TRAFFIC AND PARKING ASSESSMENT

PROPOSED MIXED-USE DEVELOPMENT

181-197 WASHINGTON STREET

SOMERVILLE, MA

JUNE 2012

REVISED APRIL 2013

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TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY …….…..……... 1
2.0 INTRODUCTION …….…….…… 2
3.0 EXISTING CONDITIONS …….…… 2
4.0 PROPOSED DEVELOPMENT …….……...….. 3
5.0 ROADWAY NETWORK …….……....…….. 5
6.0 TRAFFIC VOLUMES ……...……...…….. 8
7.0 PUBLIC TRANSIT ……..……... 9
8.0 ACCIDENT EXPERIENCE …….. 10
9.0 PARKING …….……..…….….. 10
10.0 TRIP GENERATION/DISTRIBUTION …….…… 15
11.0 TRAFFIC IMPACTS/CAPACITY ANALYSES …… 19
12.0 OFF-SITE IMPROVEMENTS ……..…….. 22

List of Figures

Figure 1 – Site Plan
Figure 2 – On-Street Parking Study Area

1.0 EXECUTIVE SUMMARY

DCI has examined the traffic and parking impacts of the proposed mixed-use development to be located at 181 and 197 Washington Street in Somerville, MA. Following is a summary of the results and conclusion of this effort.

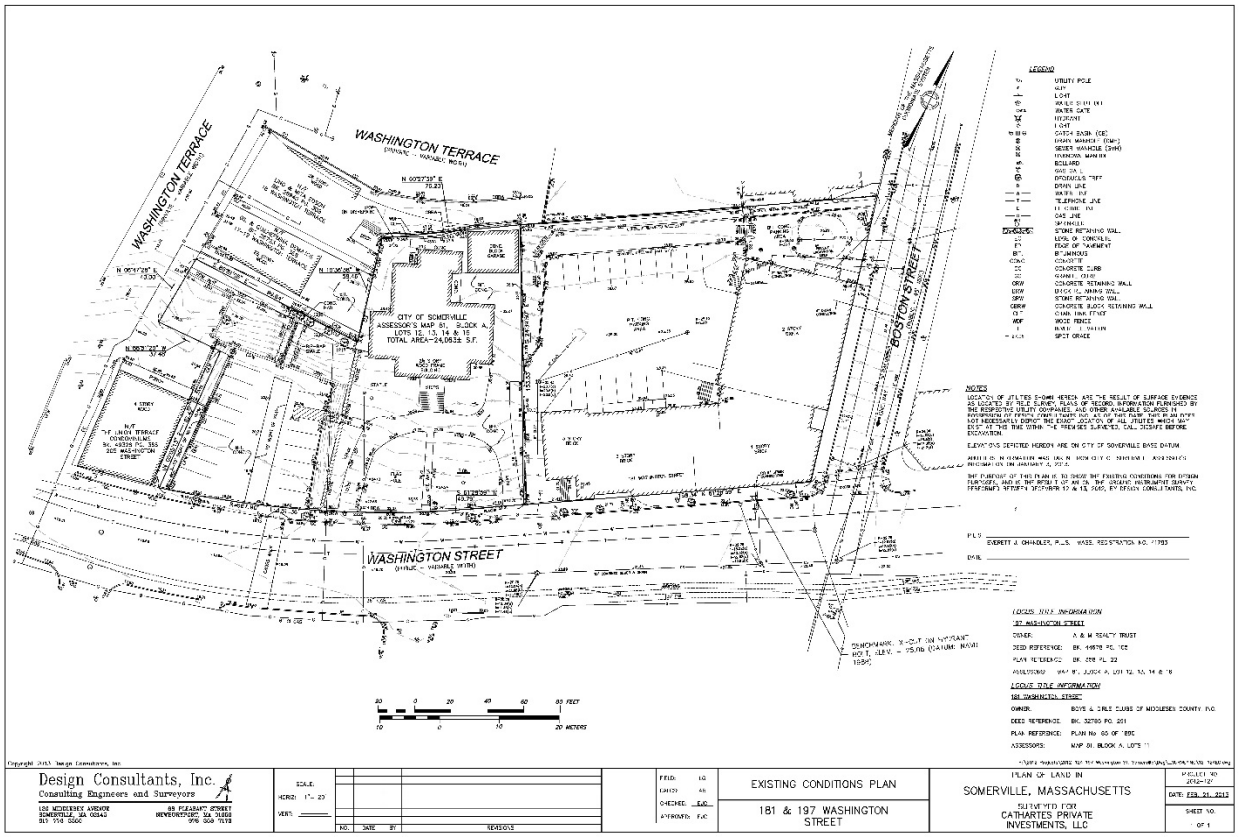
- The proposed site encompasses two parcels. The portion of the site at 181 Washington Street was previously occupied by a 24,000 SF Boys and Girls Club of Somerville. The portion of the site at 197 Washington Street was previously occupied by a funeral home. Both existing buildings will be razed.
- The proposed mixed-use development project will consist of 84 residential apartment units, approximately 6,500 SF of commercial retail space, and approximately 2,500 SF of office space. The proposed access/egress is via driveways on Washington Street and Boston Street.
- The traffic study area includes the intersection of Washington Street/Boston Street/Mansfield Street (unsignalized) and Washington Street/McGrath Highway (signalized).
- Accident data indicate that the Washington Street/Boston Street/Mansfield Street intersection is not a hazardous location. The Washington Street/McGrath Highway intersection is experiencing double the District 4 average crash rate and therefore is a safety concern.
- The proposed development is expected to generate 47 vehicle-trips (15 in/32 out) in the weekday AM peak hour, 67 vehicle-trips (39 in/28 out) in the weekday PM peak hours, and approximately 788 trips (394 in/394 out) on a daily basis.
- For comparative purposes the former 24,000 SF Boys and Girls Club is estimated to have generated 550 vehicle trips per day and 35-40 trips during peak hours. At one time the facility was used by the City's Administrative school offices.
- The mixed use development's site-generated peak hour vehicle-trips will have minimal impact on the Washington Street/McGrath Highway intersection as existing Levels of Service will be maintained with only minor increases in vehicle delays.
- The adjacent Washington Street / Boston Street / Mansfield Street intersection could be revised by making Boston Street two-way from Washington Street to the site driveway on Boston Street. This would have minimize traffic impacts on Boston Street and the residential neighborhood north of the project site.
- The on-street parking study performed on a weekday and a weekend indicated that during critical parking demands (7AM and 7PM) there is an average of 36 available on-street parking spaces on a typical weekday and 31 available on-street parking spaces on a Saturday within 500 feet of the site. This available on-street parking will adequately handle any spillover parking from the development project.
- Traffic operations at the Washington Street/McGrath Highway intersection can be improved with low cost timing revisions.
- In conclusion the proposed mixed-use development at 181-197 Washington Street can be reasonably accommodated within the existing street network.

2.0 INTRODUCTION

This report, prepared at the request of Cathartes Private Investments (CPI), assesses the traffic impacts of a proposed mixed-use development to be located at 181-197 Washington Street in Somerville, MA. This revised study is an update to a report that DCI prepared in June 2012. At that time, Somerville Community Corportation (SCC) proposed a smaller mixed use development, located only on the 181 Washington Street parcel. The current proposal from CPI and SCC is larger than the original development project, and includes both the 181 and 197 Washington Street parcels. Included in this report is a parking survey that assesses the parking needs and parking availability on the site's surrounding neighborhood streets. The focus of the traffic impacts is on the adjacent Washington Street / Boston Street / Mansfield Street intersection and the nearby Washington Street / McGrath Highway intersection. The Institute of Transportation Engineers (ITE) trip generation rates and standard traffic engineering practice and procedures have been utilized in this traffic and parking assessment.

3.0 EXISTING CONDITIONS

The existing site is presently occupied by a closed 24,000 SF Boys and Girls Club of Somerville, and a funeral home. Access to the previous Boys and Girls Club is provided by a single driveway located on the western edge of the site and parking for approximately 19 vehicles is provided at grade. A secondary service driveway is provided off of Boston Street at the rear of the existing building (see Existing Conditions Plan below). Access to the adjacent funeral home is provided via a separate U-shaped driveway, and a third driveway on Washington Street provides access to an adjacent surface parking lot.



4.0 PROPOSED DEVELOPMENT

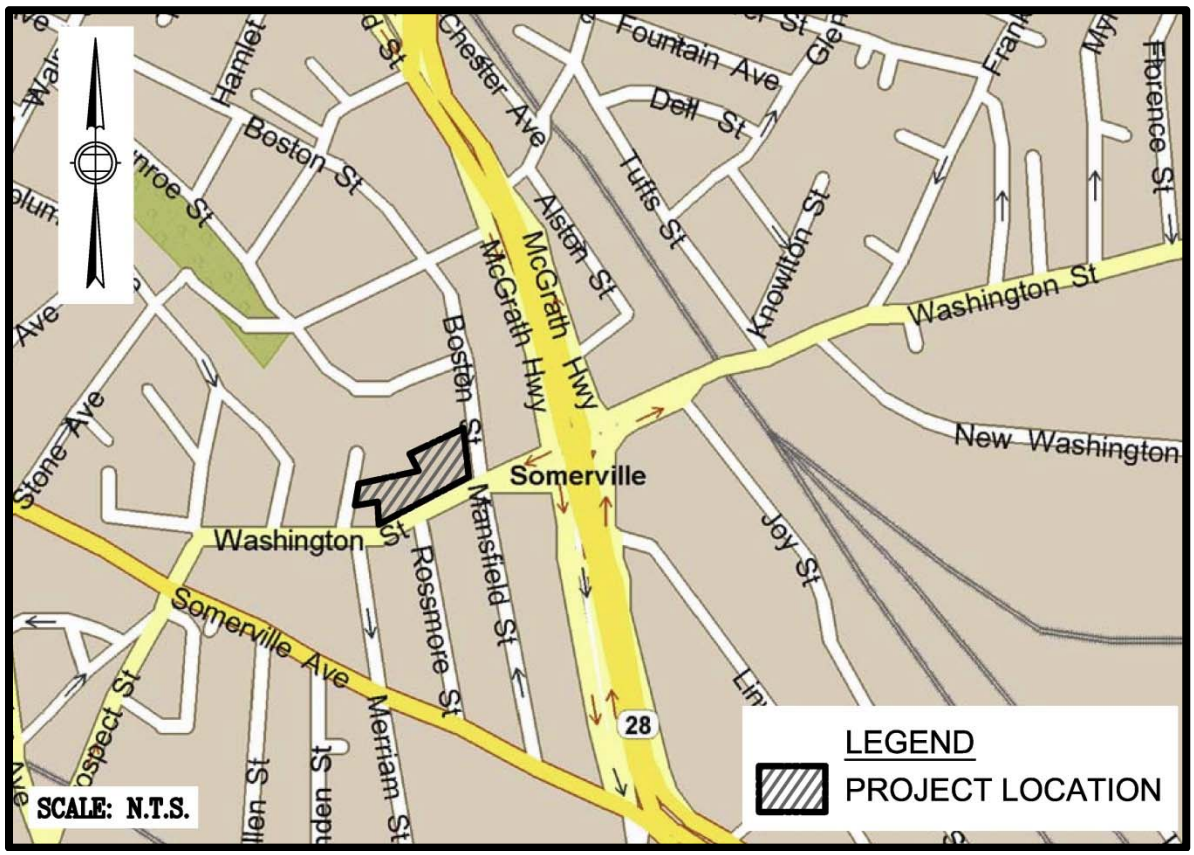
The project proponents propose to construct a mixed-use development at 181-197 Washington Street, which is located on the northwest corner of the Washington Street/Boston Street intersection (see Locus Plan below). The parcels are located in a Corridor Commercial District (CCD). The proposed development will consist of 84 rental units, approximately 6,500 SF of first floor retail space and approximately 2,500 square feet of office space.

Access to the site will be provided via one of the two following access scenarios:

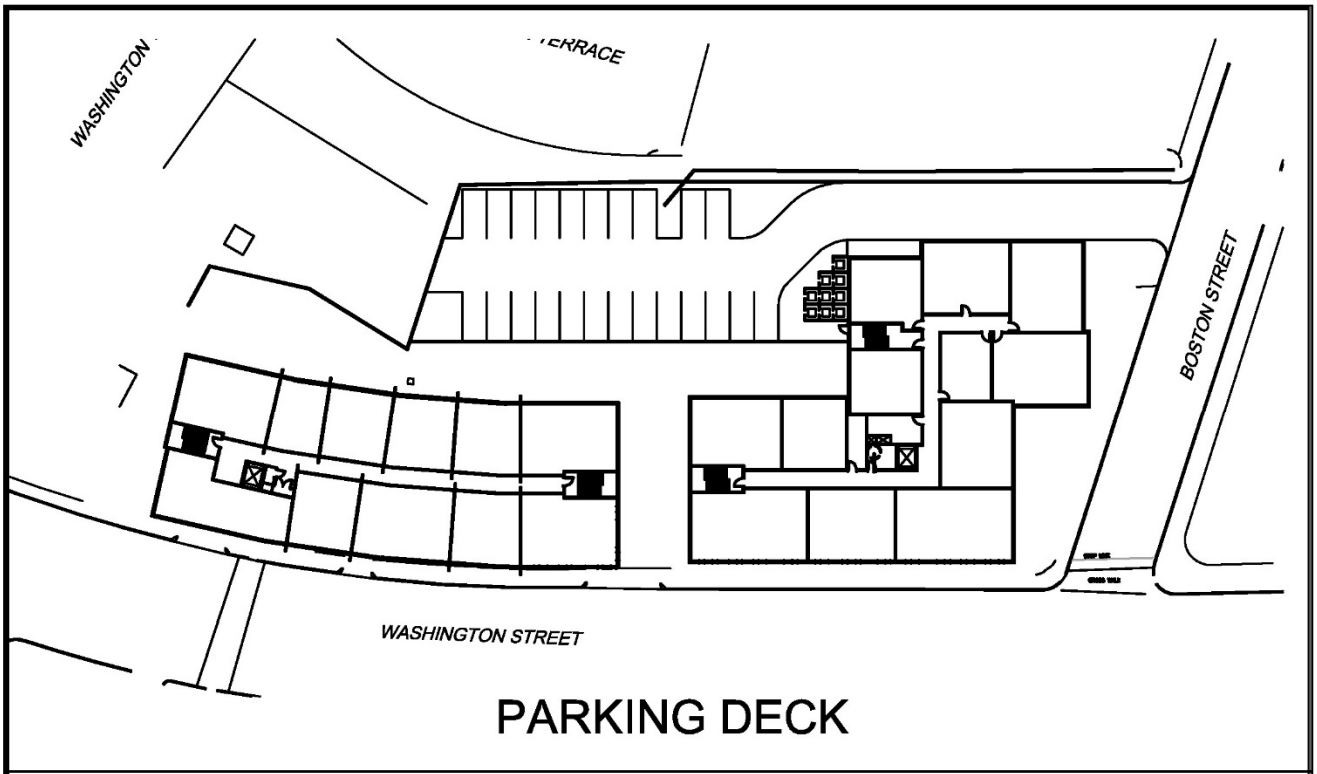
Alternative 1: Two-way driveway off of Washington Street in between the buildings and two-way ramp off of Boston Street.

Alternative 2: Two-way driveway off of Washington Street in between the buildings and two-way ramp off of Boston Street, and making Boston Street two-way between Washington Street and the Boston Street access ramp.

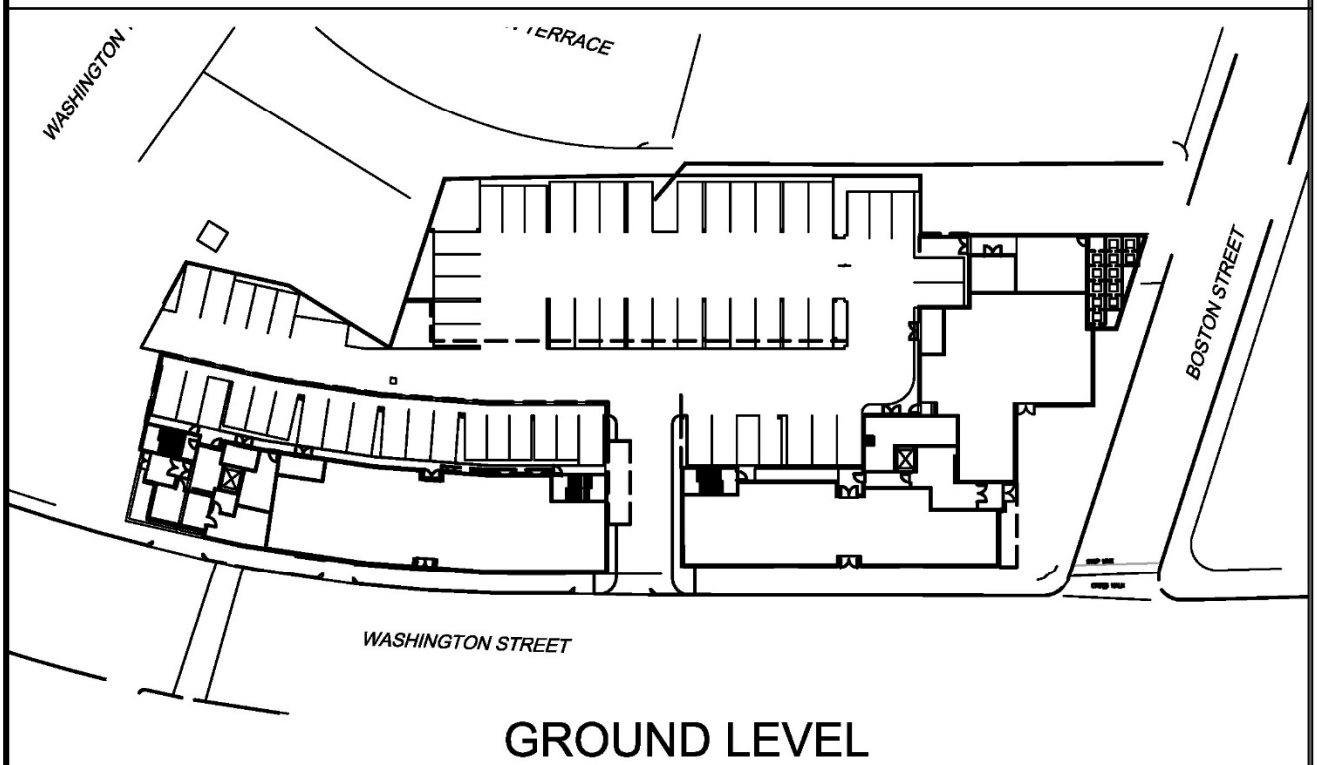
Parking for 63 vehicles will be provided on an at-grade parking lot and an additional 23 spaces on a parking structure at the rear of the site for a total of 86 off-street parking spaces (See Figure 1 – Site Plan).



Locus Plan



PARKING DECK



GROUND LEVEL

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181-197 WASHINGTON ST.
SOMERVILLE, MA

SITE PLAN

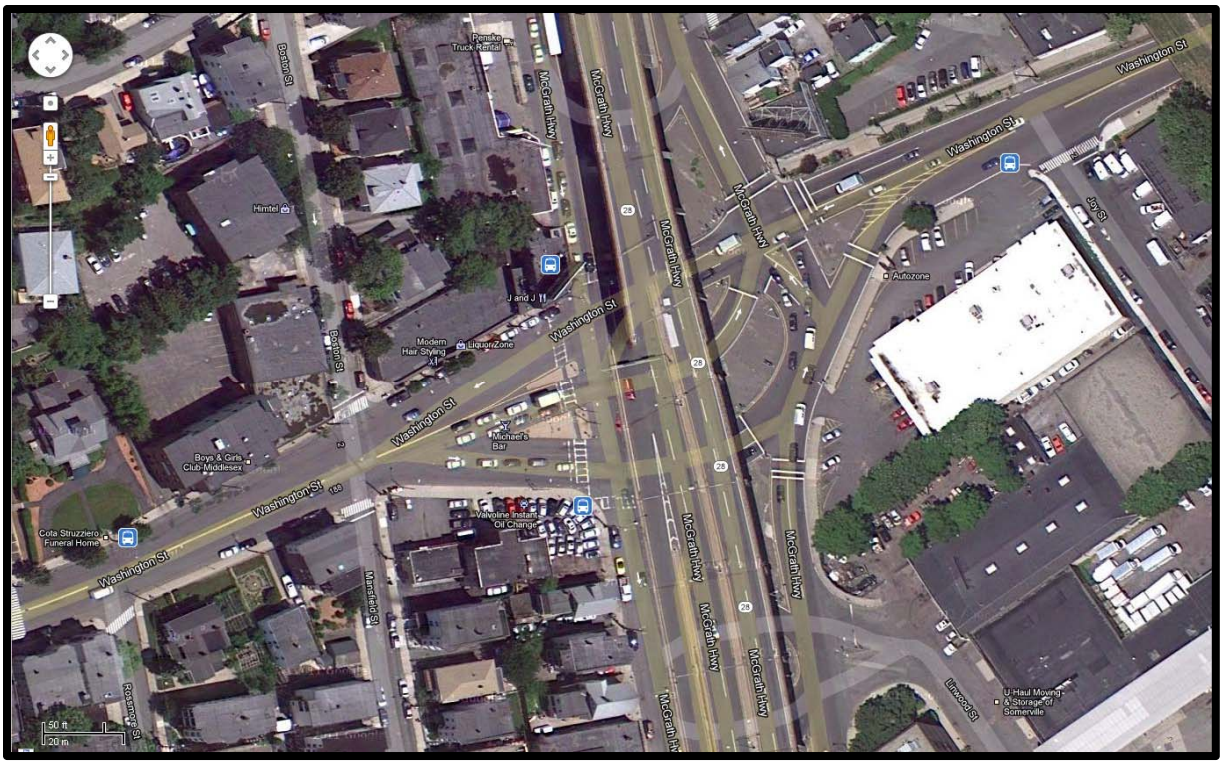
FIGURE 1 04/09/13

5.0 ROADWAY NETWORK

Washington Street is a principal arterial roadway that generally travels east-west from the Somerville/Cambridge city line, through Union Square to the Somerville/Boston City line near Sullivan Square. The subject site is located approximately 225 feet west of the Washington Street/McGrath Highway (Route 28) intersection. The McGrath Highway at this location is elevated and the access/egress ramps and turning lanes are located adjacent to the and beneath the elevated McGrath Highway.

The proposed development will be located on the northwest corner of the Washington Street/Boston street intersection. Washington Street at this intersection is 44 feet wide providing 1-2 travel lanes in each direction and parking is allowed on both sides. Boston Street is a locally owned 30 foot-wide street travelling one-way southbound from Prospect Hill Avenue to its intersection with Washington Street where traffic is controlled by a STOP sign. Mansfield Street is a one-way street travelling north from Somerville Avenue to its intersection with Washington Street opposite Boston Street, where it is also under STOP sign control.

The Washington Street/McGrath Highway intersection is a complex intersection comprised of numerous channelization islands and antiquated, pre-timed traffic signal controls. There is also a lack of ADA and MUTCD compliance at this location. This intersection, formerly controlled by the MDC (and then DCR), is now under the jurisdiction of MassDOT.



Intersection of Washington Street & McGrath Highway

The Washington Street eastbound approach provides two-lane channelization to the McGrath Highway northbound slip ramp and a channelized three lane approach to Washington Street eastbound with a southbound right turn lane. The Washington Street westbound approach is 42 feet wide providing three travel lanes. Beneath McGrath Highway, Washington Street west bound is channelized to two through lanes and a left turn lane to McGrath Highway southbound. A McGrath Highway southbound slip ramp is 31 feet wide providing two travel lanes on its signalized approach to Washington Street with parking allowed on its west side. A bus stop turnout is provided on the east side of the slip ramp.

The McGrath Highway northbound approach to Washington Street is 29 feet wide providing for two travel lanes. It is then channelized into a two lane left turn onto Washington Street westbound and a single 20 foot lane to the northbound slip ramp up to McGrath Highway. Basically, the Washington Street/McGrath Highway intersection operates under four way, four phase traffic control with each direction moving on a protected phase. Additional green times are provided to eastbound and westbound movements to clear areas beneath the elevated highway.

Field observation of the Washington Street/McGrath Highway intersection indicates that most drivers clear the intersection on 1-2 cycles. The McGrath Highway southbound slip ramp to Washington Street experiences significant delays and excessive queuing.

Due to the excessive back-ups on the southbound slip ramp, drivers seek alternate routes to get to Washington Street westbound. To minimize this cut-through traffic, the City has signed Greenville Street, and Prospect Hill Avenue at McGrath Highway "DO NOT ENTER, EXCEPT ABUTTERS, 7-9AM & 4-6PM."

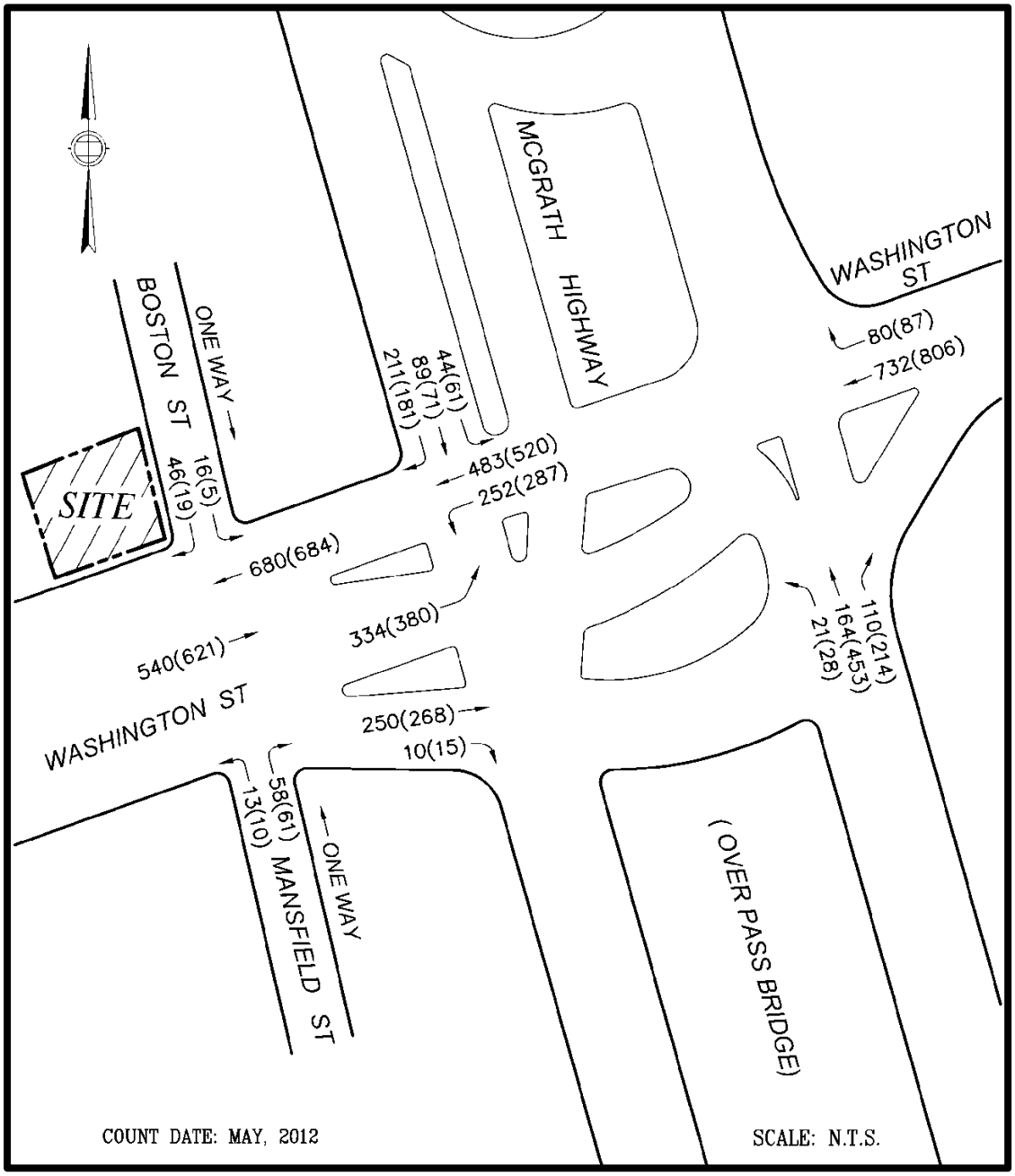
Field observations also noted that the Washington street eastbound queue from McGrath Highway occasionally backed up past Boston Street but these back-ups cleared out as soon as the eastbound approach receives its green phase.

Washington Street Eastbound Approach to McGrath Highway

McGrath Highway Southbound Approach
Note Excessive queuing

6.0 TRAFFIC VOLUMES

Peak period (7-9 AM and 4-6 PM) manual turning movement counts were recorded by DCI at the Washington Street/McGrath Highway intersection and at the Washington Street/Boston Street/Mansfield Street intersection in May 2012. At the Washington Street/McGrath Highway intersection, the peak hours occurred from 7:30 to 8:30 AM and 4:45 to 5:45 PM, while the peak hours occurred from 7:30 to 8:30 AM and 4:30 to 5:30 PM at the Washington Street/Boston Street/Mansfield Street intersection. The collected data also included pedestrians crossing the intersections. The recorded peak hour vehicular volumes are shown below.



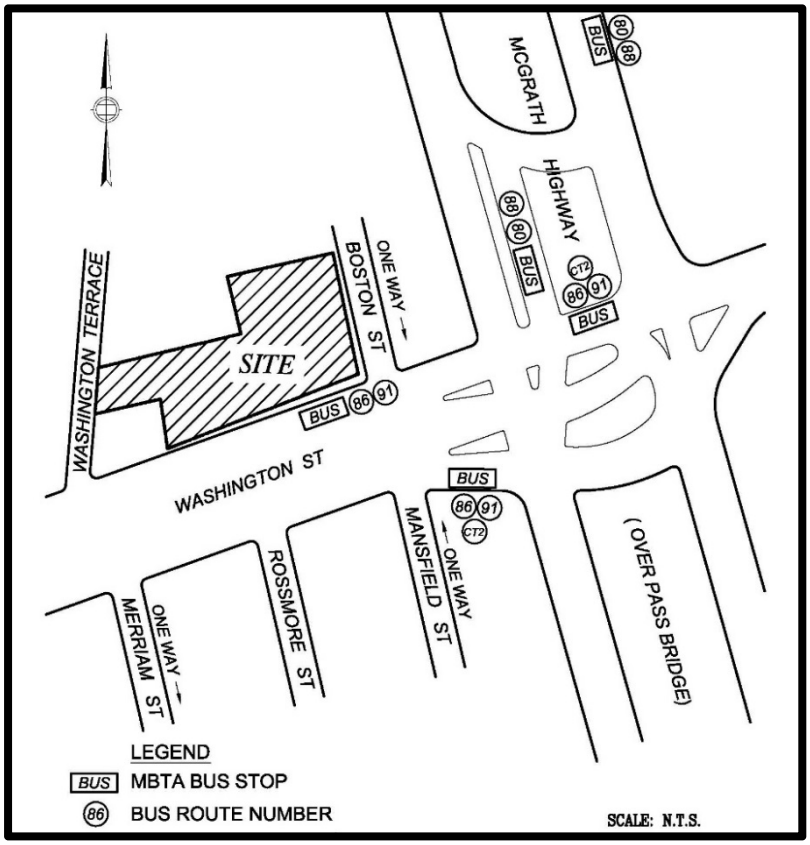
Existing Traffic Volumes

7.0 PUBLIC TRANSIT

There are many bus routes in the vicinity of the project site. The MBTA bus routes that provide service to the Washington Street/McGrath Highway area and the nearby bus stops are shown below. The various bus routes provide easy access to several multimodal transit stations. Access to and from the MBTA Orange Line subway at Sullivan Square is provided via bus routes 86, 91, and CT2, access to and from the MBTA Red Line is provided by bus routes 86, 91, and CT2 (at Harvard Square Station, Central Square Station, and Kendall/MIT Station, respectively), and access to and from the MBTA Green Line at Lechmere Station is provided by bus routes 80 and 86. All combined, the project site is easily accessible to the existing MBTA transit network. Furthermore, the proposed site is approximately 1,000 feet from the future Brickbottom Station and approximately 1,500 feet from the future Union Square Station, both of which are proposed as part of the MBTA Green Line Extension project. Detailed bus route/schedule information is contained in the attached appendix.

Table 1: MBTA Bus Routes

Bus Route #	From	via	To
80	Arlington Center	Medford Hillside	Lechmere Station
86	Sullivan Sq. Station	Harvard/Johnston Gate	Reservoir (Cleveland Circle)
88	Clarendon Hill	Highland Avenue	Lechmere Station
91	Sullivan Sq. Station	Washington Street	Central Square, Cambridge
CT2	Sullivan Sq. Station	Kendall/MIT	Ruggles Station



Bus Stop Locations

8.0 ACCIDENT EXPERIENCE

Accident experience for the Washington Street / Boston Street / Mansfield Street intersection was researched through the Somerville Police Department records for the years 2009 through 2011. The data indicated that 9 accidents occurred over the three year period.

Accident experience for the Washington Street / McGrath Highway intersection was based upon crash data provided by MassDOT, for the three-year period from 2007 to 2009. The data indicate that 51 accidents occurred over the three-year period.

Crash rates for each intersection were calculated based upon MassDOT crash rate procedures, which results in crash rates per million entering vehicles. Those crash rates were then compared with district-wide averages published by MassDOT. The District 4 average crash rate for unsignalized intersections is 0.58 and for signalized intersections 0.77.

The calculated crash rate for the Washington Street/Boston Street/Mansfield Street is 0.51 which is below the MassDOT District 4 average. The calculated crash rate for the Washington Street/McGrath Highway intersection is 1.56, well above the MassDOT District 4 average crash rate for signalized intersections. The high crash rate is indicative of the complex channelization and antiquated traffic control.

9.0 PARKING

Off-Street Parking Requirements

The combined project site at 181-197 Washington Street is located in a Corridor Commercial District (CCD). The City of Somerville parking requirements for CCD's are defined in Table 2, below:

Table 2: CCD Minimum Parking Requirements

Land Use	Number of Parking Spaces
Office	1 parking space per 800 SF
Medium Retail	1 parking space per 800 SF
Residential	1 parking space per unit

However, the City of Somerville zoning allows up to a 20% reduction in where it can be demonstrated that a use needs a lesser number of parking spaces than is otherwise required, per Section 9.13(f). The following sub-section of this report provides documented evidence from similar residential development sites that a lower number of parking spaces are needed in conjunction with affordable housing. Therefore, for the affordable housing portion of the proposed development project at 181-197 Washington Street, a required parking rate of 0.8 parking spaces per unit is used to calculate the minimum parking requirements.

Table 3 summarizes the off-street parking requirements for the proposed project.

Table 3: 181-197 Washington Street Parking Requirements

Land Use	Size	Zoning Requirements	Number of Spaces
Office/Retail	9,336 SF	1 parking space per 800SF	12
Residential – 181 Washington St (affordable housing)	40 units	0.8 parking space per unit	32
Residential – 197 Washington St (market rate housing)	39 units	1.0 parking space per unit	39
Residential – 197 Washington St (affordable housing)	5 units	0.8 parking spaces per unit	4
Total			***87***

Off-Street Parking Studies

To support the reduced parking requirements for the affordable housing portion of the project site, parking surveys were conducted at two other similar affordable housing development projects within the City of Somerville. The off-street parking utilization at the following two affordable housing development projects, both of which were developed by the Somerville Community Corporation (SCC), were observed:

- Linden Street Apartments – 42 residential units (all two-bedroom units), located at 30, 34, and 36 Linden Street, 20, 26, and 32 Merriam Street, and 10, 20, and 24 Charlestown Street
- Mystic Avenue – 53 residential units (9 one-bedroom units, 32 two-bedroom units, and 12 three-bedroom units), located at 460-480 Mystic Avenue

The number of occupied off-street parking spaces at each site was observed on a typical weekday at 7:00am, 12:00pm, and 7:00pm, and on a typical Saturday at 7:00am and 7:00pm. Table 4 summarizes the results of the off-street parking survey.

Table 4: Summary of Off-Street Parking Demand at Similar Sites

Location	Total Num. of Residential Units	Total Num. of Off-Site Parking Spaces	Observed Number of Cars Parked				
			Monday April 8, 2013			Saturday April 6, 2013	
			7am	12pm	7pm	7am	7pm
Linden St	42	56	25	18	16	26	23
Mystic Ave	53	71	23	22	28	29	19
			Observed Demand – Parking Spaces Per Unit				
			Monday April 8, 2013			Saturday April 6, 2013	
			7am	12pm	7pm	7am	7pm
Linden Street			0.60	0.43	0.38	0.62	0.55
Linden Street – Weekday & Saturday Averages			***0.47***			***0.58***	
Mystic Avenue			0.43	0.42	0.53	0.55	0.36
Mystic Avenue – Weekday & Saturday Averages			***0.46***			***0.45***	

As indicated in Table 4, the actual parking demand at both similar residential sites is well below the minimum 0.8 parking spaces per unit requirement being requested for the affordable housing at 181 Washington Street and the affordable house portion of the building

at 197 Washington Street. This more than justifies the 20% reduction in off-street parking permitted in Section 9.13(f) of the City of Somerville zoning. The off-street parking observation field data sheets are included in the attached appendix.

On-Street Parking Study

DCI performed a parking survey of on-street parking to determine if additional parking is available in the immediate vicinity of the project site. The parking survey area included on-street parking within a 500 foot walking distance of the 181-197 Washington Street project site. The study area included portions of Washington Street, Boston Street, Munroe Street, McGrath Highway, Merriam Street, Rossmore Street, Mansfield Street and Washington Terrace. Figure 2 shows the portions of each street that were included in the on-street parking study area.

The number of available parking spaces was recorded for all study area streets at 7AM, 12PM and 7PM on a typical weekday (Tuesday, May 8, 2012) and at 7AM and 7PM on a Saturday (May 5, 2012). The morning and evening hours reflect the critical parking demands, as these times are when residents are presumably at home. Table 5 summarizes the on-street parking availability in the vicinity of the project site.

Table 5: Summary of On-Street Parking Survey

	Tuesday, May 8, 2012			Saturday, May 5, 2012	
	7am	**12pm**	**7pm**	**7am**	**7pm**
Number of Available On-Street Parking Spaces	37	59	35	36	27

As indicated in Table 5, the on-street parking study data reveal that there is an average of 36 available parking spaces at 7AM and 7PM on a weekday, and an average of 31 spaces available at 7AM and 7PM on a Saturday. At 12PM on a weekday 59 parking spaces were available. The complete parking study field data sheets are contained in the attached Appendix.

These data indicate that there is ample on-street parking available on the streets surrounding the proposed 181-197 Washington Street mixed-use development project site, even if five on-street parking spaces are removed on Boston Street to allow for two-way traffic between the site driveway and Washington Street (Site Access Alternative 2).

There is also the possibility of creating new on-street parking spaces on Washington Street. The four existing driveways on Washington Street, approximately 64 linear feet of curb cuts combined, will be replaced by a single 26 foot wide driveway. This net reduction of 38 feet of curb cuts could result in an additional one to two on-street parking spaces on Washington Street.

Boston St approach to Washington St, with on-street parking on both sides of Boston St

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PARKING
STUDY AREA

FIGURE 2

Off-Street Shared Parking

The site will provide a total of 86 parking spaces and therefore, the development will be one (1) parking space short of the minimum requirements. As such, one of the residential parking spaces will signed to allow retail customers to park between the hours of 8:00am and 5:00pm. The residential and retail land uses at the proposed site are complimentary land uses, and the peak demand for parking associated with the two uses are not expected to significantly overlap. In the event that there is spill-over parking demand for the single shared off-street parking space, it is expected that the available on-street parking supply will be able to accommodate the demand for retail parking, as discussed previously.

Transportation Demand Management Plan

The project proponent's Transportation Demand Management (TDM) Plan consists of promoting alternate forms of transportation to reduce the number of single-occupancy vehicle-trips traveling to and from the project site. An enclosed, interior bicycle storage room will be provided within the building at 181 Washington Street, and a second bicycle storage area will be provided underneath the parking deck for 197 Washington Street. Combined, these safe and secure bicycle storage areas will meet or exceed the minimum requirements for bicycle parking of 42 bicycle spaces (0.5 bicycle spaces per residential unit, per Section 9.15 of the City of Somerville zoning). An additional two (2) bicycle parking spaces will be provided on Washington Street for users of the retail portion of the project site, which is also in compliance with Section 9.15 of the City of Somerville zoning.

10.0 TRIP GENERATION/DISTRIBUTION

DCI has estimated daily and peak hour vehicle trips generated by the proposed mixed development by utilizing daily and peak hour vehicle trip rates presented in the Institute of Transportation Engineers (ITE) Trip Generation Manual (9th Edition, 2012). The results of this trip generation analysis are summarized in Table 6.

Table 6: Site-Generated Vehicle-Trips

	Weekday Morning Peak Hour (vehicle-trips)			Weekday Afternoon Peak Hour (vehicle-trips)			Daily Trips
	Enter	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Total**
84 Residential Apartment Units (1)	9	34	43	34	18	52	559
6,500 SF of Retail Space (2)	3	2	5	8	10	18	288
2,500 SF of Office Space (3)	4	0	4	1	3	4	28
Unadjusted Total	16	36	52	43	31	74	875
10% Reduction (4)	-1	-4	-5	-4	-3	-7	-87
Total Site Trips	***15***	***32***	***47***	***39***	***28***	***67***	***788***

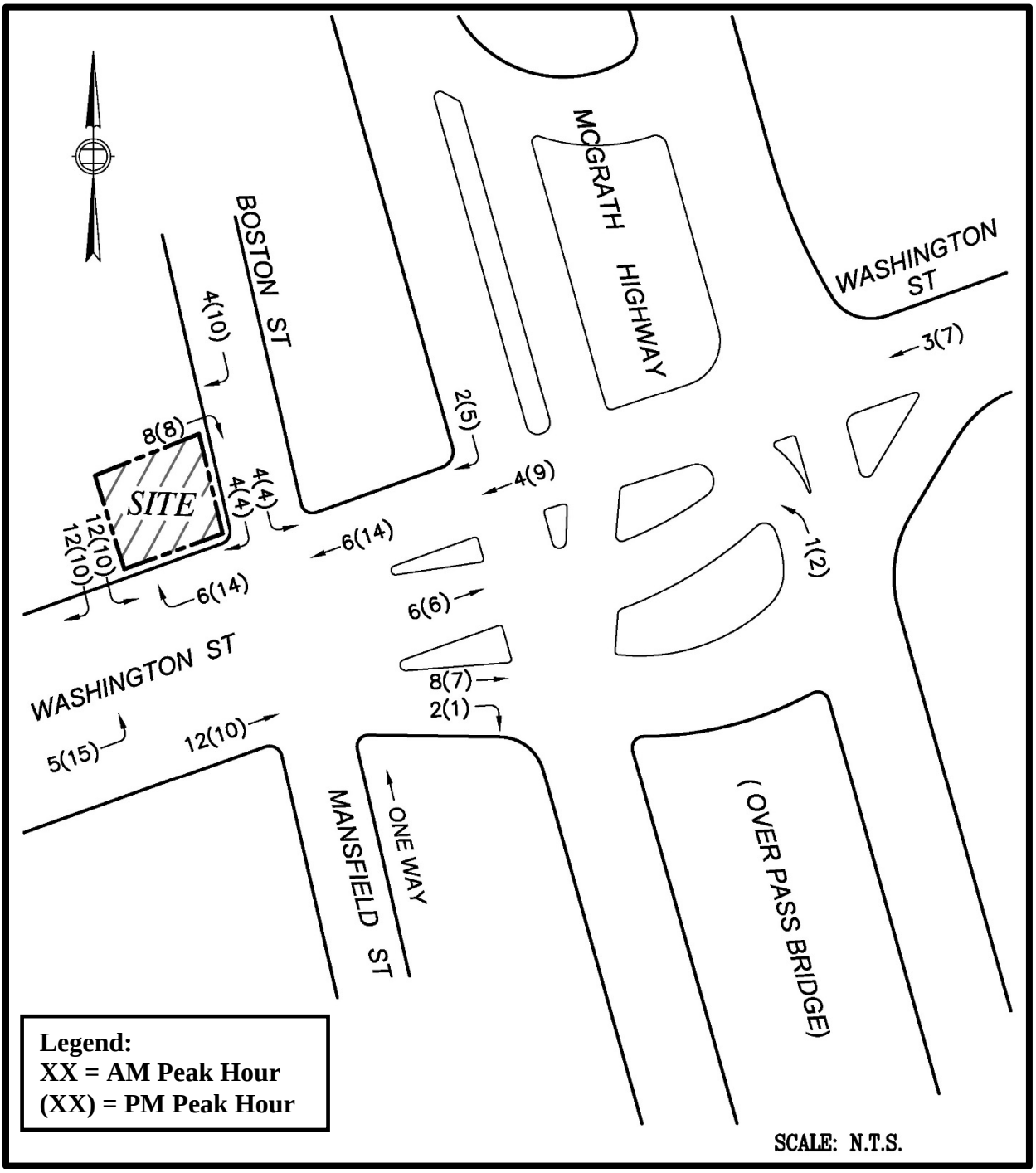
(1) Based on ITE Land Use 220 - Apartment
(2) Based on ITE Land Use 826 – Specialty Retail
(3) Based on ITE Land use 710 – General Office Building
(4) 10% reduction based on close proximity to existing and future public transportation

Based on the public transportation options that are available in the vicinity of the project site (bus service along Washington Street and the close proximity of Union Square and Sullivan

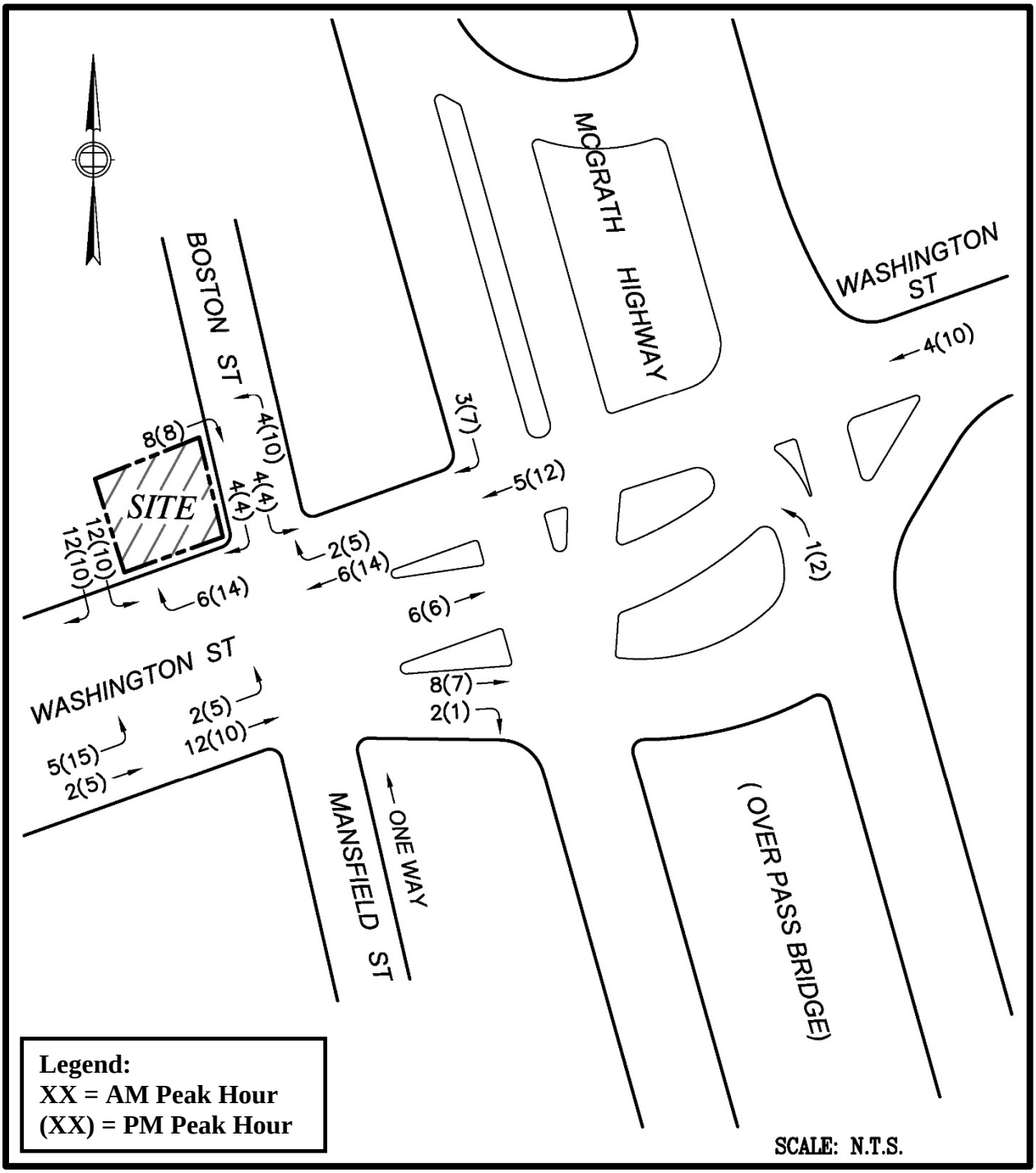
Square), the expected number of vehicle-trips have been reduced by 10%. This results in a total of 47 vehicle-trips during the weekday morning peak hour, 67 vehicle-trips during the weekday afternoon peak hour, and approximately 788 vehicle-trips over the course of a typical weekday. Complete trip generation calculations are contained in the attached appendix.

The peak hour site-generated vehicle-trips have been distributed on the study area roadways and intersections based upon existing peak hour travel. The following two figures correspond with the two possible site-access scenarios. As discussed previously, Alternative 1 would keep Boston Street a one-way roadway (toward Washington Street), as it is today. In this site-access scenario, all site traffic traveling to the parking deck would need to come through the residential neighborhood directly north of the project site. In Alternative 2, Boston Street would become a two-way roadway between Washington Street and the site driveway. This would allow vehicles to access the site driveway along Boston Street from Washington Street, without needing to travel through the adjacent residential neighborhood.

It is also noted that with alternative travel modes such as walking and bicycling and the future extension of the MBTA Green Line subway to Brickbottom and Union Square, additional reductions in peak hour vehicle-trips will most likely occur, and the vehicle-trips shown on the following figures represent a conservatively high estimate.



Project-Generated Peak Hour Vehicle-Trips
Site Access Alternative 1 – Boston Street remains a one-way roadway



Project-Generated Peak Hour Vehicle-Trips
Site Access Alternative 2 – Boston Street becomes a two-way roadway between Washington Street and the Site Driveway

11.0 TRAFFIC IMPACTS/CAPACITY ANALYSES

In order to evaluate the traffic impacts of the site generated trips, it is necessary to determine the Level of Service (LOS) for existing "No-Build" conditions and "Build" conditions with the added new traffic from the proposed development. The LOS at signalized and unsignalized intersections is based on the average delay that each vehicle experiences when traveling through the intersection. The methodologies for evaluating intersection capacity and delay and the delay thresholds for each LOS are defined in the *Highway Capacity Manual* (HCM), published by the Transportation Research Board, 2010. The LOS at an intersection ranges from LOS A (experiences little or no delays) to LOS F (over-capacity, or forced flow conditions). The table below summarizes the delay thresholds for each LOS.

Table 7: Level of Service Criteria

	Average Delay (seconds / vehicle)	
Level of Service	**Signalized Intersections**	**Unsignalized Intersections**
A	≤ 10	≤ 10
B	> 10 to 20	> 10 to 15
C	> 20 to 35	> 15 to 25
D	> 35 to 55	> 25 to 35
E	> 55 to 80	> 35 to 50
F	> 80	> 50

source: HCM2010: Highway Capacity Manual, Transportation Research Board Exhibits 18-4 and 19-1

The Synchro (version 8) software package was utilized in the capacity analyses to determine the resultant Levels-of-Service for "No-Build" and "Build" conditions at each study intersection, which are shown in Table 8. The Build conditions are based upon existing traffic volumes, with the new site-generated vehicle-trips added to the roadway network. Existing traffic volumes were not increased as recent traffic volume trends indicate little or no growth in the Somerville area.

For the purposes of this intersection capacity analysis, only Site Access Alternative 2 was analyzed. If Boston Street were not made into a two-way roadway between Washington Street and the site driveway, more traffic would travel through the residential neighborhood to the north of the project site, and less traffic would be expected to travel through the signalized intersection of Washington Street / McGrath Highway. Therefore, the project would have fewer traffic impacts on the adjacent Washington Street / McGrath Highway intersection under Site Access Alternative 1, and the intersection capacity analysis presented here (consistent with Site Access Alternative 2) is a conservative analysis.

Table 8: Intersection Capacity Analysis Summary

	Existing Conditions			Build Conditions		
	v/c ratio (1)	Ave. Delay (2)	LOS (3)	v/c ratio (1)	Ave. Delay (2)	LOS (3)
Weekday Morning Peak Hour						
Washington St / Boston St / Mansfield St						
Mansfield Street NB	0.16	13.5	B	0.16	13.7	B
Boston Street SB	0.18	16.3	C	0.22	17.6	C
Washington Street EB Left	n/a	n/a	n/a	0.00	9.3	A
Washington St / McGrath Highway						
Washington Street EB Left	0.37	38.4	D	0.38	38.3	D
Washington Street EB Through/Right	0.28	35.9	D	0.29	36.1	D
Washington Street WB Left/Through/Right	0.47	31.3	C	0.47	31.4	C
McGrath Highway NB Left	0.07	61.2	E	0.07	61.3	E
McGrath Highway NB Through	0.30	116.8	F	0.30	116.8	F
McGrath Highway NB Right	0.19	10.5	B	0.19	10.5	B
McGrath Highway SB Left/Through	1.15	>120	F	1.15	>120	F
McGrath Highway SB Right	0.72	18.9	B	0.72	18.9	B
Overall Intersection (4)	*0.47*	*47.1*	*D*	*0.47*	*47.0*	*D*
Weekday Afternoon Peak Hour						
Washington St / Boston St / Mansfield St						
Mansfield Street NB	0.16	13.7	B	0.16	14.0	B
Boston Street SB	0.07	15.0	C	0.11	17.4	C
Washington Street EB Left	n/a	n/a	n/a	0.01	9.3	A
Washington St / McGrath Highway						
Washington Street EB Left	0.47	40.2	D	0.47	40.4	D
Washington Street EB Through/Right	0.20	34.4	C	0.21	34.5	C
Washington Street WB Left/Through/Right	0.54	32.7	C	0.54	32.8	C
McGrath Highway NB Left	0.09	62.4	E	0.09	67.8	E
McGrath Highway NB Through	0.75	110.7	F	0.75	110.7	F
McGrath Highway NB Right	0.42	20.6	C	0.42	20.8	C
McGrath Highway SB Left/Through	1.02	>120	F	1.02	>120	F
McGrath Highway SB Right	0.65	18.6	B	0.66	18.7	B
Overall Intersection (4)	*0.55*	*51.7*	*D*	*0.55*	*51.6*	*D*

(1) Volume to capacity ratio
(2) Average delay per vehicle (seconds)
(3) Level of Service
(4) Weighted average, based on traffic volumes

As indicated by the traffic analyses, at the Washington Street/Boston Street/Mansfield Street intersection the movements out of Mansfield Street currently operate at LOS B in the AM and PM peak hours while the movements out of Boston Street currently operate at LOS C during both the AM and PM peak hours. Under "Build" conditions with Boston Street being made two-way, the Mansfield Street and Boston Street approaches to Washington Street are not expected to changed, and are expected to continue to operate at LOS B and LOS C, respectively.

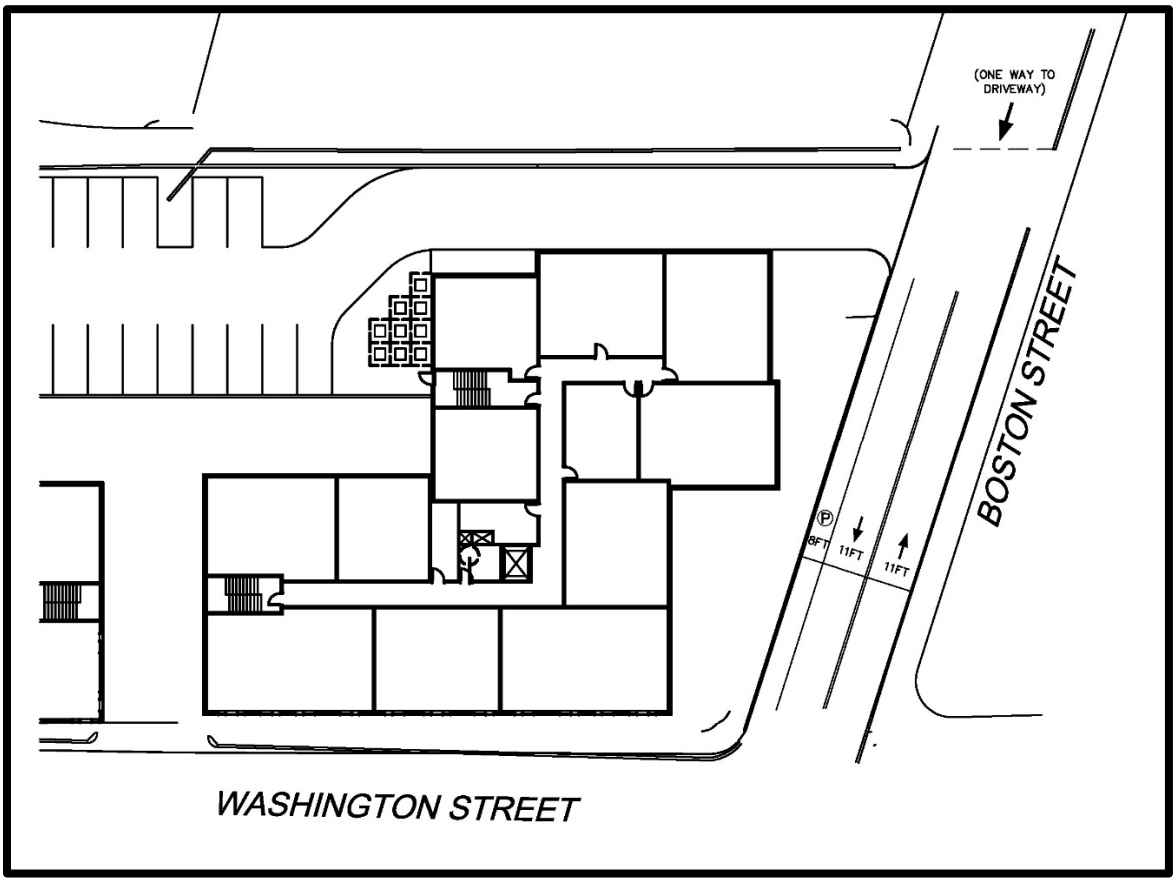
Under the existing conditions, the intersection of Washington Street / McGrath Highway operates at on overall LOS D during both the weekday morning and afternoon peak hours. Some specific movements currently operate at LOS F (the McGrath Highway SB slip ramp, and the McGrath Highway NB through movement), while the rest of the vehicular movements at this approach generally operate acceptably. The poor LOS for the southbound

slip ramp approach is a direct result of the very short green time (10 seconds) that is currently allocated for that phase.

As indicated in Table 8, all of the existing Levels of Service will be maintained under the "Build" conditions, with only minimal increases in delays. Therefore, the site-generated peak hour vehicle-trips going to and from the project site will have little, if any, impacts on traffic operations at the study area intersections.

12.0 OFF-SITE IMPROVEMENTS

For improved access to the site, the City of Somerville could implement Site Access Alternative 2, and make Boston Street two-way from Washington Street to the site's Boston Street access drive. This change would minimize traffic traveling through the adjacent residential neighborhood to access the project site. Boston Street can provide an 11-foot travel lane in each direction while maintaining parking on the west side. Approximately 5 parking spaces along the east side of Boston Street would need to be removed to accommodate the two-way traffic flow. Partial 2-way/1-way streets have been implemented previously in other parts of City. Appropriate signage will also be erected. A conceptual drawing of the proposed changes to Boston Street is shown below.



Site Access Alternative 2 – Boston Street becomes a two-way roadway between Washington Street and the Site Driveway

Additionally, the Washington Street / McGrath Highway intersection is antiquated, operates under fixed time control, contains atypical geometric lane configurations that can be confusing to unfamiliar drivers, and experiences poor Levels-of Service. The City should work with MassDOT to upgrade this intersection to meet current ADA and MUTCD standards, which would improve pedestrian and bicycle access while reducing congestion, minimizing delays, and improving safety. As an interim low cost solution, operational improvements could be realized with revised signal timings.

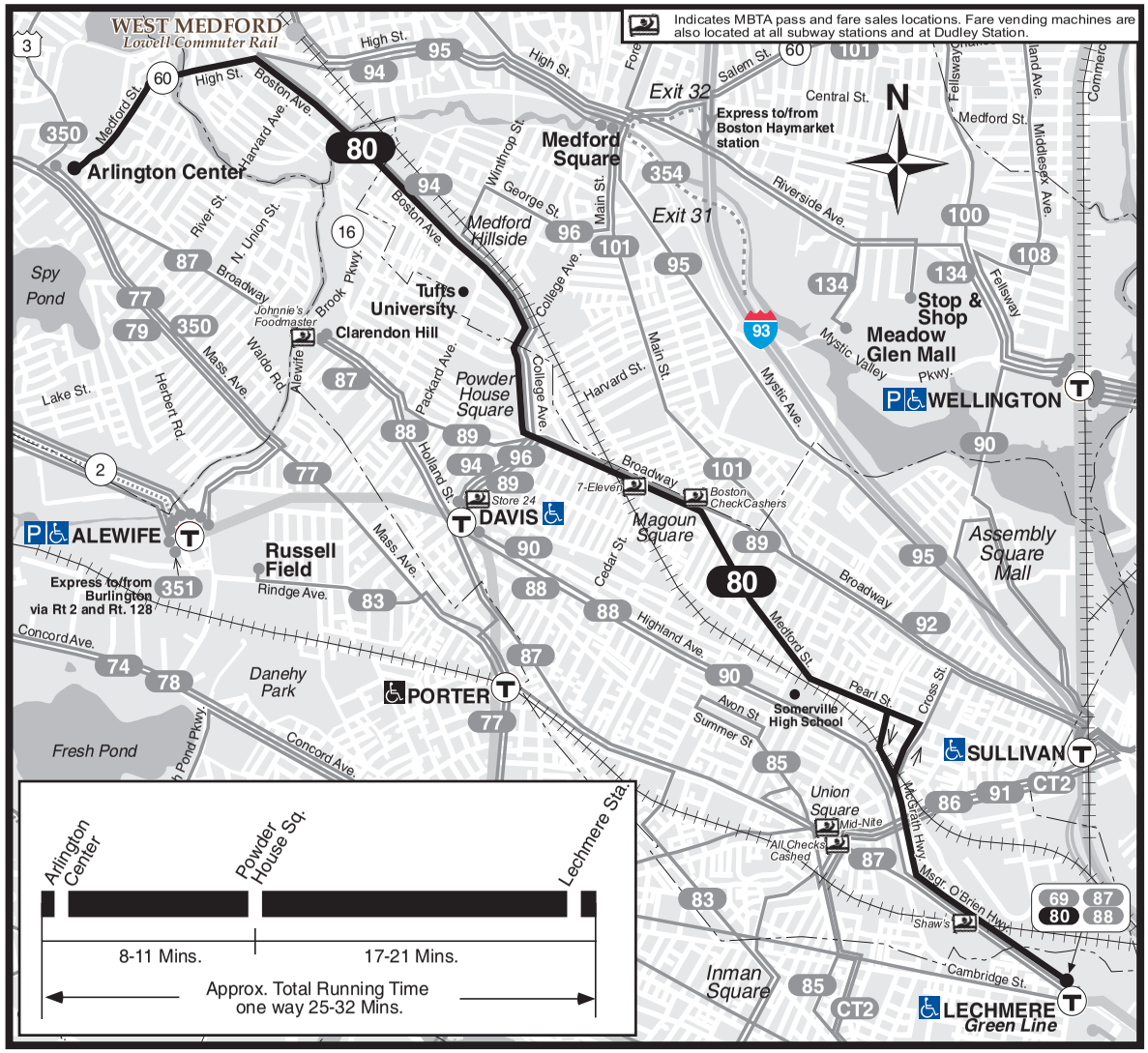
APPENDICES

Public Transportation Routes/Schedules
Crash Rate Worksheets
Off-Street Parking Data
On-Street Parking Data
Trip Generation Calculations
Intersection Capacity Analysis

APPENDIX

Public Transportation Routes/Schedules

Route 80 *Arlington Center - Lechmere Station via Medford Hillside*



80

SPRING March 23, 2013 - June 21, 2013

Arlington Center - Lechmere Station

via Medford Hillside

Serving: Medford Hillside, Powder House Square, Magoun Square, Gilman Square and connections to the Green Line

Arrive times are approximate, subject to traffic.

Customer Service/Travel Info 617-222-3200
Toll Free.....1-800-392-6100
Hearing Impaired (TTY).....617-222-5146

For more schedule or travel information, visit:
www.mbta.com

Massachusetts Bay Transportation Authority

massDOT
Massachusetts Department of Transportation

80 WEEKDAY

INBOUND			OUTBOUND		
Leave Arlington Center	Arrive Powder House Sq.	Arrive Lechmere Station	Leave Lechmere Station	Arrive Powder House Sq.	Arrive Arlington Center
5:05A	5:11A	5:24A	5:30A	5:41A	5:50A
5:30	5:36	5:49	6:00	6:13	6:24
6:00	6:08	6:22	6:30	6:43	6:54
6:20	6:28	6:46	7:00	7:16	7:32
6:40	6:49	7:07	7:20	7:36	7:52
7:00	7:09	7:27	7:40	7:56	8:12
7:20	7:29	7:53	8:00	8:16	8:32
7:40	7:52	8:16	8:20	8:36	8:52
8:00	8:12	8:36	8:45	9:01	9:17
8:20	8:32	8:56	9:25	9:41	9:57
8:40	8:52	9:11	10:00	10:16	10:32
9:00	9:10	9:27	10:35	10:51	11:07
9:25	9:35	9:52	11:10	11:26	11:42
10:00	10:10	10:27	11:45	**12:01P**	**12:17P**
10:35	10:45	11:02			
11:10	11:20	11:37			
11:45	11:55	**12:12P**	**12:20P**	**12:36P**	**12:52P**
			12:55	**1:11**	**1:27**
12:20P	**12:30P**	**12:47P**	**1:30**	**1:46**	**2:02**
12:55	**1:05**	**1:22**	**2:05**	**2:21**	**2:34**
1:30	**1:40**	**1:57**	**2:30**	**2:47**	**3:00**
2:05	**2:15**	**2:32**	**2:55**	**3:12**	**3:25**
2:30	**2:40**	**2:57**	**3:20**	**3:37**	**3:50**
2:55	**3:05**	**3:22**	**3:40**	**3:57**	**4:10**
3:20	**3:30**	**3:47**	**4:00**	**4:17**	**4:30**
3:40	**3:50**	**4:07**	**4:20**	**4:38**	**4:53**
4:00	**4:10**	**4:27**	**4:40**	**4:59**	**5:14**
4:20	**4:30**	**4:47**	**5:00**	**5:19**	**5:34**
4:40	**4:50**	**5:07**	**5:20**	**5:39**	**5:54**
5:00	**5:11**	**5:29**	**5:40**	**5:59**	**6:14**
5:20	**5:31**	**5:49**	**6:00**	**6:19**	**6:33**
5:40	**5:51**	**6:09**	**6:20**	**6:37**	**6:50**
6:00	**6:11**	**6:29**	**6:40**	**6:55**	**7:08**
6:30	**6:41**	**6:59**	**7:00**	**7:15**	**7:28**
7:00	**7:08**	**7:23**	**7:30**	**7:44**	**7:56**
7:30	**7:38**	**7:53**	**8:00**	**8:14**	**8:26**
8:30	**8:38**	**8:53**	**9:00**	**9:14**	**9:26**
9:30	**9:38**	**9:53**	**10:00**	**10:14**	**10:26**
10:30	**10:37**	**10:49**	**11:00**	**11:13**	**11:23**
11:30	**11:37**	**11:49**	12:00M	12:11A	12:21A
12:30A	12:37A	12:49A	w1:00A	1:11	1:21

80 SATURDAY

INBOUND			OUTBOUND		
Leave Arlington Center	Arrive Powder House Sq.	Arrive Lechmere Station	Leave Lechmere Station	Arrive Powder House Sq.	Arrive Arlington Center
5:05A	5:13A	5:28A	5:30A	5:41A	5:51A
6:00	6:08	6:23	6:30	6:41	6:51
6:30	6:38	6:53	7:00	7:11	7:21
7:00	7:08	7:23	7:30	7:41	7:51
7:30	7:38	7:53	8:00	8:12	8:25
8:00	8:10	8:27	8:30	8:42	8:55
8:30	8:40	8:57	9:00	9:12	9:25
9:00	9:10	9:27	9:30	9:42	9:55
9:30	9:40	9:57	10:00	10:12	10:25
10:00	10:10	10:27	10:35	10:47	11:00
10:35	10:45	11:02	11:10	11:22	11:34
11:10	11:20	11:37	11:45	**12:01P**	**12:13P**
11:45	11:55	**12:12P**			
12:20P	**12:30P**	**12:47P**	**12:20P**	**12:36P**	**12:48P**
12:55	**1:05**	**1:22**	**12:55**	**1:11**	**1:23**
1:30	**1:40**	**1:57**	**1:30**	**1:46**	**1:58**
2:05	**2:15**	**2:32**	**2:05**	**2:21**	**2:33**
2:40	**2:50**	**3:07**	**2:40**	**2:56**	**3:08**
3:15	**3:25**	**3:42**	**3:15**	**3:31**	**3:43**
3:50	**4:00**	**4:17**	**3:50**	**4:06**	**4:18**
4:25	**4:35**	**4:52**	**4:25**	**4:41**	**4:53**
5:00	**5:10**	**5:27**	**5:00**	**5:16**	**5:28**
5:35	**5:45**	**6:02**	**5:35**	**5:51**	**6:03**
6:05	**6:15**	**6:30**	**6:02**	**6:15**	**6:26**
6:32	**6:42**	**6:57**	**7:00**	**7:13**	**7:24**
7:30	**7:40**	**7:55**	**8:00**	**8:13**	**8:24**
8:30	**8:38**	**8:53**	**9:00**	**9:11**	**9:21**
9:30	**9:38**	**9:53**	**10:00**	**10:11**	**10:21**
10:30	**10:38**	**10:53**	**11:00**	**11:11**	**11:21**
11:30	**11:38**	**11:53**	12:00M	12:11A	12:21A
12:30A	12:38A	12:53A	w 1:00A	1:11	1:21

w - Waits for last trolley to arrive at Lechmere Station.

ALL BUSES ARE ACCESSIBLE TO PERSONS WITH DISABILITIES.

Route 80
Arlington Center - Lechmere Station via Medford Hillside

80 SUNDAY

INBOUND			OUTBOUND		
Leave Arlington Center	Arrive Powder House Sq.	Arrive Lechmere Station	Leave Lechmere Station	Arrive Powder House Sq.	Arrive Arlington Center
6:30A	6:38A	6:53A	7:00A	7:11A	7:21A
7:30	7:38	7:53	8:00	8:11	8:21
8:30	8:38	8:53	9:00	9:11	9:22
9:30	9:39	9:54	10:00	10:11	10:22
10:30	10:39	10:54	11:00	11:11	11:22
11:30	11:39	11:54			
12:30P	**12:39P**	**12:54P**	**12:00N**	**12:11P**	**12:22P**
1:30	**1:40**	**1:55**	**1:00P**	**1:11**	**1:22**
2:30	**2:40**	**2:55**	**2:00**	**2:11**	**2:22**
3:30	**3:40**	**3:55**	**3:00**	**3:11**	**3:22**
4:30	**4:40**	**4:55**	**4:00**	**4:11**	**4:22**
5:30	**5:40**	**5:55**	**5:00**	**5:11**	**5:22**
6:30	**6:40**	**6:55**	**6:00**	**6:11**	**6:22**
7:30	**7:38**	**7:53**	**7:00**	**7:11**	**7:21**
8:30	**8:38**	**8:53**	**8:00**	**8:11**	**8:21**
9:30	**9:38**	**9:53**	**9:00**	**9:11**	**9:21**
10:30	**10:38**	**10:53**	**10:00**	**10:11**	**10:21**
11:30	**11:38**	**11:53**	**11:00**	**11:11**	**11:21**
			12:00M	12:11A	12:21A

* Arlington Center:
Board bus on Medford St. at Mass. Ave.

FARES

Paying with...	1-bus trip	2-bus trip	Bus + subway trip
CharlieCard	$1.50	$1.50	$2.00
CharlieTicket	$2.00	$2.00	$4.50
Cash onboard	$2.00	$4.00	$4.50
Student CharlieCard*	$0.75	$0.75	$1.00
Senior/TAP CharlieCard**	$0.75	$0.75	$1.00

Children under 12 ride free when accompanied by an adult.
Blind Access CharlieCard holders ride free; if using a guide, the guide rides free.

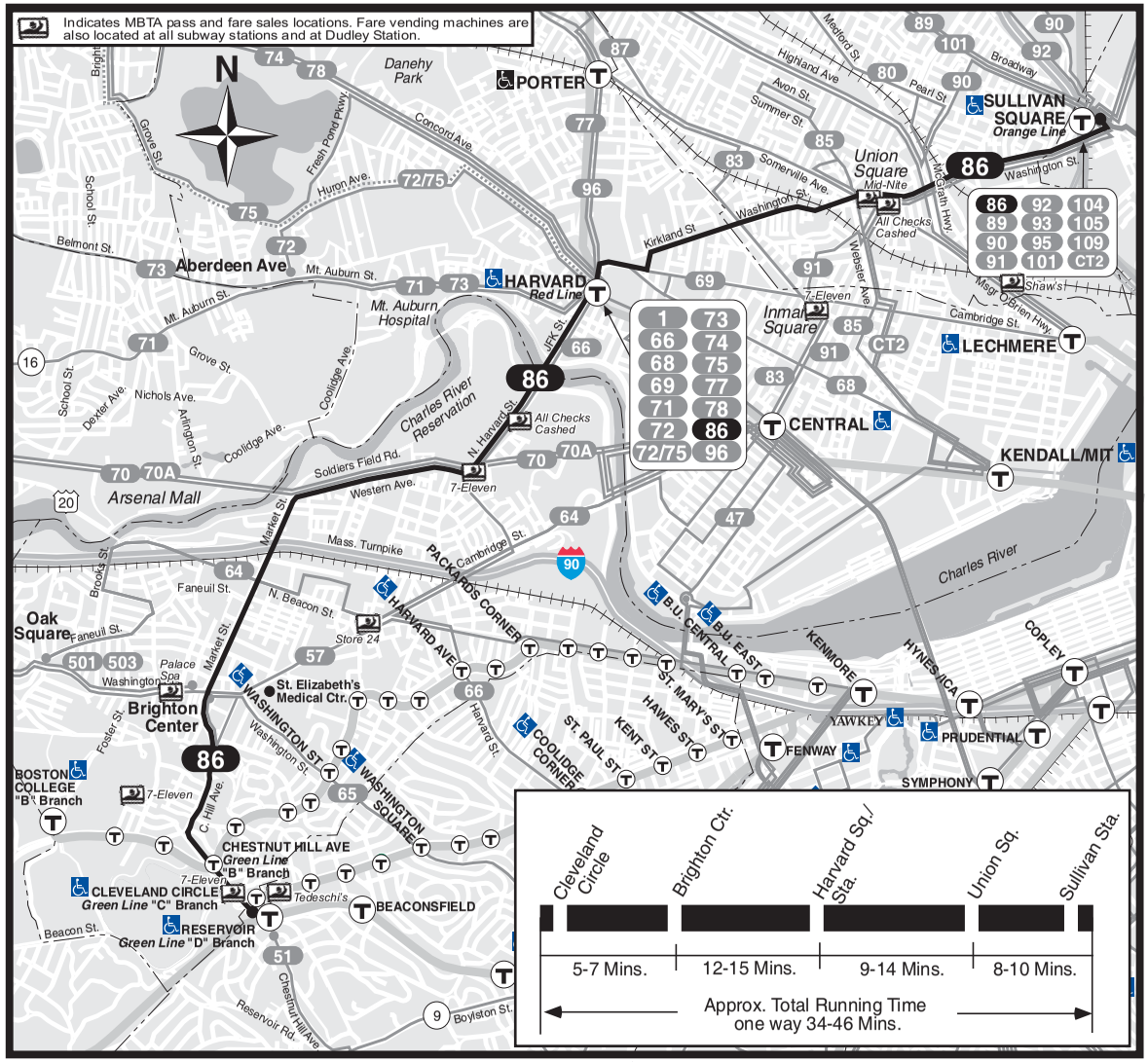
VALID PASSES: Local Bus Pass ($48/mo.); LinkPass ($70/mo.); Senior/TAP Pass** ($28/mo.); Student Pass* ($25/mo. M-F only or $28/mo. 7 days); express bus, commuter rail, and boat passes.

* Available to students through participating middle schools and high schools.
** Available to Medicare cardholders, seniors 65+ and persons with disabilities.

Spring 2013 Holidays

April 15: See Saturday **May 27: See Sunday**

Route 86 *Sullivan Square Station - Reservoir (Cleveland Circle)* *via Harvard Square/Station*



86

SPRING March 23, 2013 - June 21, 2013

Sullivan Square Station - Reservoir (Cleveland Circle) via Harvard Square/Station

Serving: Union Sq., Harvard Sq./Sta., Brighton Ctr., St. Elizabeth's Medical Ctr. and connections to the Red, Green & Orange Lines

Arrive times are approximate, subject to traffic.

Customer Service/Travel Info 617-222-3200
Toll Free.....1-800-392-6100
Hearing Impaired (TTY).....617-222-5146

For more schedule or travel information, visit:
www.mbta.com

Massachusetts Bay Transportation Authority

massDOT
Massachusetts Department of Transportation

86 WEEKDAY

INBOUND			OUTBOUND		
Leave Sullivan Sq. Sta.	Arrive Harvard Square	Arrive Cleveland Circle	Leave Cleveland Circle	Arrive Harvard Station	Arrive Sullivan Sq. Sta.
5:00A	5:10A	5:32A	5:39	5:56	6:13
5:20	5:30	5:56	6:01	6:18	6:37
5:40	5:52	6:18	6:23	6:46	7:07
5:56	6:08	6:35	6:42	7:07	7:28
6:08	6:20	6:51	6:58	7:23	7:45
6:20	6:33	7:06	7:13	7:38	8:01
6:32	6:47	7:20	7:27	7:58	8:21
6:44	6:59	7:33	7:40	8:12	8:34
6:52	7:07	7:44	7:50	8:22	8:44
7:00	7:15	7:54	8:00	8:31	8:52
7:08	7:23	8:04	8:10	8:40	9:01
7:16	7:31	8:13	8:20	8:48	9:09
7:26	7:42	8:24	8:30	8:55	9:16
7:41	7:57	8:37	8:45	9:10	9:31
7:56	8:12	8:48	9:02	9:27	9:48
8:11	8:27	9:01	9:13	9:38	9:59
8:28	8:44	9:18	9:35	10:00	10:21
8:40	8:56	9:30	9:57	10:22	10:43
9:00	9:16	9:50	10:20	10:45	11:06
9:22	9:38	10:12	10:45	11:10	11:31
9:47	10:03	10:37	11:20	11:45	**12:06P**
10:22	10:38	11:12	11:55	**12:20P**	**12:41**
11:00	11:16	11:46			
11:40	11:56	**12:26P**			
			12:35P	**1:00P**	**1:21P**
12:15P	**12:31P**	**1:01P**	**1:10**	**1:35**	**1:56**
12:35	**12:51**	**1:21**	**1:30**	**1:55**	**2:16**
12:55	**1:11**	**1:41**	**1:50**	**2:15**	**2:37**
1:15	**1:31**	**2:02**	**2:10**	**2:35**	**2:58**
1:28	**1:44**	**2:18**	**2:25**	**2:50**	**3:13**
1:45	**2:01**	**2:39**	**2:50**	**3:16**	**3:41**
2:05	**2:21**	**2:59**	**3:10**	**3:38**	**4:05**
2:25	**2:41**	**3:19**	**3:30**	**3:58**	**4:25**
2:45	**3:01**	**3:39**	**3:50**	**4:18**	**4:48**
3:05	**3:21**	**3:59**	**4:07**	**4:37**	**5:08**
3:20	**3:36**	**4:14**	**4:25**	**4:58**	**5:29**
3:38	**3:54**	**4:32**	**4:43**	**5:16**	**5:43**
3:56	**4:12**	**4:50**	**5:01**	**5:33**	**5:59**
4:13	**4:29**	**5:11**	**5:19**	**5:48**	**6:14**
4:32	**4:51**	**5:32**	**5:37**	**6:05**	**6:31**
4:47	**5:06**	**5:45**	**5:55**	**6:23**	**6:45**
5:05	**5:24**	**6:01**	**6:13**	**6:40**	**7:01**
5:23	**5:42**	**6:18**	**6:30**	**6:53**	**7:14**
5:42	**6:01**	**6:36**	**6:50**	**7:13**	**7:34**
6:00	**6:19**	**6:52**	**7:00**	**7:23**	**7:44**
6:18	**6:35**	**7:07**	**7:15**	**7:38**	**7:59**
6:40	**6:53**	**7:25**	**7:37**	**8:00**	**8:18**
7:08	**7:21**	**7:49**	**8:00**	**8:21**	**8:39**
u 7:40	**7:53**	**8:18**	**8:28**	**8:49**	**9:07**
u 8:25	**8:38**	**9:03**	**9:10**	**9:31**	**9:49**
u 9:15	**9:28**	**9:53**	**10:00**	**10:19**	**10:35**
u 10:00	**10:13**	**10:35**	**10:43**	**11:02**	**11:18**
u 10:45	**10:56**	**11:13**	**11:25**	**11:40**	**11:52**
u 11:25	**11:36**	**11:53**	12:05A	12:20A	12:32A
u 12:05A	12:16A	12:33A	12:40	12:55	1:07

86 SATURDAY

INBOUND			OUTBOUND		
Leave Sullivan Sq. Sta.	Arrive Harvard Square	Arrive Cleveland Circle	Leave Cleveland Circle	Arrive Harvard Station	Arrive Sullivan Sq. Sta.
5:00A	5:10A	5:24A	5:30A	5:44A	5:55A
6:05	6:16	6:31	6:40	6:57	7:08
7:15	7:27	7:45	7:50	8:09	8:21
7:45	7:57	8:15	8:20	8:41	8:53
8:25	8:37	8:55	9:05	9:28	9:42
9:05	9:17	9:37	9:45	10:08	10:22
9:50	10:07	10:29	10:30	10:53	11:13
10:30	10:44	11:06	11:10	11:35	11:50
10:55	11:09	11:31	11:40	**12:08P**	**12:23P**
11:25	11:39	**12:01P**			
12:00N	**12:15P**	**12:43P**	**12:15P**	**12:43P**	**12:58P**
12:35P	**12:50**	**1:17**	**12:50**	**1:18**	**1:34**
1:10	**1:26**	**1:53**	**1:25**	**1:51**	**2:08**
1:45	**2:01**	**2:28**	**2:00**	**2:27**	**2:45**
2:15	**2:31**	**2:58**	**2:30**	**2:57**	**3:15**
2:45	**3:01**	**3:28**	**3:00**	**3:29**	**3:48**
3:10	**3:26**	**3:52**	**3:30**	**4:00**	**4:13**
3:35	**3:51**	**4:18**	**4:00**	**4:25**	**4:42**
4:05	**4:21**	**4:48**	**4:30**	**4:55**	**5:12**
4:30	**4:46**	**5:14**	**5:00**	**5:26**	**5:42**
5:00	**5:16**	**5:43**	**5:30**	**5:55**	**6:11**
5:30	**5:47**	**6:13**	**6:00**	**6:25**	**6:41**
6:00	**6:14**	**6:42**	**6:30**	**6:55**	**7:09**
6:30	**6:45**	**7:10**	**7:00**	**7:23**	**7:37**
7:05	**7:21**	**7:46**	**7:25**	**7:48**	**8:02**
u 7:50	**8:04**	**8:28**	**7:55**	**8:18**	**8:32**
u 8:40	**8:52**	**9:12**	**8:40**	**9:02**	**9:16**
u 9:25	**9:37**	**9:57**	**9:20**	**9:41**	**9:55**
u10:45	**10:54**	**11:13**	**10:00**	**10:21**	**10:35**
u11:55	12:04A	12:23A	**11:20**	**11:37**	**11:49**
			12:30A	12:47A	12:59A

Harvard Sq: Board buses to Sullivan in Harvard Station (Upper Busway). Board buses to Reservoir on Mass. Ave. at Garden St. (Dawes Island) or on Eliot St at Bennett St.

Route 86
Sullivan Sq. Sta. - Cleveland Circle via Harvard Square/Station

86 SUNDAY

INBOUND			OUTBOUND		
Leave Sullivan Sq. Sta.	Arrive Harvard Square	Arrive Cleveland Circle	Leave Cleveland Circle	Arrive Harvard Station	Arrive Sullivan Sq. Sta.
7:30A	7:40A	7:57A	8:05A	8:22A	8:33A
8:40	8:52	9:12	9:15	9:36	9:49
9:50	10:02	10:22	10:30	10:55	11:11
10:20	10:32	10:53	11:05	11:31	11:49
10:50	11:02	11:23	11:40	**12:06P**	**12:24P**
11:20	11:34	11:57			
11:55	**12:08P**	**12:34P**			
12:30P	**12:42P**	**1:12P**	**12:15P**	**12:45P**	**1:00P**
1:05	**1:17**	**1:46**	**12:50**	**1:23**	**1:38**
1:40	**1:56**	**2:20**	**1:25**	**1:49**	**2:03**
2:15	**2:28**	**2:52**	**2:00**	**2:25**	**2:42**
2:50	**3:03**	**3:26**	**2:35**	**2:59**	**3:13**
3:25	**3:40**	**4:04**	**3:10**	**3:35**	**3:50**
4:00	**4:13**	**4:38**	**3:45**	**4:10**	**4:24**
4:35	**4:50**	**5:17**	**4:20**	**4:46**	**5:00**
5:10	**5:22**	**5:44**	**4:55**	**5:20**	**5:35**
5:45	**5:58**	**6:20**	**5:30**	**5:52**	**6:06**
6:20	**6:33**	**6:54**	**6:05**	**6:27**	**6:41**
7:00	**7:11**	**7:33**	**6:40**	**7:02**	**7:18**
u 7:40	**7:50**	**8:11**	**7:15**	**7:33**	**7:49**
u 9:00	**9:10**	**9:31**	**7:50**	**8:10**	**8:22**
			8:25	**8:44**	**8:56**
			9:35	**9:53**	**10:05**

u - Trip departs from Sullivan Sq. upper busway.
All other trips depart from Sullivan Sq. lower busway.

ALL BUSES ARE ACCESSIBLE TO PERSONS WITH DISABILITIES.

FARES

Paying with...	1-bus trip	2-bus trip	Bus + subway trip
CharlieCard	$1.50	$1.50	$2.00
CharlieTicket	$2.00	$2.00	$4.50
Cash onboard	$2.00	$4.00	$4.50
Student CharlieCard*	$0.75	$0.75	$1.00
Senior/TAP CharlieCard**	$0.75	$0.75	$1.00

Children under 12 ride free when accompanied by an adult.
Blind Access CharlieCard holders ride free; if using a guide, the guide rides free.

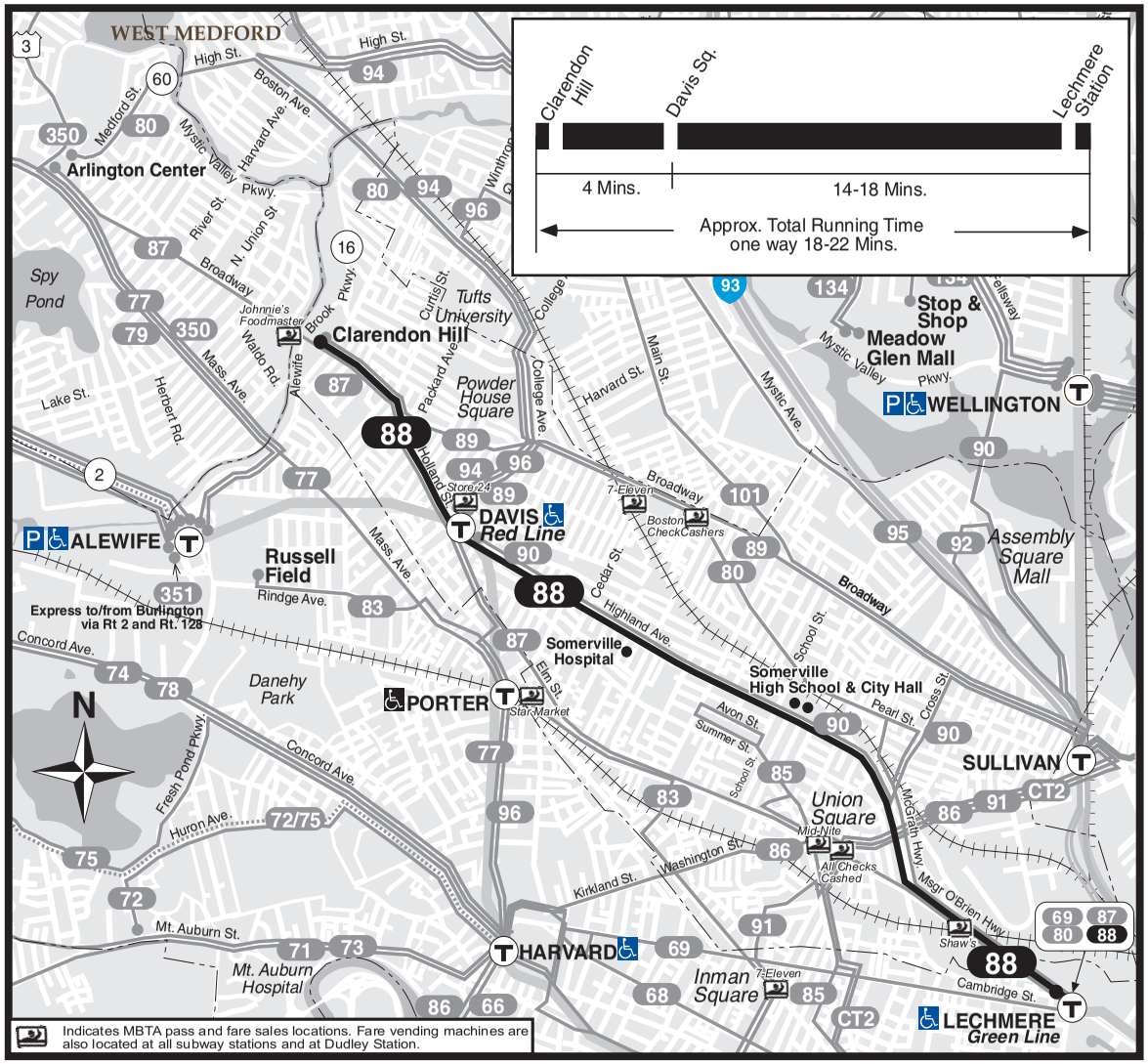
VALID PASSES: Local Bus Pass ($48/mo.); LinkPass ($70/mo.); Senior/TAP Pass** ($28/mo.); Student Pass* ($25/mo. M-F only or $28/mo. 7 days); express bus, commuter rail, and boat passes.

* Available to students through participating middle schools and high schools.
** Available to Medicare cardholders, seniors 65+ and persons with disabilities.

Spring 2013 Holidays

April 15: See Saturday **May 27: See Sunday**

Route 88 *Clarendon Hill - Lechmere Station via Highland Avenue*



88

SPRING March 23, 2013 - June 21, 2013

Clarendon Hill - Lechmere Station

via Highland Avenue

Serving: Teele Sq., Davis Station, Somerville Hospital, Somerville High School & City Hall and connections to the Red & Green Lines

Arrive times are approximate, subject to traffic.

Customer Service/Travel Info 617-222-3200
Toll Free.....1-800-392-6100
Hearing Impaired (TTY).....617-222-5146

For more schedule or travel information, visit:
www.mbta.com

Massachusetts Bay Transportation Authority

massDOT Massachusetts Department of Transportation

88 WEEKDAY

INBOUND				OUTBOUND			
Leave Clarendon Hill	Arrive Davis Square	Somerville High School	Arrive Lechmere Sta.	Leave Lechmere Sta.	Somerville High School	Arrive Davis Square	Arrive Clarendon Hill
5:16A	5:19A	5:25A	5:32A	5:35A	5:41A	5:47A	5:51A
5:41	5:44	5:50	5:57	6:05	6:12	6:20	6:24
6:06	6:09	6:15	6:22	6:35	6:42	6:50	6:54
6:28	6:33	6:41	6:52	6:57	7:04	7:12	7:16
6:50	6:55	7:03	7:14	7:19	7:26	7:36	7:41
7:06	7:11	7:19	7:30	7:40	7:48	7:58	8:03
7:16	7:22	.....	.....	7:58	8:06	8:16	8:21
7:22	7:27	7:37	7:48	8:14	8:22	8:32	8:37
7:33	7:39	.....	.....	8:30	8:38	8:48	8:53
7:38	7:44	7:55	8:06	8:46	8:54	9:04	9:09
7:48	7:54	.....	.....	9:05	9:13	9:23	9:28
7:54	8:00	8:11	8:22	9:30	9:38	9:48	9:53
8:00	8:06	.....	.....	10:00	10:08	10:18	10:23
8:10	8:16	8:27	8:38	10:35	10:43	10:53	10:58
8:20	8:26	.....	.....	11:05	11:13	11:23	11:28
8:28	8:34	8:45	8:56	11:35	11:43	11:53	11:58
8:37	8:43	.....	.....				
8:46	8:52	9:02	9:12				
9:03	9:07	9:17	9:27				
9:23	9:27	9:37	9:47				
9:45	9:49	9:59	10:09				
10:05	10:09	10:19	10:29				
10:35	10:39	10:49	10:59				
11:05	11:09	11:19	11:29	**12:05P**	**12:13P**	**12:23P**	**12:28P**
11:35	11:39	11:49	11:59	**12:35**	**12:43**	**12:53**	**12:58**
				1:05	**1:13**	**1:23**	**1:28**
12:05P	**12:09P**	**12:19P**	**12:29P**	**1:35**	**1:43**	**1:53**	**1:58**
12:35	**12:39**	**12:49**	**12:59**	**2:05**	**2:13**	**2:23**	**2:28**
1:05	**1:09**	**1:19**	**1:29**	**.....**	**s 2:35**	**2:43**	**2:49**
1:35	**1:39**	**1:49**	**1:59**	**.....**	**s 2:40**	**2:48**	**2:54**
2:05	**2:09**	**2:19**	**2:29**	**2:30**	**2:40**	**2:50**	**2:55**
2:35	**2:39**	**2:49**	**2:59**	**.....**	**s 2:50**	**2:58**	**3:04**
2:50	**2:54**	**3:04**	**3:14**	**2:50**	**3:00**	**3:10**	**3:15**
3:10	**3:14**	**3:24**	**3:34**	**3:10**	**3:20**	**3:30**	**3:35**
3:30	**3:34**	**3:44**	**3:54**	**3:30**	**3:40**	**3:50**	**3:55**
3:50	**3:54**	**4:04**	**4:14**	**3:50**	**4:00**	**4:10**	**4:15**
4:10	**4:14**	**4:24**	**4:34**	**4:10**	**4:20**	**4:30**	**4:35**
4:30	**4:34**	**4:44**	**4:54**	**4:30**	**4:40**	**4:50**	**4:55**
4:50	**4:54**	**5:04**	**5:14**	**4:50**	**5:00**	**5:12**	**5:21**
5:10	**5:14**	**5:24**	**5:34**	**5:10**	**5:21**	**5:33**	**5:42**
5:30	**5:35**	**5:46**	**5:56**	**5:30**	**5:41**	**5:53**	**6:01**
5:50	**5:55**	**6:06**	**6:16**	**5:50**	**6:01**	**6:12**	**6:17**
6:10	**6:15**	**6:26**	**6:36**	**6:10**	**6:20**	**6:31**	**6:36**
6:30	**6:35**	**6:46**	**6:56**	**6:30**	**6:40**	**6:51**	**6:56**
6:55	**7:00**	**7:11**	**7:21**	**6:50**	**7:00**	**7:11**	**7:16**
7:20	**7:25**	**7:34**	**7:43**	**7:10**	**7:20**	**7:31**	**7:35**
7:40	**7:44**	**7:52**	**8:01**	**7:35**	**7:42**	**7:52**	**7:56**
8:10	**8:14**	**8:22**	**8:31**	**8:05**	**8:12**	**8:22**	**8:26**
8:40	**8:44**	**8:52**	**9:01**	**8:40**	**8:47**	**8:57**	**9:01**
9:10	**9:14**	**9:22**	**9:31**	**9:15**	**9:22**	**9:32**	**9:36**
9:40	**9:43**	**9:50**	**9:58**	**9:50**	**9:57**	**10:07**	**10:11**
10:15	**10:18**	**10:25**	**10:33**	**10:25**	**10:31**	**10:38**	**10:42**
10:50	**10:53**	**11:00**	**11:08**	**11:00**	**11:06**	**11:13**	**11:17**
11:25	**11:28**	**11:35**	**11:43**	**11:35**	**11:41**	**11:48**	**11:52**
12:00M	12:02A	12:08A	12:15A	12:10A	12:15A	12:21A	12:24A
12:35A	12:37	12:43	12:50	w 1:00	1:05	1:11	1:14

88 SATURDAY

INBOUND				OUTBOUND			
Leave Clarendon Hill	Arrive Davis Square	Somerville High School	Arrive Lechmere Sta.	Leave Lechmere Sta.	Somerville High School	Arrive Davis Square	Arrive Clarendon Hill
5:30A	5:33A	5:38A	5:46A	6:00A	6:07A	6:14A	6:16A
6:00	6:03	6:08	6:16	6:30	6:37	6:44	6:46
6:30	6:33	6:38	6:46	7:00	7:07	7:14	7:16
7:00	7:03	7:10	7:17	7:30	7:37	7:44	7:46
7:30	7:33	7:40	7:47	8:00	8:07	8:14	8:16
8:00	8:03	8:10	8:17	8:30	8:37	8:44	8:46
8:30	8:34	8:41	8:49	9:00	9:08	9:16	9:20
9:00	9:03	9:11	9:20	9:30	9:38	9:47	9:52
9:30	9:34	9:42	9:51	10:00	10:08	10:17	10:22
10:00	10:04	10:12	10:21	10:30	10:38	10:47	10:52
10:30	10:34	10:42	10:51	11:00	11:08	11:17	11:22
11:00	11:04	11:14	11:24	11:30	11:38	11:47	11:52
11:20	11:24	11:34	11:44	11:50	11:58	**12:07P**	**12:12P**
11:40	11:44	11:54	**12:04P**				
				12:10P	**12:18P**	**12:27P**	**12:32P**
12:00N	**12:04P**	**12:14P**	**12:24P**	**12:30**	**12:38**	**12:47**	**12:52**
12:20P	**12:24**	**12:34**	**12:44**	**12:50**	**12:58**	**1:07**	**1:12**
12:40	**12:44**	**12:54**	**1:04**	**1:10**	**1:20**	**1:29**	**1:34**
1:00	**1:04**	**1:14**	**1:24**	**1:30**	**1:39**	**1:47**	**1:52**
1:20	**1:24**	**1:34**	**1:44**	**1:50**	**1:59**	**2:07**	**2:12**
1:40	**1:44**	**1:54**	**2:05**	**2:10**	**2:19**	**2:27**	**2:32**
2:00	**2:04**	**2:13**	**2:24**	**2:30**	**2:39**	**2:47**	**2:52**
2:20	**2:24**	**2:33**	**2:44**	**2:50**	**2:59**	**3:07**	**3:12**
2:40	**2:44**	**2:53**	**3:04**	**3:10**	**3:19**	**3:27**	**3:32**
3:00	**3:04**	**3:13**	**3:24**	**3:30**	**3:39**	**3:47**	**3:52**
3:20	**3:24**	**3:33**	**3:44**	**3:50**	**3:59**	**4:08**	**4:13**
3:40	**3:44**	**3:53**	**4:03**	**4:10**	**4:18**	**4:27**	**4:32**
4:00	**4:04**	**4:12**	**4:20**	**4:30**	**4:38**	**4:47**	**4:52**
4:20	**4:24**	**4:32**	**4:40**	**4:50**	**4:58**	**5:07**	**5:12**
4:40	**4:44**	**4:52**	**5:00**	**5:10**	**5:18**	**5:27**	**5:32**
5:00	**5:04**	**5:12**	**5:20**	**5:30**	**5:38**	**5:47**	**5:52**
5:20	**5:24**	**5:32**	**5:40**	**5:50**	**5:58**	**6:06**	**6:10**
5:40	**5:44**	**5:52**	**6:00**	**6:10**	**6:18**	**6:26**	**6:30**
6:00	**6:04**	**6:12**	**6:22**	**6:30**	**6:38**	**6:46**	**6:50**
6:20	**6:24**	**6:32**	**6:42**	**6:50**	**6:58**	**7:06**	**7:10**
6:40	**6:44**	**6:52**	**7:02**	**7:30**	**7:38**	**7:46**	**7:50**
7:00	**7:04**	**7:12**	**7:22**	**7:50**	**7:58**	**8:06**	**8:12**
7:20	**7:24**	**7:32**	**7:42**	**8:30**	**8:39**	**8:47**	**8:53**
8:00	**8:04**	**8:12**	**8:22**	**9:10**	**9:18**	**9:26**	**9:30**
8:20	**8:24**	**8:32**	**8:40**	**9:50**	**9:58**	**10:04**	**10:09**
9:00	**9:03**	**9:11**	**9:19**	**10:30**	**10:38**	**10:44**	**10:49**
9:40	**9:43**	**9:51**	**9:59**	**11:10**	**11:18**	**11:24**	**11:29**
10:20	**10:23**	**10:31**	**10:39**	**11:50**	**11:58**	12:04A	12:09A
11:00	**11:03**	**11:11**	**11:19**	12:30A	12:38A	12:44	12:49
11:40	**11:43**	**11:51**	**11:59**	w 1:00	1:08	1:14	1:19
12:20A	12:23A	12:31A	12:39A				

s - Does NOT run during school vacation.
w - Waits for last trolley to arrive at Lechmere Sta.

ALL BUSES ARE ACCESSIBLE TO PERSONS WITH DISABILITIES.

Route 88
Clarendon Hill - Lechmere Station via Highland Avenue

88 SUNDAY

INBOUND				OUTBOUND			
Leave Clarendon Hill	Arrive Davis Square	Somerville High School	Arrive Lechmere Sta.	Leave Lechmere Sta.	Somerville High School	Arrive Davis Square	Arrive Clarendon Hill
6:40A	6:43A	6:49A	6:58A	6:20A	6:26A	6:34A	6:38A
7:40	7:43	7:49	7:58	7:20	7:26	7:34	7:38
8:40	8:43	8:49	8:58	8:20	8:28	8:36	8:40
9:10	9:13	9:19	9:28	9:20	9:28	9:35	9:40
9:42	9:46	9:53	9:59	9:55	10:02	10:09	10:14
10:20	10:23	10:31	10:40	10:35	10:42	10:51	10:55
11:05	11:08	11:16	11:25	11:15	11:22	11:31	11:35
11:45	11:48	11:56	**12:08P**	11:55	**12:02P**	**12:11P**	**12:15P**
12:25P	**12:28P**	**12:37P**	**12:49P**	**12:35P**	**12:44P**	**12:52P**	**12:56P**
1:05	**1:08**	**1:17**	**1:29**	**1:15**	**1:24**	**1:32**	**1:38**
1:45	**1:49**	**1:58**	**2:10**	**1:55**	**2:02**	**2:11**	**2:17**
2:25	**2:29**	**2:38**	**2:50**	**2:35**	**2:42**	**2:51**	**2:57**
3:05	**3:09**	**3:18**	**3:29**	**3:15**	**3:22**	**3:31**	**3:37**
3:45	**3:49**	**3:56**	**4:04**	**3:55**	**4:02**	**4:11**	**4:17**
4:25	**4:29**	**4:36**	**4:44**	**4:35**	**4:42**	**4:51**	**4:57**
5:05	**5:09**	**5:16**	**5:24**	**5:15**	**5:23**	**5:31**	**5:35**
5:45	**5:49**	**5:56**	**6:07**	**5:55**	**6:03**	**6:11**	**6:15**
6:25	**6:29**	**6:36**	**6:44**	**6:35**	**6:43**	**6:51**	**6:55**
7:05	**7:08**	**7:15**	**7:24**	**7:15**	**7:23**	**7:31**	**7:35**
7:45	**7:48**	**7:55**	**8:04**	**7:55**	**8:03**	**8:10**	**8:14**
8:25	**8:28**	**8:35**	**8:44**	**8:35**	**8:42**	**8:48**	**8:53**
9:05	**9:08**	**9:15**	**9:24**	**9:15**	**9:22**	**9:28**	**9:33**
9:45	**9:48**	**9:55**	**10:04**	**9:55**	**10:02**	**10:08**	**10:13**
10:25	**10:28**	**10:34**	**10:42**	**10:35**	**10:42**	**10:48**	**10:53**
11:00	**11:03**	**11:09**	**11:17**	**11:10**	**11:17**	**11:23**	**11:28**
11:30	**11:33**	**11:39**	**11:47**	**11:50**	**11:57**	12:03A	12:08A
12:10A	12:13A	12:19A	12:27A	12:20A	12:27A	12:33	12:38
12:40	12:43	12:49	12:57	w 1:00	1:07	1:13	1:18

FARES

Paying with...	1-bus trip	2-bus trip	Bus + subway trip
CharlieCard	$1.50	$1.50	$2.00
CharlieTicket	$2.00	$2.00	$4.50
Cash onboard	$2.00	$4.00	$4.50
Student CharlieCard*	$0.75	$0.75	$1.00
Senior/TAP CharlieCard**	$0.75	$0.75	$1.00

Children under 12 ride free when accompanied by an adult.
Blind Access CharlieCard holders ride free; if using a guide, the guide rides free.

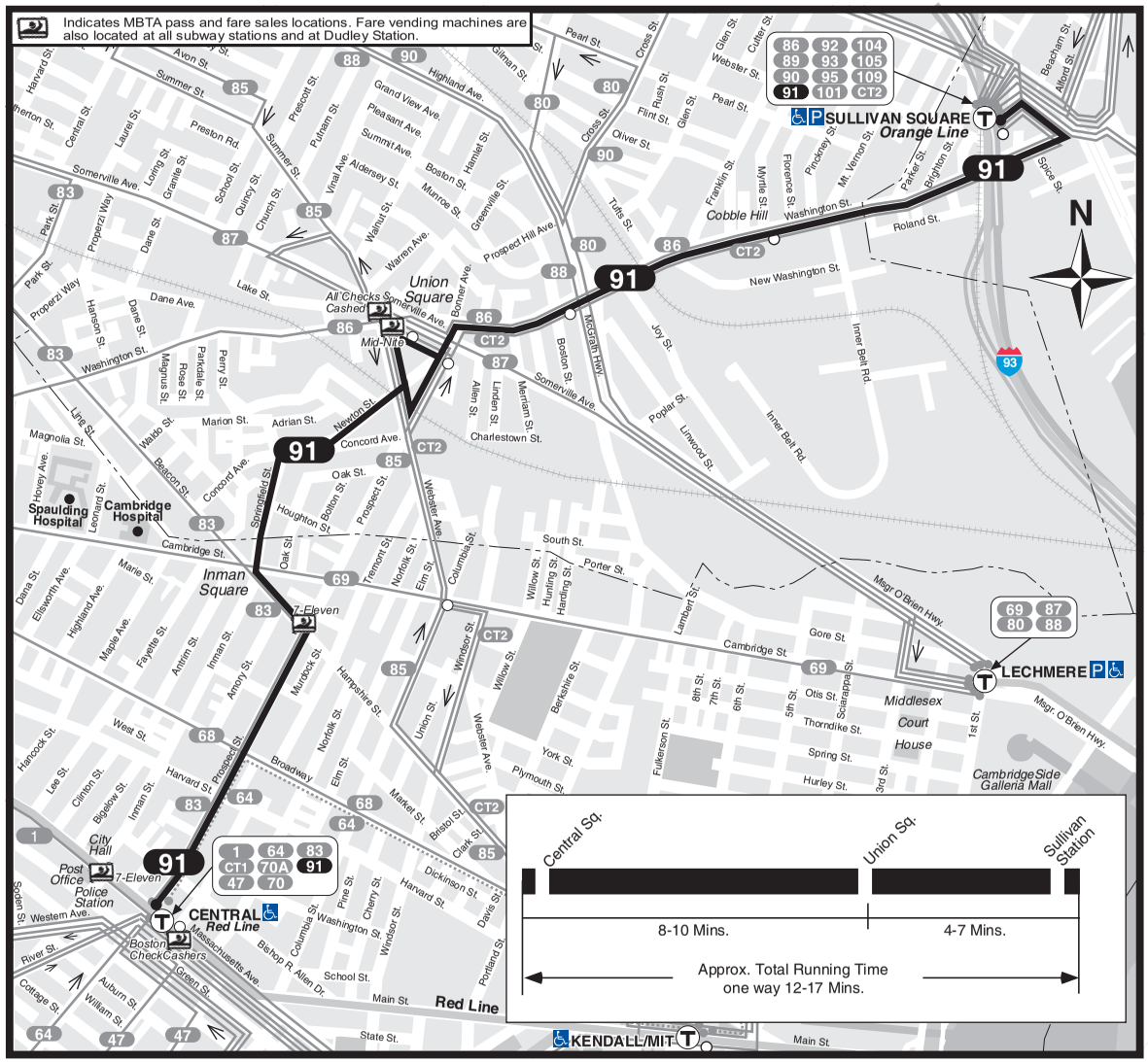
VALID PASSES: Local Bus Pass ($48/mo.); LinkPass ($70/mo.); Senior/TAP Pass** ($28/mo.); Student Pass* ($25/mo. M-F only or $28/mo. 7 days); express bus, commuter rail, and boat passes.

* Available to students through participating middle schools and high schools.
** Available to Medicare cardholders, seniors 65+ and persons with disabilities.

Spring 2013 Holidays

April 15: See Saturday **May 27: See Sunday**

Route 91 *Sullivan Square Sta. - Central Square, Cambridge* *via Washington Street*



91

SPRING March 23, 2013 - June 21, 2013

Sullivan Sq. Station - Central Sq., Cambridge

via Washington St.

Serving: **Union Square, Inman Square and connections to the Orange & Red Lines**

Arrive times are approximate, subject to traffic.

Customer Service/Travel Info 617-222-3200
Toll Free.....1-800-392-6100
Hearing Impaired (TTY).....617-222-5146

For more schedule or travel information, visit:
www.mbta.com

Massachusetts Bay Transportation Authority

massDOT
Massachusetts Department of Transportation

91 WEEKDAY

INBOUND			OUTBOUND		
Leave Sullivan Sq. Sta.	Arrive Union Square	Arrive Central Square, Cambridge	Leave Central Square, Cambridge	Arrive Union Square	Arrive Sullivan Sq. Sta.
5:15A	5:19A	5:27A	5:30A	5:35A	5:41A
5:40	5:44	5:52	5:55	6:00	6:06
5:55	5:59	6:07	6:15	6:20	6:26
6:15	6:19	6:27	6:32	6:37	6:43
6:32	6:36	6:44	6:50	6:55	7:01
6:50	6:54	7:03	7:15	7:23	7:30
7:15	7:21	7:31	7:45	7:53	8:00
7:45	7:53	8:07	8:15	8:23	8:30
8:15	8:21	8:33	8:40	8:48	8:55
8:40	8:46	8:58	9:10	9:18	9:25
9:10	9:16	9:28	9:35	9:43	9:50
9:35	9:41	9:50	10:05	10:13	10:20
10:05	10:11	10:20	10:30	10:38	10:45
10:30	10:36	10:45	10:55	11:03	11:10
10:55	11:01	11:10	11:20	11:28	11:35
11:20	11:26	11:35	11:45	11:54	**12:01P**
11:45	11:51	**12:00N**			
			12:10P	**12:19P**	**12:26P**
12:10P	**12:16P**	**12:26P**	**12:35**	**12:44**	**12:51**
12:35	**12:41**	**12:51**	**1:00**	**1:09**	**1:16**
1:00	**1:06**	**1:16**	**1:25**	**1:34**	**1:41**
1:25	**1:31**	**1:41**	**1:50**	**1:59**	**2:07**
1:50	**1:56**	**2:06**	**2:15**	**2:22**	**2:30**
2:15	**2:21**	**2:31**	**2:40**	**2:50**	**2:58**
2:40	**2:46**	**2:56**	**3:05**	**3:15**	**3:23**
3:05	**3:12**	**3:23**	**3:35**	**3:45**	**3:53**
3:35	**3:42**	**3:53**	**4:05**	**4:15**	**4:23**
4:05	**4:12**	**4:23**	**4:35**	**4:47**	**4:55**
4:35	**4:42**	**4:53**	**5:05**	**5:17**	**5:25**
5:05	**5:12**	**5:23**	**5:35**	**5:47**	**5:55**
5:35	**5:42**	**5:53**	**6:05**	**6:17**	**6:25**
6:05	**6:11**	**6:22**	**6:30**	**6:40**	**6:46**
6:35	**6:41**	**6:52**	**7:00**	**7:10**	**7:16**
7:30	**7:34**	**7:43**	**7:45**	**7:53**	**7:59**
u 8:35	**8:39**	**8:48**	**8:50**	**8:58**	**9:04**
u 9:35	**9:39**	**9:48**	**9:50**	**9:56**	**10:02**
u10:40	**10:43**	**10:51**	**10:55**	**11:02**	**11:09**
u11:40	**11:43**	**11:51**	**11:55**	12:03A	12:10A
u12:40A	12:43A	12:51A	12:55A	1:03	1:10

u - Trip departs from Sullivan Sq. upper busway.

91 SATURDAY

INBOUND			OUTBOUND		
Leave Sullivan Sq. Sta.	Arrive Union Square	Arrive Central Square, Cambridge	Leave Central Square, Cambridge	Arrive Union Square	Arrive Sullivan Sq. Sta.
5:00A	5:04A	5:12A	5:15A	5:23A	5:28A
5:30	5:34	5:42	5:45	5:53	5:58
6:00	6:04	6:12	6:15	6:23	6:28
6:30	6:34	6:42	6:45	6:53	6:58
7:00	7:04	7:12	7:15	7:23	7:28
7:30	7:34	7:42	7:45	7:53	7:58
7:55	7:59	8:07	8:15	8:23	8:28
8:15	8:19	8:27	8:40	8:48	8:53
8:35	8:39	8:47	9:00	9:08	9:14
8:55	8:59	9:07	9:20	9:28	9:34
9:15	9:21	9:29	9:40	9:48	9:54
9:35	9:41	9:49	10:00	10:08	10:14
9:55	10:01	10:09	10:20	10:28	10:34
10:15	10:21	10:29	10:40	10:48	10:54
10:35	10:41	10:49	11:00	11:08	11:14
10:55	11:01	11:09	11:20	11:28	11:35
11:15	11:21	11:29	11:40	11:53	**12:00N**
11:35	11:42	11:52			
11:55	**12:02P**	**12:12P**	**12:00N**	**12:13P**	**12:20P**
			12:20P	**12:33**	**12:40**
12:15P	**12:22P**	**12:32P**	**12:40**	**12:53**	**1:00**
12:35	**12:42**	**12:52**	**1:00**	**1:13**	**1:20**
12:55	**1:02**	**1:12**	**1:20**	**1:33**	**1:40**
1:15	**1:22**	**1:32**	**1:40**	**1:53**	**2:00**
1:35	**1:42**	**1:52**	**2:00**	**2:13**	**2:20**
1:55	**2:02**	**2:12**	**2:20**	**2:33**	**2:40**
2:15	**2:22**	**2:32**	**2:40**	**2:53**	**3:00**
2:35	**2:42**	**2:52**	**3:00**	**3:13**	**3:20**
2:55	**3:02**	**3:12**	**3:20**	**3:33**	**3:40**
3:15	**3:22**	**3:32**	**3:40**	**3:53**	**4:00**
3:35	**3:42**	**3:52**	**4:00**	**4:13**	**4:20**
3:55	**4:02**	**4:12**	**4:20**	**4:33**	**4:40**
4:15	**4:22**	**4:32**	**4:40**	**4:53**	**5:00**
4:35	**4:42**	**4:52**	**5:00**	**5:13**	**5:20**
4:55	**5:02**	**5:12**	**5:20**	**5:33**	**5:40**
5:15	**5:22**	**5:32**	**5:40**	**5:53**	**6:00**
5:35	**5:42**	**5:52**	**6:00**	**6:10**	**6:16**
5:55	**6:02**	**6:12**	**6:20**	**6:30**	**6:36**
6:25	**6:32**	**6:42**	**6:45**	**6:55**	**7:01**
7:30	**7:37**	**7:47**	**7:48**	**7:58**	**8:03**
u 8:35	**8:41**	**8:50**	**8:50**	**8:58**	**9:03**
u 9:40	**9:44**	**9:52**	**9:55**	**10:03**	**10:08**
u 10:40	**10:44**	**10:52**	**10:55**	**11:03**	**11:08**
u 11:40	**11:44**	**11:52**	**11:55**	12:03A	12:08A
u 12:40A	12:44A	12:52A	12:55A	1:03	1:08

ALL BUSES ARE ACCESSIBLE TO PERSONS WITH DISABILITIES.

91 SUNDAY

INBOUND			OUTBOUND		
Leave Sullivan Sq. Sta.	Arrive Union Square	Arrive Central Square, Cambridge	Leave Central Square, Cambridge	Arrive Union Square	Arrive Sullivan Sq. Sta.
6:30A	6:34A	6:42A	6:45A	6:53A	6:58A
7:30	7:34	7:42	7:45	7:53	7:58
8:30	8:34	8:42	8:45	8:53	8:58
9:30	9:36	9:44	9:45	9:53	9:59
10:30	10:36	10:44	10:45	10:53	10:59
11:05	11:11	11:19	11:20	11:28	11:34
11:45	11:51	11:59			
12:25P	**12:31P**	**12:39P**	**12:00N**	**12:08P**	**12:14P**
1:05	**1:11**	**1:19**	**12:40P**	**12:48**	**12:54**
1:45	**1:51**	**1:59**	**1:20**	**1:28**	**1:34**
2:25	**2:31**	**2:39**	**2:00**	**2:09**	**2:15**
3:05	**3:11**	**3:19**	**2:40**	**2:49**	**2:55**
3:45	**3:51**	**3:59**	**3:20**	**3:29**	**3:35**
4:25	**4:31**	**4:39**	**4:00**	**4:09**	**4:15**
5:05	**5:11**	**5:19**	**4:40**	**4:49**	**4:55**
5:45	**5:51**	**5:59**	**5:20**	**5:29**	**5:35**
6:30	**6:34**	**6:42**	**6:00**	**6:08**	**6:14**
7:30	**7:34**	**7:42**	**6:45**	**6:53**	**6:59**
u 8:30	**8:34**	**8:42**	**7:45**	**7:53**	**7:59**
u 9:30	**9:34**	**9:42**	**8:45**	**8:53**	**8:59**
u 10:30	**10:34**	**10:42**	**9:45**	**9:53**	**9:58**
u 11:30	**11:34**	**11:42**	**10:45**	**10:53**	**10:58**
u 12:30A	12:34A	12:42A	**11:45**	**11:53**	**11:58**
			12:45A	12:53A	12:58A

Route 91
Sullivan Sq. Sta. - Central Sq., Camb. via Washington St.

FARES

Paying with...	1-bus trip	2-bus trip	Bus + Subway Trip
CharlieCard	$1.50	$1.50	$2.00
CharlieTicket	$2.00	$2.00	$4.50
Cash onboard	$2.00	$4.00	$4.50
Student CharlieCard*	$0.75	$0.75	$1.00
Senior/TAP CharlieCard**	$0.75	$0.75	$1.00

Children under 12 ride free when accompanied by an adult.
Blind Access CharlieCard holders ride free; if using a guide, the guide rides free.

VALID PASSES: Local Bus Pass ($48/mo.); LinkPass ($70/mo.); Senior/TAP Pass** ($28/mo.); Student Pass* ($25/mo. M-F only or $28/mo. 7 days); express bus, commuter rail, and boat passes.

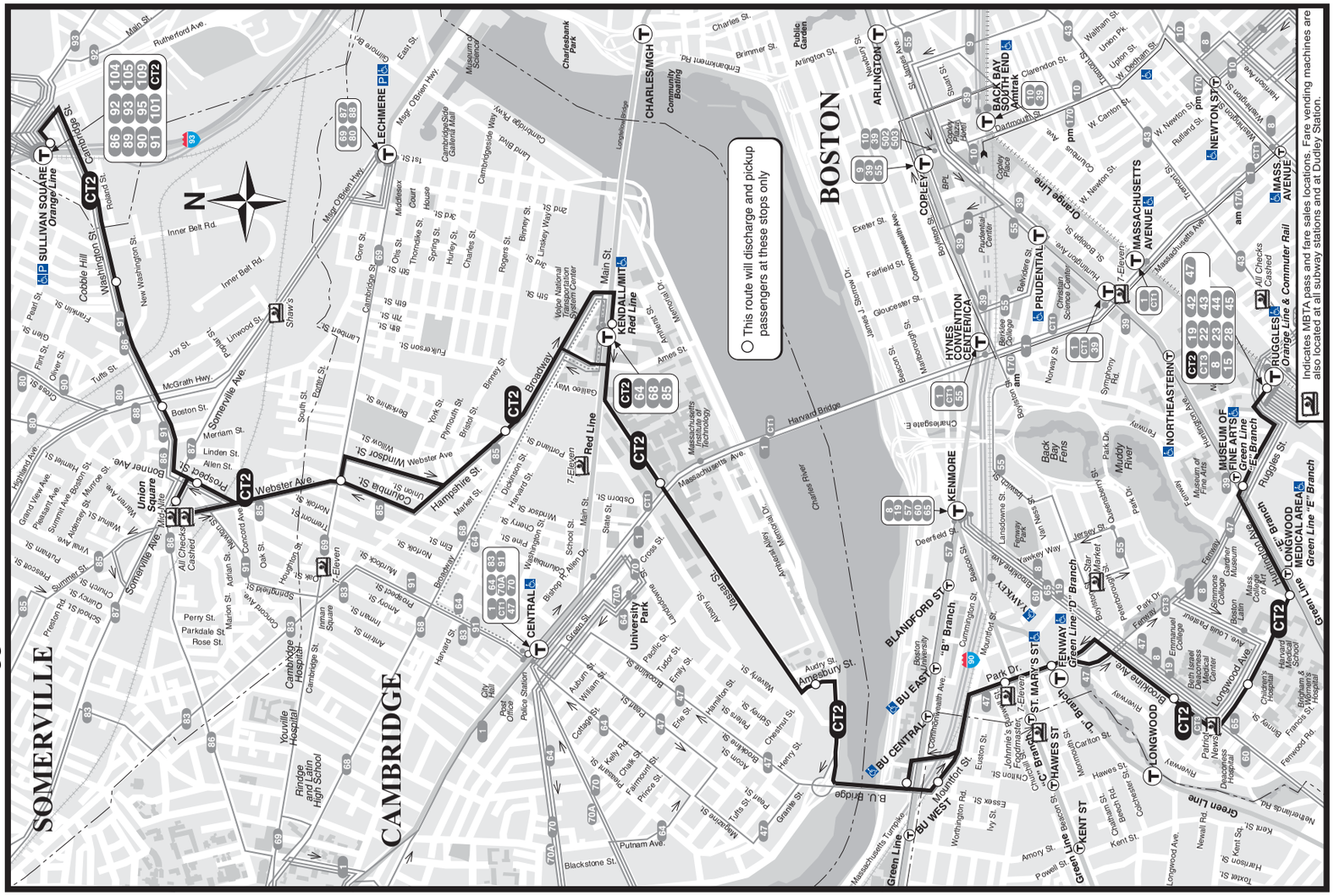
* Available to students through participating middle schools and high schools.
**Available to Medicare cardholders, seniors 65+ and persons with disabilities.

Spring 2013 Holidays

April 15: See Saturday **May 27: See Sunday**

Route CT2

Sullivan Station - Ruggles Station via Union Square, Kendall/MIT & Longwood Medical Area



CT2

SPRING March 23, 2013 - June 21, 2013

Crosstown Transit

Sullivan Station - Ruggles Station

via Union Sq., Kendall/MIT & Longwood Medical Area

Serving: Fenway Sta., Beth Israel Deaconess & Children's Hospitals, Museum of Fine Arts, Wentworth Inst. and connections to the Red, Orange and Green Lines

Arrive times are approximate, subject to traffic.

Customer Service/Travel Info 617-222-3200
Toll Free.....1-800-392-6100
Hearing Impaired (TTY).....617-222-5146

For more schedule or travel information, visit:
www.mbta.com

Massachusetts Bay Transportation Authority

massDOT
Massachusetts Department of Transportation

CT2 WEEKDAY

INBOUND

Leave Sullivan Station	Arrive Union Square	Leave Kendall/ MIT Station	Arrive Vassar/ Mass. Ave.	Arrive Vassar/ Memorial Drive	Arrive Mountfort Street	Arrive Park & Beacon Sts.	Arrive Fenway Station	Arrive Beth Israel Hospital	Arrive Children's Hospital	Arrive Huntington/ Longwood Ave.	Arrive Ruggles/ Huntington Ave.	Arrive Ruggles Station
6:35A	6:41A	6:49A	6:51A	6:53A	6:57A	6:59A	7:00A	7:03A	7:06A	7:08A	7:12A	7:16A
6:50	6:56	7:07	7:10	7:12	7:16	7:18	7:19	7:22	7:25	7:27	7:31	7:35
7:10	7:18	7:30	7:33	7:35	7:39	7:41	7:42	7:45	7:48	7:50	7:54	7:58
7:30	7:38	7:50	7:53	7:55	7:59	8:01	8:02	8:05	8:08	8:10	8:14	8:18
7:50	7:58	8:10	8:13	8:15	8:19	8:21	8:22	8:25	8:28	8:30	8:34	8:38
8:10	8:18	8:30	8:33	8:35	8:39	8:41	8:42	8:45	8:48	8:50	8:54	8:58
8:30	8:38	8:50	8:53	8:55	8:59	9:01	9:02	9:05	9:08	9:10	9:14	9:18
8:50	8:58	9:10	9:13	9:15	9:19	9:21	9:22	9:25	9:28	9:30	9:34	9:38
9:15	9:23	9:35	9:38	9:40	9:44	9:46	9:47	9:50	9:53	9:55	9:59	10:02
9:40	9:48	10:00	10:03	10:05	10:09	10:11	10:12	10:15	10:17	10:19	10:22	10:25
10:00	10:07	10:16	10:19	10:21	10:25	10:27	10:28	10:31	10:33	10:35	10:38	10:41
10:30	10:37	10:46	10:49	10:51	10:55	10:57	10:58	11:01	11:03	11:05	11:08	11:11
11:00	11:07	11:16	11:19	11:21	11:25	11:27	11:28	11:31	11:33	11:35	11:38	11:41
11:35	11:42	11:51	11:54	11:56	**12:00N**	**12:02P**	**12:03P**	**12:06P**	**12:08P**	**12:10P**	**12:13P**	**12:16P**
12:05P	**12:12P**	**12:21P**	**12:24P**	**12:26P**	**12:30P**	**12:32P**	**12:33P**	**12:36P**	**12:38P**	**12:40P**	**12:43P**	**12:46P**
12:35	**12:42**	**12:51**	**12:54**	**12:56**	**1:00**	**1:02**	**1:03**	**1:06**	**1:08**	**1:10**	**1:14**	**1:18**
1:10	**1:17**	**1:28**	**1:31**	**1:33**	**1:37**	**1:39**	**1:40**	**1:43**	**1:45**	**1:47**	**1:51**	**1:55**
1:45	**1:52**	**2:03**	**2:06**	**2:08**	**2:12**	**2:14**	**2:15**	**2:18**	**2:20**	**2:22**	**2:26**	**2:30**
2:15	**2:22**	**2:33**	**2:36**	**2:38**	**2:42**	**2:44**	**2:45**	**2:48**	**2:50**	**2:52**	**2:56**	**3:00**
2:45	**2:52**	**3:03**	**3:06**	**3:08**	**3:13**	**3:15**	**3:16**	**3:19**	**3:22**	**3:24**	**3:28**	**3:33**
3:10	**3:19**	**3:29**	**3:32**	**3:34**	**3:39**	**3:41**	**3:42**	**3:45**	**3:48**	**3:50**	**3:54**	**3:59**
3:35	**3:44**	**3:54**	**3:57**	**3:59**	**4:04**	**4:06**	**4:07**	**4:10**	**4:13**	**4:15**	**4:19**	**4:24**
4:00	**4:09**	**4:19**	**4:22**	**4:24**	**4:29**	**4:31**	**4:32**	**4:35**	**4:38**	**4:40**	**4:44**	**4:49**
4:25	**4:34**	**4:44**	**4:47**	**4:49**	**4:54**	**4:56**	**4:57**	**5:00**	**5:03**	**5:05**	**5:09**	**5:14**
4:50	**4:59**	**5:09**	**5:12**	**5:14**	**5:19**	**5:21**	**5:22**	**5:25**	**5:28**	**5:30**	**5:34**	**5:39**
5:15	**5:24**	**5:34**	**5:37**	**5:39**	**5:44**	**5:46**	**5:47**	**5:50**	**5:53**	**5:55**	**5:59**	**6:04**
5:40	**5:49**	**5:59**	**6:02**	**6:04**	**6:09**	**6:11**	**6:12**	**6:15**	**6:18**	**6:20**	**6:24**	**6:29**
6:05	**6:14**	**6:24**	**6:27**	**6:29**	**6:34**	**6:36**	**6:37**	**6:40**	**6:43**	**6:45**	**6:49**	**6:54**
6:30	**6:39**	**6:49**	**6:52**	**6:54**	**6:59**	**7:01**	**7:02**	**7:05**	**7:07**	**7:09**	**7:12**	**7:15**
7:00	**7:05**	**7:12**	**7:15**	**7:17**	**7:21**	**7:23**	**7:24**	**7:27**	**7:29**	**7:31**	**7:34**	**7:37**

CT2 WEEKDAY

OUTBOUND

Leave Ruggles Station	Arrive Ruggles/ Huntington Ave.	Arrive Huntington/ Longwood Ave.	Arrive Coop/ Children's Hospital	Arrive Beth Israel Hospital	Arrive Fenway Station	Arrive Park & Beacon Sts.	Arrive Comm Ave. B.U. Bridge	Arrive Amesbury/ Vassar Streets	Arrive Vassar/ Mass. Ave.	Arrive Kendall/ MIT Station	Arrive Union Square	Arrive Sullivan Station
5:55A	5:57A	5:59A	6:01A	6:04A	6:07A	6:08A	6:10A	6:13A	6:15A	6:19A	6:27A	6:33A
6:25	6:27	6:29	6:31	6:34	6:37	6:38	6:40	6:43	6:45	6:49	6:57	7:03
6:40	6:42	6:44	6:46	6:49	6:52	6:53	6:55	6:58	7:00	7:04	7:12	7:18
7:00	7:02	7:04	7:06	7:09	7:12	7:13	7:15	7:18	7:20	7:24	7:32	7:38
7:20	7:22	7:24	7:26	7:29	7:32	7:33	7:35	7:38	7:40	7:44	7:52	7:58
7:40	7:42	7:44	7:46	7:49	7:52	7:53	7:55	7:58	8:00	8:04	8:13	8:20
7:55	7:57	7:59	8:01	8:04	8:07	8:08	8:11	8:14	8:16	8:20	8:29	8:36
8:10	8:12	8:15	8:17	8:20	8:23	8:24	8:27	8:30	8:32	8:36	8:45	8:52
8:30	8:32	8:35	8:37	8:40	8:43	8:44	8:47	8:50	8:52	8:56	9:05	9:12
8:50	8:52	8:55	8:57	9:00	9:03	9:04	9:07	9:10	9:12	9:16	9:25	9:32
9:15	9:17	9:20	9:22	9:25	9:28	9:29	9:32	9:35	9:37	9:41	9:50	9:57
9:45	9:47	9:50	9:52	9:55	9:58	9:59	10:01	10:04	10:06	10:10	10:18	10:25
10:15	10:17	10:19	10:21	10:24	10:26	10:27	10:29	10:32	10:34	10:38	10:46	10:53
10:50	10:52	10:54	10:56	10:59	11:01	11:02	11:04	11:07	11:09	11:13	11:21	11:28
11:20	11:22	11:24	11:26	11:29	11:31	11:32	11:34	11:37	11:39	11:43	11:51	11:58
11:50	11:52	11:54	11:56	11:59	**12:01P**	**12:02P**	**12:04P**	**12:07P**	**12:09P**	**12:13P**	**12:21P**	**12:28P**
12:25P	**12:27P**	**12:29P**	**12:31P**	**12:34P**	**12:36P**	**12:37P**	**12:39P**	**12:42P**	**12:44P**	**12:48P**	**12:56P**	**1:04P**
12:55	**12:57**	**12:59**	**1:02**	**1:05**	**1:08**	**1:09**	**1:12**	**1:16**	**1:19**	**1:23**	**1:33**	**1:42**
1:25	**1:27**	**1:30**	**1:33**	**1:36**	**1:39**	**1:40**	**1:43**	**1:47**	**1:50**	**1:54**	**2:04**	**2:13**
1:50	**1:52**	**1:55**	**1:58**	**2:01**	**2:04**	**2:05**	**2:08**	**2:12**	**2:15**	**2:19**	**2:29**	**2:38**
2:15	**2:17**	**2:20**	**2:23**	**2:26**	**2:29**	**2:30**	**2:33**	**2:37**	**2:40**	**2:44**	**2:54**	**3:03**
2:40	**2:42**	**2:45**	**2:48**	**2:51**	**2:54**	**2:55**	**2:58**	**3:02**	**3:05**	**3:09**	**3:19**	**3:28**
3:05	**3:07**	**3:10**	**3:13**	**3:16**	**3:19**	**3:20**	**3:23**	**3:27**	**3:30**	**3:34**	**3:44**	**3:53**
3:30	**3:32**	**3:35**	**3:38**	**3:41**	**3:44**	**3:45**	**3:48**	**3:52**	**3:55**	**3:59**	**4:09**	**4:18**
3:55	**3:57**	**4:00**	**4:03**	**4:06**	**4:09**	**4:10**	**4:13**	**4:17**	**4:20**	**4:24**	**4:34**	**4:43**
4:20	**4:22**	**4:25**	**4:28**	**4:31**	**4:34**	**4:35**	**4:38**	**4:42**	**4:45**	**4:49**	**4:59**	**5:08**
4:45	**4:47**	**4:50**	**4:53**	**4:56**	**4:59**	**5:00**	**5:03**	**5:07**	**5:10**	**5:14**	**5:24**	**5:33**
5:10	**5:12**	**5:15**	**5:18**	**5:21**	**5:24**	**5:25**	**5:28**	**5:32**	**5:35**	**5:39**	**5:49**	**5:58**
5:35	**5:37**	**5:40**	**5:43**	**5:46**	**5:49**	**5:50**	**5:53**	**5:57**	**6:00**	**6:04**	**6:14**	**6:23**
6:00	**6:02**	**6:05**	**6:08**	**6:11**	**6:14**	**6:15**	**6:18**	**6:22**	**6:25**	**6:29**	**6:39**	**6:48**
6:20	**6:22**	**6:25**	**6:28**	**6:31**	**6:34**	**6:35**	**6:38**	**6:42**	**6:45**	**6:49**	**6:59**	**7:04**
6:45	**6:47**	**6:50**	**6:53**	**6:56**	**6:59**	**7:00**	**7:02**	**7:05**	**7:07**	**7:11**	**7:18**	**7:23**

In addition to the stops listed above, this route also stops in Somerville on Washington St. at Myrtle Street and at McGrath Highway. In Cambridge this route also stops at Cambridge & Columbia Streets and at One Kendall Square (Hampshire St. at Broadway).

ALL BUSES ARE ACCESSIBLE TO PERSONS WITH DISABILITIES.

Route CT2
Sullivan Station - Ruggles Station via Union Sq., Kendall/MIT & Longwood Medical Area

NO SERVICE ON WEEKENDS & MOST HOLIDAYS

Spring 2013
Holidays without service:
April 15 - Patriot's Day
May 27 - Memorial Day

FARES

Paying with...	1- bus trip	2- bus trip	Bus + subway trip
CharlieCard	$1.50	$1.50	$2.00
CharlieTicket	$2.00	$2.00	$4.50
Cash onboard	$2.00	$4.00	$4.50
Student CharlieCard*	$0.75	$0.75	$1.00
Senior/TAP CharlieCard**	$0.75	$0.75	$1.00

Children under 12 ride free when accompanied by an adult.
Blind Access CharlieCard holders ride free, if using a guide, the guide rides free.

VALID PASSES: Local Bus Pass ($48/mo.); LinkPass ($70/mo.); Senior/TAP Pass** ($28/mo.); Student Pass* ($25/mo. M-F only or $28/mo. 7 days); express bus, commuter rail, and boat passes.

* Available to students through participating middle schools and high schools.
**Available to Medicare cardholders, seniors 65+ and persons with disabilities.

APPENDIX

Crash Rate Worksheets

Traffic & Safety Engineering Home
Accessible Pedestrian Signal Installation Policy
Accident (Crash) Data
Approved Signal Controls
Crash Rates
Guide Sign Policy for Secondary State Highways
Management Plans (Flaggers and Police Details)
Massachusetts Amendments to the Federal MUTCD
25% Design Submission Guidelines and Traffic Analysis Tools
Mast Arm and Foundation Details Standard Drawings
Road Safety Audits
Roadway Safety Tips
Speed Limit Regulations
Strategic Highway Safety Plan
Supplemental Sign Policy
Top Crash Location Reports and Maps
Traffic Safety Toolbox

Print this page

<<back | 1 | 2

Average Crash Rates

Crash information queried on January 23, 2013

Intersection - Crashes per million entering vehicles

Location	Signalized Intersections	Unsignalized Intersections
Statewide	0.80	0.60
District 1*	0.92*	0.43*
District 2	0.82	0.68
District 3	0.89	0.66
District 4	0.77	0.58
District 5	0.77	0.58
District 6	0.76	0.58

* - District 1 should use Statewide Rates due to low sample total

2010 Functional Classification - crashes per million vehicle miles traveled

Roadway Federal Functional Classification	Rural	Urban
Statewide	0.92	1.95
Interstate	0.39	0.55
Principal arterial - other freeways and expressways	0.33	0.64
Principal arterial - other	0.65	3.23
Minor arterial	0.96	3.63
Major collector	1.58	3.80
Minor collector	2.36	-
Local	1.35	1.87

Notes on Functional Classification Data

- Crash rates are based solely on Geocoded Crashes (*approximately 94% of all Crashes in the system but not uniformly Geocoded by Functional Classification*)
- If a crash occurred at an intersection or along two different functional classifications, the crash was assigned to the higher order roadway.
- Source of VMTs: **http://www.fhwa.dot.gov/policyinformation/statistics/2010/vm2.cfm**

c. 2012 Commonwealth of Massachusetts

Moving Massachusetts Forward.
massDOT
Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Somerville COUNT DATE : May [illegible]

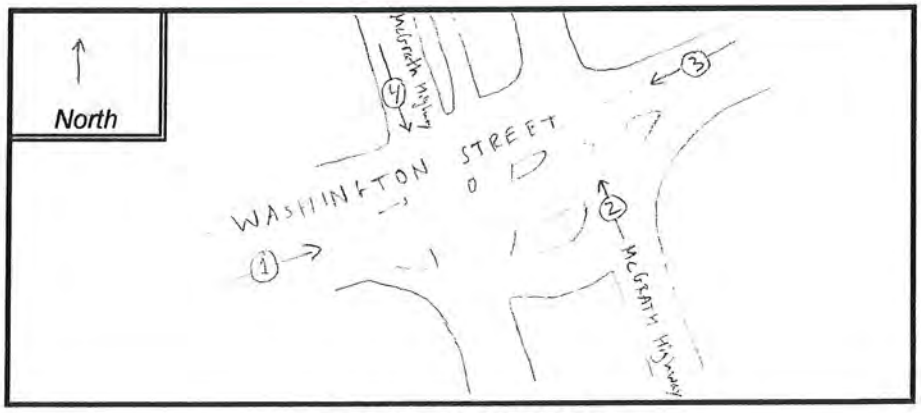
DISTRICT : 4 UNSIGNALIZED : [ ] SIGNALIZED : [X]

~ INTERSECTION DATA ~

MAJOR STREET : Washington Street and McGrath Highway (Route 28)

MINOR STREET(S) :

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	East	North	West	South		
PEAK HOURLY VOLUMES (AM/PM) :	663	695	893	433		2,684

" K " FACTOR : 0.09

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : 29,822

TOTAL # OF CRASHES : 51 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : 17

CRASH RATE CALCULATION : 1.56

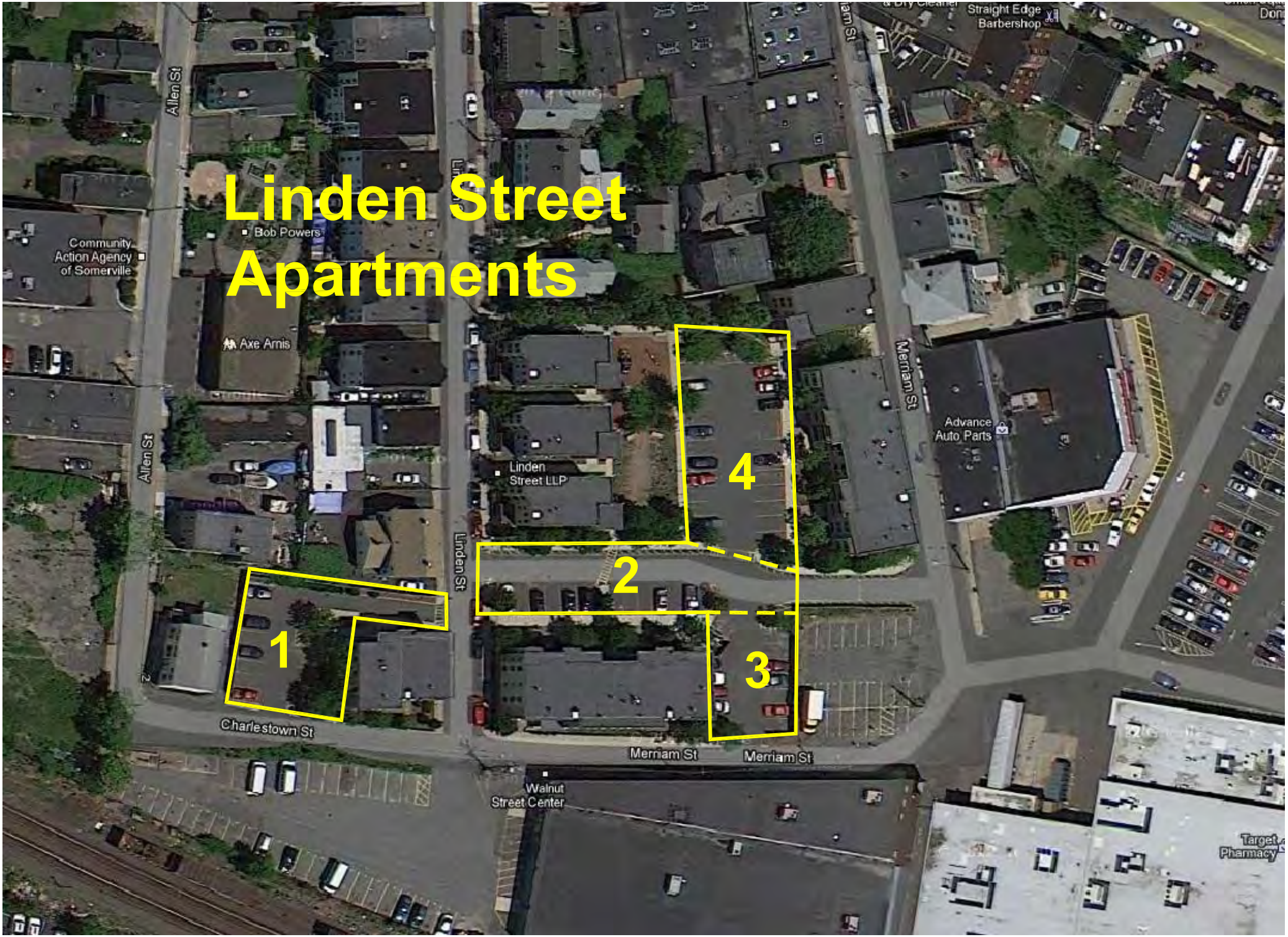
RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : District Avg 0.75

Project Title & Date: 181 Washington St Somerville (2011-081) May 25th, 2012

APPENDIX

Off-Street Parking Data


Linden Street Apartments
1
2
3
4
Allen St
Linden St
Merriam St
Charlestown St
Community Action Agency of Somerville
Bob Powers
Axe Amis
Linden Street LLP
Advance Auto Parts
Straight Edge Barbershop
Walnut Street Center
Target Pharmacy

460-480 Mystic Ave
1
2
3
note:
area 3 is for commercial parking, not for residents
Mystic Ave
Mystic Ave
Mystic Ave
Mystic Ave
Butler Dr
Butler Dr
Memorial Rd
Memorial Rd
Temple St
Temple St
Temple St
Central Convenience Store
Avalon Dental Center, Family Dentist in Somerville
93
38
436

Off-Street Parking Survey

City: Somerville, MA
Locations: Linden St & Mystic Ave
Dates: 4/6/13 - 4/8/13
Weather:

Proj. No.: 2012-124.10
Sheet No.:
Calculate by: B. Pyburn
Notes:

		Number of Cars Parked in each off-street parking area				
		Weekday			Saturday	
		date: 4/8/13			date: 4/6/13	
	Total Number of off-street parking spaces	7:00am	12:00pm	7:00pm	7:00am	7:00pm
Linden Street Parking Areas						
Area 1	9 (4 compact / 1 HC)	3	6	3	2	4
Area 2	13 (7 compact)	6	2	6	5	6
Area 3	12 (5 compact)	3	2	2	4	5
Area 4	22 (2 HC)	13	8	5	15	8
Mystic Ave Parking Areas						
Area 1	53 (2 HC)	20	10	17	24	14
Area 2	18 (1 HC)	3	12	11	5	5
Area 3	10 (2 HC)	2	4	2	2	2

(note Area 3 is for the commercial portion of the site, not for resident parking)

APPENDIX

On-Street Parking Data

Parking Survey

City: Somerville, MA
Street: 181 Washington St
Date: 5/8/2012 Tuesday
Weather: rainy

Proj. No.: 2011-081
Sheet No.: 1
Calculate by: Steve Wen
Notes:

Weekday Available Parking Spaces

Street	Section		Subsection	7:00 AM	12:00 PM	7:00 PM
	From	to				
Washington St	#223 Washington St	McGrath Highway	North Side	0	0	0
			South Side	2	3	5
Washington Terrace	#54 Washington Terrace	Washington St	East Side	2	1	2
			West Side	0	0	0
Boston St	#27 Boston St	Washington St	East Side	6	12	8
			West Side	9	11	9
Munroe St	#11 Munroe St	Boston St	North Side	0	7	0
			South Side	1	3	2
McGrath Highway	#300 McGrath Highway	#358 McGrath Highway	East Side	0	0	0
			West Side	8	5	2
Merriam St	# 87 Merriam St	Washington St	East Side	0	0	1
			West Side	0	0	0
Rossmore St	#25 Rossmore St	Washington St	East Side	0	5	1
			West Side	1	1	1
Mansfield St	#35 Mansfield St	Washington St	East Side	3	10	1
			West Side	5	1	3
			TOTAL:	37	59	35

Average 7 AM & 7 PM = 36 Available Parking Spaces

Parking Survey

City: Somerville, MA
Street: 181 Washington St
Date: 5/5/2012 Saturday
Weather: cloudy

Proj. No.: 2011-081
Sheet No.: 2
Calculate by: Steve Wen
Notes:

Saturday Available Parking Spaces

Street	Section From	Section to	Subsection	7:00 AM	7:00 PM
Washington St	#223 Washington St	McGrath Highway	North Side	0	0
			South Side	0	0
Washington Terrace	#54 Washington Terrace	Washington St	East Side	0	1
			West Side	0	0
Boston St	#27 Boston St	Washington St	East Side	9	7
			West Side	10	6
Munroe St	#11 Munroe St	Boston St	North Side	2	0
			South Side	2	1
McGrath Highway	#300 McGrath Highway	#358 McGrath Highway	East Side	0	0
			West Side	9	4
Merriam St	# 87 Merriam St	Washington St	East Side	0	0
			West Side	0	1
Rossmore St	#25 Rossmore St	Washington St	East Side	1	1
			West Side	0	0
Mansfield St	#35 Mansfield St	Washington St	East Side	0	2
			West Side	3	4
			TOTAL:	36	27

Average 7 AM & 7 PM = 31.5 Available Parking Spaces

APPENDIX

Trip Generation Calculations

Design Consultants, Inc.
February 15, 2013
197 & 181 Washington Street
Trip Generation Calculations
Based on ITE's Trip Generation Manual, 9th Edition (2012)

Land Use: 220, Apartment

number of units:	**84**

	AM Peak	**PM Peak**	**Weekday Daily**
Average Rate (per num. of dwelling units)	0.51	0.62	6.65
Percent Entering	20%	65%	50%
Percent Exiting	80%	35%	50%
Total Trips	43	52	559
Entering Trips	9	34	280
Exiting Trips	34	18	279

Land Use: 826, Specialty Retail Center

gross leasble area:	**6,500**	**SF**

	AM Peak *	**PM Peak**	**Weekday Daily**
Average Rate (per 1,000 SF)	0.70	2.71	44.32
Percent Entering	62%	44%	50%
Percent Exiting	38%	56%	50%
Total Trips	5	18	288
Entering Trips	3	8	144
Exiting Trips	2	10	144

* Land Use 826, Specialty Retail Center does not contain any data regarding trips made during the AM peak hour of the adjacent street traffic. To estimate the trips in the AM peak hour of the adjacent street traffic, the Shopping Center (Land Use 820) land use was used. The ratio of the average rate in the AM peak hour of the adjacent street traffic (0.96) to the average rate in the PM peak hour of the adjacent street traffic (3.71) was applied to the average rate PM peak hour rate of Land Use 826. The percent entering/exiting from Land Use 820 was also used.

Land Use: 710, General Office Building

gross floor area:	**2,500**	**SF**

	AM Peak	**PM Peak**	**Weekday Daily**
Average Rate (per num. of dwelling units)	1.56	1.49	11.03
Percent Entering	88%	17%	50%
Percent Exiting	12%	83%	50%
Total Trips	4	4	28
Entering Trips	4	1	14
Exiting Trips	0	3	14

Total Site Trips (unadjusted)

	AM Peak	**PM Peak**	**Weekday Daily**
Total Trips	52	74	875
Entering Trips	16	43	438
Exiting Trips	36	31	437

Total Site Trips (10% reduction)

	AM Peak	**PM Peak**	**Weekday Daily**
Total Trips	47	67	788
Entering Trips	15	39	394
Exiting Trips	32	28	394

APPENDIX

Intersection Capacity Analysis – Weekday Morning Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	334	0	252	483	0	0	0	0	0	133	211
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3406	0	1719	3438	0	0	0	0	0	1863	1583
Flt Permitted				0.950								
Satd. Flow (perm)	0	3406	0	1719	3438	0	0	0	0	0	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												257
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		124			159			104			434	
Travel Time (s)		2.8			3.6			2.4			9.9	
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92	0.82	0.82	0.82
Heavy Vehicles (%)	6%	6%	6%	5%	5%	5%	2%	2%	2%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	375	0	268	514	0	0	0	0	0	162	257
Turn Type		NA		Split	NA						NA	Prot
Protected Phases		1 2		4	4						3	3
Permitted Phases												
Minimum Split (s)				20.0	20.0						16.0	16.0
Total Split (s)				74.0	74.0						16.0	16.0
Total Split (%)				56.1%	56.1%						12.1%	12.1%
Yellow Time (s)				3.0	3.0						4.0	4.0
All-Red Time (s)				1.0	1.0						2.0	2.0
Lost Time Adjust (s)				0.0	0.0						0.0	0.0
Total Lost Time (s)				4.0	4.0						6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)		39.0		70.0	70.0						10.0	10.0
Actuated g/C Ratio		0.30		0.53	0.53						0.08	0.08
v/c Ratio		0.37		0.29	0.28						1.15	0.72
Control Delay		38.1		1.2	0.8						174.0	18.9
Queue Delay		0.3		0.5	0.3						0.0	0.0
Total Delay		38.4		1.7	1.1						174.0	18.9
LOS		D		A	A						F	B
Approach Delay		38.4			1.3						78.9	
Approach LOS		D			A						E	
Queue Length 50th (ft)		134		3	2						~163	0
Queue Length 95th (ft)		177		3	3						#269	56
Internal Link Dist (ft)		44			79			24			354	
Turn Bay Length (ft)												
Base Capacity (vph)		1006		911	1823						141	357
Starvation Cap Reductn		0		310	694						0	0
Spillback Cap Reductn		196		0	0						0	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.46		0.45	0.46						1.15	0.72

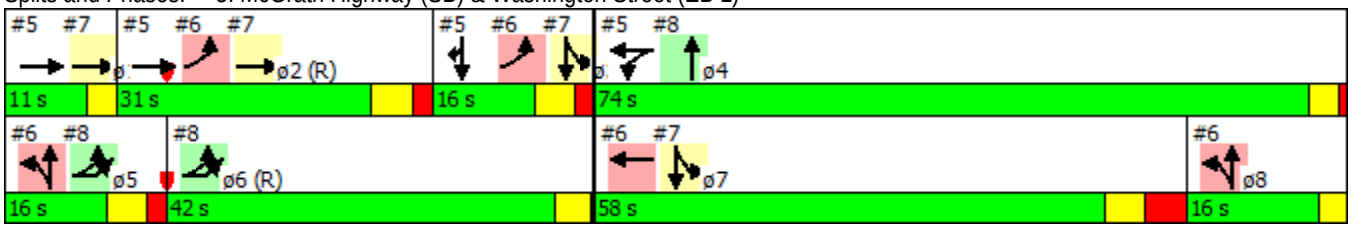
Intersection Summary	
Area Type:	Other
Cycle Length: 132	

Lane Group	ø1	ø2	ø5	ø6	ø7	ø8
Lane Configurations						
Volume (vph)						
Ideal Flow (vphpl)						
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 (%)						
Shared Lane Traffic (%)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	1	2	5	6	7	8
Permitted Phases						
Minimum Split (s)	11.0	31.0	16.0	20.0	20.0	16.0
Total Split (s)	11.0	31.0	16.0	42.0	58.0	16.0
Total Split (%)	8%	23%	12%	32%	44%	12%
Yellow Time (s)	3.0	4.0	4.0	3.5	4.0	3.0
All-Red Time (s)	0.0	2.0	2.0	0.5	4.0	0.0
Lost Time Adjust (s)						
Total Lost Time (s)						
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

Intersection Summary

Actuated Cycle Length: 132
Offset: 0 (0%), Referenced to phase 2:EBT and 6:, Start of Green
Natural Cycle: 95
Control Type: Pretimed
Maximum v/c Ratio: 1.15
Intersection Signal Delay: 30.7 Intersection LOS: C
Intersection Capacity Utilization 45.5% ICU Level of Service A
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: McGrath Highway (SB) & Washington Street (EB L)

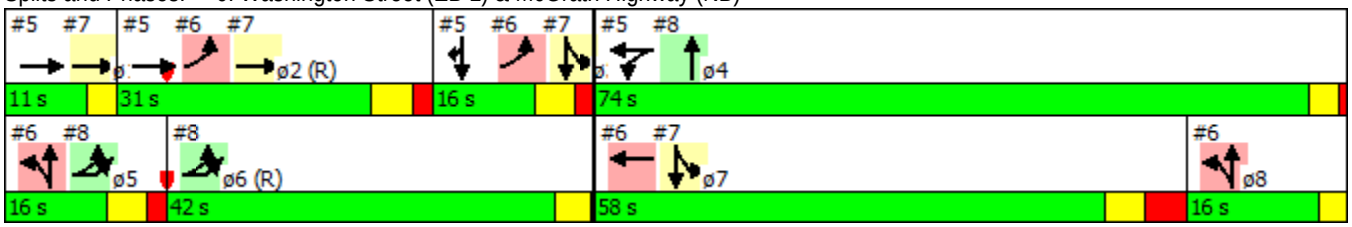


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	334	0	0	0	732	80	21	164	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		100	0		0	0		0
Storage Lanes	2		0	1		1	1		0	0		0
Taper Length (ft)	25			150			25			25		
Satd. Flow (prot)	3303	0	0	0	4866	0	1535	3229	0	0	0	0
Flt Permitted	0.950						0.950	0.999				
Satd. Flow (perm)	3303	0	0	0	4866	0	1535	3229	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					16							
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		159			352			127			369	
Travel Time (s)		3.6			8.0			2.9			8.4	
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.88	0.88	0.88	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	5%	5%	5%	7%	7%	7%	2%	2%	2%
Shared Lane Traffic (%)							10%					
Lane Group Flow (vph)	375	0	0	0	864	0	22	188	0	0	0	0
Turn Type	Prot				NA		Split	NA				
Protected Phases	2 3!				7		5 8!	5 8!				
Permitted Phases												
Minimum Split (s)					20.0							
Total Split (s)					58.0							
Total Split (%)					43.9%							
Yellow Time (s)					4.0							
All-Red Time (s)					4.0							
Lost Time Adjust (s)					0.0							
Total Lost Time (s)					8.0							
Lead/Lag					Lead							
Lead-Lag Optimize?					Yes							
Act Effct Green (s)	41.0				50.0		26.0	26.0				
Actuated g/C Ratio	0.31				0.38		0.20	0.20				
v/c Ratio	0.37				0.47		0.07	0.30				
Control Delay	7.3				31.3		40.3	43.0				
Queue Delay	0.9				0.0		20.9	73.7				
Total Delay	8.1				31.3		61.2	116.8				
LOS	A				C		E	F				
Approach Delay					31.3			111.0				
Approach LOS					C			F				
Queue Length 50th (ft)	143				198		17	81				
Queue Length 95th (ft)	190				241		47	120				
Internal Link Dist (ft)		79			272			47			289	
Turn Bay Length (ft)												
Base Capacity (vph)	1025				1853		302	636				
Starvation Cap Reductn	381				0		266	512				
Spillback Cap Reductn	0				0		0	0				
Storage Cap Reductn	0				0		0	0				
Reduced v/c Ratio	0.58				0.47		0.61	1.52				

Intersection Summary

Area Type: Other	
Cycle Length: 132	
Actuated Cycle Length: 132	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 95	
Control Type: Pretimed	
Maximum v/c Ratio: 1.15	
Intersection Signal Delay: 36.9	Intersection LOS: D
Intersection Capacity Utilization 45.5%	ICU Level of Service A
Analysis Period (min) 15	
! Phase conflict between lane groups.	

Splits and Phases: 6: Washington Street (EB L) & McGrath Highway (NB)



Lane Group	ø1	ø2	ø3	ø4	ø5	ø6	ø8
Lane Configurations							
Volume (vph)							
Ideal Flow (vphpl)							
Storage Length (ft)							
Storage Lanes							
Taper Length (ft)							
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 (%)							
Shared Lane Traffic (%)							
Lane Group Flow (vph)							
Turn Type							
Protected Phases	1	2	3	4	5	6	8
Permitted Phases							
Minimum Split (s)	11.0	31.0	16.0	20.0	16.0	20.0	16.0
Total Split (s)	11.0	31.0	16.0	74.0	16.0	42.0	16.0
Total Split (%)	8%	23%	12%	56%	12%	32%	12%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	3.5	3.0
All-Red Time (s)	0.0	2.0	2.0	1.0	2.0	0.5	0.0
Lost Time Adjust (s)							
Total Lost Time (s)							
Lead/Lag	Lead	Lag			Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes			Yes	Yes	Yes
Act Effct Green (s)							
Actuated g/C Ratio							
v/c Ratio							
Control Delay							
Queue Delay							
Total Delay							
LOS							
Approach Delay							
Approach LOS							
Queue Length 50th (ft)							
Queue Length 95th (ft)							
Internal Link Dist (ft)							
Turn Bay Length (ft)							
Base Capacity (vph)							
Starvation Cap Reductn							
Spillback Cap Reductn							
Storage Cap Reductn							
Reduced v/c Ratio							

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	250	10	0	0	0	0	0	0	44	341	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	4864	0	0	0	0	0	0	0	1770	1863	0
Flt Permitted										0.950		
Satd. Flow (perm)	0	4864	0	0	0	0	0	0	0	1770	1863	0
Right Turn on Red			Yes			Yes			Yes	Yes		Yes
Satd. Flow (RTOR)		5								83		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		142			156			280			104	
Travel Time (s)		3.2			3.5			6.4			2.4	
Peak Hour Factor	0.64	0.64	0.64	0.92	0.92	0.92	0.92	0.92	0.92	0.82	0.82	0.82
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	407	0	0	0	0	0	0	0	54	416	0
Turn Type		NA								Split	NA	
Protected Phases		1 2								3 7	3 7	
Permitted Phases												
Minimum Split (s)												
Total Split (s)												
Total Split (%)												
Yellow Time (s)												
All-Red Time (s)												
Lost Time Adjust (s)												
Total Lost Time (s)												
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)		39.0								68.0	68.0	
Actuated g/C Ratio		0.30								0.52	0.52	
v/c Ratio		0.28								0.06	0.43	
Control Delay		35.9								0.1	4.7	
Queue Delay		0.0								0.0	0.0	
Total Delay		35.9								0.1	4.7	
LOS		D								A	A	
Approach Delay		35.9									4.2	
Approach LOS		D									A	
Queue Length 50th (ft)		97								0	27	
Queue Length 95th (ft)		87								m0	m29	
Internal Link Dist (ft)		62			76			200			24	
Turn Bay Length (ft)												
Base Capacity (vph)		1440								952	959	
Starvation Cap Reductn		0								0	0	
Spillback Cap Reductn		34								0	0	
Storage Cap Reductn		0								0	0	
Reduced v/c Ratio		0.29								0.06	0.43	

Intersection Summary	
Area Type:	Other
Cycle Length: 132	

Lane Group	ø1	ø2	ø3	ø4	ø5	ø6	ø7	ø8
Lane Configurations								
Volume (vph)								
Ideal Flow (vphpl)								
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 (%)								
Shared Lane Traffic (%)								
Lane Group Flow (vph)								
Turn Type								
Protected Phases	1	2	3	4	5	6	7	8
Permitted Phases								
Minimum Split (s)	11.0	31.0	16.0	20.0	16.0	20.0	20.0	16.0
Total Split (s)	11.0	31.0	16.0	74.0	16.0	42.0	58.0	16.0
Total Split (%)	8%	23%	12%	56%	12%	32%	44%	12%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	3.5	4.0	3.0
All-Red Time (s)	0.0	2.0	2.0	1.0	2.0	0.5	4.0	0.0
Lost Time Adjust (s)								
Total Lost Time (s)								
Lead/Lag	Lead	Lag			Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes			Yes	Yes	Yes	Yes
Act Effct Green (s)								
Actuated g/C Ratio								
v/c Ratio								
Control Delay								
Queue Delay								
Total Delay								
LOS								
Approach Delay								
Approach LOS								
Queue Length 50th (ft)								
Queue Length 95th (ft)								
Internal Link Dist (ft)								
Turn Bay Length (ft)								
Base Capacity (vph)								
Starvation Cap Reductn								
Spillback Cap Reductn								
Storage Cap Reductn								
Reduced v/c Ratio								

Intersection Summary

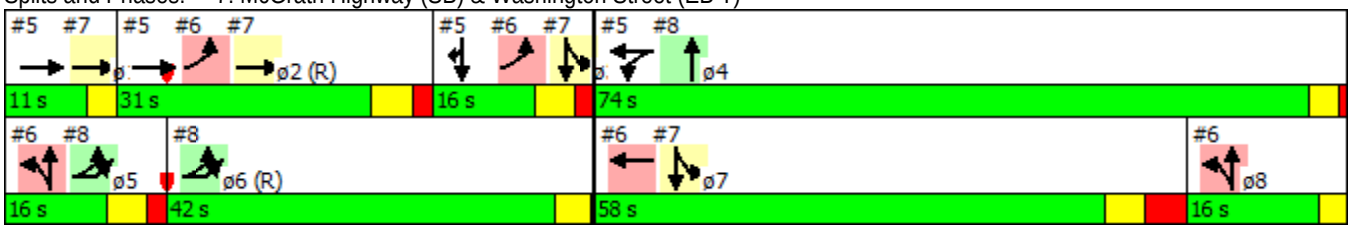
Actuated Cycle Length: 132
Offset: 0 (0%), Referenced to phase 2:EBT and 6:, Start of Green
Natural Cycle: 95
Control Type: Pretimed
Maximum v/c Ratio: 1.15

Intersection Signal Delay: 18.9	Intersection LOS: B
Intersection Capacity Utilization 31.3%	ICU Level of Service A

Analysis Period (min) 15

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

Splits and Phases: 7: McGrath Highway (SB) & Washington Street (EB T)



Lane Group	EBL2	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR	ø1
Lane Configurations												
Volume (vph)	0	294	0	0	185	110	0	0	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Satd. Flow (prot)	3477	1703	0	0	3185	0	0	0	0	0	0	
Flt Permitted		0.950										
Satd. Flow (perm)	3477	1703	0	0	3185	0	0	0	0	0	0	
Right Turn on Red	Yes		Yes			Yes			Yes			
Satd. Flow (RTOR)					125							
Link Speed (mph)		30			30			30		30		
Link Distance (ft)		156			257			127		422		
Travel Time (s)		3.5			5.8			2.9		9.6		
Peak Hour Factor	0.64	0.64	0.64	0.88	0.88	0.88	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	6%	6%	6%	7%	7%	7%	2%	2%	2%	2%	2%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	459	0	0	335	0	0	0	0	0	0	
Turn Type	Split	NA			NA							
Protected Phases	5 6	5 6			4							1
Permitted Phases												
Minimum Split (s)					20.0							11.0
Total Split (s)					74.0							11.0
Total Split (%)					56.1%							8%
Yellow Time (s)					3.0							3.0
All-Red Time (s)					1.0							0.0
Lost Time Adjust (s)					0.0							
Total Lost Time (s)					4.0							
Lead/Lag												Lead
Lead-Lag Optimize?												Yes
Act Effct Green (s)		52.0			70.0							
Actuated g/C Ratio		0.39			0.53							
v/c Ratio		0.69			0.19							
Control Delay		19.3			10.2							
Queue Delay		2.5			0.3							
Total Delay		21.8			10.5							
LOS		C			B							
Approach Delay		21.8			10.5							
Approach LOS		C			B							
Queue Length 50th (ft)		361			45							
Queue Length 95th (ft)		314			70							
Internal Link Dist (ft)		76			177			47		342		
Turn Bay Length (ft)												
Base Capacity (vph)		670			1747							
Starvation Cap Reductn		112			0							
Spillback Cap Reductn		0			890							
Storage Cap Reductn		0			0							
Reduced v/c Ratio		0.82			0.39							

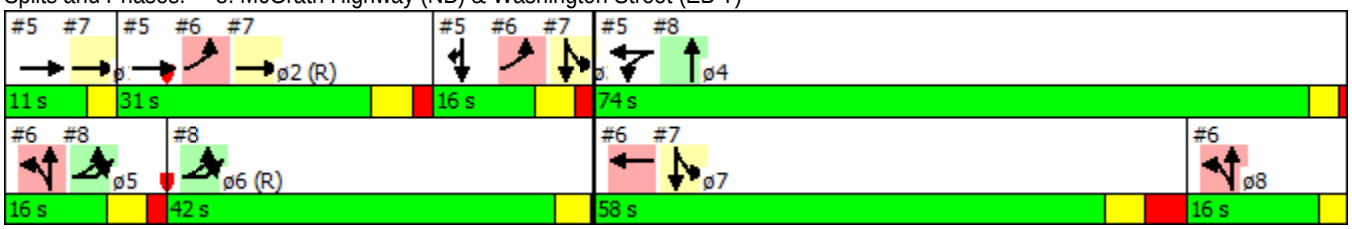
Intersection Summary	
Area Type:	Other
Cycle Length: 132	

Lane Group	ø2	ø3	ø5	ø6	ø7	ø8
Lane Configurations						
Volume (vph)						
Ideal Flow (vphpl)						
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 (%)						
Shared Lane Traffic (%)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	2	3	5	6	7	8
Permitted Phases						
Minimum Split (s)	31.0	16.0	16.0	20.0	20.0	16.0
Total Split (s)	31.0	16.0	16.0	42.0	58.0	16.0
Total Split (%)	23%	12%	12%	32%	44%	12%
Yellow Time (s)	4.0	4.0	4.0	3.5	4.0	3.0
All-Red Time (s)	2.0	2.0	2.0	0.5	4.0	0.0
Lost Time Adjust (s)						
Total Lost Time (s)						
Lead/Lag	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

Intersection Summary

Actuated Cycle Length: 132	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 95	
Control Type: Pretimed	
Maximum v/c Ratio: 1.15	
Intersection Signal Delay: 17.0	Intersection LOS: B
Intersection Capacity Utilization 33.3%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 8: McGrath Highway (NB) & Washington Street (EB T)



Intersection	
Intersection Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	540	0	0	680	0	13	0	58	16	0	46
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	0		0	0		0	0		0	0		0
Median Width		0			0			0			0	
Grade, %		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.94	0.94	0.94	0.89	0.89	0.89	0.86	0.86	0.86
Heavy Vehicles, %	5	5	5	2	2	2	0	0	0	0	0	0
Mvmt Flow	0	551	0	0	723	0	15	0	65	19	0	53
Number of Lanes	0	2	0	0	2	0	0	1	0	0	1	0

Major/Minor		Major 1			Major 2			Minor 1			Minor 2	
Conflicting Flow All	723	0	0	551	0	0	913	1274	276	999	1274	362
Stage 1	-	-	-	-	-	-	551	551	-	723	723	-
Stage 2	-	-	-	-	-	-	362	723	-	276	551	-
Follow-up Headway	2.25	-	-	2.22	-	-	3.5	4	3.3	3.5	4	3.3
Pot Capacity-1 Maneuver	856	-	-	1015	-	-	232	169	727	201	169	641
Stage 1	-	-	-	-	-	-	491	519	-	388	434	-
Stage 2	-	-	-	-	-	-	635	434	-	712	519	-
Time blocked-Platoon, %	0	-	-	0	-	-	0	0	0	0	0	0
Mov Capacity-1 Maneuver	856	-	-	1015	-	-	213	169	727	183	169	641
Mov Capacity-2 Maneuver	-	-	-	-	-	-	213	169	-	183	169	-
Stage 1	-	-	-	-	-	-	491	519	-	388	434	-
Stage 2	-	-	-	-	-	-	582	434	-	648	519	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	13.5	16.3
HCM LOS	-	-	B	C

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Cap, veh/h	504	856	-	-	1015	-	-	389
HCM Control Delay, s	13.5	0	-	-	0	-	-	16.3
HCM Lane V/C Ratio	0.16	-	-	-	-	-	-	0.18
HCM Lane LOS	B	A	-	-	A	-	-	C
HCM 95th-tile Q, veh	0.6	0.0	-	-	0.0	-	-	0.7

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	340	0	252	488	0	0	0	0	0	133	214
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3406	0	1719	3438	0	0	0	0	0	1863	1583
Flt Permitted				0.950								
Satd. Flow (perm)	0	3406	0	1719	3438	0	0	0	0	0	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												261
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		124			159			104			434	
Travel Time (s)		2.8			3.6			2.4			9.9	
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92	0.82	0.82	0.82
Heavy Vehicles (%)	6%	6%	6%	5%	5%	5%	2%	2%	2%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	382	0	268	519	0	0	0	0	0	162	261
Turn Type		NA		Split	NA						NA	Prot
Protected Phases		1 2		4	4						3	3
Permitted Phases												
Minimum Split (s)				20.0	20.0						16.0	16.0
Total Split (s)				74.0	74.0						16.0	16.0
Total Split (%)				56.1%	56.1%						12.1%	12.1%
Yellow Time (s)				3.0	3.0						4.0	4.0
All-Red Time (s)				1.0	1.0						2.0	2.0
Lost Time Adjust (s)				0.0	0.0						0.0	0.0
Total Lost Time (s)				4.0	4.0						6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)		39.0		70.0	70.0						10.0	10.0
Actuated g/C Ratio		0.30		0.53	0.53						0.08	0.08
v/c Ratio		0.38		0.29	0.28						1.15	0.72
Control Delay		38.3		1.2	0.8						174.0	18.9
Queue Delay		0.3		0.5	0.3						0.0	0.0
Total Delay		38.5		1.7	1.1						174.0	18.9
LOS		D		A	A						F	B
Approach Delay		38.5			1.3						78.3	
Approach LOS		D			A						E	
Queue Length 50th (ft)		136		3	2						~163	0
Queue Length 95th (ft)		182		3	3						#269	56
Internal Link Dist (ft)		44			79			24			354	
Turn Bay Length (ft)												
Base Capacity (vph)		1006		911	1823						141	361
Starvation Cap Reductn		0		311	685						0	0
Spillback Cap Reductn		193		0	0						0	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.47		0.45	0.46						1.15	0.72

Intersection Summary	
Area Type:	Other
Cycle Length: 132	

Lane Group	ø1	ø2	ø5	ø6	ø7	ø8
Lane Configurations						
Volume (vph)						
Ideal Flow (vphpl)						
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 (%)						
Shared Lane Traffic (%)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	1	2	5	6	7	8
Permitted Phases						
Minimum Split (s)	11.0	31.0	16.0	20.0	20.0	16.0
Total Split (s)	11.0	31.0	16.0	42.0	58.0	16.0
Total Split (%)	8%	23%	12%	32%	44%	12%
Yellow Time (s)	3.0	4.0	4.0	3.5	4.0	3.0
All-Red Time (s)	0.0	2.0	2.0	0.5	4.0	0.0
Lost Time Adjust (s)						
Total Lost Time (s)						
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

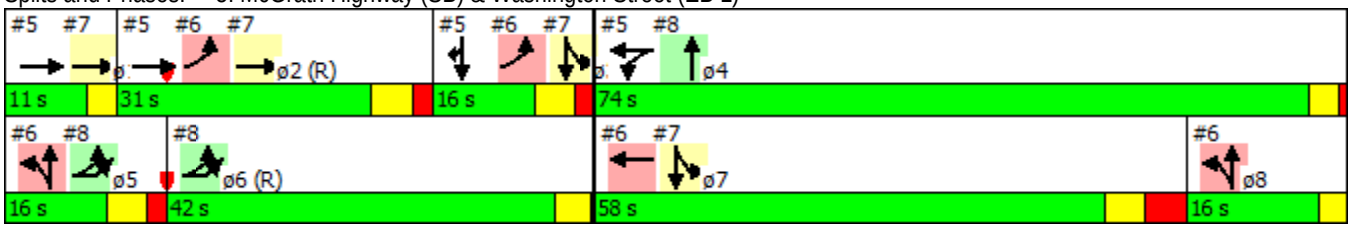
Intersection Summary

Actuated Cycle Length: 132	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 95	
Control Type: Pretimed	
Maximum v/c Ratio: 1.15	
Intersection Signal Delay: 30.7	Intersection LOS: C
Intersection Capacity Utilization 45.6%	ICU Level of Service A
Analysis Period (min) 15	

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

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

Splits and Phases: 5: McGrath Highway (SB) & Washington Street (EB L)

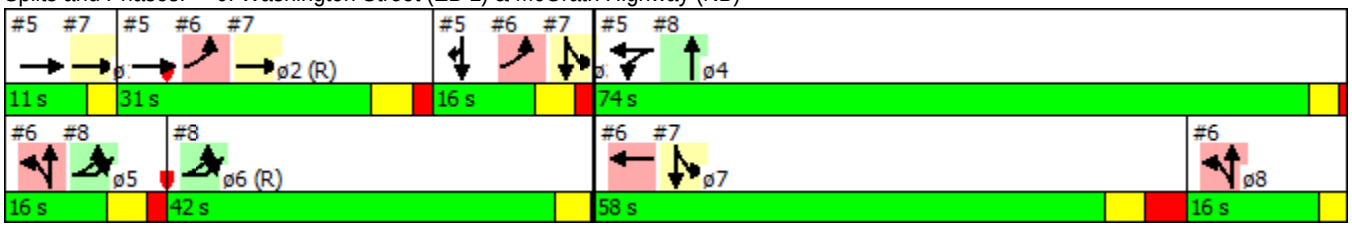


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	334	0	0	0	736	80	22	164	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		100	0		0	0		0
Storage Lanes	2		0	1		1	1		0	0		0
Taper Length (ft)	25			150			25			25		
Satd. Flow (prot)	3303	0	0	0	4866	0	1535	3229	0	0	0	0
Flt Permitted	0.950						0.950	0.999				
Satd. Flow (perm)	3303	0	0	0	4866	0	1535	3229	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					16							
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		159			352			127			369	
Travel Time (s)		3.6			8.0			2.9			8.4	
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.88	0.88	0.88	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	5%	5%	5%	7%	7%	7%	2%	2%	2%
Shared Lane Traffic (%)							10%					
Lane Group Flow (vph)	375	0	0	0	868	0	22	189	0	0	0	0
Turn Type	Prot				NA		Split	NA				
Protected Phases	2 3!				7		5 8!	5 8!				
Permitted Phases												
Minimum Split (s)					20.0							
Total Split (s)					58.0							
Total Split (%)					43.9%							
Yellow Time (s)					4.0							
All-Red Time (s)					4.0							
Lost Time Adjust (s)					0.0							
Total Lost Time (s)					8.0							
Lead/Lag					Lead							
Lead-Lag Optimize?					Yes							
Act Effct Green (s)	41.0				50.0		26.0	26.0				
Actuated g/C Ratio	0.31				0.38		0.20	0.20				
v/c Ratio	0.37				0.47		0.07	0.30				
Control Delay	7.2				31.4		40.4	43.0				
Queue Delay	0.9				0.0		20.9	73.7				
Total Delay	8.1				31.4		61.3	116.8				
LOS	A				C		E	F				
Approach Delay					31.4			111.0				
Approach LOS					C			F				
Queue Length 50th (ft)	143				200		17	81				
Queue Length 95th (ft)	190				241		47	121				
Internal Link Dist (ft)		79			272			47			289	
Turn Bay Length (ft)												
Base Capacity (vph)	1025				1853		302	636				
Starvation Cap Reductn	380				0		266	512				
Spillback Cap Reductn	0				0		0	0				
Storage Cap Reductn	0				0		0	0				
Reduced v/c Ratio	0.58				0.47		0.61	1.52				

Intersection Summary

Area Type: Other	
Cycle Length: 132	
Actuated Cycle Length: 132	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 95	
Control Type: Pretimed	
Maximum v/c Ratio: 1.15	
Intersection Signal Delay: 36.9	Intersection LOS: D
Intersection Capacity Utilization 45.6%	ICU Level of Service A
Analysis Period (min) 15	
! Phase conflict between lane groups.	

Splits and Phases: 6: Washington Street (EB L) & McGrath Highway (NB)



Lane Group	ø1	ø2	ø3	ø4	ø5	ø6	ø8
Lane Configurations							
Volume (vph)							
Ideal Flow (vphpl)							
Storage Length (ft)							
Storage Lanes							
Taper Length (ft)							
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 (%)							
Shared Lane Traffic (%)							
Lane Group Flow (vph)							
Turn Type							
Protected Phases	1	2	3	4	5	6	8
Permitted Phases							
Minimum Split (s)	11.0	31.0	16.0	20.0	16.0	20.0	16.0
Total Split (s)	11.0	31.0	16.0	74.0	16.0	42.0	16.0
Total Split (%)	8%	23%	12%	56%	12%	32%	12%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	3.5	3.0
All-Red Time (s)	0.0	2.0	2.0	1.0	2.0	0.5	0.0
Lost Time Adjust (s)							
Total Lost Time (s)							
Lead/Lag	Lead	Lag			Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes			Yes	Yes	Yes
Act Effct Green (s)							
Actuated g/C Ratio							
v/c Ratio							
Control Delay							
Queue Delay							
Total Delay							
LOS							
Approach Delay							
Approach LOS							
Queue Length 50th (ft)							
Queue Length 95th (ft)							
Internal Link Dist (ft)							
Turn Bay Length (ft)							
Base Capacity (vph)							
Starvation Cap Reductn							
Spillback Cap Reductn							
Storage Cap Reductn							
Reduced v/c Ratio							

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	258	12	0	0	0	0	0	0	44	341	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	4859	0	0	0	0	0	0	0	1770	1863	0
Flt Permitted										0.950		
Satd. Flow (perm)	0	4859	0	0	0	0	0	0	0	1770	1863	0
Right Turn on Red			Yes			Yes			Yes	Yes		Yes
Satd. Flow (RTOR)		5								83		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		142			156			280			104	
Travel Time (s)		3.2			3.5			6.4			2.4	
Peak Hour Factor	0.64	0.64	0.64	0.92	0.92	0.92	0.92	0.92	0.92	0.82	0.82	0.82
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	422	0	0	0	0	0	0	0	54	416	0
Turn Type		NA								Split	NA	
Protected Phases		1 2								3 7	3 7	
Permitted Phases												
Minimum Split (s)												
Total Split (s)												
Total Split (%)												
Yellow Time (s)												
All-Red Time (s)												
Lost Time Adjust (s)												
Total Lost Time (s)												
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)		39.0								68.0	68.0	
Actuated g/C Ratio		0.30								0.52	0.52	
v/c Ratio		0.29								0.06	0.43	
Control Delay		36.1								0.1	4.7	
Queue Delay		0.0								0.0	0.0	
Total Delay		36.1								0.1	4.7	
LOS		D								A	A	
Approach Delay		36.1									4.2	
Approach LOS		D									A	
Queue Length 50th (ft)		101								0	27	
Queue Length 95th (ft)		90								m0	m29	
Internal Link Dist (ft)		62			76			200			24	
Turn Bay Length (ft)												
Base Capacity (vph)		1439								952	959	
Starvation Cap Reductn		0								0	0	
Spillback Cap Reductn		34								0	0	
Storage Cap Reductn		0								0	0	
Reduced v/c Ratio		0.30								0.06	0.43	

Intersection Summary	
Area Type:	Other
Cycle Length: 132	

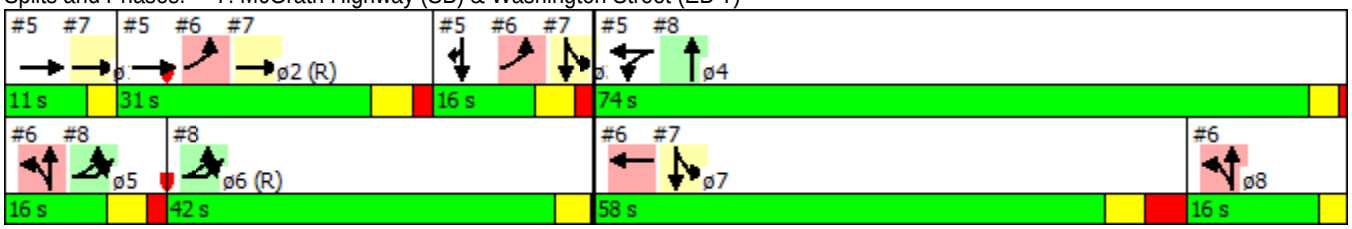
Lane Group	ø1	ø2	ø3	ø4	ø5	ø6	ø7	ø8
Lane Configurations								
Volume (vph)								
Ideal Flow (vphpl)								
Satd. Flow (prot)								
Flt Permitted								
Satd. Flow (perm)								
Right Turn on Red								
Satd. Flow (RTOR)								
Link Speed (mph)								
Link Distance (ft)								
Travel Time (s)								
Peak Hour Factor								
Heavy Vehicles (%)								
Shared Lane Traffic (%)								
Lane Group Flow (vph)								
Turn Type								
Protected Phases	1	2	3	4	5	6	7	8
Permitted Phases								
Minimum Split (s)	11.0	31.0	16.0	20.0	16.0	20.0	20.0	16.0
Total Split (s)	11.0	31.0	16.0	74.0	16.0	42.0	58.0	16.0
Total Split (%)	8%	23%	12%	56%	12%	32%	44%	12%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	3.5	4.0	3.0
All-Red Time (s)	0.0	2.0	2.0	1.0	2.0	0.5	4.0	0.0
Lost Time Adjust (s)								
Total Lost Time (s)								
Lead/Lag	Lead	Lag			Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes			Yes	Yes	Yes	Yes
Act Effct Green (s)								
Actuated g/C Ratio								
v/c Ratio								
Control Delay								
Queue Delay								
Total Delay								
LOS								
Approach Delay								
Approach LOS								
Queue Length 50th (ft)								
Queue Length 95th (ft)								
Internal Link Dist (ft)								
Turn Bay Length (ft)								
Base Capacity (vph)								
Starvation Cap Reductn								
Spillback Cap Reductn								
Storage Cap Reductn								
Reduced v/c Ratio								

Intersection Summary

Actuated Cycle Length: 132	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 95	
Control Type: Pretimed	
Maximum v/c Ratio: 1.15	
Intersection Signal Delay: 19.3	Intersection LOS: B
Intersection Capacity Utilization 31.5%	ICU Level of Service A
Analysis Period (min) 15	

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

Splits and Phases: 7: McGrath Highway (SB) & Washington Street (EB T)



Lane Group	EBL2	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR	ø1
Lane Configurations												
Volume (vph)	0	302	0	0	186	110	0	0	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Satd. Flow (prot)	3477	1703	0	0	3185	0	0	0	0	0	0	
Flt Permitted		0.950										
Satd. Flow (perm)	3477	1703	0	0	3185	0	0	0	0	0	0	
Right Turn on Red	Yes		Yes			Yes			Yes			
Satd. Flow (RTOR)					125							
Link Speed (mph)		30			30			30		30		
Link Distance (ft)		156			257			127		422		
Travel Time (s)		3.5			5.8			2.9		9.6		
Peak Hour Factor	0.64	0.64	0.64	0.88	0.88	0.88	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	6%	6%	6%	7%	7%	7%	2%	2%	2%	2%	2%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	472	0	0	336	0	0	0	0	0	0	
Turn Type	Split	NA			NA							
Protected Phases	5 6	5 6			4							1
Permitted Phases												
Minimum Split (s)					20.0							11.0
Total Split (s)					74.0							11.0
Total Split (%)					56.1%							8%
Yellow Time (s)					3.0							3.0
All-Red Time (s)					1.0							0.0
Lost Time Adjust (s)					0.0							
Total Lost Time (s)					4.0							
Lead/Lag												Lead
Lead-Lag Optimize?												Yes
Act Effct Green (s)		52.0			70.0							
Actuated g/C Ratio		0.39			0.53							
v/c Ratio		0.70			0.19							
Control Delay		20.0			10.2							
Queue Delay		3.1			0.3							
Total Delay		23.0			10.5							
LOS		C			B							
Approach Delay		23.0			10.5							
Approach LOS		C			B							
Queue Length 50th (ft)		376			46							
Queue Length 95th (ft)		323			70							
Internal Link Dist (ft)		76			177			47		342		
Turn Bay Length (ft)												
Base Capacity (vph)		670			1747							
Starvation Cap Reductn		112			0							
Spillback Cap Reductn		0			890							
Storage Cap Reductn		0			0							
Reduced v/c Ratio		0.85			0.39							

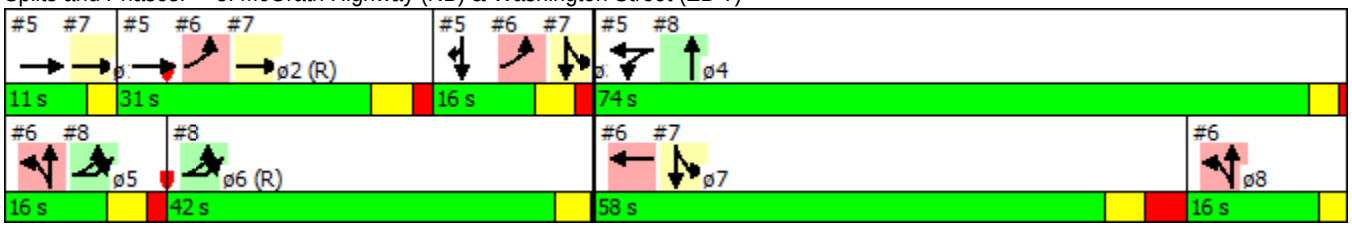
Intersection Summary	
Area Type:	Other
Cycle Length: 132	

Lane Group	ø2	ø3	ø5	ø6	ø7	ø8
Lane Configurations						
Volume (vph)						
Ideal Flow (vphpl)						
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 (%)						
Shared Lane Traffic (%)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	2	3	5	6	7	8
Permitted Phases						
Minimum Split (s)	31.0	16.0	16.0	20.0	20.0	16.0
Total Split (s)	31.0	16.0	16.0	42.0	58.0	16.0
Total Split (%)	23%	12%	12%	32%	44%	12%
Yellow Time (s)	4.0	4.0	4.0	3.5	4.0	3.0
All-Red Time (s)	2.0	2.0	2.0	0.5	4.0	0.0
Lost Time Adjust (s)						
Total Lost Time (s)						
Lead/Lag	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

Intersection Summary

Actuated Cycle Length: 132	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 95	
Control Type: Pretimed	
Maximum v/c Ratio: 1.15	
Intersection Signal Delay: 17.8	Intersection LOS: B
Intersection Capacity Utilization 33.7%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 8: McGrath Highway (NB) & Washington Street (EB T)



Intersection	
Intersection Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	2	552	0	0	686	2	13	0	58	20	0	50
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	0		0	0		0	0		0	0		0
Median Width		0			0			0			0	
Grade, %		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.94	0.94	0.94	0.89	0.89	0.89	0.86	0.86	0.86
Heavy Vehicles, %	5	5	5	2	2	2	0	0	0	0	0	0
Mvmt Flow	2	563	0	0	730	2	15	0	65	23	0	58
Number of Lanes	0	2	0	0	2	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 2		
Conflicting Flow All	732	0	0	563	0	0	932	1299	282	1017	1298	366
Stage 1	-	-	-	-	-	-	567	567	-	731	731	-
Stage 2	-	-	-	-	-	-	365	732	-	286	567	-
Follow-up Headway	2.25	-	-	2.22	-	-	3.5	4	3.3	3.5	4	3.3
Pot Capacity-1 Maneuver	849	-	-	1005	-	-	224	163	721	195	163	637
Stage 1	-	-	-	-	-	-	481	510	-	384	430	-
Stage 2	-	-	-	-	-	-	632	430	-	703	510	-
Time blocked-Platoon, %	0	-	-	0	-	-	0	0	0	0	0	0
Mov Capacity-1 Maneuver	849	-	-	1005	-	-	203	163	721	177	163	637
Mov Capacity-2 Maneuver	-	-	-	-	-	-	203	163	-	177	163	-
Stage 1	-	-	-	-	-	-	480	508	-	383	430	-
Stage 2	-	-	-	-	-	-	574	430	-	638	508	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	13.7	17.6
HCM LOS	-	-	B	C

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Cap, veh/h	491	849	-	-	1005	-	-	366
HCM Control Delay, s	13.7	9.25	0	-	0	-	-	17.6
HCM Lane V/C Ratio	0.16	0.00	-	-	-	-	-	0.22
HCM Lane LOS	B	A	A	-	A	-	-	C
HCM 95th-tile Q, veh	0.6	0.0	-	-	0.0	-	-	0.8

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

APPENDIX

Intersection Capacity Analysis – Weekday Afternoon Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	380	0	287	548	0	0	0	0	0	132	181
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3539	0	1770	3539	0	0	0	0	0	1845	1568
Flt Permitted				0.950								
Satd. Flow (perm)	0	3539	0	1770	3539	0	0	0	0	0	1845	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												195
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		124			159			104			434	
Travel Time (s)		2.8			3.6			2.4			9.9	
Peak Hour Factor	0.78	0.78	0.78	0.87	0.87	0.87	0.92	0.92	0.92	0.93	0.93	0.93
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	487	0	330	630	0	0	0	0	0	142	195
Turn Type		NA		Split	NA						NA	Prot
Protected Phases		1 2		4	4						3	3
Permitted Phases												
Minimum Split (s)				20.0	20.0						16.0	16.0
Total Split (s)				74.0	74.0						16.0	16.0
Total Split (%)				56.1%	56.1%						12.1%	12.1%
Yellow Time (s)				3.0	3.0						4.0	4.0
All-Red Time (s)				1.0	1.0						2.0	2.0
Lost Time Adjust (s)				0.0	0.0						0.0	0.0
Total Lost Time (s)				4.0	4.0						6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)		39.0		70.0	70.0						10.0	10.0
Actuated g/C Ratio		0.30		0.53	0.53						0.08	0.08
v/c Ratio		0.47		0.35	0.34						1.02	0.65
Control Delay		39.8		1.3	0.9						141.3	18.6
Queue Delay		0.4		0.5	0.3						0.0	0.0
Total Delay		40.2		1.8	1.2						141.3	18.6
LOS		D		A	A						F	B
Approach Delay		40.2			1.4						70.3	
Approach LOS		D			A						E	
Queue Length 50th (ft)		179		3	3						~126	0
Queue Length 95th (ft)		197		4	3						#267	78
Internal Link Dist (ft)		44			79			24			354	
Turn Bay Length (ft)												
Base Capacity (vph)		1045		938	1876						139	299
Starvation Cap Reductn		0		265	615						0	0
Spillback Cap Reductn		203		0	0						0	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.58		0.49	0.50						1.02	0.65

Intersection Summary	
Area Type:	Other
Cycle Length: 132	

Lane Group	ø1	ø2	ø5	ø6	ø7	ø8
Lane Configurations						
Volume (vph)						
Ideal Flow (vphpl)						
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 (%)						
Shared Lane Traffic (%)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	1	2	5	6	7	8
Permitted Phases						
Minimum Split (s)	11.0	31.0	16.0	20.0	20.0	16.0
Total Split (s)	11.0	31.0	16.0	42.0	58.0	16.0
Total Split (%)	8%	23%	12%	32%	44%	12%
Yellow Time (s)	3.0	4.0	4.0	3.5	4.0	3.0
All-Red Time (s)	0.0	2.0	2.0	0.5	4.0	0.0
Lost Time Adjust (s)						
Total Lost Time (s)						
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

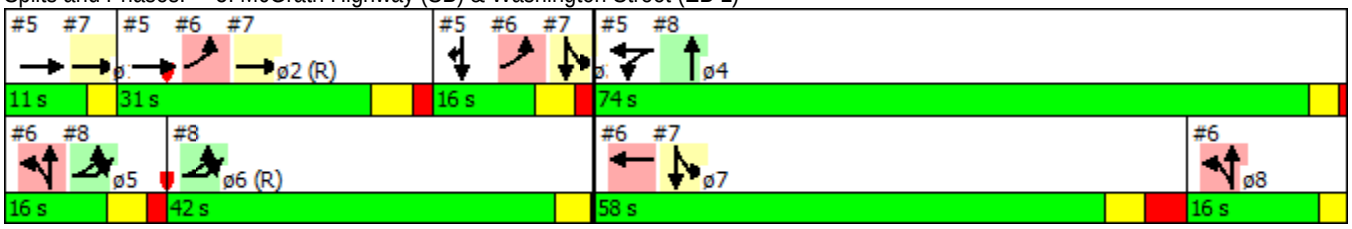
Intersection Summary

Actuated Cycle Length: 132	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 95	
Control Type: Pretimed	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 25.0	Intersection LOS: C
Intersection Capacity Utilization 53.9%	ICU Level of Service A
Analysis Period (min) 15	

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

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

Splits and Phases: 5: McGrath Highway (SB) & Washington Street (EB L)

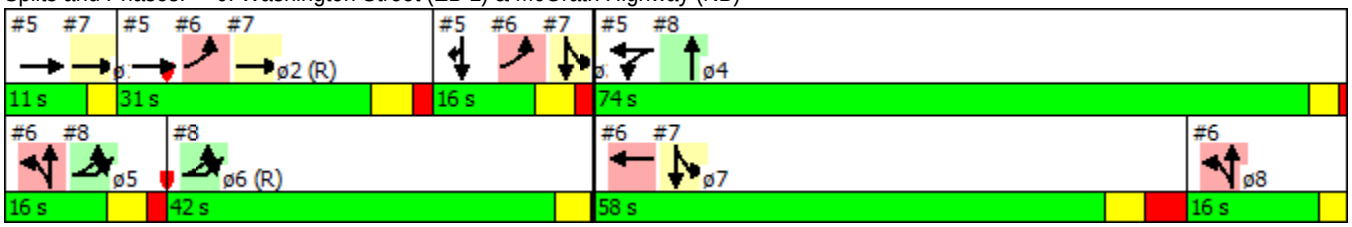


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	380	0	0	0	806	87	28	453	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		100	0		0	0		0
Storage Lanes	2		0	1		1	1		0	0		0
Taper Length (ft)	25			150			25			25		
Satd. Flow (prot)	3433	0	0	0	5009	0	1626	3424	0	0	0	0
Flt Permitted	0.950						0.950					
Satd. Flow (perm)	3433	0	0	0	5009	0	1626	3424	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					16							
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		159			352			127			369	
Travel Time (s)		3.6			8.0			2.9			8.4	
Peak Hour Factor	0.78	0.78	0.78	0.87	0.87	0.87	0.90	0.90	0.90	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Shared Lane Traffic (%)							10%					
Lane Group Flow (vph)	487	0	0	0	1026	0	28	506	0	0	0	0
Turn Type	Prot				NA		Split	NA				
Protected Phases	2 3!				7		5 8!	5 8!				
Permitted Phases												
Minimum Split (s)					20.0							
Total Split (s)					58.0							
Total Split (%)					43.9%							
Yellow Time (s)					4.0							
All-Red Time (s)					4.0							
Lost Time Adjust (s)					0.0							
Total Lost Time (s)					8.0							
Lead/Lag					Lead							
Lead-Lag Optimize?					Yes							
Act Effct Green (s)	41.0				50.0		26.0	26.0				
Actuated g/C Ratio	0.31				0.38		0.20	0.20				
v/c Ratio	0.46				0.54		0.09	0.75				
Control Delay	7.8				32.7		36.2	50.5				
Queue Delay	0.6				0.0		26.2	60.2				
Total Delay	8.5				32.7		62.4	110.7				
LOS	A				C		E	F				
Approach Delay					32.7			108.2				
Approach LOS					C			F				
Queue Length 50th (ft)	191				245		24	249				
Queue Length 95th (ft)	107				278		58	315				
Internal Link Dist (ft)		79			272			47			289	
Turn Bay Length (ft)												
Base Capacity (vph)	1066				1907		320	674				
Starvation Cap Reductn	270				0		280	431				
Spillback Cap Reductn	0				0		0	0				
Storage Cap Reductn	0				0		0	0				
Reduced v/c Ratio	0.61				0.54		0.70	2.08				

Intersection Summary

Area Type: Other	
Cycle Length: 132	
Actuated Cycle Length: 132	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 95	
Control Type: Pretimed	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 46.6	Intersection LOS: D
Intersection Capacity Utilization 53.9%	ICU Level of Service A
Analysis Period (min) 15	
! Phase conflict between lane groups.	

Splits and Phases: 6: Washington Street (EB L) & McGrath Highway (NB)



Lane Group	ø1	ø2	ø3	ø4	ø5	ø6	ø8
Lane Configurations							
Volume (vph)							
Ideal Flow (vphpl)							
Storage Length (ft)							
Storage Lanes							
Taper Length (ft)							
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 (%)							
Shared Lane Traffic (%)							
Lane Group Flow (vph)							
Turn Type							
Protected Phases	1	2	3	4	5	6	8
Permitted Phases							
Minimum Split (s)	11.0	31.0	16.0	20.0	16.0	20.0	16.0
Total Split (s)	11.0	31.0	16.0	74.0	16.0	42.0	16.0
Total Split (%)	8%	23%	12%	56%	12%	32%	12%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	3.5	3.0
All-Red Time (s)	0.0	2.0	2.0	1.0	2.0	0.5	0.0
Lost Time Adjust (s)							
Total Lost Time (s)							
Lead/Lag	Lead	Lag			Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes			Yes	Yes	Yes
Act Effct Green (s)							
Actuated g/C Ratio							
v/c Ratio							
Control Delay							
Queue Delay							
Total Delay							
LOS							
Approach Delay							
Approach LOS							
Queue Length 50th (ft)							
Queue Length 95th (ft)							
Internal Link Dist (ft)							
Turn Bay Length (ft)							
Base Capacity (vph)							
Starvation Cap Reductn							
Spillback Cap Reductn							
Storage Cap Reductn							
Reduced v/c Ratio							

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	268	15	0	0	0	0	0	0	61	358	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	5045	0	0	0	0	0	0	0	1752	1845	0
Flt Permitted										0.950		
Satd. Flow (perm)	0	5045	0	0	0	0	0	0	0	1752	1845	0
Right Turn on Red			Yes			Yes			Yes	Yes		Yes
Satd. Flow (RTOR)		7								83		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		142			156			280			104	
Travel Time (s)		3.2			3.5			6.4			2.4	
Peak Hour Factor	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	301	0	0	0	0	0	0	0	66	385	0
Turn Type		NA								Split	NA	
Protected Phases		1 2								3 7	3 7	
Permitted Phases												
Minimum Split (s)												
Total Split (s)												
Total Split (%)												
Yellow Time (s)												
All-Red Time (s)												
Lost Time Adjust (s)												
Total Lost Time (s)												
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)		39.0								68.0	68.0	
Actuated g/C Ratio		0.30								0.52	0.52	
v/c Ratio		0.20								0.07	0.41	
Control Delay		34.4								0.1	3.4	
Queue Delay		0.0								0.0	0.0	
Total Delay		34.4								0.1	3.4	
LOS		C								A	A	
Approach Delay		34.4									2.9	
Approach LOS		C									A	
Queue Length 50th (ft)		69								0	15	
Queue Length 95th (ft)		95								m0	m18	
Internal Link Dist (ft)		62			76			200			24	
Turn Bay Length (ft)												
Base Capacity (vph)		1495								942	950	
Starvation Cap Reductn		0								0	0	
Spillback Cap Reductn		33								0	0	
Storage Cap Reductn		0								0	0	
Reduced v/c Ratio		0.21								0.07	0.41	

Intersection Summary	
Area Type:	Other
Cycle Length: 132	

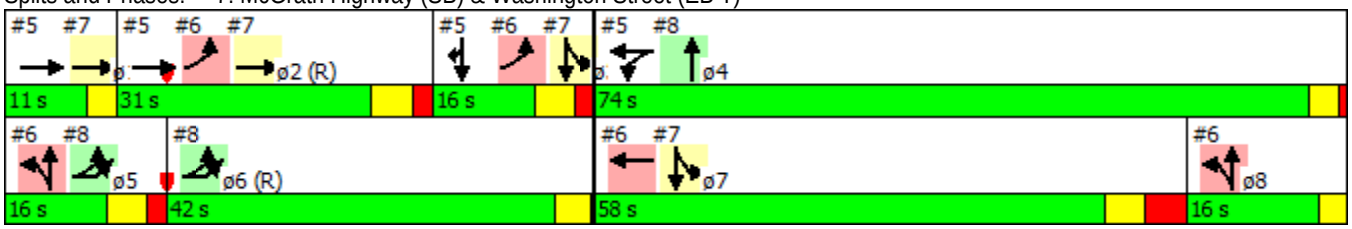
Lane Group	ø1	ø2	ø3	ø4	ø5	ø6	ø7	ø8
Lane Configurations								
Volume (vph)								
Ideal Flow (vphpl)								
Satd. Flow (prot)								
Flt Permitted								
Satd. Flow (perm)								
Right Turn on Red								
Satd. Flow (RTOR)								
Link Speed (mph)								
Link Distance (ft)								
Travel Time (s)								
Peak Hour Factor								
Heavy Vehicles (%)								
Shared Lane Traffic (%)								
Lane Group Flow (vph)								
Turn Type								
Protected Phases	1	2	3	4	5	6	7	8
Permitted Phases								
Minimum Split (s)	11.0	31.0	16.0	20.0	16.0	20.0	20.0	16.0
Total Split (s)	11.0	31.0	16.0	74.0	16.0	42.0	58.0	16.0
Total Split (%)	8%	23%	12%	56%	12%	32%	44%	12%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	3.5	4.0	3.0
All-Red Time (s)	0.0	2.0	2.0	1.0	2.0	0.5	4.0	0.0
Lost Time Adjust (s)								
Total Lost Time (s)								
Lead/Lag	Lead	Lag			Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes			Yes	Yes	Yes	Yes
Act Effct Green (s)								
Actuated g/C Ratio								
v/c Ratio								
Control Delay								
Queue Delay								
Total Delay								
LOS								
Approach Delay								
Approach LOS								
Queue Length 50th (ft)								
Queue Length 95th (ft)								
Internal Link Dist (ft)								
Turn Bay Length (ft)								
Base Capacity (vph)								
Starvation Cap Reductn								
Spillback Cap Reductn								
Storage Cap Reductn								
Reduced v/c Ratio								

Intersection Summary

Actuated Cycle Length: 132	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 95	
Control Type: Pretimed	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 15.5	Intersection LOS: B
Intersection Capacity Utilization 32.7%	ICU Level of Service A
Analysis Period (min) 15	

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

Splits and Phases: 7: McGrath Highway (SB) & Washington Street (EB T)



Lane Group	EBL2	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR	ø1
Lane Configurations												
Volume (vph)	0	329	0	0	481	214	0	0	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Satd. Flow (prot)	3614	1770	0	0	3410	0	0	0	0	0	0	
Flt Permitted		0.950										
Satd. Flow (perm)	3614	1770	0	0	3410	0	0	0	0	0	0	
Right Turn on Red	Yes		Yes			Yes			Yes			
Satd. Flow (RTOR)					82							
Link Speed (mph)		30			30			30		30		
Link Distance (ft)		156			257			127		422		
Travel Time (s)		3.5			5.8			2.9		9.6		
Peak Hour Factor	0.94	0.94	0.94	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	2%	2%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	350	0	0	772	0	0	0	0	0	0	
Turn Type	Split	NA			NA							
Protected Phases	5 6	5 6			4							1
Permitted Phases												
Minimum Split (s)					20.0							11.0
Total Split (s)					74.0							11.0
Total Split (%)					56.1%							8%
Yellow Time (s)					3.0							3.0
All-Red Time (s)					1.0							0.0
Lost Time Adjust (s)					0.0							
Total Lost Time (s)					4.0							
Lead/Lag												Lead
Lead-Lag Optimize?												Yes
Act Effct Green (s)		52.0			70.0							
Actuated g/C Ratio		0.39			0.53							
v/c Ratio		0.50			0.42							
Control Delay		16.5			17.3							
Queue Delay		0.6			3.3							
Total Delay		17.1			20.6							
LOS		B			C							
Approach Delay		17.1			20.6							
Approach LOS		B			C							
Queue Length 50th (ft)		259			180							
Queue Length 95th (ft)		362			228							
Internal Link Dist (ft)		76			177			47		342		
Turn Bay Length (ft)												
Base Capacity (vph)		697			1846							
Starvation Cap Reductn		116			0							
Spillback Cap Reductn		0			950							
Storage Cap Reductn		0			0							
Reduced v/c Ratio		0.60			0.86							

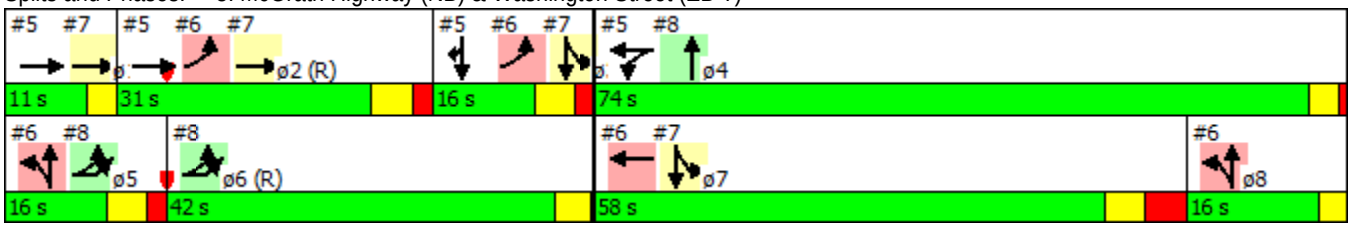
Intersection Summary	
Area Type:	Other
Cycle Length: 132	

Lane Group	ø2	ø3	ø5	ø6	ø7	ø8
Lane Configurations						
Volume (vph)						
Ideal Flow (vphpl)						
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 (%)						
Shared Lane Traffic (%)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	2	3	5	6	7	8
Permitted Phases						
Minimum Split (s)	31.0	16.0	16.0	20.0	20.0	16.0
Total Split (s)	31.0	16.0	16.0	42.0	58.0	16.0
Total Split (%)	23%	12%	12%	32%	44%	12%
Yellow Time (s)	4.0	4.0	4.0	3.5	4.0	3.0
All-Red Time (s)	2.0	2.0	2.0	0.5	4.0	0.0
Lost Time Adjust (s)						
Total Lost Time (s)						
Lead/Lag	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

Intersection Summary

Actuated Cycle Length: 132	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 95	
Control Type: Pretimed	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 19.5	Intersection LOS: B
Intersection Capacity Utilization 46.7%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 8: McGrath Highway (NB) & Washington Street (EB T)



Intersection	
Intersection Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	621	0	0	684	0	10	0	61	5	0	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	0		0	0		0	0		0	0		0
Median Width		0			0			0			0	
Grade, %		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.91	0.91	0.91	0.93	0.93	0.93	0.86	0.86	0.86
Heavy Vehicles, %	1	1	1	2	2	2	0	0	0	0	0	0
Mvmt Flow	0	654	0	0	752	0	11	0	66	6	0	22
Number of Lanes	0	2	0	0	2	0	0	1	0	0	1	0

Major/Minor		Major 1			Major 2			Minor 1			Minor 2	
Conflicting Flow All	752	0	0	654	0	0	1030	1406	327	1079	1406	376
Stage 1	-	-	-	-	-	-	654	654	-	752	752	-
Stage 2	-	-	-	-	-	-	376	752	-	327	654	-
Follow-up Headway	2.21	-	-	2.22	-	-	3.5	4	3.3	3.5	4	3.3
Pot Capacity-1 Maneuver	860	-	-	929	-	-	190	140	675	175	140	627
Stage 1	-	-	-	-	-	-	427	466	-	373	421	-
Stage 2	-	-	-	-	-	-	623	421	-	665	466	-
Time blocked-Platoon, %	0	-	-	0	-	-	0	0	0	0	0	0
Mov Capacity-1 Maneuver	860	-	-	929	-	-	183	140	675	158	140	627
Mov Capacity-2 Maneuver	-	-	-	-	-	-	183	140	-	158	140	-
Stage 1	-	-	-	-	-	-	427	466	-	373	421	-
Stage 2	-	-	-	-	-	-	601	421	-	600	466	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	13.7	15
HCM LOS	-	-	B	C

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Cap, veh/h	490	860	-	-	929	-	-	387
HCM Control Delay, s	13.7	0	-	-	0	-	-	15
HCM Lane V/C Ratio	0.16	-	-	-	-	-	-	0.07
HCM Lane LOS	B	A	-	-	A	-	-	C
HCM 95th-tile Q, veh	0.5	0.0	-	-	0.0	-	-	0.2

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	386	0	287	560	0	0	0	0	0	132	188
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3539	0	1770	3539	0	0	0	0	0	1845	1568
Flt Permitted				0.950								
Satd. Flow (perm)	0	3539	0	1770	3539	0	0	0	0	0	1845	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												202
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		124			159			104			434	
Travel Time (s)		2.8			3.6			2.4			9.9	
Peak Hour Factor	0.78	0.78	0.78	0.87	0.87	0.87	0.92	0.92	0.92	0.93	0.93	0.93
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	495	0	330	644	0	0	0	0	0	142	202
Turn Type		NA		Split	NA						NA	Prot
Protected Phases		1 2		4	4						3	3
Permitted Phases												
Minimum Split (s)				20.0	20.0						16.0	16.0
Total Split (s)				74.0	74.0						16.0	16.0
Total Split (%)				56.1%	56.1%						12.1%	12.1%
Yellow Time (s)				3.0	3.0						4.0	4.0
All-Red Time (s)				1.0	1.0						2.0	2.0
Lost Time Adjust (s)				0.0	0.0						0.0	0.0
Total Lost Time (s)				4.0	4.0						6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)		39.0		70.0	70.0						10.0	10.0
Actuated g/C Ratio		0.30		0.53	0.53						0.08	0.08
v/c Ratio		0.47		0.35	0.34						1.02	0.66
Control Delay		39.9		1.3	0.9						141.3	18.7
Queue Delay		0.4		0.5	0.3						0.0	0.0
Total Delay		40.4		1.8	1.2						141.3	18.7
LOS		D		A	A						F	B
Approach Delay		40.4			1.4						69.3	
Approach LOS		D			A						E	
Queue Length 50th (ft)		183		3	3						~126	0
Queue Length 95th (ft)		200		4	3						#267	79
Internal Link Dist (ft)		44			79			24			354	
Turn Bay Length (ft)												
Base Capacity (vph)		1045		938	1876						139	305
Starvation Cap Reductn		0		272	604						0	0
Spillback Cap Reductn		203		0	0						0	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.59		0.50	0.51						1.02	0.66

Intersection Summary	
Area Type:	Other
Cycle Length: 132	

Lane Group	ø1	ø2	ø5	ø6	ø7	ø8
Lane Configurations						
Volume (vph)						
Ideal Flow (vphpl)						
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 (%)						
Shared Lane Traffic (%)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	1	2	5	6	7	8
Permitted Phases						
Minimum Split (s)	11.0	31.0	16.0	20.0	20.0	16.0
Total Split (s)	11.0	31.0	16.0	42.0	58.0	16.0
Total Split (%)	8%	23%	12%	32%	44%	12%
Yellow Time (s)	3.0	4.0	4.0	3.5	4.0	3.0
All-Red Time (s)	0.0	2.0	2.0	0.5	4.0	0.0
Lost Time Adjust (s)						
Total Lost Time (s)						
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

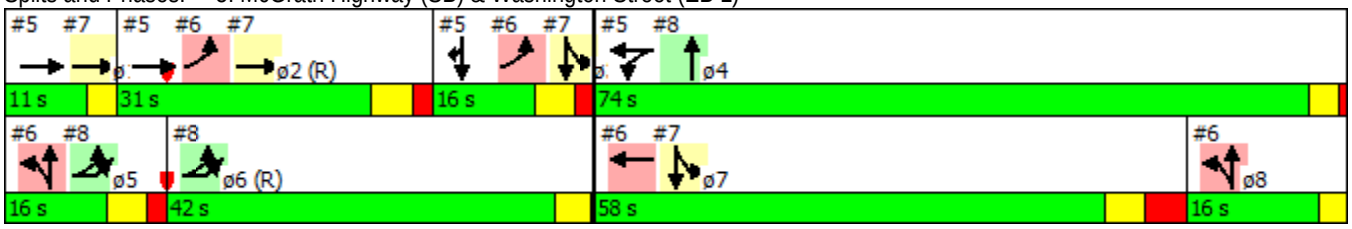
Intersection Summary

Actuated Cycle Length: 132	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 95	
Control Type: Pretimed	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 24.9	Intersection LOS: C
Intersection Capacity Utilization 54.3%	ICU Level of Service A
Analysis Period (min) 15	

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

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

Splits and Phases: 5: McGrath Highway (SB) & Washington Street (EB L)

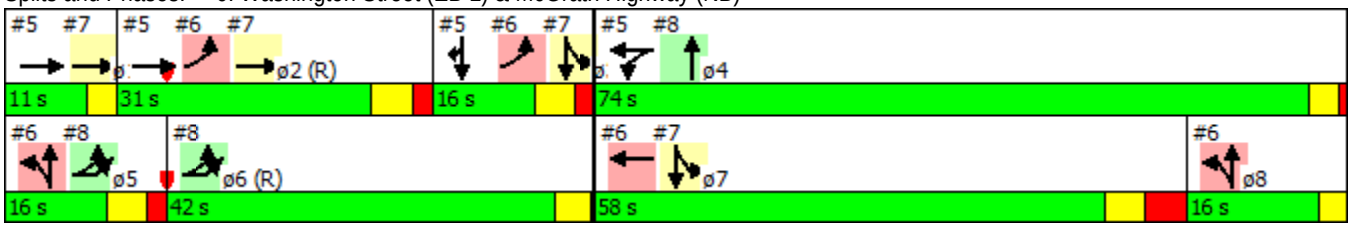


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	386	0	0	0	816	87	30	453	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		100	0		0	0		0
Storage Lanes	2		0	1		1	1		0	0		0
Taper Length (ft)	25			150			25			25		
Satd. Flow (prot)	3433	0	0	0	5014	0	1626	3424	0	0	0	0
Flt Permitted	0.950						0.950					
Satd. Flow (perm)	3433	0	0	0	5014	0	1626	3424	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					16							
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		159			352			127			369	
Travel Time (s)		3.6			8.0			2.9			8.4	
Peak Hour Factor	0.78	0.78	0.78	0.87	0.87	0.87	0.90	0.90	0.90	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Shared Lane Traffic (%)							10%					
Lane Group Flow (vph)	495	0	0	0	1038	0	30	506	0	0	0	0
Turn Type	Prot				NA		Split	NA				
Protected Phases	2 3!				7		5 8!	5 8!				
Permitted Phases												
Minimum Split (s)					20.0							
Total Split (s)					58.0							
Total Split (%)					43.9%							
Yellow Time (s)					4.0							
All-Red Time (s)					4.0							
Lost Time Adjust (s)					0.0							
Total Lost Time (s)					8.0							
Lead/Lag					Lead							
Lead-Lag Optimize?					Yes							
Act Effct Green (s)	41.0				50.0		26.0	26.0				
Actuated g/C Ratio	0.31				0.38		0.20	0.20				
v/c Ratio	0.46				0.54		0.09	0.75				
Control Delay	7.9				32.8		36.3	50.5				
Queue Delay	0.6				0.0		31.4	60.3				
Total Delay	8.5				32.8		67.8	110.7				
LOS	A				C		E	F				
Approach Delay					32.8			108.3				
Approach LOS					C			F				
Queue Length 50th (ft)	195				248		25	249				
Queue Length 95th (ft)	110				282		60	315				
Internal Link Dist (ft)		79			272			47			289	
Turn Bay Length (ft)												
Base Capacity (vph)	1066				1909		320	674				
Starvation Cap Reductn	260				0		280	432				
Spillback Cap Reductn	0				0		0	0				
Storage Cap Reductn	0				0		0	0				
Reduced v/c Ratio	0.61				0.54		0.75	2.09				

Intersection Summary

Area Type: Other	
Cycle Length: 132	
Actuated Cycle Length: 132	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 95	
Control Type: Pretimed	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 46.6	Intersection LOS: D
Intersection Capacity Utilization 54.3%	ICU Level of Service A
Analysis Period (min) 15	
! Phase conflict between lane groups.	

Splits and Phases: 6: Washington Street (EB L) & McGrath Highway (NB)



Lane Group	ø1	ø2	ø3	ø4	ø5	ø6	ø8
Lane Configurations							
Volume (vph)							
Ideal Flow (vphpl)							
Storage Length (ft)							
Storage Lanes							
Taper Length (ft)							
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 (%)							
Shared Lane Traffic (%)							
Lane Group Flow (vph)							
Turn Type							
Protected Phases	1	2	3	4	5	6	8
Permitted Phases							
Minimum Split (s)	11.0	31.0	16.0	20.0	16.0	20.0	16.0
Total Split (s)	11.0	31.0	16.0	74.0	16.0	42.0	16.0
Total Split (%)	8%	23%	12%	56%	12%	32%	12%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	3.5	3.0
All-Red Time (s)	0.0	2.0	2.0	1.0	2.0	0.5	0.0
Lost Time Adjust (s)							
Total Lost Time (s)							
Lead/Lag	Lead	Lag			Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes			Yes	Yes	Yes
Act Effct Green (s)							
Actuated g/C Ratio							
v/c Ratio							
Control Delay							
Queue Delay							
Total Delay							
LOS							
Approach Delay							
Approach LOS							
Queue Length 50th (ft)							
Queue Length 95th (ft)							
Internal Link Dist (ft)							
Turn Bay Length (ft)							
Base Capacity (vph)							
Starvation Cap Reductn							
Spillback Cap Reductn							
Storage Cap Reductn							
Reduced v/c Ratio							

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	275	16	0	0	0	0	0	0	61	358	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	5045	0	0	0	0	0	0	0	1752	1845	0
Flt Permitted										0.950		
Satd. Flow (perm)	0	5045	0	0	0	0	0	0	0	1752	1845	0
Right Turn on Red			Yes			Yes			Yes	Yes		Yes
Satd. Flow (RTOR)		7								83		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		142			156			280			104	
Travel Time (s)		3.2			3.5			6.4			2.4	
Peak Hour Factor	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	310	0	0	0	0	0	0	0	66	385	0
Turn Type		NA								Split	NA	
Protected Phases		1 2								3 7	3 7	
Permitted Phases												
Minimum Split (s)												
Total Split (s)												
Total Split (%)												
Yellow Time (s)												
All-Red Time (s)												
Lost Time Adjust (s)												
Total Lost Time (s)												
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)		39.0								68.0	68.0	
Actuated g/C Ratio		0.30								0.52	0.52	
v/c Ratio		0.21								0.07	0.41	
Control Delay		34.5								0.1	3.5	
Queue Delay		0.0								0.0	0.0	
Total Delay		34.5								0.1	3.5	
LOS		C								A	A	
Approach Delay		34.5									3.0	
Approach LOS		C									A	
Queue Length 50th (ft)		71								0	15	
Queue Length 95th (ft)		98								m0	m18	
Internal Link Dist (ft)		62			76			200			24	
Turn Bay Length (ft)												
Base Capacity (vph)		1495								942	950	
Starvation Cap Reductn		0								0	0	
Spillback Cap Reductn		33								0	0	
Storage Cap Reductn		0								0	0	
Reduced v/c Ratio		0.21								0.07	0.41	

Intersection Summary	
Area Type:	Other
Cycle Length: 132	

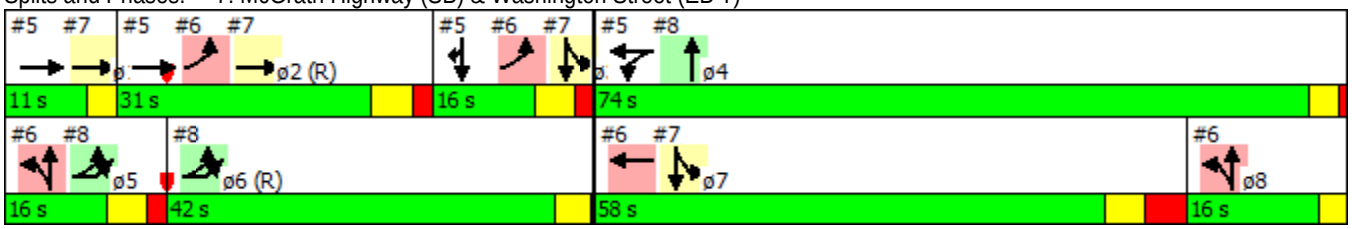
Lane Group	ø1	ø2	ø3	ø4	ø5	ø6	ø7	ø8
Lane Configurations								
Volume (vph)								
Ideal Flow (vphpl)								
Satd. Flow (prot)								
Flt Permitted								
Satd. Flow (perm)								
Right Turn on Red								
Satd. Flow (RTOR)								
Link Speed (mph)								
Link Distance (ft)								
Travel Time (s)								
Peak Hour Factor								
Heavy Vehicles (%)								
Shared Lane Traffic (%)								
Lane Group Flow (vph)								
Turn Type								
Protected Phases	1	2	3	4	5	6	7	8
Permitted Phases								
Minimum Split (s)	11.0	31.0	16.0	20.0	16.0	20.0	20.0	16.0
Total Split (s)	11.0	31.0	16.0	74.0	16.0	42.0	58.0	16.0
Total Split (%)	8%	23%	12%	56%	12%	32%	44%	12%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	3.5	4.0	3.0
All-Red Time (s)	0.0	2.0	2.0	1.0	2.0	0.5	4.0	0.0
Lost Time Adjust (s)								
Total Lost Time (s)								
Lead/Lag	Lead	Lag			Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes			Yes	Yes	Yes	Yes
Act Effct Green (s)								
Actuated g/C Ratio								
v/c Ratio								
Control Delay								
Queue Delay								
Total Delay								
LOS								
Approach Delay								
Approach LOS								
Queue Length 50th (ft)								
Queue Length 95th (ft)								
Internal Link Dist (ft)								
Turn Bay Length (ft)								
Base Capacity (vph)								
Starvation Cap Reductn								
Spillback Cap Reductn								
Storage Cap Reductn								
Reduced v/c Ratio								

Intersection Summary

Actuated Cycle Length: 132	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 95	
Control Type: Pretimed	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 15.8	Intersection LOS: B
Intersection Capacity Utilization 32.8%	ICU Level of Service A
Analysis Period (min) 15	

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

Splits and Phases: 7: McGrath Highway (SB) & Washington Street (EB T)



Lane Group	EBL2	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR	ø1
Lane Configurations												
Volume (vph)	0	336	0	0	483	214	0	0	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Satd. Flow (prot)	3614	1770	0	0	3410	0	0	0	0	0	0	
Flt Permitted		0.950										
Satd. Flow (perm)	3614	1770	0	0	3410	0	0	0	0	0	0	
Right Turn on Red	Yes		Yes			Yes			Yes			
Satd. Flow (RTOR)					81							
Link Speed (mph)		30			30			30		30		
Link Distance (ft)		156			257			127		422		
Travel Time (s)		3.5			5.8			2.9		9.6		
Peak Hour Factor	0.94	0.94	0.94	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	2%	2%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	357	0	0	775	0	0	0	0	0	0	
Turn Type	Split	NA			NA							
Protected Phases	5 6	5 6			4							1
Permitted Phases												
Minimum Split (s)					20.0							11.0
Total Split (s)					74.0							11.0
Total Split (%)					56.1%							8%
Yellow Time (s)					3.0							3.0
All-Red Time (s)					1.0							0.0
Lost Time Adjust (s)					0.0							
Total Lost Time (s)					4.0							
Lead/Lag												Lead
Lead-Lag Optimize?												Yes
Act Effct Green (s)		52.0			70.0							
Actuated g/C Ratio		0.39			0.53							
v/c Ratio		0.51			0.42							
Control Delay		16.4			17.3							
Queue Delay		0.7			3.4							
Total Delay		17.1			20.8							
LOS		B			C							
Approach Delay		17.1			20.8							
Approach LOS		B			C							
Queue Length 50th (ft)		265			181							
Queue Length 95th (ft)		369			230							
Internal Link Dist (ft)		76			177			47		342		
Turn Bay Length (ft)												
Base Capacity (vph)		697			1846							
Starvation Cap Reductn		116			0							
Spillback Cap Reductn		0			950							
Storage Cap Reductn		0			0							
Reduced v/c Ratio		0.61			0.86							

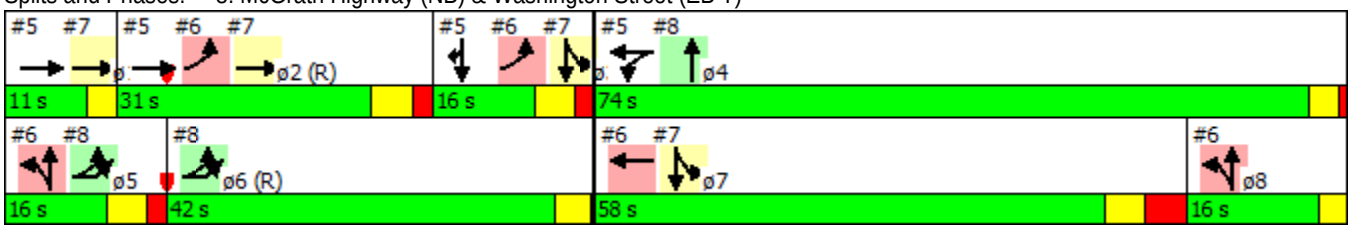
Intersection Summary	
Area Type:	Other
Cycle Length: 132	

Lane Group	ø2	ø3	ø5	ø6	ø7	ø8
Lane Configurations						
Volume (vph)						
Ideal Flow (vphpl)						
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 (%)						
Shared Lane Traffic (%)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	2	3	5	6	7	8
Permitted Phases						
Minimum Split (s)	31.0	16.0	16.0	20.0	20.0	16.0
Total Split (s)	31.0	16.0	16.0	42.0	58.0	16.0
Total Split (%)	23%	12%	12%	32%	44%	12%
Yellow Time (s)	4.0	4.0	4.0	3.5	4.0	3.0
All-Red Time (s)	2.0	2.0	2.0	0.5	4.0	0.0
Lost Time Adjust (s)						
Total Lost Time (s)						
Lead/Lag	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

Intersection Summary

Actuated Cycle Length: 132	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 95	
Control Type: Pretimed	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 19.6	Intersection LOS: B
Intersection Capacity Utilization 47.1%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 8: McGrath Highway (NB) & Washington Street (EB T)



Intersection	
Intersection Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	631	0	0	698	5	10	0	61	9	0	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	0		0	0		0	0		0	0		0
Median Width		0			0			0			0	
Grade, %		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.91	0.91	0.91	0.93	0.93	0.93	0.86	0.86	0.86
Heavy Vehicles, %	1	1	1	2	2	2	0	0	0	0	0	0
Mvmt Flow	5	664	0	0	767	5	11	0	66	10	0	27
Number of Lanes	0	2	0	0	2	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 2		
Conflicting Flow All	773	0	0	664	0	0	1059	1448	332	1113	1445	386
Stage 1	-	-	-	-	-	-	675	675	-	770	770	-
Stage 2	-	-	-	-	-	-	384	773	-	343	675	-
Follow-up Headway	2.21	-	-	2.22	-	-	3.5	4	3.3	3.5	4	3.3
Pot Capacity-1 Maneuver	845	-	-	921	-	-	181	133	670	166	133	618
Stage 1	-	-	-	-	-	-	415	456	-	364	413	-
Stage 2	-	-	-	-	-	-	616	412	-	651	456	-
Time blocked-Platoon, %	0	-	-	0	-	-	0	0	0	0	0	0
Mov Capacity-1 Maneuver	845	-	-	921	-	-	172	132	670	149	132	618
Mov Capacity-2 Maneuver	-	-	-	-	-	-	172	132	-	149	132	-
Stage 1	-	-	-	-	-	-	411	452	-	361	413	-
Stage 2	-	-	-	-	-	-	589	412	-	582	452	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	14	17.4
HCM LOS	-	-	B	C

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Cap, veh/h	476	845	-	-	921	-	-	328
HCM Control Delay, s	14	9.287	0	-	0	-	-	17.4
HCM Lane V/C Ratio	0.16	0.01	-	-	-	-	-	0.11
HCM Lane LOS	B	A	A	-	A	-	-	C
HCM 95th-tile Q, veh	0.6	0.0	-	-	0.0	-	-	0.4

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined