 runs at approximately 30 minute intervals.

Bus route 76 provides service between Hanscom/Lincoln Labs and Alewife Station. It travels along Frontage Road and Lake Street, with the nearest stop approximately a 700 feet east of the Project site. Route 76 runs at 20-40 minute intervals. Bus route 78 provides service between Wadsworth Road in Arlington and Harvard Square in Cambridge. The route runs along Pleasant Street and Brighton Street, with a stop at the corner of the Project site. Route 78 runs at 25-35 minute intervals. Bus route 84 provides service between Wadsworth Road in Arlington and Alewife Station in Cambridge. In the vicinity of the Project area, the route runs along Frontage Road and Lake Street. It runs at 30 minute intervals.

Given the Project proximity to multiple bus routes, this analysis shows that that 0.35 parking spaces per seat will be sufficient for Alternative One. Additionally, one parking space for every 250 square feet of space will be sufficient for Alternative Two. Consequently, the twenty-one (21) parking spaces would meet the parking demand for this location according to this analysis.

Conclusion

The Project located at 344 Pleasant Street will have approximately 3,516 square feet of space in total. Alternative One would provide a Dunkin Donuts restaurant that will account for approximately 1,500 square feet and 15 seats, two other commercial spaces that will account for 1,747 square feet, and 269 square feet of common space. The 15 seats for the Dunkin Donuts and the 1,747 square feet for the other two commercial spaces are the basis for the required number of parking spaces. Alternative Two would provide one commercial space that will occupy 3,516 square feet of space. Although Alternative Two proposes the same amount of square footage as Alternative One, the required number of parking spaces would be solely based on total square footage. Alternative One requires 14.5 parking spaces and Alternative Two requires 14.1 parking spaces, based on the Belmont Zoning Ordinance.

For Alternative One, the measured parking demand of similar commercial developments in the area was 0.35 parking spaces per 15-minute interval per seat in the restaurant. This would result in a required 5.25 commercial parking spaces per 15-minute interval for the Dunkin Donuts at 344 Pleasant Street. Additionally, the BZO requires 14.1 parking spaces for Alternative Two of the proposed Project. Based on these facts, DCI concludes that the twenty (20) parking spaces that will provided on-site during remediation will be sufficient for the Project at 344 Pleasant Street in Belmont for either alternative.

APPENDIX



S0801

COMMUTING CHARACTERISTICS BY SEX

2010-2014 American Community Survey 5-Year Estimates

Supporting documentation on code lists, subject definitions, data accuracy, and statistical testing can be found on the American Community Survey website in the Data and Documentation section.

Sample size and data quality measures (including coverage rates, allocation rates, and response rates) can be found on the American Community Survey website in the Methodology section.

Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, it is the Census Bureau's Population Estimates Program that produces and disseminates the official estimates of the population for the nation, states, counties, cities and towns and estimates of housing units for states and counties.

Subject	Massachusetts				
	Total		Male		Female
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate
Workers 16 years and over	3,284,998	+/-8,324	1,672,359	+/-5,803	1,612,639
MEANS OF TRANSPORTATION TO WORK					
Car, truck, or van	79.7%	+/-0.2	79.9%	+/-0.2	79.5%
Drove alone	72.0%	+/-0.2	72.3%	+/-0.2	71.7%
Carpooled	7.7%	+/-0.1	7.7%	+/-0.2	7.8%
In 2-person carpool	6.2%	+/-0.1	6.1%	+/-0.1	6.3%
In 3-person carpool	0.9%	+/-0.1	0.9%	+/-0.1	0.9%
In 4-or-more person carpool	0.7%	+/-0.1	0.7%	+/-0.1	0.6%
Workers per car, truck, or van	1.06	+/-0.01	1.06	+/-0.01	1.06
Public transportation (excluding taxicab)	9.5%	+/-0.1	9.2%	+/-0.2	9.8%
Walked	4.7%	+/-0.1	4.5%	+/-0.1	5.0%
Bicycle	0.8%	+/-0.1	1.0%	+/-0.1	0.4%
Taxicab, motorcycle, or other means	0.9%	+/-0.1	1.0%	+/-0.1	0.8%
Worked at home	4.4%	+/-0.1	4.3%	+/-0.1	4.5%
PLACE OF WORK					
Worked in state of residence	96.0%	+/-0.1	95.2%	+/-0.1	96.8%
Worked in county of residence	65.3%	+/-0.2	62.3%	+/-0.2	68.5%
Worked outside county of residence	30.7%	+/-0.2	33.0%	+/-0.2	28.3%
Worked outside state of residence	4.0%	+/-0.1	4.8%	+/-0.1	3.2%
Living in a place	69.8%	+/-0.1	69.2%	+/-0.2	70.3%
Worked in place of residence	23.8%	+/-0.1	22.1%	+/-0.2	25.5%
Worked outside place of residence	46.0%	+/-0.2	47.1%	+/-0.2	44.9%
Not living in a place	30.2%	+/-0.1	30.8%	+/-0.2	29.7%
Living in 12 selected states	100.0%	+/-0.1	100.0%	+/-0.1	100.0%
Worked in minor civil division of residence	31.1%	+/-0.2	29.2%	+/-0.2	33.0%
Worked outside minor civil division of residence	68.9%	+/-0.2	70.8%	+/-0.2	67.0%
Not living in 12 selected states	0.0%	+/-0.1	0.0%	+/-0.1	0.0%
Workers 16 years and over who did not work at home	3,139,018	+/-8,339	1,599,644	+/-5,961	1,539,374
TIME LEAVING HOME TO GO TO WORK					

Subject	Massachusetts				
	Total		Male		Female
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate
12:00 a.m. to 4:59 a.m.	2.8%	+/-0.1	4.0%	+/-0.1	1.6%
5:00 a.m. to 5:29 a.m.	2.9%	+/-0.1	4.1%	+/-0.1	1.7%
30 a.m. to 5:59 a.m.	4.0%	+/-0.1	5.3%	+/-0.1	2.7%
6:00 a.m. to 6:29 a.m.	8.1%	+/-0.1	9.7%	+/-0.2	6.4%
6:30 a.m. to 6:59 a.m.	9.9%	+/-0.1	10.6%	+/-0.2	9.2%
7:00 a.m. to 7:29 a.m.	14.6%	+/-0.1	14.8%	+/-0.2	14.3%
7:30 a.m. to 7:59 a.m.	12.5%	+/-0.1	10.9%	+/-0.2	14.1%
8:00 a.m. to 8:29 a.m.	13.6%	+/-0.2	12.0%	+/-0.2	15.3%
8:30 a.m. to 8:59 a.m.	6.9%	+/-0.1	5.6%	+/-0.1	8.3%
9:00 a.m. to 11:59 p.m.	24.6%	+/-0.2	22.9%	+/-0.3	26.4%
TRAVEL TIME TO WORK					
Less than 10 minutes	11.5%	+/-0.1	10.4%	+/-0.2	12.6%
10 to 14 minutes	12.8%	+/-0.1	11.7%	+/-0.2	14.0%
15 to 19 minutes	13.4%	+/-0.1	12.6%	+/-0.2	14.2%
20 to 24 minutes	13.2%	+/-0.2	12.8%	+/-0.2	13.7%
25 to 29 minutes	5.9%	+/-0.1	5.9%	+/-0.1	5.9%
30 to 34 minutes	14.1%	+/-0.1	14.5%	+/-0.2	13.7%
35 to 44 minutes	7.9%	+/-0.1	8.5%	+/-0.1	7.3%
45 to 59 minutes	9.9%	+/-0.1	10.7%	+/-0.2	9.1%
60 or more minutes	11.1%	+/-0.1	12.8%	+/-0.2	9.5%
Mean travel time to work (minutes)	28.3	+/-0.1	30.0	+/-0.1	26.6
VEHICLES AVAILABLE					
Workers 16 years and over in households	3,222,591	+/-7,804	1,648,211	+/-5,529	1,574,380
No vehicle available	5.8%	+/-0.1	5.6%	+/-0.2	6.0%
1 vehicle available	23.9%	+/-0.2	21.9%	+/-0.3	26.0%
2 vehicles available	43.5%	+/-0.3	44.9%	+/-0.3	42.1%
3 or more vehicles available	26.8%	+/-0.2	27.7%	+/-0.3	25.9%
PERCENT IMPUTED					
Means of transportation to work	7.7%	(X)	(X)	(X)	(X)
Private vehicle occupancy	8.6%	(X)	(X)	(X)	(X)
Place of work	10.3%	(X)	(X)	(X)	(X)
Time leaving home to go to work	16.2%	(X)	(X)	(X)	(X)
Travel time to work	11.4%	(X)	(X)	(X)	(X)
Vehicles available	1.1%	(X)	(X)	(X)	(X)

Subject	Massachusetts	Belmont CDP, Massachusetts			
	Female	Total		Male	
	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Workers 16 years and over	+/-5,192	12,564	+/-418	6,493	+/-299
MEANS OF TRANSPORTATION TO WORK					
Car, truck, or van	+/-0.2	70.8%	+/-2.5	69.7%	+/-3.3
Drove alone	+/-0.2	63.2%	+/-2.6	62.8%	+/-3.4
Carpooled	+/-0.2	7.6%	+/-1.7	6.8%	+/-1.7
In 2-person carpool	+/-0.1	6.3%	+/-1.4	5.3%	+/-1.3
In 3-person carpool	+/-0.1	0.8%	+/-0.6	0.9%	+/-0.7
In 4-or-more person carpool	+/-0.1	0.5%	+/-0.4	0.7%	+/-0.7
Workers per car, truck, or van	+/-0.01	1.06	+/-0.01	1.06	+/-0.02
Public transportation (excluding taxicab)	+/-0.2	14.7%	+/-1.9	14.8%	+/-2.4
Walked	+/-0.1	2.3%	+/-0.6	1.9%	+/-0.8
Bicycle	+/-0.1	1.6%	+/-0.6	2.4%	+/-0.9
Taxicab, motorcycle, or other means	+/-0.1	1.4%	+/-0.8	1.6%	+/-1.2
Worked at home	+/-0.1	9.2%	+/-1.3	9.7%	+/-1.9
PLACE OF WORK					
Worked in state of residence	+/-0.1	99.4%	+/-0.3	99.2%	+/-0.5
Worked in county of residence	+/-0.3	69.0%	+/-2.3	67.4%	+/-3.2
Worked outside county of residence	+/-0.2	30.5%	+/-2.3	31.8%	+/-3.1
Worked outside state of residence	+/-0.1	0.6%	+/-0.3	0.8%	+/-0.5
Living in a place	+/-0.2	100.0%	+/-0.3	100.0%	+/-0.5
Worked in place of residence	+/-0.2	20.6%	+/-2.3	18.9%	+/-3.1
Worked outside place of residence	+/-0.3	79.4%	+/-2.3	81.1%	+/-3.1
Not living in a place	+/-0.2	0.0%	+/-0.3	0.0%	+/-0.5
Living in 12 selected states	+/-0.1	100.0%	+/-0.3	100.0%	+/-0.5
Worked in minor civil division of residence	+/-0.3	20.6%	+/-2.3	18.9%	+/-3.1
Worked outside minor civil division of residence	+/-0.3	79.4%	+/-2.3	81.1%	+/-3.1
Not living in 12 selected states	+/-0.1	0.0%	+/-0.3	0.0%	+/-0.5
Workers 16 years and over who did not work at home	+/-5,017	11,402	+/-396	5,862	+/-293
TIME LEAVING HOME TO GO TO WORK					
12:00 a.m. to 4:59 a.m.	+/-0.1	1.0%	+/-0.5	1.2%	+/-0.8
5:00 a.m. to 5:29 a.m.	+/-0.1	1.3%	+/-0.7	1.8%	+/-1.0
5:30 a.m. to 5:59 a.m.	+/-0.1	1.3%	+/-0.6	2.1%	+/-1.0
6:00 a.m. to 6:29 a.m.	+/-0.1	5.6%	+/-1.3	7.0%	+/-2.0
6:30 a.m. to 6:59 a.m.	+/-0.2	4.8%	+/-0.8	5.0%	+/-1.2
7:00 a.m. to 7:29 a.m.	+/-0.2	16.5%	+/-1.7	18.6%	+/-2.6
7:30 a.m. to 7:59 a.m.	+/-0.2	17.2%	+/-1.9	18.1%	+/-2.7
8:00 a.m. to 8:29 a.m.	+/-0.2	18.6%	+/-2.7	16.7%	+/-2.9
8:30 a.m. to 8:59 a.m.	+/-0.2	11.6%	+/-1.7	11.0%	+/-2.0
9:00 a.m. to 11:59 p.m.	+/-0.3	22.2%	+/-2.5	18.3%	+/-3.0
TRAVEL TIME TO WORK					
Less than 10 minutes	+/-0.2	9.5%	+/-1.6	8.1%	+/-2.1
10 to 14 minutes	+/-0.2	10.6%	+/-1.6	10.6%	+/-2.0
15 to 19 minutes	+/-0.2	11.3%	+/-1.5	9.0%	+/-1.9
20 to 24 minutes	+/-0.2	14.1%	+/-1.7	11.9%	+/-2.1
25 to 29 minutes	+/-0.1	7.5%	+/-1.5	8.0%	+/-2.1
30 to 34 minutes	+/-0.2	19.3%	+/-1.8	20.7%	+/-2.6
35 to 44 minutes	+/-0.1	9.9%	+/-1.5	12.0%	+/-2.1
45 to 59 minutes	+/-0.2	10.7%	+/-1.6	11.1%	+/-2.0
60 or more minutes	+/-0.2	7.1%	+/-1.2	8.6%	+/-1.7
Mean travel time to work (minutes)	+/-0.1	27.6	+/-1.1	29.0	+/-1.2
VEHICLES AVAILABLE					
Workers 16 years and over in households	+/-5,023	12,560	+/-420	6,490	+/-299

Subject	Massachusetts	Belmont CDP, Massachusetts			
	Female	Total		Male	
	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
No vehicle available	+/-0.1	1.1%	+/-0.6	0.8%	+/-0.6
1 vehicle available	+/-0.3	25.2%	+/-2.7	24.3%	+/-3.1
2 vehicles available	+/-0.3	52.4%	+/-3.7	52.6%	+/-3.8
3 or more vehicles available	+/-0.3	21.3%	+/-3.2	22.4%	+/-3.4
PERCENT IMPUTED					
Means of transportation to work	(X)	5.1%	(X)	(X)	(X)
Private vehicle occupancy	(X)	6.4%	(X)	(X)	(X)
Place of work	(X)	6.5%	(X)	(X)	(X)
Time leaving home to go to work	(X)	12.6%	(X)	(X)	(X)
Travel time to work	(X)	6.9%	(X)	(X)	(X)
Vehicles available	(X)	0.7%	(X)	(X)	(X)

Subject	Belmont CDP, Massachusetts		ZCTA5 02478		
	Female		Total		Male
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate
Workers 16 years and over	6,071	+/-309	12,533	+/-415	6,477
MEANS OF TRANSPORTATION TO WORK					
Car, truck, or van	72.1%	+/-3.1	71.0%	+/-2.4	69.8%
Drove alone	63.6%	+/-3.1	63.4%	+/-2.6	63.0%
Carpooled	8.5%	+/-2.1	7.7%	+/-1.7	6.9%
In 2-person carpool	7.3%	+/-1.9	6.3%	+/-1.4	5.3%
In 3-person carpool	0.8%	+/-0.6	0.8%	+/-0.6	0.9%
In 4-or-more person carpool	0.3%	+/-0.3	0.5%	+/-0.4	0.7%
Workers per car, truck, or van	1.07	+/-0.02	1.06	+/-0.01	1.06
Public transportation (excluding taxicab)	14.5%	+/-2.5	14.7%	+/-1.9	14.8%
Walked	2.7%	+/-1.1	2.3%	+/-0.6	1.9%
Bicycle	0.7%	+/-0.5	1.5%	+/-0.6	2.4%
Taxicab, motorcycle, or other means	1.2%	+/-0.9	1.4%	+/-0.8	1.6%
Worked at home	8.7%	+/-1.7	9.1%	+/-1.3	9.5%
PLACE OF WORK					
Worked in state of residence	99.7%	+/-0.4	99.4%	+/-0.3	99.2%
Worked in county of residence	70.6%	+/-2.8	68.9%	+/-2.4	67.3%
Worked outside county of residence	29.1%	+/-2.8	30.6%	+/-2.3	31.8%
Worked outside state of residence	0.3%	+/-0.4	0.6%	+/-0.3	0.8%
Living in a place	100.0%	+/-0.6	100.0%	+/-0.3	100.0%
Worked in place of residence	22.5%	+/-2.9	20.6%	+/-2.3	18.7%
Worked outside place of residence	77.5%	+/-2.9	79.4%	+/-2.3	81.3%
Not living in a place	0.0%	+/-0.6	0.0%	+/-0.3	0.0%
Living in 12 selected states	100.0%	+/-0.6	100.0%	+/-0.3	100.0%
Worked in minor civil division of residence	22.5%	+/-2.9	20.6%	+/-2.3	18.7%
Worked outside minor civil division of residence	77.5%	+/-2.9	79.4%	+/-2.3	81.3%
Not living in 12 selected states	0.0%	+/-0.6	0.0%	+/-0.3	0.0%
Workers 16 years and over who did not work at home	5,540	+/-305	11,387	+/-396	5,862
TIME LEAVING HOME TO GO TO WORK					
12:00 a.m. to 4:59 a.m.	0.8%	+/-0.6	1.0%	+/-0.5	1.2%
5:00 a.m. to 5:29 a.m.	0.7%	+/-0.6	1.3%	+/-0.7	1.8%
5:30 a.m. to 5:59 a.m.	0.5%	+/-0.5	1.3%	+/-0.6	2.1%
6:00 a.m. to 6:29 a.m.	4.0%	+/-1.5	5.6%	+/-1.3	7.0%
6:30 a.m. to 6:59 a.m.	4.6%	+/-1.2	4.8%	+/-0.8	5.0%
7:00 a.m. to 7:29 a.m.	14.2%	+/-2.4	16.5%	+/-1.7	18.6%
7:30 a.m. to 7:59 a.m.	16.1%	+/-2.5	17.2%	+/-1.9	18.1%
8:00 a.m. to 8:29 a.m.	20.5%	+/-3.6	18.6%	+/-2.7	16.7%
8:30 a.m. to 8:59 a.m.	12.2%	+/-2.5	11.5%	+/-1.7	11.0%
9:00 a.m. to 11:59 p.m.	26.3%	+/-3.4	22.2%	+/-2.5	18.3%
TRAVEL TIME TO WORK					
Less than 10 minutes	11.0%	+/-2.2	9.6%	+/-1.6	8.1%
10 to 14 minutes	10.6%	+/-2.3	10.6%	+/-1.6	10.6%
15 to 19 minutes	13.7%	+/-2.1	11.3%	+/-1.5	9.0%
20 to 24 minutes	16.5%	+/-2.5	14.1%	+/-1.7	11.9%
25 to 29 minutes	7.0%	+/-1.7	7.4%	+/-1.5	8.0%
30 to 34 minutes	17.8%	+/-2.8	19.3%	+/-1.8	20.7%
35 to 44 minutes	7.6%	+/-1.7	9.9%	+/-1.5	12.0%
45 to 59 minutes	10.2%	+/-2.1	10.7%	+/-1.6	11.1%
60 or more minutes	5.5%	+/-1.6	7.1%	+/-1.2	8.6%
Mean travel time to work (minutes)	26.1	+/-1.5	27.6	+/-1.1	29.0
VEHICLES AVAILABLE					
Workers 16 years and over in households	6,070	+/-310	12,529	+/-417	6,474

Subject	Belmont CDP, Massachusetts		ZCTA5 02478		
	Female		Total		Male
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate
No vehicle available	1.4%	+/-0.9	1.1%	+/-0.6	0.8%
1 vehicle available	26.3%	+/-3.3	25.3%	+/-2.7	24.3%
2 vehicles available	52.2%	+/-4.2	52.5%	+/-3.7	52.7%
3 or more vehicles available	20.1%	+/-3.8	21.1%	+/-3.2	22.2%
PERCENT IMPUTED					
Means of transportation to work	(X)	(X)	5.1%	(X)	(X)
Private vehicle occupancy	(X)	(X)	6.4%	(X)	(X)
Place of work	(X)	(X)	6.5%	(X)	(X)
Time leaving home to go to work	(X)	(X)	12.6%	(X)	(X)
Travel time to work	(X)	(X)	6.9%	(X)	(X)
Vehicles available	(X)	(X)	0.7%	(X)	(X)

Subject	ZCTA5 02478		
	Male	Female	
	Margin of Error	Estimate	Margin of Error
Workers 16 years and over	+/-298	6,056	+/-309
MEANS OF TRANSPORTATION TO WORK			
Car, truck, or van	+/-3.3	72.3%	+/-3.1
Drove alone	+/-3.4	63.8%	+/-3.1
Carpooled	+/-1.7	8.5%	+/-2.1
In 2-person carpool	+/-1.3	7.3%	+/-1.9
In 3-person carpool	+/-0.7	0.8%	+/-0.6
In 4-or-more person carpool	+/-0.7	0.3%	+/-0.3
Workers per car, truck, or van	+/-0.02	1.07	+/-0.02
Public transportation (excluding taxicab)	+/-2.4	14.6%	+/-2.5
Walked	+/-0.8	2.7%	+/-1.1
Bicycle	+/-0.9	0.5%	+/-0.3
Taxicab, motorcycle, or other means	+/-1.2	1.2%	+/-0.9
Worked at home	+/-1.9	8.8%	+/-1.7
PLACE OF WORK			
Worked in state of residence	+/-0.5	99.7%	+/-0.4
Worked in county of residence	+/-3.2	70.5%	+/-2.8
Worked outside county of residence	+/-3.1	29.2%	+/-2.8
Worked outside state of residence	+/-0.5	0.3%	+/-0.4
Living in a place	+/-0.5	100.0%	+/-0.6
Worked in place of residence	+/-3.1	22.6%	+/-2.9
Worked outside place of residence	+/-3.1	77.4%	+/-2.9
Not living in a place	+/-0.5	0.0%	+/-0.6
Living in 12 selected states	+/-0.5	100.0%	+/-0.6
Worked in minor civil division of residence	+/-3.1	22.6%	+/-2.9
Worked outside minor civil division of residence	+/-3.1	77.4%	+/-2.9
Not living in 12 selected states	+/-0.5	0.0%	+/-0.6
Workers 16 years and over who did not work at home	+/-293	5,525	+/-304
TIME LEAVING HOME TO GO TO WORK			
12:00 a.m. to 4:59 a.m.	+/-0.8	0.8%	+/-0.6
5:00 a.m. to 5:29 a.m.	+/-1.0	0.7%	+/-0.6
5:30 a.m. to 5:59 a.m.	+/-1.0	0.5%	+/-0.5
6:00 a.m. to 6:29 a.m.	+/-2.0	4.1%	+/-1.5
6:30 a.m. to 6:59 a.m.	+/-1.2	4.6%	+/-1.2
7:00 a.m. to 7:29 a.m.	+/-2.6	14.2%	+/-2.4
7:30 a.m. to 7:59 a.m.	+/-2.7	16.2%	+/-2.5
8:00 a.m. to 8:29 a.m.	+/-2.9	20.6%	+/-3.6
8:30 a.m. to 8:59 a.m.	+/-2.0	12.0%	+/-2.5
9:00 a.m. to 11:59 p.m.	+/-3.0	26.3%	+/-3.4
TRAVEL TIME TO WORK			
Less than 10 minutes	+/-2.1	11.1%	+/-2.2
10 to 14 minutes	+/-2.0	10.6%	+/-2.3
15 to 19 minutes	+/-1.9	13.8%	+/-2.1
20 to 24 minutes	+/-2.1	16.5%	+/-2.5
25 to 29 minutes	+/-2.1	6.7%	+/-1.6
30 to 34 minutes	+/-2.6	17.9%	+/-2.8
35 to 44 minutes	+/-2.1	7.7%	+/-1.7
45 to 59 minutes	+/-2.0	10.3%	+/-2.1
60 or more minutes	+/-1.7	5.5%	+/-1.6
Mean travel time to work (minutes)	+/-1.2	26.1	+/-1.5
VEHICLES AVAILABLE			
Workers 16 years and over in households	+/-299	6,055	+/-309

Subject	ZCTA5 02478		
	Male	Female	
	Margin of Error	Estimate	Margin of Error
No vehicle available	+/-0.6	1.4%	+/-0.9
1 vehicle available	+/-3.1	26.4%	+/-3.3
2 vehicles available	+/-3.8	52.3%	+/-4.2
3 or more vehicles available	+/-3.4	19.9%	+/-3.8
PERCENT IMPUTED			
Means of transportation to work	(X)	(X)	(X)
Private vehicle occupancy	(X)	(X)	(X)
Place of work	(X)	(X)	(X)
Time leaving home to go to work	(X)	(X)	(X)
Travel time to work	(X)	(X)	(X)
Vehicles available	(X)	(X)	(X)

Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. The value shown here is the 90 percent margin of error. The margin of error can be interpreted roughly as providing a 90 percent probability that the interval defined by the estimate minus the margin of error and the estimate plus the margin of error (the lower and upper confidence bounds) contains the true value. In addition to sampling variability, the ACS estimates are subject to nonsampling error (for a discussion of nonsampling variability, see Accuracy of the Data). The effect of nonsampling error is not represented in these tables.

The 12 selected states are Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Wisconsin.

Workers include members of the Armed Forces and civilians who were at work last week.

While the 2010-2014 American Community Survey (ACS) data generally reflect the February 2013 Office of Management and Budget (OMB) definitions of metropolitan and micropolitan statistical areas; in certain instances the names, codes, and boundaries of the principal cities shown in ACS tables may differ from the OMB definitions due to differences in the effective dates of the geographic entities.

Estimates of urban and rural population, housing units, and characteristics reflect boundaries of urban areas defined based on Census 2010 data. As a result, data for urban and rural areas from the ACS do not necessarily reflect the results of ongoing urbanization.

Source: U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates

Explanation of Symbols:

1. An '***' entry in the margin of error column indicates that either no sample observations or too few sample observations were available to compute a standard error and thus the margin of error. A statistical test is not appropriate.
2. An '-' entry in the estimate column indicates that either no sample observations or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest interval or upper interval of an open-ended distribution.
3. An '-' following a median estimate means the median falls in the lowest interval of an open-ended distribution.
4. An '+' following a median estimate means the median falls in the upper interval of an open-ended distribution.
5. An '****' entry in the margin of error column indicates that the median falls in the lowest interval or upper interval of an open-ended distribution. A statistical test is not appropriate.
6. An '*****' entry in the margin of error column indicates that the estimate is controlled. A statistical test for sampling variability is not appropriate.
7. An 'N' entry in the estimate and margin of error columns indicates that data for this geographic area cannot be displayed because the number of sample cases is too small.
8. An '(X)' means that the estimate is not applicable or not available.



GeoInsight®

Environmental Strategy & Engineering

October 13, 2017

GeoInsight Project 6484-000

Joseph M. Noone, Esq.
Avery, Dooley, & Noone, LLP
3 Brighton Street
Belmont, MA 02478

RE: Remediation System Space Requirements
Former Getty Service Station No. 30339
350 Pleasant Street, Belmont, Massachusetts
Release Tracking Number (RTN): 3-29709

Dear Attorney Noone,

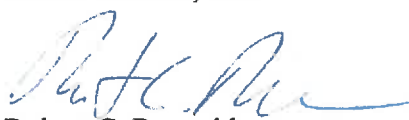
GeoInsight, Inc. (GeoInsight) prepared this letter at the request of Getty Properties Corp. (Getty) for the former Getty Service Station No. 30339 located at 350 Pleasant Street in Belmont, Massachusetts (the Property).

GeoInsight currently operates a remediation system that extracts and treats soil vapors at the Property. The remediation system is located inside a wheeled trailer that is currently located near the eastern side of the existing building. As part of the proposed redevelopment activities, the remediation system will be relocated to the southwestern corner of the Property.


This letter is to confirm that the remediation system trailer will occupy one parking space on the Property after the redevelopment activities are completed. Other remedial system components (e.g., piping manifold, vapor treatment units) will be located in the proposed landscaped area in the southwest corner of the Property and will not occupy or infringe upon other parking spaces.

If you have questions regarding this letter, please contact either of us at (978) 679-1600.

Sincerely,
GEOINSIGHT, INC.



Robert C. Reynolds
Project Engineer



Kevin D. Trainer, C.P.G., P.G., L.S.P.
Senior Associate

GeoInsight, Inc.
186 Granite Street, 3rd Floor, Suite A
Manchester, NH 03101-2643
Tel (603) 314-0820
Fax (603) 314-0821
www.geoinsight.com

GeoInsight, Inc.
One Monarch Drive, Suite 201
Littleton, MA 01460-1440
Tel (978) 679-1600
Fax (978) 679-1601
www.geoinsight.com

GeoInsight, Inc.
200 Court Street, 2nd Floor
Middletown, CT 06457-3341
Tel (860) 894-1022
Fax (860) 894-1023
www.geoinsight.com

EXHIBIT I

Design Consultants, Inc.

120 Middlesex Avenue
Somerville, MA 02145
(617) 776-3350

MEMORANDUM

DCI JOB NO. 2014-078

TO: Belmont Pleasant Street LLC
517 Concord Avenue
Cambridge, MA 02138

FROM: Tom Bertulis, P.E., PTOE
Design Consultants, Inc.

SUBJECT: Response to Comments Memorandum
344 Pleasant Street
Belmont, MA

DATE: August 1, 2017

In response to the comments from the Belmont Planning Board dated July 26th, 2017 of the submitted Traffic Impact and Access Study ("TIAS") dated February 2017, the subsequent pages include DCI's responses to the comments.

- A. Actually, the traffic study on the proposed impact of the new development is generally reasonable. The projections are based on two scenarios- a Dunkin Donuts with two retail stores or a family restaurant with two stores. I believe that they use an apparel store and the other uses. This (a clothing store) is probably the least traffic impact that a use could have. What would happen if the secondary use was not an apparel store, as used in the Traffic Study? Suppose it was a more intense use with more traffic?

Comments: *Using the clothing store and apparel store as the secondary uses, there was indeed minimal traffic impact, and many of the resulting delays increased by less than a second. However, even with more intense uses with more traffic, the increases would not be significant. Given the time constraints, it was not possible to build new traffic models for every scenario. However, an engineering estimation of the more intense uses as set below shows that most of the other possible uses do not negatively impact the level of service and result in only very insignificant increases in delay.*

- B. Suppose it was a convenience store (most likely if the DD did not go into the space)? How would that affect traffic since there are no immediate convenience stores nearby except the small one in the nearby gas station? How would the traffic change during the day?

Comments: DCI calculated the number of trips associated with a convenience store alternative. The original trip generation calculations are shown below. A 51% pass-by trip percentage was assumed for LUC 851, which is consistent with the ITE Trip Generation Handbook, 3rd Edition. The tables below show both the calculations for a 24-hour convenience store and a 15-16 hour convenience store.

Using Land Use Code 851 (24-hour Convenience Store)

Land Use Code: 851	24-Hour Convenience	
	AM Peak Hour	PM Peak Hour
Size (per 1000sqft)	1.500	1.500
multiply by	73.1	53.42
Total Trips	110	80
Deduct 51% Pass-By Trips	54	39

Land Use Code: 826	Specialty Retail	
	AM Peak Hour	PM Peak Hour
Size (per 1000 sf Occ. Gr. Leasable Area)	1.747	1.747
Average Rate	6.84	2.71
Total Trips	12	5

Comparison of Land Uses		
	AM Peak Hour	PM Peak Hour
Auto Repair Shop	5	6
Proposed (Store + General Retail)	66	44
Difference	61	38

Comparison of Land Uses		
	AM Peak Hour	PM Peak Hour
Former Land Use (Gas Station)	38	55
Proposed (Store + General Retail)	66	44
Difference	28	-11

As shown above, the 24-hour convenience store alternative, combined with a land use for general retail, would result in 61 more trips during the morning peak hour and 38 more trips during the evening peak hour as compared to an Auto Repair Shop. This represents approximately one trip per minute during each peak hour. As shown in the subsequent table, the additional trips, when compared to an Auto Repair Shop, represent a total of 3.54% and 2.00% of existing traffic at Pleasant Street and Brighton Street during the morning (1722 vph) and evening (1902 vph) peak hours, respectively. Additionally, as compared to the most recent use, a Gas Station, this alternative is expected to generate 28 more trips during the morning peak hour and 11 fewer trips during the evening peak hour. The 28 additional trips during the morning peak hour represent 1.63% of the existing traffic at Pleasant Street and Brighton Street. Neither scenario will significantly increase the delay per vehicle on the traffic network.

Comparison with Auto Repair Shop	AM Peak Hour	PM Peak Hour
Existing Traffic - Pleasant St. and Brighton St.	1722	1902
Proposed Generated Trips	61	38
% of Existing Traffic	3.54%	2.00%

Comparison with Gas Station	AM Peak Hour	PM Peak Hour
Existing Traffic - Pleasant St. and Brighton St.	1722	1902
Proposed Generated Trips	28	-11
% of Existing Traffic	1.63%	-0.58%

Using Land Use Code 852 (15-16 hour Convenience Store)

DCI then calculated the total number of trips that are expected to be generated by LUC 852, which represents a convenience store that is only open 15-16 hours per day. The trip generation calculations are shown below. Similarly to LUC 852, a 51% pass-by trip percentage was assumed, consistent with ITE.

Land Use Code: 852	16-Hour Convenience	
	AM Peak Hour	PM Peak Hour
Size (per 1000sqft)	1.500	1.500
multiply by	32.60	36.22
Total Trips	49	54
Deduct 51% Pass-By Trips	24	27

Land Use Code: 826		Specialty Retail	
	AM Peak Hour	PM Peak Hour	
Size (per 1000 sf Occ. Gr. Leasable Area)	1.747	1.747	
Average Rate	6.84	2.71	
Total Trips	12	5	

Comparison of Land Uses		
	AM Peak Hour	PM Peak Hour
Auto Repair Shop	5	6
Proposed (Store + General Retail)	36	32
Difference	31	26

Comparison of Land Uses		
	AM Peak Hour	PM Peak Hour
Former Land Use (Gas Station)	38	55
Proposed (Store + General Retail)	36	32
Difference	-2	-23

As shown above, the 15-16 hour convenience store alternative, combined with a land use for general retail, would result in 31 more trips during the morning peak hour and 26 more trips during the evening peak hour as compared to an Auto Repair Shop. This represents approximately one trip per every two minutes during each peak hour. As shown in the subsequent table, this represents a total of less than 2% of existing traffic at Pleasant Street and Brighton Street during the morning (1722 vph) and evening (1902 vph) peak hours, respectively, which will not increase the delay per vehicle on the traffic network. Additionally, as compared to the last use, a Gas Station, this scenario would generate two (2) fewer trips during the morning peak hour and 23 fewer trips during the evening peak hour, resulting in a reduction of vehicles and delay per vehicle on the traffic network during the peak hours. This results in a net zero number of new trips, and it is expected that the overall delay per vehicle will decrease. Neither scenario will significantly affect the delay per vehicle on the traffic network.

Comparison with Auto Repair Shop	AM Peak Hour	PM Peak Hour
Existing Traffic - Pleasant St. and Brighton St.	1722	1902
Proposed Generated Trips	31	26
% of Existing Traffic	1.80%	1.37%

Comparison with Gas Station	AM Peak Hour	PM Peak Hour
Existing Traffic - Pleasant St. and Brighton St.	1722	1902
Proposed Generated Trips	-2	-23
% of Existing Traffic	-0.12%	-1.21%

The previous tables show the percentage of existing traffic the proposed development would generate.

- C. If it was a family restaurant, how would it change the traffic pattern/volumes in terms of time of day? More at lunchtime? More at night?

Comments: *A family restaurant could potentially increase the lunchtime trips and trips at night after the evening rush hour. However, a family restaurant would not likely add significant increases in delay to the traffic network.*

- D. Given heavy morning time usage if a DD, how does this affect the traffic turning pattern heading south toward Belmont Center? How many left hand turns into the lot? Does this slow traffic? Would these cars have turned onto Brighton Street?

Comments: *This does not slow traffic because the vehicles pulling into the proposed development will likely take advantage of the traffic signal, turning left onto Brighton Street and then right into the proposed lot. That would minimize any disruption to the traffic flow on Pleasant Street.*

Depending on which scenario was used, during the morning peak hour, there might be only one left-turn every two minutes, which would not significantly impact traffic along Pleasant Street.

- E. As the traffic moves through the lot, does this clog up the Brighton Street intersection?

Comments: *As designed, the parking lot has aisles that are wide enough to accommodate two-way movements into and out of the site. Vehicles will have room to maneuver around the site parking lot without affecting traffic entering or exiting onto the adjacent roadways.*

In the most conservative model that DCI has analyzed, there would be approximately two (2) vehicle-movements per minute, on average. During the evening peak hour, there would be one vehicle-movement per minute, on average. Neither scenario will cause the intersection at Brighton Street to clog up.

- F. In addition, the Study makes the assumption that because there are a number of DDs in the area that this reduces the trip generation specifically to the site. However, the DD stores cited are on Mass Ave in Arlington, Concord Ave at Fresh Pond – these are not natural destinations for cars going to the Alewife T from Pleasant Street. The DD stores

in Belmont are in Waverley, which is not a convenient in and out, and Trapelo Road at White Street which only works if you are going from Pleasant Street all the way down and then up Trapelo Road to Mt Auburn. Given the traffic patterns (density, speed, etc.)- it wouldn't be unreasonable for someone going from Waverley Square to skip the one on Church Street and do the easier in/out on Pleasant Street. If you begin to play with these assumptions, there may be some additional trip generation? What might the traffic look like with a reduction at 70% or 60%?

Comments: DCI calculated the number of trips associated with the potential use as a Dunkin Donuts if the percentage of pass-by trips was reduced to 60%. As shown in the subsequent tables, that use would generate 41 trips during the morning peak hour and 19 trips during the evening peak hour, even before taking any credit for the land uses on-site. Comparing it to the previous gas station, this results in only three (3) additional trips during the morning peak hour, which represents 0.20% of existing traffic, and a **net zero number of new trips** for the proposed project. As compared to an Auto Repair Shop, it results in 36 net new trips during the morning peak hour and 13 net new trips during the evening peak hour. Each scenario represents an increase of less than one trip per minute, on average, which will not cause a significant increase in delay.

Proposed Trip Generation

Land Use Code: 936		Coffee/Donut Shop	
	AM Peak Hour	PM Peak Hour	
Size (per 1000sqft)	1.500	1.500	
multiply by	64.21	25.81	
Total Trips	96	39	
Deduct 60% Pass-By Trips	39	15	

Land Use Code: 876		Apparel Store	
	AM Peak Hour	PM Peak Hour	
Size (per 1000sqft)	0.746	0.746	
multiply by	1.00	3.83	
Total Trips	1	3	

Land Use Code: 918		Hair Salon	
	AM Peak Hour	PM Peak Hour	
Size (per 1000sqft)	1.001	1.001	
multiply by	1.21	1.45	
Total Trips	1	1	

Comparison to Former Gas Station

Net New Trips		
	AM Peak Hour	PM Peak Hour
Prior Land Use (Gas Station)	38	55
Proposed (incl. Dunkin Donuts)	41	19
Difference	3	-36

Comparison to an Auto Repair Shop

Comparison of Land Uses		
	AM Peak Hour	PM Peak Hour
Current Land Use (Auto Repair Shop)	5	6
Proposed (incl. Dunkin Donuts)	41	19
Difference	36	13

- G. Use of an Auto Repair Shop, a Gas Station as the former land use, and the proposed use as General Retail.

Comments: *As shown above in the response to question (F), even when the use of an Auto Repair Shop as the existing land use instead of a Gas Station is considered, there are still only an estimated 36 AM peak hour trips and 13 PM peak hour trips. As mentioned above, each scenario translates into an increase of less than one trip per minute, on average, which will not cause a significant increase in delay. Using the Gas Station as the previous use, it correlates to a net zero number of new trips for the proposed use, which would result in no increase in delay for motor vehicles.*

Previous Gas Station

As mentioned, there was previously a Gas Station on site that had eight (8) fueling stations. The gas station was the previous active use on the site. In order to compare the proposed Project with the previous Gas Station, the trips associated with this land use were calculated using the Trip Generation Manual, using LUC 945 – Gas Station with Convenience Market, and is shown in the subsequent table.

Land Use Code: 945		Gasoline/Service Station	
	AM Peak Hour	PM Peak Hour	
Size (Vehicle Fueling Stations)	8.0	8.0	
multiply by	12.58	15.65	
Total Trips	100	126	
Deduct 62% AM, 56% PM Pass-By Trips	38	55	

As can be seen, the Gas Station generated 38 trips during the morning peak hour and 55 trips during the evening peak hour.

As compared to the Gas Station, it is expected that the proposed Project will generate 16 fewer trips during the morning peak hour and 46 fewer trips during the evening peak hour. The subsequent table shows the comparison of the proposed Project with the previous Gas Station.

Comparison of Land Uses		
	AM Peak Hour	PM Peak Hour
Prior Land Use (Gas Station)	38	55
Proposed (General Retail)	22	9
Difference	-16	-46

Auto Repair Shop

In order to compare the proposed Project with an auto repair shop, the trips associated with this land use were calculated using the Trip Generation Manual, using LUC 942 – Automobile Care Center, and is shown in the subsequent table.

Land Use Code: 942		Auto Repair Shop	
	AM Peak Hour	PM Peak Hour	
Size (per 1000 sf Occ. Gr. Leasable Area)	2.004	2.004	
multiply by	2.25	3.11	
Total Trips	5	6	

As can be seen, the Auto Repair Shop generates five (5) trips during the morning peak hour and six (6) trips during the evening peak hour.

As compared to the auto repair shop, it is expected that the proposed Project, will generate 17 more trips during the morning peak hour and three (3) more trips during the evening peak hour. These trips represent 0.99% and 0.16%, less than 1%, of the existing traffic during the morning and evening peak hours at the intersection of Pleasant Street and

Brighton Street, respectively. The subsequent table shows the comparison of the proposed Project with an auto repair shop, as well as the percent of existing traffic.

Comparison of Land Uses		
	AM Peak Hour	PM Peak Hour
Current Land Use (Auto Repair Shop)	5	6
Proposed (General Retail)	22	9
Difference	17	3
% of Existing Traffic	0.99%	0.16%

Using these morning peak and evening peak hour trips, DCI analyzed the intersections for any increase in delay. The delays were calculated using Synchro 9.0, and were input into a table. The corresponding levels of service were then applied to each movement and the overall intersections. The subsequent table shows the levels of service during the Existing, No-Build, and Build scenarios for the alternative listed above. The trips associated with the project were added during the Build scenario.

Delay Summary – Morning Peak Hour

ID	East-West Road	North-South Road	Lane	AM Peak Hour		
				No-Build	Build	Difference
				Avg. delay / veh (s)	Avg. delay / veh (s)	Avg. delay / veh (s)
1	Pleasant Street	Lake Street/ Frontage Road	SB L	56.9	56.9	0.0
			SB T	58.6	58.6	0.0
			SB R	24.8	25.3	0.5
			NB L	40.2	40.2	0.0
			NB R	12.9	12.9	0.0
			EB TR	21.9	21.9	0.0
			WB L	18.6	18.6	0.0
			WB T	13.9	14	0.1
			Overall	27.0	27.1	0.1
2	Pleasant Street	Brighton Street	SB LTR	12.3	12.3	0.0
			NB LT	14.8	14.8	0.0
			NB R	4.1	4.1	0.0
			EB LTR	22.7	22.7	0.0
			WB L	56.0	57.1	1.1
			WB TR	17.0	17.1	0.1
			Overall	24.6	24.9	0.3
3	Cross St	Brighton Street	SB LTR	14.8	14.8	0.0
			NB LTR	13.9	13.9	0.0
			EB LTR	25.8	25.8	0.0
			WB LTR	108.5	108.5	0.0
			Overall	37.0	37	0.0

No Build contains the Auto Repair Shop trips

Build contains General Retail trips minus the Auto Repair Shop trips

Delay Summary – Evening Peak Hour

ID	East-West Road	North-South Road	Lane	PM Peak Hour		
				No-Build	Build	Difference
				Avg. delay / veh (s)	Avg. delay / veh (s)	Avg. delay / veh (s)
1	Pleasant Street	Lake Street/ Frontage Road	SB L	49.2	49.2	0.0
			SB T	48.6	48.6	0.0
			SB R	18.7	19	0.3
			NB L	40.5	40.5	0.0
			NB R	61.9	61.9	0.0
			EB TR	22.0	22	0.0
			WB L	12.3	12.3	0.0
			WB T	12.2	12.2	0.0
			Overall	29.2	29.2	0.0
2	Pleasant Street	Brighton Street	SB LTR	12.6	12.6	0.0
			NB LT	15.2	15.2	0.0
			NB R	4.5	4.5	0.0
			EB LTR	32.1	32.2	0.1
			WB L	>120	>120	0.0
			WB TR	13.9	14	0.1
			Overall	66.4	67.6	1.2
3	Cross St	Brighton Street	SB LTR	15.3	15.3	0.0
			NB LTR	48.5	49	0.5
			EB LTR	36.3	36.3	0.0
			WB LTR	>120	>120	0.0
			Overall	51.7	51.9	0.2

No Build contains the Auto Repair Shop trips

Build contains General Retail trips minus the Auto Repair Shop trips

As can be seen from the tables, there are minimal increases in delay going from the No-Build to Build scenarios. On average, the movements and overall intersection increase 0.1 seconds per vehicle during the morning peak hour and 0.1 seconds per vehicle during the evening peak hour. This represents a lack of impact from the proposed alternative, General Retail vs an Auto Repair Shop.

EXHIBIT J



GeoInsight®

Environmental Strategy & Engineering

October 13, 2017

GeoInsight Project 6484-000

Joseph M. Noone, Esq.
Avery, Dooley, & Noone, LLP
3 Brighton Street
Belmont, MA 02478

RE: Remediation System Space Requirements
Former Getty Service Station No. 30339
350 Pleasant Street, Belmont, Massachusetts
Release Tracking Number (RTN): 3-29709

Dear Attorney Noone,

GeoInsight, Inc. (GeoInsight) prepared this letter at the request of Getty Properties Corp. (Getty) for the former Getty Service Station No. 30339 located at 350 Pleasant Street in Belmont, Massachusetts (the Property).

GeoInsight currently operates a remediation system that extracts and treats soil vapors at the Property. The remediation system is located inside a wheeled trailer that is currently located near the eastern side of the existing building. As part of the proposed redevelopment activities, the remediation system will be relocated to the southwestern corner of the Property.

This letter is to confirm that the remediation system trailer will occupy one parking space on the Property after the redevelopment activities are completed. Other remedial system components (e.g., piping manifold, vapor treatment units) will be located in the proposed landscaped area in the southwest corner of the Property and will not occupy or infringe upon other parking spaces.

If you have questions regarding this letter, please contact either of us at (978) 679-1600.

Sincerely,
GEOINSIGHT, INC.

Robert C. Reynolds
Project Engineer

Kevin D. Trainer, C.P.G., P.G., L.S.P.
Senior Associate

GeoInsight, Inc.
186 Granite Street, 3rd Floor, Suite A
Manchester, NH 03101-2643
Tel (603) 314-0820
Fax (603) 314-0821
www.geoinsight.com

GeoInsight, Inc.
One Monarch Drive, Suite 201
Littleton, MA 01460-1440
Tel (978) 679-1600
Fax (978) 679-1601
www.geoinsight.com

GeoInsight, Inc.
200 Court Street, 2nd Floor
Middletown, CT 06457-3341
Tel (860) 894-1022
Fax (860) 894-1023
www.geoinsight.com

EXHIBIT K



GeoInsight®

Environmental Strategy & Engineering

July 18, 2017

GeoInsight Project 6484-000

Joseph M. Noone, Esq.
Avery, Dooley, & Noone, LLP
3 Brighton Street
Belmont, MA 02478

RE: Proposed Redevelopment Activities
Former Getty Service Station No. 30339
350 Pleasant Street, Belmont, Massachusetts
Release Tracking Number (RTN): 3-29709

Dear Attorney Noone,

GeoInsight, Inc. (GeoInsight) prepared this letter at the request of Getty Properties Corp. (Getty) for the former Getty Service Station No. 30339 located at 350 Pleasant Street in Belmont, Massachusetts (the Property).

GeoInsight is currently conducting response actions in response to a release of gasoline at the Property under MADEP RTN #3-29709. These response actions include the current operation of a remediation system that extracts and treats soil vapors, and periodic sampling of groundwater from on-site and off-site monitoring wells. A description of response actions conducted at the Property can be obtained from reports that are publicly-available at the eDEP website (<http://public.dep.state.ma.us/SearchableSites2/Search.aspx>), including the most recent Status Report dated March 31, 2017, prepared by GeoInsight on behalf of Getty.

GeoInsight understands that redevelopment activities are proposed for the Property. It is our understanding that:

- the existing canopy, pump island foundations, and service station building will be demolished and removed;
- a new slab-on-grade building will be constructed on the western portion of the Property;
- an asphalt-paved parking lot and landscaped areas will be located on the eastern portion of the Property; and
- new subsurface utilities will be connected to the proposed building.

GeoInsight, Inc.
186 Granite Street, 3rd Floor, Suite A
Manchester, NH 03101-2643
Tel (603) 314-0820
Fax (603) 314-0821
www.geoinsight.com

GeoInsight, Inc.
One Monarch Drive, Suite 201
Littleton, MA 01460-1440
Tel (978) 679-1600
Fax (978) 679-1601
www.geoinsight.com

GeoInsight, Inc.
200 Court Street, 2nd Floor
Middletown, CT 06457-3341
Tel (860) 894-1022
Fax (860) 894-1023
www.geoinsight.com



Based on our discussions, it is not anticipated that redevelopment activities will impair the environmental remediation of the Property, and the following activities will be completed during redevelopment so that response actions can continue at the Property:

- the remediation system treatment components and subsurface piping will be re-located to the northwestern side of the Property;
- monitoring wells damaged or destroyed during construction will be replaced in consultation with GeoInsight; and
- as appropriate, gasoline-impacted soil encountered during excavation activities will be properly managed in accordance with the Massachusetts Contingency Plan (MCP; 310 CMR 40.0000).

Getty will continue to conduct response actions associated with the gasoline release at the Property in accordance with the MCP. If you have questions regarding this letter, please contact either of us at (978) 679-1600.

Sincerely,
GEOINSIGHT, INC.

Robert C. Reynolds
Project Engineer

Kevin D. Trainer, P.G., L.S.P.
Senior Associate

