Traffic Impact & Access Study

Proposed The Shoppes at Maynard Crossing
129 Parker Street
Maynard, Massachusetts

Prepared for
Captial Group Properties, LLC

February 2013

GREEN INTERNATIONAL AFFILIATES, INC.
Civil - Structural – Transportation Engineers, Westford, MA

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Executive Summary

The proposed commercial and residential development, known as The Shoppes at Maynard Crossing, is to be constructed at 129 Parker Street in Maynard, Massachusetts. A total of 16 new buildings and one renovated building presently on-site are currently proposed with a total of approximately 720,400 square feet of space. About 348,100 square feet represents retail use of the site, and 322,000 square feet will be utilized as residential space. The existing 50,300 square foot office building will be retained and renovated and provided to the Town for their use. The site was a former office complex owned by DEC at one time, within the surrounding area consisting of houses and buildings and associated playing fields of the Maynard public schools including the high school. The major entrance and exit for the development is on Parker Street at the current major site drive for the former office complex, approximately 300 feet south of B Street and 650 feet north of the northern intersection with Old Marlboro Road. A secondary site drive is to be situated just slightly south of the other existing site drive located opposite of South Street.

The analysis and evaluation of the existing and future 2018 (No-Build and Build conditions) traffic volumes, roadway/site access and safety considerations are included in this report. The guidelines of the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) and the Massachusetts Department of Transportation (MassDOT) as well as considering those of the Institute of Transportation Engineers (ITE) and the regulations of the Town of Maynard were used for conducting traffic impact and access studies.

Existing Conditions

Given the site was studied in detail between 2006-2007 and the economy being static at best the past five years, this update study focuses on the evaluation of the site drive intersections as well as seven other intersections along Parker Street (Route 27) and two additional intersections along Great Road (Route 117).

Parker Street (Route 27) is a two lane undivided road with one lane for each direction of traffic, and functions in this area as an urban principal arterial under local jurisdiction. The intersections of Parker Street with Great Road (Route 117) and with Waltham Street at Powder Mill Road are signalized.

Great Road, also a two lane undivided road functioning as an urban principal arterial west of Parker Street and an urban minor arterial east of Parker Street. It's intersections at Main Street (Route 62) and at Parker Street are signalized. The high school and other schools are accessed from Great Road approximately 800 feet west of Parker Street. The football field and track are located at the Great Road intersection with Park Street (SW quadrant).

Based on recently obtained traffic data and daily traffic volume on Parker Street just north of the project site was observed to be approximately 14,500 vehicles per day (vpd) on a weekday and 11,800 vpd on a Saturday. The evaluation of the signalized intersections indicated that the study intersections currently operate at LOS 'A' to 'C' during the peak periods although it appears that several of the traffic signals may not be functioning optimally.

Future Conditions

The analysis of the proposed development focused on the year 2018. It included estimating traffic conditions for 2018 with and without the proposed development. The No-Build for analysis purposes assumes no activity on the 129 Parker Street site. In reality, some type of redevelopment will occur on this site at some point in the future if the current proposal is not advanced. Forecasts of the project were based on models published by the Institute of Transportation Engineers (ITE). Based on the ITE models for average conditions and under full development, it is estimated that the site would generate approximately 18,068 total vehicle trip-ends over the course of a typical 24 hour weekday. Over the 24-hour period approximately 9,034 vehicle trips enter the site and 9,034 vehicle trips exit the site. The total peak hour trip estimates for the weekday morning is 553 vehicle trips while during the weekday evening period, 1,643 vehicle trips are generated. A greater proportion (58%) of the morning peak hour traffic is expected to enter the site while in the afternoon peak hour, traffic entering and exiting is more evenly distributed. On Saturdays, the site is expected to generate a total of 22,102 vehicle trips were estimated in a 24-hour period, with 11,051 vehicle trips entering the site and 11,051 vehicle trips leaving the site. During peak hour on a Saturday, some 2,124 trips are estimated to be generated, with 52% of these vehicle trips entering the site and 48% of these vehicle trips exiting the site within Saturday peak hour.

In addition to project site related traffic, additional non-project traffic growth related to other developments in the area and general growth were incorporated into the traffic networks.

There are several important aspects of the traffic forecasts to note including:

- A significant amount of the traffic generated by the project will be by motorists already present on the abutting or nearby roadway system,
- There will be a measurable portion of the site generated trips that will in effect be “captured” internally as trips are made between the different on-site land uses (i.e. residential to/from retail),
- The retail related trips will be spread out over an eight to ten hour period, and
- The retail characteristic of the center will reflect more of a community level center and consequently is likely to generate a somewhat lower amount of traffic that what was used in this report. In other words, it is anticipated that the trip generating characteristics of this proposed project, given its location and competing opportunities within a 15 to 25 mile radius, would likely be in the lower quartile of the modeling.

The analysis examined the Build conditions at the site drive with and without the signal to determine the incremental impact of the proposed development. Without a signalized access, a Level of Service ‘F’ would occur during the peak hours resulting in long delays to patrons of the new site use. With a signalized access, it is expected to operate at LOS ‘B’ to ‘C’ depending on the peak hour. Even taking into account the factors noted above, the project is anticipated to generate a relatively high number of peak hour vehicle trips – <u>not unlike the previous proposal as well as the former DEC complex at its peak</u>. While the street segments of both Parker Street and Great Road have the physical capacity to accommodate a substantial amount of traffic, the nearby signalized intersection of Parker Street at Great Road will tend to control traffic flow operations in the project area once the site is redeveloped. With that and based on the traffic analysis, a set of recommendations were developed and are outlined in the following section.

Recommendations

The analysis showed that the project can be accommodated on the abutting street system, several recommendations have been made to enhance the site's access-egress and reduce the impact of the project. The recommendations are as follows:

Site Access/Internal Circulation Actions

- The primary site drive will need to be signalized and that would include pedestrian control. The geometry is proposed to include a two lane exit approach, a northbound left turn lane and a southbound right turn entry lane.

- It is recommended that the secondary drive located on the north side of the project site be configured to be a right turn in only driveway.

- The project should strive to accommodate and encourage safe travel by other modes such as walking and bicycling. To that end, a new ADA compliant sidewalk is recommended along the west side of Parker Street from the primary site drive to Great Road. The sidewalk would connect with the internal sidewalk network.

- Bicycle racks should be strategically placed within the center to accommodate and encourage bicycle travel.

- Create a pedestrian/bicycle pathway connection between the site and the high school/ballfields – likely near the proposed Town/community building.

- Adjustments to the first internal intersection on the main site drive should be considered including preventing exiting from the adjacent parking fields and turning either left or straight across the main drive. The left turn into the large southern parking field should be shifted to the second major internal driveway.

- The internal road system should be designed to accommodate transit vehicles.

Off-Site Actions

- The intersection of Parker Street with Great Road should be updated in terms of traffic signal equipment, signal timing and geometry including lengthening the northbound left turn lane capacity, installing a westbound left turn lane and provision of a separate right turn lane in the northbound direction.

- Guide signage should be installed in key locations on Great Road and Parker Street and at the site drive indicating the preferred routes and turns between the project site and Great Road (Route 117). This should include a pylon type sign with major tenants listed and be located at the Great Road at Parker Street intersection ideally in the southeast quadrant of the intersection.

- Work with the Town to ensure optimum signal timing and operations occur at the intersection of Parker Street with Powder Mill Road and Waltham Street.

- A new ADA compliant sidewalk should be installed along the west side of Parker Street as part of the road work extending from the site frontage to Great Road.

- It is recommended that a sidewalk be installed on the east side of Parker Street between Old Marlboro Road and North Street pending verification that sufficient right of way exists. If ROW is

insufficient, a contribution to a sidewalk fund could be made or future construction commitment while the Town works out the easements.

- A pedestrian crossing warning beacon system is recommended for Parker Street at Field Street regardless of the disposition of the sidewalk along the east side of Parker Street.

- It is anticipated that a new Transportation Management Association (TMA) will be formed in this region including the town of Maynard. If it comes to fruition, it is recommended that the development's ownership join the TMA.

- The neighborhood east of the project site and bounded by Great Road, Parker Street and Old Marlboro Road should be monitored during the first year or two after full occupancy to identify any significant change in unwanted travel patterns & volumes within the neighborhood attributable to The Shoppes. While actions will require the concurrence of the neighborhood residents, Town departments, the peer review consultant and the Planning Board, they could include items such as one way streets, maintaining or expanding turn prohibitions currently in place on Parker Street near the project site, reduction of pavement widths, tightening intersection corners, and installing speed humps and other speed control measures.

Introduction

This report provides an analysis of a proposed mixed-use development to be constructed at 129 Parker Street (Route 27) in Maynard, Massachusetts. This redevelopment, named The Shoppes at Maynard Crossing, will be located on the site of the former Digital Equipment Corporation (DEC) office complex on the west side of Parker Street between Field Street and Vose Hill Road. The project location is shown on Figure 1 with respect to nearby major intersections such as Parker Street (Route 27)/Great Road (Route 117) and Route 27/Powder Mill Road/Waltham Street, along with nearby places of interest.

At this time, the site is largely cleared with the exception of one former office building. The new proposed project is composed of nine residential buildings with a total of 250 apartment units and a clubhouse building; an existing 50,300 square foot office building that will renovated and be provided to the Town for offices and community services; and retail use within seven buildings totaling approximately 348,100 square feet. Access will be via reconstructed existing driveways, with one on Parker Street between Field Street and Old Marlboro Road at its present location, and a second drive situated just south of an existing site drive opposite of South Street. Under the current plan, the existing driveways will be reconstructed to accommodate two-way traffic with the major driveway proposed to have two lanes entering the site and a right and a left lane exiting the site. As will be discussed later in this report, the primary site drive would also be signalized. The secondary drive was evaluated for possible turn restrictions and this is discussed later in the report. After redevelopment, the site will continue to be bordered by wooded areas and ball fields to the west, and wooded areas and residences to the north and south and Parker Street.

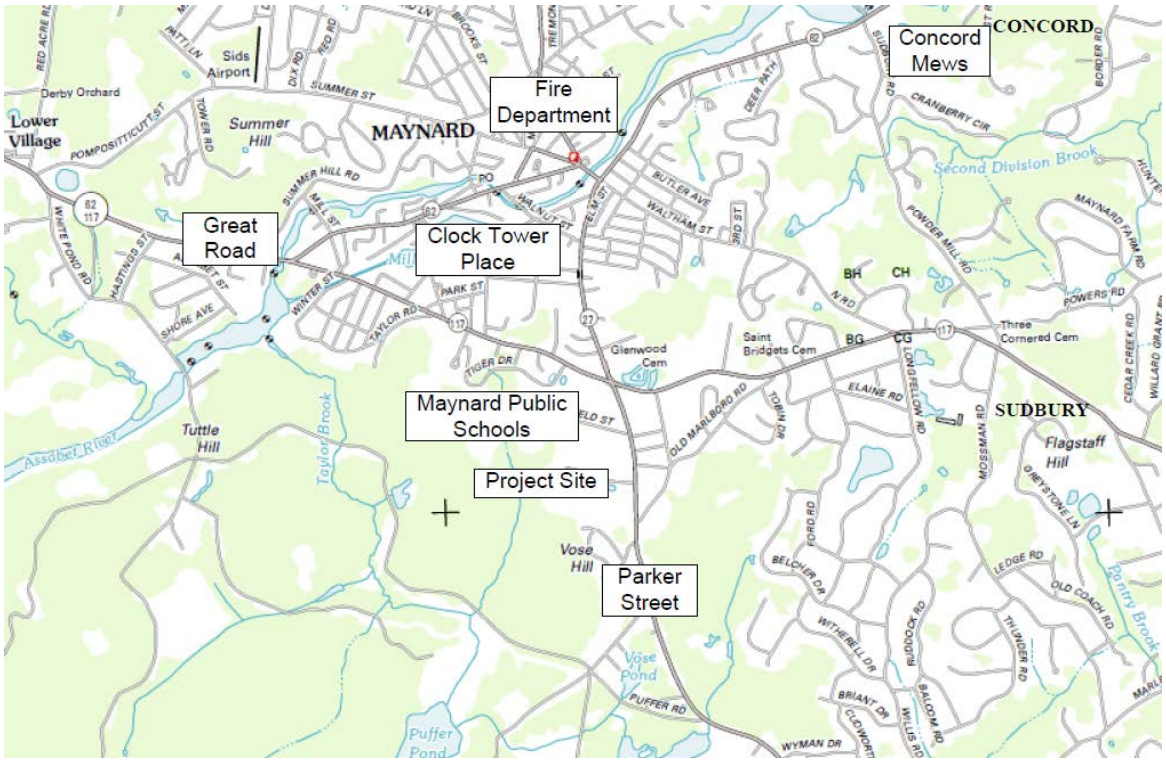


Figure 1. Overall Project Area

The analysis and evaluation in this report includes of traffic volumes, safety data and review, and analysis of the roadway/site access interface. The guidelines of the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) and the Massachusetts Department of Transportation (MassDOT) as well as considering those of the Institute of Transportation Engineers (ITE) and the regulations of the Town of Maynard were used for creating the traffic impact and access study. The report's content contains descriptions of existing characteristics of the proposed roadway network, current conditions and the estimated traffic impacts and access-egress characteristics of the proposed development.

Existing Traffic Conditions

The following sections describe the existing transportation system in terms of physical and operational characteristics. The selection of the study area took into account the location and type of project and focused on the evaluation of the roadways and intersections in the vicinity of the site that are anticipated to be most impacted by the proposed project. The review of the previously approved project studies was also considered.

A. EXISTING ROADWAY NETWORK

The study focused on areas of Parker Street and Great Road in the vicinity of the project site and nine intersections along Parker Street and Great Road of the site including:

- Great Road (Route 117) at Main Street (Route 62)
- Great Road at Sudbury Street
- Great Road at Parker Street (Route 27)
- Parker Street at Waltham Street at Powder Mill Road
- Parker Street at Walnut Street
- Parker Street at Field Street at North Street
- Parker Street at South Street
- Parker Street at Old Marlboro Road (northern intersection)
- Parker Street at Vose Hill Road

As part of this study, a field reconnaissance was conducted to verify current physical and operational features identified in both the 2006 proposal of the redevelopment of 129 Parker Street as well as features identified in an updated network analysis. A description of the study roadways serving the project is included in the following paragraphs. Unless otherwise specified, all of the minor roads mentioned near the project area are two-way roads with two lanes with widening at certain intersections for turn lanes.

Major Roads

1. Great Road (Route 117)

Great Road (Route 117) in the project area consists of one travel lane in each direction in the vicinity of the proposed development site. It provides connections between Maynard and Stow, Bolton and I-495 to the west and Sudbury and Concord to the east. The roadway comes under local jurisdiction. A double yellow center line separates the eastbound and westbound directions of the road. A one- to one-and-a-half foot shoulder is marked on each side of the road. Sidewalks exist along both sides of Great Road in the study area. Posted speed limits on Great Road in the project area were noted as 35 miles per hour (mph). Several public schools area located off Great Road including the high school.

2. Parker Street (Route 27)

Parker Street (Route 27) is a two-lane, two-way road in the project area. It provides connections to Sudbury to the south and, via continuations of Route 27 such as Acton Street, to Acton and Route 2 to

the north. A double yellow center line separates the northbound and southbound movements, and there are approximately one-foot shoulders marked on either side of the road. The posted speed limit along Parker Street is 35 mph south of Great Road and 30 mph north of Great Road.

Intersections

1. Parker Street at Great Road

This signalized intersection is formed by Parker Street crossing Great Road. The intersection angle is at a skew. Great Road runs east-west while Parker Street runs in a north-south direction. Each approach has exclusive left-only lanes, 12-foot wide through lanes, and channelized right-turn lanes. The right-turn lane at Great Road eastbound has a right turn signal. Great Road eastbound has a left-turn lane approximately 10 feet wide and a right-turn lane that is about 11 feet wide. Great Road westbound has a right-turn approximately 12 feet wide and a left-turn lane approximately 11 feet wide. Parker Street northbound has an approximately nine-foot wide left-turn lane and a right-turn lane that is about 13 feet wide. Parker Street southbound has an approximately 16-foot wide right-turn lane and a 10-foot wide left-turn lane. Pedestrians cross at the northern and western legs; each leg being serviced by a separate pushbutton-activated pedestrian crossing phase. Parker Street has a posted speed limit of 20 mph for both northbound and southbound approaches. The intersection is bordered by a Boys & Girls Club building in the northwest corner, the high school track in the southwest corner, houses in the southeast corner, and a cemetery and wooded area in the northeast corner.

Great Road looking east towards Parker Street

2. Great Road at Main Street (Route 62)

This signalized intersection, approximately 5,800 feet to the west of the Great Road at Parker Street intersection, consists of Great Road comprising the eastern and western legs and Main Street, intersecting and ending at Great Road at a skew, comprises the northern leg. In addition, a drive serving a parking lot for a dentist's office and several other small offices at the southern end of the intersection, and controlled by the traffic signal. Main Street, like Great Road, is a two-lane two-way road with directions separated by a double yellow center line. On the eastbound approach Great Road has a through and a left-turn lane marked with left-turn arrows and "ONLY" pavement markings. In the westbound direction Great Road has a through lane and a channelized right-turn lane, while the Main Street approach has a shared lane (mainly serving as a right-turn lane, as few vehicles go straight into the parking lot) and a left-only lane with left arrows and "ONLY" pavement markings. Travel lane widths are generally 10-11 feet in width on the eastbound and Main Street approaches. The eastbound and southbound left movements are serviced with left-turn signals. Pedestrians cross from the northwest, northeast, and southeast corners to a center island; all three crossings operate on the same pedestrian

pushbutton-activated phase. Speed limits are 35 mph along Great Road and Main Street. In the northeast quadrant of the intersection is a gas station, and in the northwest quadrant of the intersection wooded areas and houses are located.

3. Great Road at Sudbury Street

Sudbury Street meets at Great Road on the north side forming a slightly skewed, three-legged 'T'-type unsignalized intersection. Sudbury Street, the minor approach, has STOP control whereas Great Road runs free at this intersection. All three approaches have a single lane from which through movements and/or turns are made. A crosswalk traverses Sudbury Street and the Great Road eastbound approach. Both of the single-lane Great Road approaches are approximately 12 feet wide, whereas the Sudbury Street approach widens at the mouth of the intersection with an approximately 14-foot wide STOP bar for left-turning traffic and an approximately 22-foot wide STOP bar for right-turning vehicles. This intersection is abutted by houses along Sudbury Street and the westbound side of Great Road, and due south of the intersection is a baseball field.

4. Parker Street at Waltham Street at Powder Mill Street

At this four-legged signalized intersection, Parker Street forms the southern approach of the intersection, Powder Mill Road forms the northern approach, and Waltham Street forms the eastern and western approaches. The bridge over the Assabet River is currently being reconstructed and as a result, there is some width reduction presently on the western leg of Waltham Street but no detour. Waltham Street westbound descends into the intersection at an approximately four percent slope and Parker Street descends down to the intersection at approximately five to six percent. Route 27 turns west from Parker Street to the western leg of Waltham Street. All four approaches meet at approximately right angles. Waltham Street on the eastbound approach, at the STOP bar of this intersection, has a through/left lane approximately 14 feet wide and a 12 foot right-turn lane. Parker Street has a widened approach lane that is approximately 16 feet wide at the intersection; left-turning vehicles at this approach are serviced by a left-only signal, as does the Waltham Street eastbound approach. Waltham Street on the westbound approach has a single approach lane some 15 feet wide, and Powder Mill Road has a through/left lane and a right-turn lane that are each about 11 feet wide. Both right-turn lanes have a right-turn arrow and "ONLY" pavement markings. The posted speed for Powder Mill Road is 25 mph; the other roads had no posted speed limit in the vicinity of the intersection. Land uses in the vicinity include mixed-use commercial at the southeast corner of the intersection, a gas station at the northeast corner, several small businesses in northwest corner, and a print shop, Tedeschi's convenience store and a Dunkin' Donuts occupying the southwest corner of the intersection.

5. Parker Street at Walnut Street

Parker Street is intersected by Walnut Street, forming a three-legged 'T'-type unsignalized intersection with Walnut Street the minor street. Parker Street runs free while Walnut Street is STOP controlled. Walnut Street has an east-west orientation, and Parker Street runs in a north-south direction. All of the approaches consist of a single travel lane each. Pavement markings on Walnut Street include a STOP bar and a crosswalk. A crosswalk also traverses Parker Street just north of McKinley Street. Parker Street has 11-foot wide lanes in this location with the Walnut Street approach is approximately 14 to15 feet wide.

6. Parker Street at Field Street at North Street

Field Street and North Street for a slightly offset four way intersection with Parker Street just north of the project site. Both Field Street and North Street are local residential streets, have no pavement markings and are both STOP controlled approaches to Parker Street. Each approach consists of a single lane. North Street is also posted with a "DO NOT ENTER" sign with posted times of "3:30 PM – 5:30 PM." A crosswalk traverses Parker Street diagonally, meeting at the southern corner of Parker Street at North Street. Parker Street has one approximately 11-foot wide lane at both of its approaches, while undivided Field Street and North Street are approximately 22 feet and 20 feet wide total, respectively. Field Street serves 21 homes while North Street is one of the local streets serving the neighborhood east of the project site.

7. Parker Street at South Street

This unsignalized intersection has four legs with the existing secondary site drive at 129 Parker Street forming the fourth leg. South Street, which forms the eastern leg of the intersection, is approximately 24-foot wide. The eastern and northern sides of the intersection are bounded by houses, and the office complex is situated in the southwestern corner of the intersection. South Street is posted with a "Do Not Enter" sign accompanied by a smaller sign listing the times "3:30 PM – 5:30 PM." Neither the site drive nor South Street currently has pavement markings. A crosswalk traverses Parker Street just south of South Street. Parker Street has an 11-foot wide lane at both of its approaches. South Street, minus flares, undivided roadway. South Street is one of the local roadways serving the neighborhood east of the project site.

8. Parker Street in Vicinity of Site

Currently, the major site drive to the vacant office complex consists of a two lane approach (right and left lane exits) and a wide entry lane that meets at Parker Street perpendicularly. Parker Street in this area is approximately 24 to 26 feet wide. The approaches to the existing site drive are straight and level with generally good visibility along Parker Street in this area. It is currently anticipated that this intersection would be reconstructed as part of the new development. Parker Street is lined with some fairly large (over 18" in diameter) trees north and south of the intersection. A sidewalk exists on the west side although its current condition is below average. Opposite from the office complex are single-family houses.

Parker Street looking south towards site

Parker Street looking north towards site

9. Parker Street at Old Marlboro Road (north)

Old Marlboro Road consists of two separate sections, with the two portions being approximately 1,400 feet apart along Parker Street. This analysis focuses on the northern location. The northern intersection of Parker Street at Old Marlboro Road is a three-legged intersection with Parker Street forming the northern and southern legs and Old Marlboro Road forming the eastern leg. There are no pavement markings on Old Marlboro Road at this intersection. The through movement of Old Marlboro Road intersects Parker Street at approximately 50°, although a flared right-turn entry exists. The wide (100+ feet) opening for Old Marlboro Road has a STOP-sign posted at each corner of the leg. Old Marlboro Road is a two-way street. This intersection is located within approximately 650 feet of project site. Old Marlboro Road also intersects Great Road to the east. This 'through' connection resulted in concerns by neighborhood residents of traffic diversions due to the shorter route, particularly when substantial delays occur at the Parker Street intersection with Great Road. The intersection is surrounded by single-family houses with the southeast quadrant being undeveloped.

10. Parker Street at Vose Hill Road

Vose Hill Road is located about 1,000 feet south of the project site. It forms an unsignalized intersection with Parker Street. Vose Hill Road is STOP controlled. Parker Street forms the northern and southern legs while Vose Hill Road forms the third, western leg of this intersection. Vose Hill Road descends downhill at an approximately five percent grade, while the intersection is approximately perpendicular to Parker Street. Vose Hill Road has no pavement markings or signage, but the intersection has recently

been reconstructed with new wheelchair ramps, curbing, and a southward extension of the existing sidewalk along the western side of Parker Street. Vose Hill Road is approximately 30 feet wide.

B. TRAFFIC VOLUMES

As part of this study, new traffic data was collected during November 2012 and consisted of weekday peak period (typically within 7-9 AM and 4-6 PM) and Saturday peak period (typically within 11 AM – 1 PM) automated turning movement counts (TMCs) at the study intersections noted previously. The count program also included a 48-hour Automatic Traffic Recorder (ATR) vehicle count on Parker Street just north of the major site drive. The TMC and ATR data collected as a part of the traffic study are included in the Appendix.

Table 1 summarizes the ATR data that was collected as part of this study. As indicated, the average weekday traffic volume on Parker Street north of the site drive is between 14,500 and 14,600 vehicles per day. The Parker Street AM peak hour flows north of the site are approximately 1,200 to 1,300 vehicles per hour representing 8.3% to 8.9%of the weekday total. The PM peak hour volumes north of the site were approximately 1,300 to 1,400 vehicles per hour representing approximately 8.9% to 9.6% of the total weekday volume. On Saturday, about 11,800 vehicles per day were observed to travel on Parker Street, with 8.4% of daily traffic occurring during peak hour representing 1,000 vehicles.

TABLE 1
SUMMARY OF OBSERVED TRAFFIC DATA
PARKER STREET NORTH OF MAJOR SITE DRIVE

Date of Count	Day of Week	24 Hour Weekday	Weekday AM Peak	Percent of Daily Volume	Weekday PM Peak	Percent of Daily Volume
11/15/12	Thursday	14,500	1,300	8.8%	1,400	9.6%
11/16/12	Friday	14,600	1,200	8.3%	1,300	8.9%
11/17/12	Saturday	11,800	-	-	1,000*	8.4%*

* Peak hour traffic on Saturday begins at 12:30 PM
Note: Data has been rounded. November 2012 (ATR) data.

The traffic count data was reviewed for several aspects including peaking along Parker Street as well as the hourly variation of traffic flow. Figure 2 illustrates the variation in traffic flow over the 24 hour period during a weekday. Figure 3 exhibits the Saturday data. The data shows that during the weekday, there is a distinct peaking in traffic flow for the typical commuter morning and evening peak periods. Between the two peaks, traffic flow along this section of Parker Street was observed to reduce by approximately 40%. On Saturday, the hourly variation differs from the weekday as there tends to be a slowly increasing level of flow beginning mid-morning and continuing into the afternoon where it begins to decrease. In addition, the peak on Saturday is 21% lower than the weekday peak hour volumes.

In developing the estimated average or typical volume conditions for the study, a review of permanent traffic count station data maintained by the Massachusetts Department of Transportation (MassDOT) was completed. This review estimated the seasonal variation of traffic flow on roadways similar to the function and/or located in the general region and determined if the data collected in the field needed to be

adjusted to reflect appropriate analysis conditions. The permanent count stations (Sta. Nos. 5, 307, 3293, 3295, 4114) maintained by MassDOT were identified and reviewed to evaluate seasonal and year-to-year changes. The particular stations reviewed are located within 20 miles of the project site and are locatied north andor west of Boston and north and/or east of Worcester.

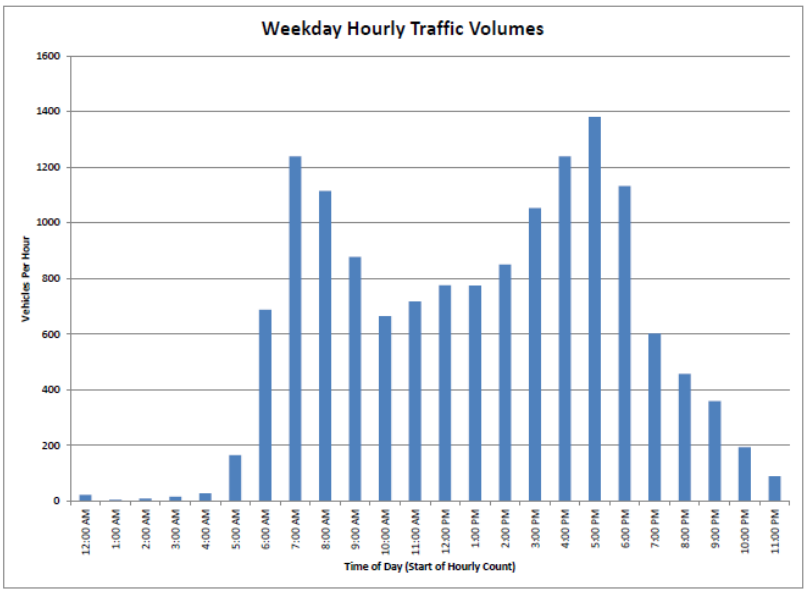


Figure 2
Hourly Variation in Weekday Traffic Volumes
Parker Street in Vicinity of 129 Parker Street

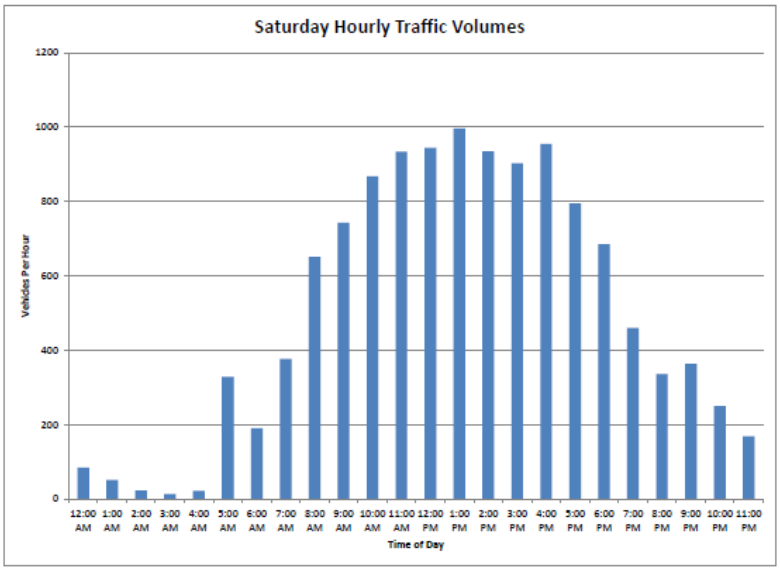


Figure 3
Hourly Variation in Saturday Traffic Volumes
Parker Street in Vicinity of 129 Parker Street

The data from these count stations indicated that November volumes tended to be less than one percent below average monthly conditions. Consequently, in developing the base networks for analysis purposes, the count data was considered a close match to estimated existing average conditions, therefore no seasonal adjustment factor was applied. Historical data for the study area was also reviewed as part of this study from the mid-2000's and were generally found to be similar in terms of both pattern and magnitude.

Figures 4 through 6 illustrate the estimated existing weekday morning, weekday evening and Saturday midday peak hour traffic volume networks for the study area.

Proposed Shoppes at Maynard Crossing
Maynard, Massachusetts

AM Peak Hour

Not to Scale

Green International Affiliates, Inc.

Existing Traffic Volume Network

Figure 4

PM Peak Hour

Not to Scale

Green International Affiliates, Inc.

Existing Traffic Volume Network

Figure 5

Saturday Peak Hour

Not to Scale

Green International Affiliates, Inc.

Existing Traffic Volume Network

Figure 6

C. CRASH EXPERIENCE

Crash history at study intersections were examined as part of this study for the most recently available three-year period at that time, which was 2008 to 2010. Crash data presented in this report was obtained from the MassDOT Crash Record System (CRS). The data is summarized in Table 2

A total of fifty-nine (59) accidents were reported for the nine study locations over the three-year data period, or an average of 20 crashes per year combined for all the study intersections. Highlights have been noted below:

- The intersection of Parker Street and Waltham Street with Powder Mill Road experienced the highest frequency of reported crashes, with thirty (30) reported crashes over the three-year period averaging ten (10) reported crashes per year. This figure includes accidents at the drive to Tedeschi's and Dunkin' Donuts. The predominant crash types were angle collision-type collisions (40% of crashes) and rear-end-type (30% of total) collisions.

- Parker Street at Great Road experienced the next highest frequency with ten (10) reported crashes in the three-year study period, or approximately three (3) reported crashes per year. The majority (70%) of these crashes were rear-end-type collisions.

- The intersections of Parker Street at Walnut Street and Great Road at Main Street experienced approximately two reported crashes per year while the remaining study locations experienced fewer than two crashes per year.

- The majority of all reported crashes resulted in property damage only crash types and under clear, dry conditions. It was noted, however, that a relatively high proportion (40%) of crashes reported at the Parker Street/Waltham Street/Powder Mill Road intersection occurred under wet and rain conditions.

- The most common type of accident reported in the project area are rear-end collisions, which comprise some 41% of all accidents. Also common were angle type collisions, making up some 30% of all accidents.

- About 14% of all accidents in the study area resulted in personal injury; no fatalities were reported at any of the studied intersections from 2008 to 2010.

- About 43% of reported accidents reported in the study area and time span occurred during peak hours.

The trends noted in the data can be taken into consideration when planning access for the proposed 129 Parker Street redevelopment.

TABLE 2
SUMMARY OF REPORTED CRASH DATA FOR MAYNARD, 2008-2010

Location	Total	Crash Type						Severity			Pavement		Weather			Peak Hour
		AC[a]	HO[b]	RE[c]	SS[d]	SV[e]	O/U[f]	PD[g]	PI[h]	F[i]	Dry	Wet[j]	Clear	Snow	Rain[k]	
Great Road at:																
Main St	5	1	0	2	0	1	1	4	0	0	5	0	5	0	0	3
Sudbury Street	2	1	0	0	0	1	0	1	1	0	1	1	1	0	1	1
Parker St	10	0	1	7	0	1	1	6	2	0	8	2	7	1	1	6
Parker Street at:																
Waltham St at Powder Mill Rd	30	12	2	9	4	1	2	25	1	0	17	12	16	1	12	11
Walnut St	7	2	1	4	0	0	0	5	2	0	6	1	5	0	2	2
Field St at North St	2	1	0	1	0	0	0	2	0	0	0	2	1	0	1	1
South St	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Old Marlboro Rd (unspecified location)	2	0	0	0	0	2	0	0	2	0	0	2	1	0	1	2
Vose Hill Rd	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Source: MassDOT Crash Report for Maynard, 2008-2010.
Note: [a] - angle collision; [b] – head-on collision, [c] - rear-end collision; [d] - side swipe; [e] - single vehicle; [f] – other or unspecified; [g] - property damage; [h] - personal injury; [i] - fatality; [j] - wet, snowy, or icy; [k] - rain, cloudy, or foggy

As part of this safety review, the "crash rate" for the study intersections was also determined. The calculation of the crash rate accounts for the amount of traffic that enters the intersection, and relates the number of accidents at a location directly to the amount of traffic that passes through the location. It becomes a more comprehensive measure for identifying potentially hazardous locations compared to simple averages. The calculated rate is compared to the District-wide averages. Intersections experiencing crash rates greater than the above averages are potentially experiencing an unusually high number or higher than expected number of crashes relative to traffic volumes at that particular location and may warrant further investigation or improvements. For the MASSDOT District 3 area, which covers the study area, has an average crash rate of 0.66 crashes per MEV for unsignalized intersections and 0.90 crashes per MEV for signalized intersections. The results of the crash rate analysis are in Table 3.

The calculated crash rates of the existing intersections in the vicinity of the project area are generally low when compared to the regional average. The crash rate (in crashes per million entering vehicles) for the intersection of Parker Street, Waltham Street and Powder Mill Road was calculated to be 1.53. This is above the average crash rate of 0.90 for a signalized intersection in MassDOT District 3. The other intersections in the study area were all found to be below the district averages. The signalized intersection of Parker Street at Great Road is 0.45 and the crash rate for Great Road at Main Street is lower still at 0.33. The crash rate for unsignalized intersections in District 3 is 0.66. Crash rates for unsignalized intersections in the study area were found to be below the district average.

TABLE 3
SUMMARY OF REPORTED CRASH DATA FOR MAYNARD, 2008-2010

Intersection	Type of Control	Total No. of Crashes (3 Years)	Average No. of Crashes/Yr.	Crash Rate (per MEV)
Great Rd at Main St	Signalized	5	1.7	0.33
Great Rd at Parker St	Signalized	10	3.3	0.45
Parker St at Waltham St at Powder Mill Rd	Signalized	30	10.0	1.53
Great Rd at Sudbury Street	Unsignalized	2	0.7	0.16
Parker St at Walnut St	Unsignalized	7	2.3	0.58
Parker St at Field St at North St	Unsignalized	2	0.7	0.17
Parker St at South St	Unsignalized	0	0.0	0.00
Parker St at Old Marlboro Rd	Unsignalized	2	0.7	0.17
Parker St at Vose Hill Rd	Unsignalized	0	0.0	0.00

* Assuming that the two crashes at the unspecified Old Marlboro Road intersection occurred at the northern intersection
Source: MassDOT Crash Report for Maynard, 2008-2010. MassDOT Dist 3 avg.: signalized 0.90; unsignalized 0.66

D. EXISTING PUBLIC TRANSPORTATION NETWORK

As part of this study, the presence of nearby public transit systems was identified to better understand the potential interaction among multiple modes of travel as well as the potential roadway network impact of commuters driving to transit stations.

Based on the review, there is no fixed route public transportation provided within the Town of Maynard, although Maynard lies relatively close to the MBTA commuter rail line (Fitchburg line).

Commuter Rail

The proposed project is within five miles of two commuter rail stations along the Massachusetts Bay Transit Authority's (MBTA) Fitchburg / South Acton line. The South Acton Station, managed by the Town of Acton, has 287 parking spaces as well as 44 spaces for bicycles and is located approximately 3.1 miles from the project site. Route 27 and Route 62 provide a key access route between Maynard and the station. The West Concord Station, which has 146 vehicle parking spaces and 10 bicycle spaces, is managed by the Town of Concord[1] and it is located approximately 4.5 miles from the project site. Route 62 provides a key access route between the station and the site. Both stations provide access to Cambridge and North Station in Boston, so it is reasonable to assume that at least some commuters will choose to live at and (during weekday peak hours) commute to/from the project site to either of these two stations. During peak hours a train stops at each station approximately once every one-half hour (see appendix for MBTA schedules as of January 2013).

[1] Massachusetts Bay Transit Authority website, Schedules & Maps, 2013

Probable Impacts of the Project

The impact of the proposed development project on the roadway network within the study area was evaluated and the results are described in this section. For study purposes, the year 2018 was used for the analysis year and represents a six-year build out timeframe from the inventory period and takes into account the permitting and construction time periods.

A. NO-BUILD TRAFFIC VOLUMES

The Year 2018 No-Build traffic volume network was developed by taking into account existing traffic volumes, and identifying potential area wide background traffic volume growth as well as known site specific condition (background) developments that could contribute to traffic flow on the study network.

1. Background Traffic Growth

In determining a background traffic growth rate, historical traffic count data trends for the project's analysis area were reviewed. The trends were determined from the permanent count station data maintained by the Massachusetts Department of Transportation (MassDOT) and identified previously in the report. The historical traffic data from the MassDOT permanent count stations indicated, when combined, a slight increase of approximately 0.4% in annual average traffic volumes for the region since 2005[2]. A review of peak hour traffic volumes at the study intersections in the previously studied 129 Parker Street report found that traffic volumes have remained fairly constant over the past six years[3].

Presuming some level of economic rebound is inevitable in the future, an assumption for some general background growth has been incorporated into the No-Build networks. Traffic growth rates of 0.5% per year for the first three (3) years and 1.0% per year for the following three (3) years were selected and cumulatively applied to the existing peak hour traffic volumes. These rates would presumably account for some of the more remote growth in the region as well as general nearby residential/ business growth that could potentially result in added traffic through the study area.

2. Site-Specific Development

In addition to background growth, research on site specific developments or uses that are likely to occur within the study time frame in the vicinity of the proposed project was completed. Based on discussions with the region's Town Planning Board offices, it was determined that there were four substantive site specific developments in the project area that have some potential to directly affect traffic in the study area. These were reviewed and determined reasonable to incorporate into the future network. Projected volumes from these four developments were included in the 2018 No-Build roadway network for this project. These site-specific developments as noted below include one Maynard development and nearby projects in Concord, Stow, and Sudbury.

---

[2] MassDOT Traffic Volume Counts; 2009 Report.

[3] Preliminary Traffic Impact and Access Study, 129 Parker Street Redevelopment, Vanesse & Associates, Inc., Oct. 2006

It should be noted that the No-Build does not assume any redevelopment activity on the subject site. As a result, the incremental impacts of the proposed project described later will be somewhat overstated.

In Maynard, Clock Tower Place is expected to have 300,000 square feet of office space converted, renovated and leased out as 300 small apartment units.

The Concord Mews development in the southwest corner of Concord abuts the corners of Maynard, Acton and Sudbury. Construction of this 350 residential unit project has recently been completed. However, it is apparently not fully occupied at this time and an assumption that twenty-five percent of the units are unoccupied was incorporated into this analysis. As residents move into this development, they will continue to contribute to traffic volumes along Route 62, which in turn includes Powder Mill Road in Maynard, among other roads[4].

Two other developments were also identified. Along Route 117 in Stow is the new (as of 2012) Villages of Stow development, comprising 96 single-family homes fully built but not fully occupied. Near the Maynard town line in Sudbury is the recently completed 14 single-family home development along Mary Catherine Lane, which is in close proximity (1-1/3 mile) of the project site and has entrances on both Great Road and Waltham Street (road names in Maynard). In each of these cases, estimates of potential traffic was made based on the ITE trip generation models or taken from project reports if available.

3. No-Build Traffic Volumes

Consequently, the year 2018 No-Build traffic volumes were determined by adding six (6) years' background traffic growth of one-half percent annually (for three years) and one percent annually (for the following three years), plus additional volume expected from recently completed or future expected residential developments in the area.

The estimated year 2018 No-Build traffic volumes projected for the weekday morning and evening peak hours plus the Saturday peak hours at the study intersections are shown in Figures 7, 8, and 9.

[4] Town of Concord, 2012 Community Preservation Plan, July 21, 2011

Proposed Shoppes at Maynard Crossing
Maynard, Massachusetts

AM Peak Hour

Not to Scale

Green International Affiliates, Inc.

2018 No-Build Traffic
Volume Network

Figure 7

PM Peak Hour

Not to Scale

Green International Affiliates, Inc.

2018 No-Build Traffic
Volume Network
Figure 8

Saturday Peak Hour

Not to Scale

Green International Affiliates, Inc.

2018 No-Build Traffic Volume Network

Figure 9

B. PROPOSED PROJECT DESCRIPTION

The currently proposed 129 Parker Street project entails the development and occupation of a mixed use project with a total floor space of 670,100 square feet in addition to the renovation of an existing 50,300 square foot office building, representing a total of 720,400 square feet. It will be a mixed-use development with residential, retail, office, and community uses. The mixed use project will be situated between Field Street to the north and Vose Hill Road and Dettling Road to the south on a 58.3-acre parcel. The current plans consist of providing approximately 348,100 square feet of retail use, 250 apartments and the 50,300 square foot building. The existing office building proposed to be renovated and provided to the town of public use. Although not finalized, discussions for possible uses of the building have included town related offices and community recreational/senior type uses. Figure 10 graphically depicts the current concept.

Figure 10. Layout of The Shoppes at Maynard Crossing Project

Source: Capital Group Properties, The Shoppes at Maynard Crossing Presentation, February 2013

The project also includes the reconstruction of two existing site drives to access the site buildings from Parker Street. The major site drive is proposed to consist of a two-lane entrance to the site and a tow lane exit with one lane each for vehicles exiting left and right from the site. Directional flow will be separated by a raised median. As will be discussed later, the major site drive is proposed to be signalized. A smaller, secondary site drive was first proposed to provide access to and egress from the site under the current plan. However, following the initial analysis, it was recommended that this drive be designed as a right

turn in only drive. Both site drives will be reconstructed at or near the two current site drives on Parker Street that served the former office complex on the site.

C. SITE GENERATED TRAFFIC VOLUMES

In this section an estimate of traffic to be generated by the proposed shopping center development was completed and assigned to roadways/intersections within the study area and added to the No-Build traffic volume network to develop the Build traffic condition.

1. Site Trip Generation

In order to estimate the number of trips that could be generated by the proposed development, statistics published by the Institute of Transportation Engineers (ITE) in Trip Generation for similar land uses were examined. The ITE trip generation statistics represent compilations of data from studies/projects throughout the United States collected over the past 30+ years on trip generation characteristics for different types of land uses. The data has been compiled to provide transportation analysts with guidelines in forecasting 24 hour and peak hour volumes for the specified use.

Based on a review of the ITE database, a combination of three different land uses have been selected as the most similar to the project type. These land uses correspond to: Land Use Code (LUC) 220, which corresponds to residential apartments; LUC 495, for a recreational community center; LUC 710 for general office space; and LUC 820, which corresponds to the retail component. Calculations were completed for each land use and the estimated vehicle trips (without adjustment) generated by the project are presented in Table 4. Detailed trip generation calculations are included in the Appendix.

TABLE 4
SUMMARY OF ESTIMATED
SITE TRIP GENERATION
(vehicle trips)

	In	Out	Total
Weekday	9,034	9,034	18,068
AM Peak Hour	301	252	553
PM Peak Hour	804	839	1,643
Saturday	11,051	11,051	22,102
Saturday Peak Hour	1,108	1,016	2,124

Source: ITE Trip Generation, 9th Edition, 2012, LUC 220, 495, 710, 820

As shown in Table 4, the proposed development based on the sizes of each component and LUC 220, 495, 710 and 820 models is expected to generate a total of 18,068 vehicle trips over the course of an average weekday that will include 9,034 entering and 9,034 exiting trips over the 24 hour period. The weekday morning peak hour is expected to generate 553 total trips with 301 inbound and 252 outbound trips. The weekday evening peak hour is expected to generate 1,643 total trips with 804 inbound and 839 outbound trips. On an average Saturday the site is expected to generate a total of 22,102 trips total, with 11,051 trips each for both inbound and outbound traffic. The amount of trips generated during the Saturday midday peak hour is projected to be 1,108 inbound and 1,016 outbound.

The current proposal for the site use is similar but somewhat different from that of the 2007 plans for 129 Parker Street[5]. The major differences between the new plan and the previous proposal include: only one of the current site buildings is to be retained; there is more retail space; there are a greater number of residential units planned in the current proposal[3]; and there is less office/R & D/manufacturing space. Hence, projected traffic volumes differ from that of the 2007 proposal with the current proposal estimated to generate a greater number of trips over the course of the day as well as during the evening peak hour and on Saturday while on weekday morning peak hour will be substantially lower than the 2007 plan. Table 5 compares the trip generating characteristics of each. While the retail oriented project would generate more traffic in total, much of the site traffic would be spread over an 8 to 10 hour period. In addition to the two redevelopment proposals, an estimate of the 550,000 square foot former DEC complex that operated on the site is included in the table.

TABLE 5
SUMMARY OF DIFFERENCES IN ESTIMATED
SITE TRIP GENERATION BETWEEN 2007 AND CURRENT PROPOSALS
(vehicle trips)

	Current Proposal	2007 Proposal	Former DEC Complex
	Total[1]	Total	Total[2]
Weekday	18,068	13,904	6,140
AM Peak Hour	553	749	907
PM Peak Hour	1,643	1,366	772
Saturday	22,102	17,322	902
Saturday Peak Hour	2,124	1,258	77

Source: ITE Trip Generation, 9th Edition, 2012, LUC 220, 495, 710, 820
[1] – included new, passby, diverted and 'captured' trips
[2] – DEC trips estimated from ITE LUC 750.

However, due to the retail nature of the project, not all the vehicle trips generated by the development are expected to be new trips to the roadway network. In fact, it is expected that a sizable portion of site traffic will be made up of *passby trips*, *diverted trips* and what it known as '*internal capture'* trips. *Passby* traffic is that portion of traffic that is expected to be passing by the site whether or not the project was there and the motorist makes an intermediate stop at the site on the way to their primary destination. This type of trip could be considered an impulse trip or a planned trip along the way to the ultimate destination. For general retail uses, passby rates could be as high as 40-50% depending on the type of land use. Passby rates for banks have been shown to date to be as high as 50% with an average of 35%. However, a 25% limit that is generally accepted for retail uses under MassDOT guidelines unless exceptions are specifically supported. With the application of the passby factor, the net increase in traffic on the adjacent street system will be substantially reduced. Passby volume will not affect driveway volumes.

In addition, some trips designated as *diverted-link* type will also be generated when drivers already traversing the general area around the project site divert from their certain route to enter the site, in a manner similar to that of passby traffic. Diverted-link volume will not affect driveway volumes, but will affect volumes on the adjacent roadway network within the study area. While the magnitude of diverted

[5] Capital Group Properties, The Shoppes at Maynard Crossing Presentation, October 2012

traffic would vary depending on the type of development, its size, tenant characteristics and location, the MassDOT guidelines limit a combination of passby and diverted trips to 25%.

For this study, a factor of twenty-five percent (25%) was used in total for passby and diverted-link trips with fifteen percent (15%) applied for passby trips while ten percent (10%) was applied to diverted trips.

In addition to passby and diverted-link trips, there is also the phenomenon of *internal trip capture*. It is expected that some of the trips generated by each individual businesses, office, and residence in The Shoppes at Maynard Crossing will interact directly with other uses from within the project site, and hence not produce any additional trips on the adjacent side streets. Data reviewed from the ITE database indicates that such internal capture residential-to-retail and retail-to-office (and vice versa for each) trips can represent up to 20-30% of individual trip types made to access locales within a proposed, mixed-use development. A methodology published by ITE has been used in this analysis to estimate internal trip capture. The ultimate result takes into account the type and magnitude of the project components. The calculation details are provided in the Appendix.

The calculation indicated that 6.5-10% of all trips would be internal capture type traffic depending on the time period. Table 6 summarizes the estimated site-generated traffic categorized as 'new' trips or as part of passby, diverted-link or internal traffic.

TABLE 6
SUMMARY OF ESTIMATED
SITE TRAFFIC

	New Traffic			Passby/ Diverted-Link Traffic			Internal Capture Traffic			Total Traffic		
	in	out	total	in	out	total	in	out	total	in	out	total
Weekday												
24 Hours	6,502	6,502	13,004	1,823	1,823	3,646	709	709	1,418	9,034	9,034	18,068
AM Peak Hour	229	201	430	49	29	78	23	22	45	301	252	553
PM Peak Hour	589	618	1,207	164	169	333	51	52	103	804	839	1,643
Saturday												
24 Hours	7,999	7,999	15,998	2,461	2,461	4,922	591	591	1,182	11,051	11,051	22,102
Peak Hour	818	753	1,571	255	228	483	35	35	70	1,108	1,016	2,124

In total and taking into account all project components, approximately 20-23% of total daily trips to and from the site are expected to be pass-by or diverted-link trips. Depending on peak hour and the fact that different land uses generate different relative volumes throughout the week, during peak hours passby and diverted-link trips can be expected to comprise of 16-23% of all site-generated traffic. It is anticipated that, depending on the time period, approximately 5-7% of all new trips generated by the site will be of internal capture type, and hence reduce additional volume onto the adjacent street system.

In summary, the project is a mixed-use development with a substantial amount of residential units lending to the potential of significant internal trip capture with lower corresponding impacts on the abutting roadway system. Being in close proximity to the schools and ballfields also lends itself to walking/bicycling and fewer vehicle trips whether related to school or recreational trips. While the retail component is substantive, it is likely to function more as a community type center attracting trips from

Maynard and to a lesser extent, the immediate border areas of surrounding communities. Taking into account the above as well as the site's location relative to regional highways and other competing retail centers within the region, the forecasts that have been developed as part of this study and that form the basis of subsequent analysis are considered to be conservatively high or "worst case" forecasts.

2. Site Trip Distribution/Assignment

Once the number of trips projected to be generated by the development has been determined, trips are assigned to the site driveways and study area roadways based on trip distribution patterns determined for the project. For this project, an analysis of directional distribution of generated trips to and from the site was completed for each major land use. In the analysis additional traffic volumes are anticipated to follow existing traffic patterns which, in turn, are a function of regional population densities, shopping opportunities, areas of employment, and recreational activities.

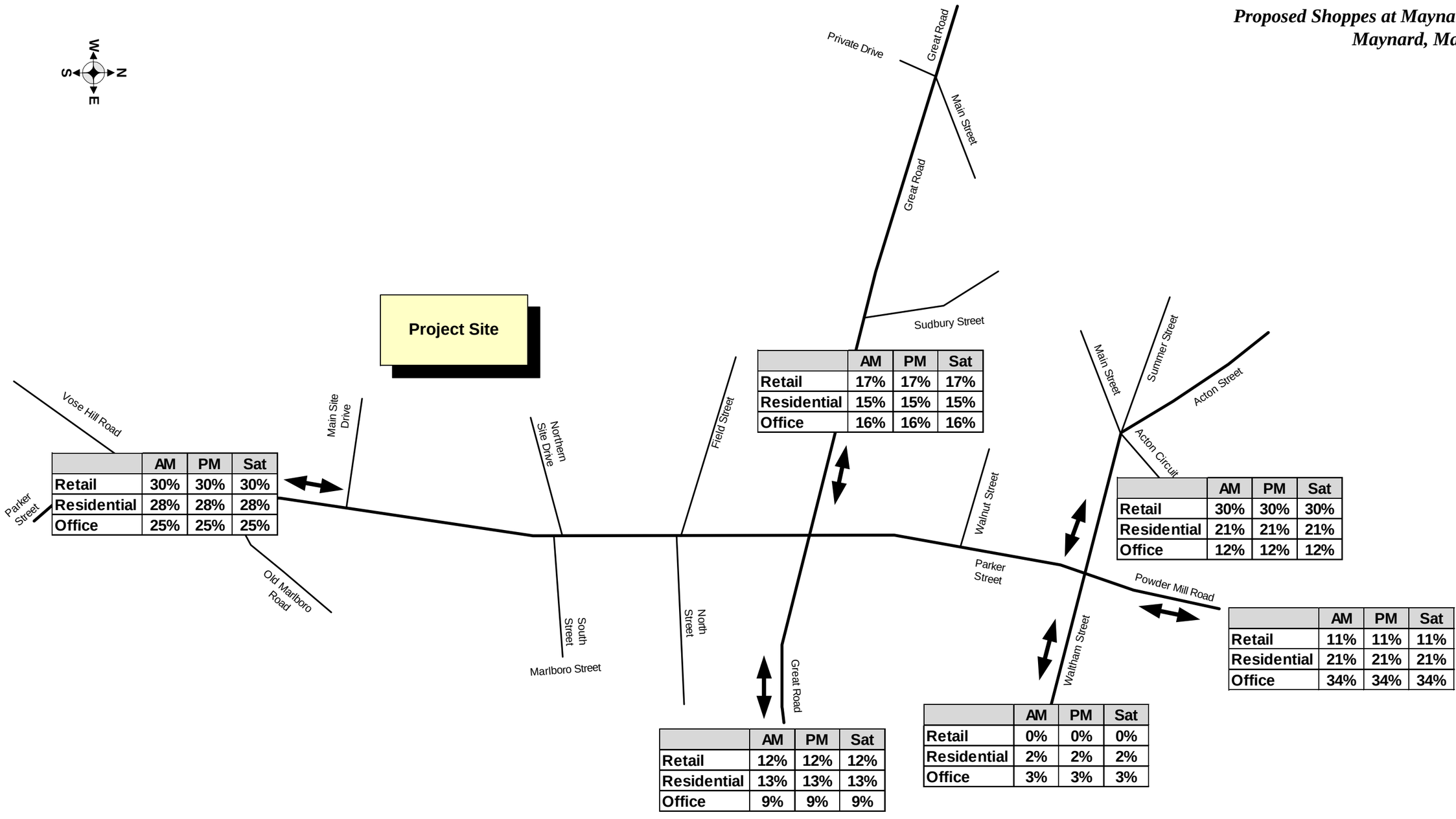
For this specific analysis, distribution patterns were completed separately for each major land use. Trip distribution patters for residential related trips for the weekday peak hours were based largely on U.S. Census work trip data for Maynard residents. Office related distribution patterns were also based on the U.S. Census work trip data - places of residences for those working in Maynard. The retail oriented trip distribution pattern took into account the region's population and travel times culminating in a modified gravity type model for new retail trips.

The trip patterns for passby, diverted and residential Saturday trips were estimated based on the existing observed traffic patterns in the area.

As a result of this analysis, the estimated percentages by direction and for each analysis period were developed. The estimated patterns for new trips by key land use are graphically presented in Figure 11.

3. Build Traffic Volumes

Trips estimated for the proposed development were assigned to the site driveway and study area roadway using the trip distribution percentages shown in the appendix. Peak hour site traffic volumes were then added to the No-Build traffic volumes to establish the 2018 Build condition traffic networks. Figures 12, 13, and 14 present the Build traffic volumes for the weekday morning and evening peak hours and the Saturday peak hour, respectively.



	AM	PM	Sat
Retail	30%	30%	30%
Residential	28%	28%	28%
Office	25%	25%	25%

	AM	PM	Sat
Retail	17%	17%	17%
Residential	15%	15%	15%
Office	16%	16%	16%

	AM	PM	Sat
Retail	30%	30%	30%
Residential	21%	21%	21%
Office	12%	12%	12%

	AM	PM	Sat
Retail	11%	11%	11%
Residential	21%	21%	21%
Office	34%	34%	34%

	AM	PM	Sat
Retail	12%	12%	12%
Residential	13%	13%	13%
Office	9%	9%	9%

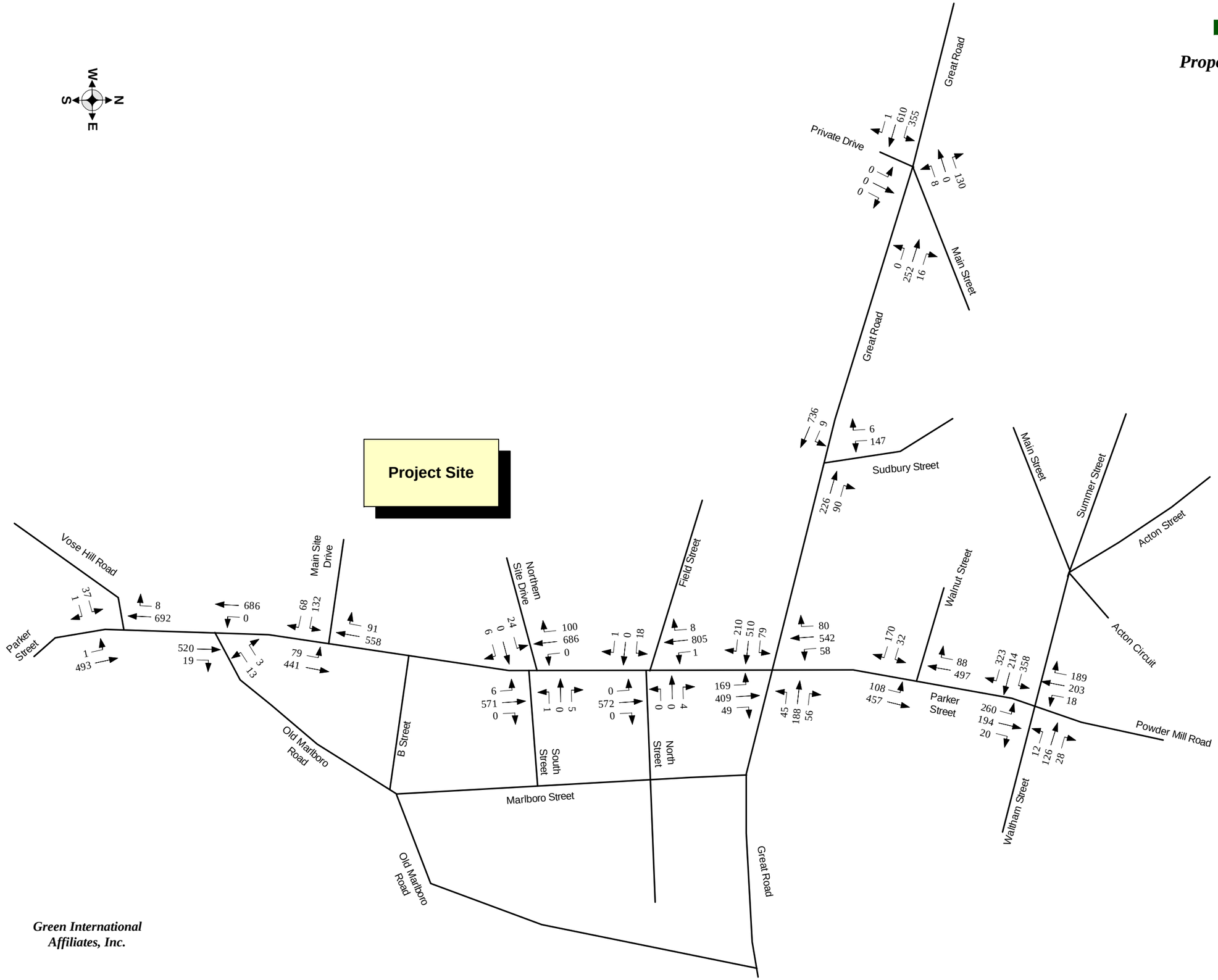
	AM	PM	Sat
Retail	0%	0%	0%
Residential	2%	2%	2%
Office	3%	3%	3%

Not to Scale

Green International Affiliates, Inc.

Estimated Trip Distribution Patterns
Study Network
Figure 11

Proposed Shoppes at Maynard Crossing
Maynard, Massachusetts



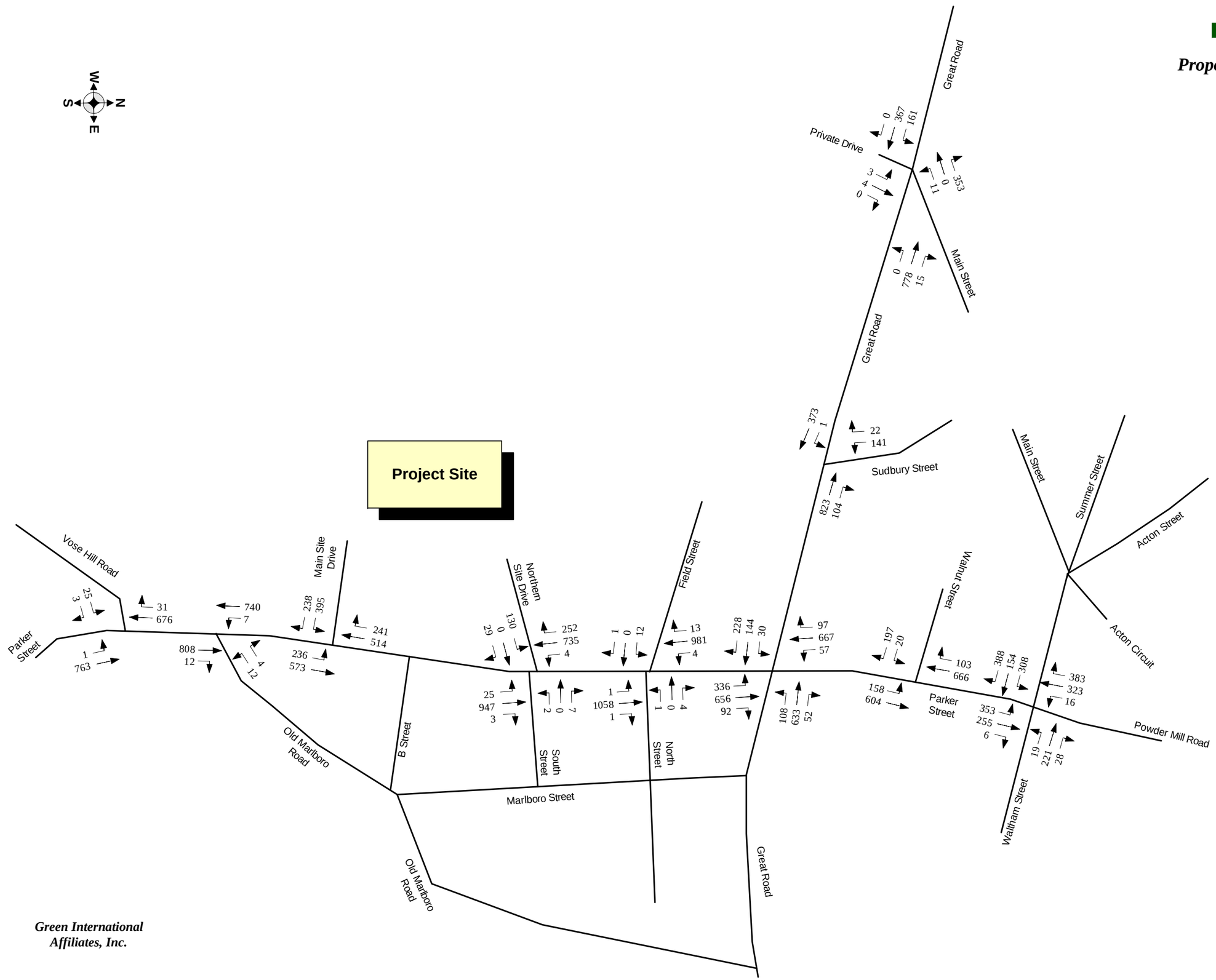
AM Peak Hour

Not to Scale

Green International Affiliates, Inc.

2018 Build Traffic
Volume Network

Figure 12

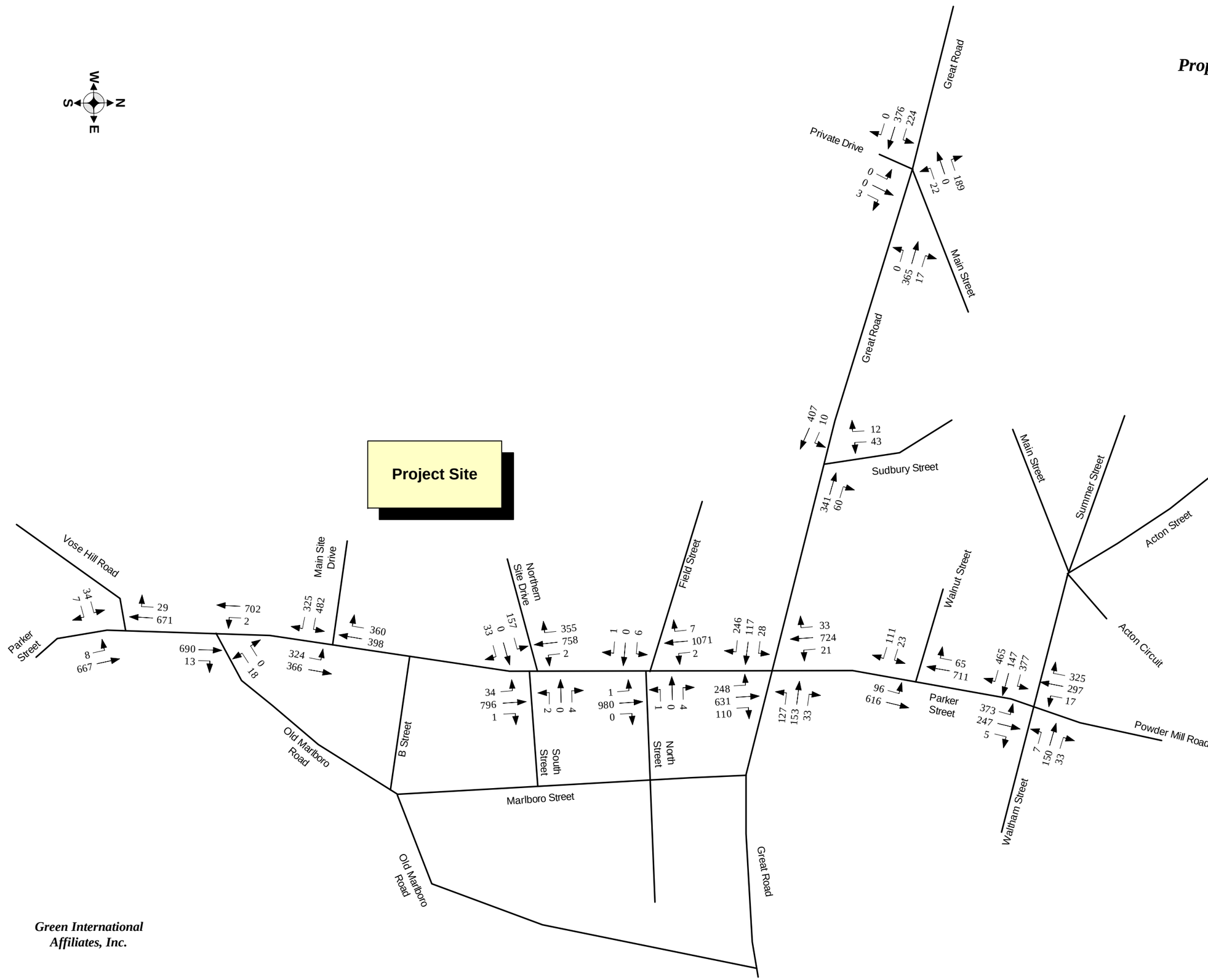


Not to Scale

PM Peak Hour

2018 Build Traffic
Volume Network
Figure 13

Green International Affiliates, Inc.



Saturday Peak Hour

Not to Scale

2018 Build Traffic
Volume Network

Figure 14

Green International Affiliates, Inc.

D. ANALYSIS

Previous sections of this report described the current conditions of nearby intersections and the development of the 2018 No-Build and 2018 Build traffic volume networks including the site generated trip forecasts. Included in this section is an examination of the volume changes, capacity/Level of Service (LOS) analysis for the study intersection under each condition and sight distances relative to the site access drive were reviewed. Signal warrants were also reviewed with respect to the primary site drive.

1. Traffic Volume Increases

Initially, a comparison of No-Build and Build volumes on the surrounding roadway system was completed. Table 7 summarizes the increases in traffic volumes south of the site drive and in the vicinity of the closest major intersection to the site drive, Parker Street at Great Road.

TABLE 7
SUMMARY OF ESTIMATED ROADWAY TRAFFIC INCREASES
No-Build[1] vs. Build

Location	Weekday AM Peak Hour			Weekday PM Peak Hour			Saturday Peak Hour		
	No-Build	Build	Δ in Volume	No-Build	Build	Δ in Volume	No-Build	Build	Δ in Volume
Parker Street									
North of Great Road	1,048	1,232	184	1,120	1,625	505	894	1,534	640
North of Project	1,057	1,378	321	1,126	2,043	917	853	1,624	771
South of Project	1,100	1,238	138	1,149	1,572	423	862	1,423	561
Great Road									
East of Parker Street	859	906	47	1,003	1,086	83	405	561	156
West of Parker Street	1,135	1,199	64	1,230	1,441	211	616	851	235

[1] – No-Build condition shown in this table presumes no activity on the project site.

The most substantive increase in traffic volumes are expected during the PM peak and Saturday peak hours rather than the AM peak hour due to the fact that a large part of the project is proposed to be retail-oriented. The key findings include the following:

- The largest estimated increases due to the project will occur on Parker Street due to the project access location and especially between the site drive and Great Road.

- Great Road volumes will increase by approximately 100 to 230 vehicle trips during weekday evenings and Saturday peak hours with approximately 60 or fewer vehicles during the AM peak hour.

- Overall, the change in volume away from the site is expected to be small during the morning, while the larger increases will occur during the afternoon and Saturday peak hour periods due primarily to the retail component.

2. Capacity/Level of Service (LOS) Analysis

The study intersections were examined with regard to flow rates, capacity and delay characteristics to determine the Level of Service (LOS) as described on the Highway Capacity Manual (HCM) for the existing and future (No-Build and Build with and without signal) traffic conditions. Level of Service is an indicator of operating conditions which occur on a given roadway feature while accommodating varying levels of traffic volumes. It is a qualitative measure that accounts for a number of operational factors including roadway geometry, speed, traffic composition, peak hour factors, travel delay, freedom to maneuver and driver expectation. When all of these measures are assessed and a Level of Service is assigned to a roadway or intersection, it is equivalent to presenting an "index" to the operational qualities of the section under study. Level of Service is classified into six levels that are designated 'A' through 'F' based on the control delay ranges they fall under. These are presented in Table 8 for both signalized and unsignalized intersections.

In practice, any given roadway/intersection may operate at a wide LOS range depending upon time of day, day of week or period of year. It should be noted that for unsignalized intersections, the Level of Service is not computed for the intersection as a whole. Instead, the level of service is determined by the computed or measured control delay for each individual critical movement.

TABLE 8
LEVEL OF SERVICE CRITERIA FOR
UNSIGNALIZED AND SIGNALIZED INTERSECTIONS

Level of Service	Unsignalized Intersections Control Delay Range (sec)	Signalized Intersections Control Delay Range (sec)
A	<= 10	<= 10
B	> 10 and <= 15	> 10 and <= 20
C	> 15 and <= 25	> 20 and <= 35
D	> 25 and <= 35	> 35 and <= 55
E	> 35 and <= 50	> 55 and <= 80
F	> 50	> 80

The study intersections were evaluated using the SYNCHRO computer models that follow the procedures established in the HCM was used to complete the analysis. Using existing roadway features and the intersection controls, traffic operations at the study intersections were evaluated for existing as well as future conditions. Analysis results are presented in Tables 9-14 for the study intersections. Build conditions reflect mitigated characteristics. Also shown in the Tables are the results published for the 2006 129 Parker Street proposed plan and an estimate for conditions presuming the DEC operation was in place for the 550,000 square foot office park. The Level of Service analysis indicated that:

<u>AM Peak Hour</u>

- In general, the morning peak period is expected to experience generally small impacts due to the project. The key signalized intersections will tend to operate reasonably well at levels similar to conditions without the project. There are a few exceptions in terms of particular movements that are estimated to incur some added delays.

- Several unsignalized locations experience delays under current conditions and this will

tend to worsen to a degree in the future as traffic volumes increase regardless of this proposed project or some other redevelopment plan. These high delay conditions depend on the specific movement and direction of flow.

- Most of the unsignalized locations in the general vicinity of the project are estimated to operate in the future at LOS 'D' to LOS 'F' under the Build condition depending on location and direction. The noted operating condition is largely due to the left turn exiting maneuvers from the STOP controlled approaches and in most of the locations, this amounts to less than 20 vehicle movements during the entire peak hour.

- The primary site drive with a traffic signal is expected to operate at a LOS 'B' during the morning peak hour with short delays, particularly for motorists along Parker Street.

- The secondary unsignalized site drive was initially tested as a full access drive and the results indicated that the left turns entering or exiting would experience substantial delay. A recommendation for this drive was made to limit it to a right turn in only driveway.

PM Peak Hour

- With the exception of certain specific movements, the three (3) major signalized intersections in relation to this proposed development currently operate at reasonable or manageable levels of service during the PM peak hour,

- Levels of service at the two intersections: Parker Street at Great Road and Parker Street at Powder Mill Road will be reduced in the future with the full Build project compared to the No-Build and without any further mitigation. (Note: this is likely condition when the subject 129 Parker Street site is redeveloped with proposed project or any other commercial alternative),

- Motorists exiting the STOP controlled approaches at unsignalized intersections will experience long delays in the future during the peak hours, particularly related to the left turn exiting traffic. (Note: this is likely condition in the future when the subject 129 Parker Street site is redeveloped with proposed project or any other commercial alternative). However, during the PM peak hour, the exiting volume on most of these streets is low and left turn exiting volume at approximately 5 or fewer vehicles.

- The signalized primary site drive with the turn lanes as planned is expected to operate at LOS 'D' during the PM peak hour.

- The secondary unsignalized site drive was initially tested as a full access drive and the results indicated that the left turns entering or exiting would experience substantial delay. A recommendation for this drive was made to limit it to a right turn in only driveway.

Saturday Midday Peak Hour

- For the most part, the major signalized intersections are expected to operate reasonably well on Saturday as general traffic volumes on the project area roadways tend to be

lower than during the week and vehicle trips for all trip purposes tend to be more spread out over the course of the day. The Parker Street intersection with Powder Mill Road is expected to operate at LOS 'E' during the Saturday peak hour, primarily due to the left turn movement from Parker Street.

- Motorists exiting the unsignalized intersections near the project site are expected to experience long delays, particularly related to left turns. However, the average vehicle delays are substantially lower than during the weekday PM peak hour. For the locations expected to experience some of the longest delays, the left turn volume is projected at less than five vehicles.

- The signalized primary site drive is expected to operate at LOS 'D' during Saturday peak hour with Parker Street 'through' volumes experiencing short delays.

- The secondary unsignalized site drive was initially tested as a full access drive and the results indicated that the left turns entering or exiting would experience substantial delay. A recommendation for this drive was made to limit it to a right turn in only driveway.

In summary, the analysis of the proposed Shoppes development based on what is believed to be a 'worst case peak hour forecast condition has shown the following:

- The site access/egress will be adequately facilitated with the primary site drive being signalized with turn lanes on Parker Street. The secondary drive would create operational issues if is remains a full access drive.

- The intersection of Parker Street with Great Road is the key intersection relative to the project and during the weekday peak hours, it currently experiences certain traffic flow issues. These will become more pronounced in the future with the proposed development of 129 Parker Street requiring improvements.

- With the project, the section of Parker Street between the site and Great Road will become more heavily traveled and this will increase the vehicle delays incurred by motorists exiting the minor side streets in this area. While not ideal, the combination of the traffic signal at the site along with the lower travel speeds that will result in the peak hours due to the volumes and signal operation, gaps in the traffic stream will be created that will help alleviate the delays and help those motorists exit onto Parker Street. It is noted again that in many of these locations, the exiting volume in total and left turn exit volume in particular is significantly low.

- The analysis completed for the new site proposal indicated results generally similar in overall levels of service and delays when compared to either the 2006 proposal that had been previously approved by the Town as well as when DEC was in full operation.

TABLE 9
SUMMARY OF LEVEL OF SERVICE SIGNALIZED INTERSECTIONS
AM PEAK HOUR

	Existing Conditions			Future No-Build			Future Build Conditions Under Current Proposal			Future Build Conditions Under 2006 Proposal			Future Conditions With DEC In Operation+		
	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS
Parker Street at Site Drive (Signalized)															
Northbound Left	-	-	-	-	-	-	0.25	5.8	A	0.63	31.1	C	-	-	-
Northbound Thru	-	-	-	-	-	-	0.39	4.4	A	0.32	3.7	A	0.26	6.3	A
Southbound Thru	-	-	-	-	-	-	0.72	11.8	B	0.69	13.1	B	0.53	0.0	A
Southbound Right	-	-	-	-	-	-	0.06	8.3	A	0.21	8.1	A	-	-	-
Eastbound Left	-	-	-	-	-	-	0.59	20.3	C	0.58	25.8	C	2.08	> 200	F
Eastbound Right	-	-	-	-	-	-	0.05	18.6	B	0.03	21.1	C	0.06	14.5	B
Overall	**-**	**-**	**-**	**-**	**-**	**-**	**0.67**	**11.8**	**B**	**0.66**	**12.9**	**B**			
Great Road at Main Street															
Northbound Left/Thru/Right	n/a*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.01	21.6	C	n/a	n/a	n/a
Southbound Left/Thru	0.18	23.8	C	0.37	24.2	C	0.36	23.8	C	0.04	21.8	C	0.36	23.8	C
Southbound Right	0.08	6.4	A	0.08	6.6	A	0.08	6.9	A	0.07	6.8	A	0.08	6.9	A
Eastbound Left	0.52	9.2	A	0.58	10.1	B	0.60	10.8	B	0.75	19.6	B	0.60	10.8	B
Eastbound Thru/Right	0.46	1.7	A	0.49	1.7	A	0.53	1.9	A	0.49	3.4	A	0.53	1.9	A
Westbound Left/Thru	0.42	12.1	B	0.44	12.1	B	0.49	11.9	B	0.67	21.5	C	0.49	11.9	B
Westbound Right	0.02	10.4	B	0.02	10.2	B	0.03	9.8	A	0.05	15.3	B	0.03	9.8	A
Overall	**0.47**	**6.2**	**A**	**0.51**	**6.6**	**A**	**0.54**	**6.8**	**A**	**0.57**	**12.7**	**B**	**0.54**	**6.8**	**A**
Parker Street at Waltham Street at Powder Mill Road															
Northbound Left	0.74	31.2	C	0.83	39.0	D	0.84	33.6	C	**	**	**	0.84	33.6	C
Northbound Thru/Right	0.31	20.7	C	0.34	20.4	C	0.28	16.4	B	1.19	131.5	F	0.28	16.4	B
Southbound Left/Thru	0.63	35.7	D	0.71	38.0	D	0.79	41.4	D	0.64	37.0	D	0.79	41.4	D
Southbound Right	0.13	28.7	C	0.22	28.6	C	0.26	26.6	C	0.21	27.5	C	0.26	26.6	C
Eastbound Left/Thru	0.82	22.2	C	1.05	67.9	E	1.03	62.6	E	1.07	67.4	E	1.03	62.6	E
Eastbound Right	0.28	10.0	A	0.31	11.3	B	0.41	13.5	B	0.51	17.6	B	0.41	13.5	B
Westbound Left/Thru/Right	0.17	9.2	A	0.99	64.0	E	0.20	11.8	B	0.39	32.5	C	0.20	11.8	B
Overall	**0.77**	**0.21**	**C**	**0.94**	**44.8**	**D**	**0.92**	**35.4**	**D**	**1.10**	**58.6**	**E**	**0.92**	**35.4**	**D**
Parker Street at Great Road															
Northbound Left	0.48	14.5	B	0.48	14.1	B	0.85	41.3	D	0.58	27.6	C	2.54	> 200	F
Northbound Thru	0.44	13.3	B	0.42	12.8	B	0.53	14.8	B	0.65	29.2	C	0.39	12.9	B
Northbound Right	0.02	0.0	A	0.02	0.0	A	0.05	0.1	A	0.06	21.2	C	0.03	0.0	A
Southbound Left	0.28	12.3	B	0.20	11.2	B	0.25	19.3	B	0.11	16.1	B	0.19	11.3	B
Southbound Thru	0.49	13.8	B	0.48	13.4	B	0.83	32.7	C	0.88	35.9	D	0.90	30.1	C
Southbound Right	0.04	0.0	A	0.08	0.1	A	0.08	0.1	A	0.13	15.8	B	0.06	0.1	A
Eastbound Left	0.32	14.5	B	0.39	18.0	B	0.40	20.2	C	0.45	31.5	C	0.42	25.3	C
Eastbound Thru	0.73	21.0	C	0.80	27.9	C	0.84	33.3	C	1.19	142.2	F	0.85	39.5	D
Eastbound Right	0.27	14.0	B	0.31	17.0	B	0.16	0.2	A	0.59	33.6	C	0.61	28.8	C
Westbound Left	0.13	13.3	B	0.20	16.8	B	0.63	32.6	C	1.23	> 200	F	1.51	> 200	F
Westbound Thru	0.28	14.0	B	0.32	17.1	B	0.33	19.2	B	0.46	30.9	C	0.37	24.3	C
Westbound Right	0.03	0	A	0.04	0.0	A	0.04	0.0	A	0.06	27.1	C	0.05	0.1	A
Overall	**0.60**	**14.6**	**B**	**0.62**	**16.3**	**B**	**0.83**	**22.6**	**C**	**0.96**	**58.4**	**E**	**2.13**	**74.4**	**E**

* n/a indicates that generally no vehicles exit from this approach during this time period
** Northbound left, through, and right movements are considered for a single-lane approach in the 2006 proposal's analysis

+ analysis assumes that no signals or additional lanes will be installed at major site drive location, as in existing case

TABLE 10
SUMMARY OF LEVEL OF SERVICE UNSIGNALIZED INTERSECTIONS
AM PEAK HOUR

	Existing Conditions			Future No-Build			Future Build Conditions Under Current Proposal			Future Build Conditions Under 2006 Proposal			Future Conditions With DEC In Operation		
	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS
Parker Street at Walnut Street															
Northbound Left/Thru	0.11	3.0	A	0.12	3.3	A	0.13	3.4	A	0.20	5.0	A	0.13	3.4	A
Eastbound Left/Right	0.39	16.2	C	0.46	18.5	C	0.71	36.9	E	0.77	43.7	E	0.71	36.9	E
Great Road at Sudbury Street															
Southbound Left/Right	0.78	59.5	F	0.91	86.5	F	1.30	>200	F	0.81	81.9	F	1.30	> 200	F
Eastbound Left/Thru	0.00	0.1	A	0.00	0.1	A	0.03	0.9	A	0.01	0.1	A	0.03	0.9	A
Parker Street at North Street at Field Street															
Northbound Left/Thru/Right	0.00	0.0	A	0.00	0.0	A	0.00	0.0	A	0.00	0.0	A	0.01	0.6	A
Southbound Left/Thru/Right	0.00	0.1	A	0.00	0.1	A	0.03	0.9	A	0.01	0.2	A	0.00	0.2	A
Eastbound Left/Thru/Right	0.14	25.2	D	0.16	29.2	D	0.39	80.1	F	1.71	> 200	F	3.45	> 200	F
Westbound Left/Thru/Right	0.02	10.8	B	0.02	11.0	B	0.02	12.4	B	0.10	39.8	E	0.40	187.7	F
Parker Street at South Street at Secondary Site Drive (right turn in only)															
Northbound Thru/Right	0.00	0.0	A	0.00	0.0	A	0.00	0.0	A	0.00	0.1	A	1.73	> 200	F
Southbound Left/Thru/Right	0.00	0.0	A	0.00	0.0	A	0.00	0.0	A	0.00	0.0	A	0.00	0.0	A
Westbound Left/Right	0.04	13.8	B	0.04	14.6	B	0.06	19.8	C	0.07	25.1	D	##	> 200	F
Parker Street at Old Marlboro Road															
Southbound Left/Thru	0.00	0.0	A	0.00	0.0	A	0.00	0.0	A	0.00	0.0	A	0.00	0.0	A
Westbound Left/Right	0.08	18.2	C	0.10	20.0	C	0.15	29.4	D	0.21	57.3	F	0.16	26.3	D
Parker Street at Vose Hill Road															
Northbound Left/Thru	0.00	0.1	A	0.00	0.1	A	0.01	0.1	A	X	X	X	0.00	0.1	A
Eastbound Left/Right	0.19	22.1	C	0.21	24.6	C	0.38	42.5	E	X	X	X	0.32	40.6	E

Note: 'X' indicates that this intersection was not analyzed under the analysis of the 2006 proposal
'##' indicates that v/c could not be calculated; Eastbound movements are assumed to be made as in existing, resulting in similar levels of service as the westbound approach

TABLE 11
SUMMARY OF LEVEL OF SERVICE SIGNALIZED INTERSECTIONS
PM PEAK HOUR

	Existing Conditions			Future No-Build			Future Build Conditions Under Current Proposal			Future Build Conditions Under 2006 Proposal			Future Conditions With DEC In Operation+		
	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS
Parker Street at Site Drive (Signalized)															
Northbound Left	-	-	-	-	-	-	0.80	28.3	C	0.73	44.7	D	-	-	-
Northbound Thru	-	-	-	-	-	-	0.60	14.3	B	0.49	12.7	B	0.03	0.7	A
Southbound Thru	-	-	-	-	-	-	0.83	34.5	C	0.84	34.9	C	0.33	0.0	A
Southbound Right	-	-	-	-	-	-	0.16	19.8	B	0.21	19.6	B	-	-	-
Eastbound Left	-	-	-	-	-	-	0.93	48.3	D	0.97	52.1	D	2.05	> 200	F
Eastbound Right	-	-	-	-	-	-	0.18	19.5	B	0.13	17.6	B	0.30	14.5	B
Overall	**-**	**-**	**-**	**-**	**-**	**-**	**0.83**	**28.9**	**C**	**0.88**	**32.1**	**C**			
Great Road at Main Street															
Northbound Left/Thru/Right	0.33	23.8	C	0.34	25.0	C	0.31	24.2	C	0.04	24.6	C	0.34	25.1	C
Southbound Left/Thru	0.33	23.8	C	0.38	25.9	C	0.49	28.1	C	0.06	24.7	C	0.38	26.0	C
Southbound Right	0.55	12.3	B	0.59	12.6	B	0.59	12.7	B	0.64	17.0	B	0.59	12.7	B
Eastbound Left	0.31	11.4	B	0.32	11.1	B	0.32	11.3	B	0.36	18.0	B	0.32	11.2	B
Eastbound Thru/Right	0.20	1.1	A	0.22	1.1	A	0.29	1.3	A	0.23	2.3	A	0.23	1.1	A
Westbound Left/Thru	0.81	17.1	B	0.91	26.2	C	1.01	46.7	D	0.88	27.1	C	1.00	44.9	D
Westbound Right	0.02	7.6	A	0.02	8.3	A	0.02	8.3	A	0.02	11.0	B	0.02	8.3	A
Overall	**0.68**	**12.6**	**C**	**0.74**	**16.6**	**B**	**0.79**	**25.2**	**C**	**0.75**	**18.6**	**B**	**0.78**	**25.4**	**C**
Parker Street at Waltham Street at Powder Mill Road															
Northbound Left	0.53	20.4	C	0.57	21.1	C	1.33	185.1	F	**	**	**	1.65	> 200	F
Northbound Thru/Right	0.23	17.9	B	0.30	18.0	B	0.41	15.5	B	1.43	> 200	F	0.45	21.0	C
Southbound Left/Thru	0.67	34.9	C	0.73	37.2	D	0.92	52.9	D	0.68	37.8	D	0.76	39.4	D
Southbound Right	0.37	29.1	C	0.50	30.1	C	0.55	25.5	C	0.34	2.1	A	0.53	31.3	C
Eastbound Left/Thru	0.90	35.4	D	1.04	69.9	E	1.08	81.2	F	1.04	68.4	E	0.84	28.5	C
Eastbound Right	0.22	11.6	B	0.24	12.6	B	0.42	12.6	B	0.31	12.1	B	0.40	13.3	B
Westbound Left/Thru/Right	0.29	12.1	B	0.32	13.2	B	0.34	11.9	B	0.48	30.2	C	0.31	12.4	B
Overall	**0.79**	**25.5**	**C**	**0.89**	**35.5**	**D**	**1.15**	**60.2**	**E**	**1.20**	**85.9**	**F**	**1.15**	**79.7**	**E**
Parker Street at Great Road															
Northbound Left	0.59	17.1	B	0.68	20.8	C	1.11	111.2	F	0.78	31.6	C	1.13	109.4	F
Northbound Thru	0.37	12.8	B	0.42	13.2	B	0.69	16.5	B	0.78	22.8	C	0.78	21.6	C
Northbound Right	0.02	0.0	A	0.02	0.0	A	0.10	0.1	A	0.11	12.0	B	0.08	0.1	A
Southbound Left	0.16	11.1	B	0.20	11.5	B	0.33	25.1	C	0.30	23.5	C	0.54	18.1	B
Southbound Thru	0.38	12.8	B	0.41	13.1	B	1.10	97.1	F	0.82	32.9	C	0.46	13.7	B
Southbound Right	0.09	0.1	A	0.10	0.1	A	0.10	0.1	A	0.11	17.9	B	0.10	0.1	A
Eastbound Left	0.56	35.9	D	0.68	50.0	D	0.65	47.5	D	0.65	47.5	D	0.65	45.6	D
Eastbound Thru	0.26	23.2	C	0.28	23.4	C	0.30	25.5	C	0.51	29.5	C	0.28	23.4	C
Eastbound Right	0.08	21.5	C	0.09	21.6	C	0.09	0.1	A	0.40	28.2	C	0.10	21.7	C
Westbound Left	0.10	21.8	C	0.10	21.8	C	0.38	26.7	C	0.59	33.5	C	0.13	22.1	C
Westbound Thru	1.01	70.0	E	1.16	122.1	F	1.16	121.3	F	0.98	67.9	E	1.16	122.1	F
Westbound Right	0.04	0.0	A	0.08	0.1	A	0.04	0.0	A	0.14	25.7	C	0.08	0.1	A
Overall	**0.76**	**29.9**	**C**	**0.87**	**45.7**	**D**	**1.10**	**63.9**	**E**	**0.88**	**33.7**	**C**	**1.14**	**51.7**	**D**

* n/a indicates that generally no vehicles exit from this approach during this time period
** Northbound left, through, and right movements are considered for a single-lane approach in the 2006 proposal's analysis

+ analysis assumes that no signals or additional lanes will be installed at major site drive location, as in existing case

TABLE 12
SUMMARY OF LEVEL OF SERVICE UNSIGNALIZED INTERSECTIONS
PM PEAK HOUR

	Existing Conditions			Future No-Build			Future Build Conditions Under Current Proposal			Future Build Conditions Under 2006 Proposal			Future Conditions With DEC In Operation###		
	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS
Parker Street at Walnut Street															
Northbound Left/Thru	0.18	4.6	A	0.21	5.1	A	0.27	6.6	A	0.35	8.7	A	0.22	5.2	A
Eastbound Left/Right	0.43	17.7	C	0.58	25.9	D	1.19	167.7	F	1.68	> 200	F	0.86	60.3	F
Great Road at Sudbury Street															
Southbound Left/Right	0.82	60.5	F	1.11	140.0	F	1.66	> 200	F	2.80	> 200	F	1.34	> 200	F
Eastbound Left/Thru	0.00	0.2	A	0.03	1.0	A	0.59	0.0	A	0.00	0.1	A	0.03	1.1	A
Parker Street at North Street at Field Street															
Northbound Left/Thru/Right	0.00	0.1	A	0.00	0.1	A	0.01	0.3	A	0.01	0.3	A	0.00	0.2	A
Southbound Left/Thru/Right	0.01	0.3	A	0.01	0.3	A	0.02	0.9	A	0.02	0.6	A	0.02	0.6	A
Eastbound Left/Thru/Right	0.13	28.2	D	0.18	34.6	D	0.53	142.0	F	0.36	197.9	F	0.59	170.7	F
Westbound Left/Thru/Right	0.04	17.6	C	0.05	19.8	C	0.13	49.0	E	0.08	73.3	F	0.14	52.8	F
Parker Street at South Street at Secondary Site Drive															
Northbound Thru/Right	0.00	0.0	A	0.00	0.0	A	0.00	0.0	A	0.00	0.0	A	0.02	0.5	A
Southbound Left/Thru/Right	0.01	0.2	A	0.01	0.2	A	0.02	0.1	A	0.01	0.3	A	0.01	0.3	A
Westbound Left/Right	0.09	20.2	C	0.11	23.1	C	0.59	181.5	F	0.08	76.3	F	0.26	67.9	F
Parker Street at Old Marlboro Road															
Southbound Left/Thru	0.01	0.3	A	0.01	0.4	A	0.02	0.4	A	0.01	0.2	A	0.01	0.4	A
Westbound Left/Right	0.11	20.7	C	0.13	23.7	C	0.37	74.9	F	0.75	148.2	F	0.18	30.7	D
Parker Street at Vose Hill Road															
Northbound Left/Thru	0.00	0.1	A	0.00	0.1	A	0.01	0.1	A	X	X	X	0.00	0.1	A
Eastbound Left/Right	0.14	21.0	C	0.17	24.0	C	0.52	79.5	F	X	X	X	0.22	32.1	D

Note: 'X' indicates that this intersection was not analyzed under the analysis of the 2006 proposal
'###' Northern eastbound movements are assumed to be made at northern site drive as in existing, resulting in a v/c ratio of 13.13 and a delay of > 200 s (LOS F)

TABLE 13
SUMMARY OF LEVEL OF SERVICE SIGNALIZED INTERSECTIONS
SATURDAY PEAK HOUR

	Existing Conditions			Future No-Build			Future Build Conditions Under Current Proposal			Future Build Conditions Under 2006 Proposal			Future Conditions With DEC In Operation+		
	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS
Parker Street at Site Drive (Signalized)															
Northbound Left	-	-	-	-	-	-	0.96	52.8	D	0.82	47.2	D	-	-	-
Northbound Thru	-	-	-	-	-	-	0.40	13.5	B	0.44	10.0	B	0.01	0.4	A
Southbound Thru	-	-	-	-	-	-	0.87	45.7	D	0..64	20.9	C	0.31	0.0	A
Southbound Right	-	-	-	-	-	-	0.24	24.5	C	0.23	16.3	B	-	-	-
Eastbound Left	-	-	-	-	-	-	1.00	58.6	E	0.76	23.6	C	0.04	19.0	C
Eastbound Right	-	-	-	-	-	-	0.25	16.4	B	0.10	14.1	B	0.01	11.6	B
Overall	**-**	**-**	**-**	**-**	**-**	**-**	**0.95**	**38.2**	**D**	**0.72**	**20.4**	**C**			
Great Road at Main Street															
Northbound Left/Thru/Right	0.01	12.1	B	0.01	14.7	B	0.01	16.7	B	0.01	11.1	B	0.01	16.4	B
Southbound Left/Thru	0.36	16.3	B	0.48	22.5	C	0.34	19.0	B	0.03	11.1	B	0.48	24.2	C
Southbound Right	0.08	6.5	A	0.12	6.2	A	0.21	8.5	A	0.10	6.2	A	0.12	7.3	A
Eastbound Left	0.39	8.3	A	0.36	7.7	A	0.44	11.3	B	0.58	16.6	B	0.39	9.1	A
Eastbound Thru/Right	0.20	1.6	A	0.21	1.4	A	0.33	1.8	A	0.38	5.4	A	0.22	1.3	A
Westbound Left/Thru	0.43	8.3	A	0.52	10.8	B	0.54	10.8	B	0.70	18.1	B	0.45	10.0	B
Westbound Right	0.03	7.0	A	0.04	8.7	A	0.03	8.2	A	0.06	11.6	B	0.04	8.3	A
Overall	**0.41**	**6.4**	**A**	**0.43**	**6.9**	**A**	**0.48**	**7.9**	**A**	**0.40**	**11.5**	**B**	**0.42**	**7.3**	**A**
Parker Street at Waltham Street at Powder Mill Road															
Northbound Left	0.41	16.5	B	0.50	19.9	B	1.32	165.8	F	**	**	**	0.56	22.7	C
Northbound Thru/Right	0.22	15.3	B	0.29	18.3	B	0.41	0.4	A	1.09	92.7	F	0.31	20.0	C
Southbound Left/Thru	0.55	28.5	C	0.69	35.9	D	0.96	35.1	D	0.53	32.8	C	0.70	37.3	D
Southbound Right	0.23	25.3	C	0.25	28.0	C	0.53	25.2	C	0.21	26.8	C	0.41	30.2	C
Eastbound Left/Thru	0.81	24.5	C	0.97	49.2	D	1.07	77.7	E	1.07	83.0	F	0.92	36.0	D
Eastbound Right	0.20	11.6	B	0.23	12.2	B	0.55	14.6	B	0.29	15.6	B	0.26	11.2	B
Westbound Left/Thru/Right	0.21	11.6	B	0.23	12.2	B	0.25	11.8	B	0.49	30.3	C	0.22	10.8	B
Overall	**0.69**	**20.5**	**C**	**0.84**	**30.1**	**C**	**1.15**	**60.7**	**E**	**1.06**	**56.1**	**E**	**0.82**	**26.6**	**C**
Parker Street at Great Road															
Northbound Left	0.25	5.2	A	0.31	6.9	A	0.93	50.2	E	0.61	13.1	B	0.33	7.1	A
Northbound Thru	0.32	5.3	A	0.38	6.9	A	0.56	6.3	A	0.59	11.3	B	0.36	6.9	A
Northbound Right	0.02	0.0	A	0.02	0.0	A	0.11	0.1	A	0.10	7.6	A	0.06	0.1	A
Southbound Left	0.09	4.6	A	0.11	5.9	A	0.09	9.4	A	0.11	10.2	B	0.11	5.9	A
Southbound Thru	0.39	5.5	A	0.45	7.3	A	0.92	30.5	C	0.59	14.1	B	0.46	7.4	A
Southbound Right	0.04	0.0	A	0.04	0.0	A	0.02	0.0	A	0.06	9.7	A	0.04	0.0	A
Eastbound Left	0.17	9.8	A	0.15	9.7	A	0.25	22.0	C	0.26	24.4	C	0.16	10.9	B
Eastbound Thru	0.28	10.2	B	0.24	10.0	A	0.35	22.3	C	0.40	25.0	C	0.23	11.1	B
Eastbound Right	0.07	9.4	A	0.07	9.3	A	0.20	0.3	A	0.21	23.7	C	0.08	10.5	B
Westbound Left	0.11	9.6	A	0.09	9.4	A	0.74	34.8	C	0.64	31.9	C	0.11	10.6	B
Westbound Thru	0.43	10.9	B	0.38	10.6	B	0.55	24.3	C	0.56	27.2	C	0.39	11.9	B
Westbound Right	0.03	0.0	A	0.31	0.0	A	0.03	0.0	A	0.05	22.8	C	0.03	0.0	A
Overall	**0.40**	**6.5**	**A**	**0.42**	**7.3**	**A**	**0.85**	**19.9**	**B**	**0.59**	**17.0**	**B**	**0.43**	**7.5**	**A**

* n/a indicates that generally no vehicles exit from this approach during this time period
** Northbound left, through, and right movements are considered for a single-lane approach in the 2006 proposal's analysis

+ analysis assumes that no signals or additional lanes will be installed at major site drive location, as in existing case

TABLE 14
SUMMARY OF LEVEL OF SERVICE UNSIGNALIZED INTERSECTIONS
SATURDAY PEAK HOUR

	Existing Conditions			Future No-Build			Future Build Conditions Under Current Proposal			Future Build Conditions Under 2006 Proposal			Future Conditions With DEC In Operation###		
	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS
Parker Street at Walnut Street															
Northbound Left/Thru	0.10	3.2	B	0.12	3.3	A	0.17	4.1	A	0.12	3.0	A	0.12	3.3	A
Eastbound Left/Right	0.26	13.8	A	0.37	17.4	C	0.85	79.3	F	0.35	18.7	C	0.39	18.4	C
Great Road at Sudbury Street															
Southbound Left/Right	0.08	12.7	B	0.10	13.4	B	0.18	18.0	C	0.15	16.6	C	0.12	13.9	B
Eastbound Left/Thru	0.01	0.4	A	0.01	0.4	A	0.03	0.8	A	0.01	0.3	A	0.20	0.9	A
Parker Street at North Street at Field Street															
Northbound Left/Thru/Right	0.00	0.0	A	0.00	0.0	A	0.01	0.4	A	0.00	0.0	A	0.00	0.1	A
Southbound Left/Thru/Right	0.00	0.1	A	0.00	0.1	A	0.01	0.3	A	0.01	0.3	A	0.00	0.1	A
Eastbound Left/Thru/Right	0.05	17.0	C	0.06	18.8	C	0.86	> 200	F	0.32	83.9	F	0.07	20.9	C
Westbound Left/Thru/Right	0.03	13.3	B	0.03	14.2	B	0.30	131.5	F	0.00	16.6	C	0.03	15.1	C
Parker Street at South Street at Secondary Site Drive															
Northbound Thru/Right	0.00	0.1	A	0.00	0.1	A	0.00	0.0	A	0.00	0.0	A	0.03	0.03	A
Southbound Left/Thru/Right	0.00	0.1	A	0.00	0.1	A	0.01	0.0	A	0.01	0.3	A	0.11	0.11	A
Westbound Left/Right	0.04	14.7	B	0.05	16.0	C	1.06	> 200	F	0.01	17.0	C	161.90	> 200	F
Parker Street at Old Marlboro Road															
Southbound Left/Thru	0.00	0.1	A	0.00	0.1	A	0.00	0.1	A	0.01	0.2	A	0.00	0.1	A
Westbound Left/Right	0.08	16.1	C	0.09	17.7	C	0.28	51.5	F	0.09	24.0	C	0.10	18.4	C
Parker Street at Vose Hill Road															
Northbound Left/Thru	0.01	0.5	A	0.02	0.5	A	0.02	0.6	A	X	X	X	0.02	0.5	A
Eastbound Left/Right	0.10	15.9	C	0.12	17.6	C	0.50	65.1	F	X	X	X	0.12	18.4	C

Note: '#' indicates that v/c could not be calculated.
'X' indicates that this intersection was not analyzed under the analysis of the 2006 proposal
'###' Northern eastbound movements are assumed to be made at northern site drive as in existing, resulting in a v/c ratio of 13.13 and a delay of > 200 s (LOS F)

The detailed SYNCHRO LOS reports provide information on vehicle queuing for each intersection. The details and summaries of the estimated vehicle queuing for the signalized and unsignalized intersections are included in the Appendix.

- The results indicate that on average, the northbound left turn lane into the site will require a capacity of at least 200 feet and the current concept provides for approximately 260 feet.

- The results also showed that the queuing on Parker Street on the northbound approach to Great Road would be impacted during the weekday PM peak hour and Saturday midday peak hour.

- In relation to the unsignalized intersections, the key finding related to project impact surrounded the secondary site drive related to left turns entering and exiting the site. As indicated previously, recommendations as to this drive being limited to a right in only drive will resolve these issues.

3. Traffic Signal Warrants Analysis

As part of this evaluation, traffic signal warrants were examined for the proposed site drive signalization in accordance to the procedures and criteria described in the Manual of Uniform Traffic Control Devices[6] (MUTCD). Traffic signal warrants have been developed over the years to guide the analyst in determining whether or not a traffic signal should be installed at a particular location.

The warrants relate to volumes, safety and other factors as defined in the MUTCD. There are currently nine (9) warrants defined, but the most relevant warrant for this project would be Warrant 1 (the Eight-Hour warrant) that relates to volume criteria. It should be noted that care and engineering judgment needs to also be incorporated in any decision related to installing new signals and simply satisfying one or more of the warrant criteria does not mean that a traffic signal must or necessarily should be installed. The criteria for Signal Warrant No. 1 is summarized as follows:

- <u>Warrant 1, Eight Hour Vehicular Volume</u>

  In order to meet the warrant, vehicle volume in each of any eight (8) hours of an average day, on the major street in both directions and the high minor street approach should be the following:

A.	No. of Approach Lanes	Volume
	Major street (1)/minor street (1)	major street (500)/minor street (150)
	Major street (2 or more)/minor street (1)	major street (600)/minor street (150)
	Major street (2 or more)/minor street (2)	major street (600)/minor street (200)
	Major street (1)/minor street (2 or more)	major street (500)/minor street (200)

[6] Federal Highway Administration, <u>Manual on Uniform Traffic Control Devices</u>, Washington DC, 2009

B.	No. of Approach Lanes	Volume
	Major street (1)/minor street (1)	major street (750)/minor street (75)
	Major street (2 or more)/minor street (1)	major street (900)/minor street (75)
	Major street (2 or more)/minor street (2)	major street (900)/minor street (100)
	Major street (1)/minor street (2 or more)	major street (750)/minor street (100)

Condition A is used when a large volume of intersection traffic is the principal reason to consider a signal. Condition B is used when a large amount of traffic on the major street causes excessive delays or problems for the minor street to enter or the cross major street; Condition B is also used when Condition A is not met.

The analysis is based on the estimated hourly exit flow from the site and the Parker Street volumes. The estimated site volumes over the course of the day are based on the ITE trip generation data that indicates hourly variation of shopping center traffic. The analysis is summarized in Table 17, and the worksheets are included in the Appendix. Parker Street has one lane per direction away from the intersection that will also include turn lanes. While the site drive is to have two approach lanes (one for each turn), the warrants analysis shown in Table 15 focused on the left turn exit only to be conservative. The analysis indicates that the minimum volume criteria under Warrant No. 1 at the proposed site drive on Parker Street are satisfied. As can be seen in the Table, Condition A is satisfied for 10 hours on Parker Street. Condition B is also satisfied for 10 hours.

TABLE 15
SUMMARY OF TRAFFIC SIGNAL WARRANTS
Parker Street at Proposed Site Drive, Weekday

Warrant Hours	Major Road: (Total of both approaches)	Minor Road: (Left turn vol. on approach)	Condition A - Minimum Vehicular Volume		Condition B - Interruption of Continuous Traffic	
Hour Begin:	**Parker Street**	**Site Drive**	**>= 500 vehs.**	**>= 150 vehs.**	**>= 750 vehs.**	**>= 75 vehs.**
6:00 AM	688	9	Y	N	N	N
7:00 AM	1282	27	Y	N	Y	N
8:00 AM	1253	37	Y	N	Y	N
9:00 AM	1219	61	Y	N	Y	N
10:00 AM	1141	131	Y	N	Y	Y
11:00 AM	1295	189	Y	Y	Y	Y
12:00 Noon	1425	253	Y	Y	Y	Y
1:00 PM	1332	262	Y	Y	Y	Y
2:00 PM	1338	357	Y	Y	Y	Y
3:00 PM	1525	353	Y	Y	Y	Y
4:00 PM	1705	357	Y	Y	Y	Y
5:00 PM	1860	369	Y	Y	Y	Y
6:00 PM	1610	301	Y	Y	Y	Y
7:00 PM	1135	289	Y	Y	Y	Y
8:00 PM	732	309	Y	Y	N	Y
9:00 PM	454	289	N	Y	N	Y
Hours Warranted:			***10***		***10***	
Signal Warranted?			***YES***		***YES***	

Consequently, based on the signal warrants analysis and the level of service analysis, it can be concluded that a traffic signal at the major site drive meets the warrants and enables patrons of the abutting land uses to safely and relatively efficiently access and egress the driveway.

Conclusions and Recommendations

The previous sections of this traffic report described the analysis procedures, assumptions and results of this traffic study. The roadways and intersections within the study area were seen to have the ability to accommodate the proposed development related traffic. The following summarizes the traffic analysis:

- For the most part, traffic flows reasonable well in the study area during the peak hours notwithstanding certain movements or constraints such as the Parker Street intersection with Powder Mill Road and Waltham Street. This overall condition may be reflective of the down economy and certainly near the site where the 129 Parker Street site has been inactive for some time.

- The project as proposed is expected to generate a relatively high level of traffic, however, with its mixed use characteristics and retail component, a substantial amount of site related traffic will be made up by motorists currently on the abutting and nearby roadway system as well as "captured" within the site as residents interact with the retail/commercial and office land uses.

- While trip forecasts are based on the ITE models, a conservative estimate has been developed and analyzed using below average passby/diverted trip rates and given the project's location within the region and not being proximate to the major regional highways. That said, it is estimated that the "new" vehicle trips will total approximately 13,004 on a weekday with 430 during the AM peak hour and 1,207 during the PM peak hour.

- If one takes into account the former use with the DEC complex functioned at its peak, the net "new" amount of traffic entering and exiting the site will be significantly lower than evaluated in this report.

- The result of the project based on the traffic estimates contained herein will be a substantial increase in traffic between the site and Great Road. At that point, traffic begins to disperse in multiple directions reducing the impact.

- The most significant impact of the project will be at the Parker Street intersection with Great Road. Mitigation improvements will be required at this location.

Recommendations

The analyses has shown that the proposed project will increase traffic on the abutting and nearby roadways and traffic imrpovements will be required both at the site and off-site. The proposed actions are as follows:

Site Access/Internal Circulation Actions

- The primary site drive will need to be signalized that would include pedestrian control. The geometry is proposed to include a two lane exit approach, a northbound left turn lane and a southbound right turn entry lane.

- It is recommended that the secondary drive located on the north side of the project site be configured to be a right turn in only driveway. With this action, the primary site drive will continue to operate at acceptable levels of service during the peak hours.

- The project should strive to accommodate and encourage safe travel by other modes such as walking and bicycling. To that end, a new ADA compliant sidewalk is recommended along the west side of Parker Street from the primary site drive to Great Road. The sidewalk would connect with the internal sidewalk network.

- Bicycle racks should be strategically placed within the center to accommodate and encourage bicycle travel.

- Create a pedestrian/bicycle pathway connection between the site and the high school/ballfields – likely near the proposed Town/community building.

- Adjustments to the first internal intersection on the main site drive should be considered including preventing exiting from the adjacent parking fields and turning either left or straight across the main drive. The left turn into the large southern parking field should be shifted to the second major internal driveway.

- The internal road system should be designed to accommodate transit vehicles.

Off-Site Actions

- The intersection of Parker Street with Great Road should be updated in terms of traffic signal equipment, signal timing and geometry including lengthening the northbound left turn lane capacity, installing a westbound left turn lane and provision of a separate right turn lane in the northbound direction.

- Guide signage should be installed in key locations on Great Road and Parker Street and at the site drive indicating the preferred routes and turns between the project site and Great Road (Route 117). This should include a pylon type sign with major tenants listed and be located at the Great Road at Parker Street intersection in the southeast quadrant.

- Work with the Town to ensure optimum signal timing and operations occur at the intersection of Parker Street with Powder Mill Road and Waltham Street.

- A new ADA compliant sidewalk should be installed along the west side of Parker Street as part of the road work extending from the site frontage to Great Road.

- It is recommended that a sidewalk be installed on the east side of Parker Street between Old Marlboro Road and North Street pending verification that sufficient right of way exists. If ROW is insufficient, a contribution to a sidewalk fund could be made or future construction commitment while the Town works out the easements.

- A pedestrian crossing warning beacon system is recommended for Parker Street at Field Street regardless of the disposition of the sidewalk along the east side of Parker Street.

- It is anticipated that a new Transportation Management Association (TMA) will be formed in this region including Maynard and if it comes to fruition, it is recommended that the development's ownership join the TMA.

- The neighborhood east of the project site and bounded by Great Road, Parker Street and Old Marlboro Road should be monitored during the first year or two after full occupancy to identify any significant change in unwanted travel patterns & volumes within the neighborhood attributable to The Shoppes. While actions will require the concurrence of the neighborhood residents, Town departments, the peer review consultant and the Planning Board, they could include items such as one way streets, turn prohibitions, reduction of pavement widths, tightening intersection corners, and installing speed humps and other speed control measures.

Appendix

PART 1
(separate document)
• traffic volume data

PART 2
• crash rate calculations
• MassDOT season adjustment factors and historical growth
• commuter rail schedules and fares
• trip generation calculations
• traffic assignment worksheets
• level of service computation sheets
• queue tables
• signal warrants worksheets
• preliminary conceptual access-site plan

Crash Rate Calculations

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : MAYNARD COUNT DATE : 11/15/2012

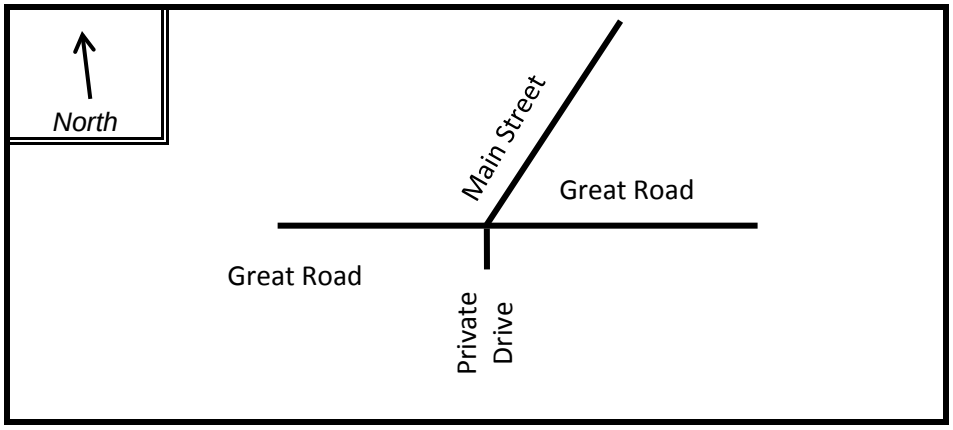
DISTRICT : 3 UNSIGNALIZED : [ ] SIGNALIZED : [X]

~ INTERSECTION DATA ~

MAJOR STREET : GREAT ROAD

MINOR STREET(S) : MAIN STREET

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	→	↓	←	↑		
PEAK HOURLY VOLUMES (AM/PM) :	389	327	663	7		1,386

" K " FACTOR : **0.099** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **14,029**

TOTAL # OF CRASHES : 5 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **1.67**

CRASH RATE CALCULATION : 0.33 RATE = (A * 1,000,000) / (V * 365)

Comments :

Project Title & Date: Proposed 129 Parker Street Redevelopment, Maynard, MA, January 2013

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : MAYNARD COUNT DATE : 11/15/2012

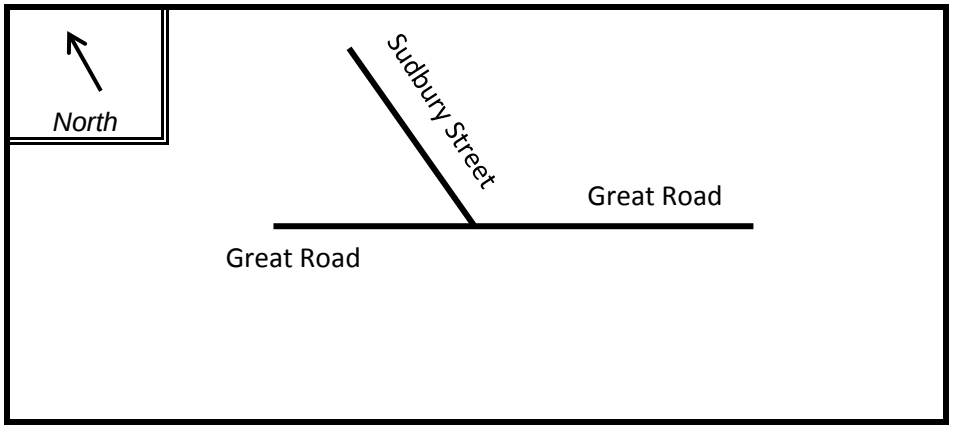
DISTRICT : 3 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : GREAT ROAD

MINOR STREET(S) : SUDBURY STREET

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	→	↘	←	↖		
PEAK HOURLY VOLUMES (AM/PM) :	254	135	755			1,144

" K " FACTOR : **0.099** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **11,579**

TOTAL # OF CRASHES : 2 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.67**

CRASH RATE CALCULATION : 0.16

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

Comments :

Project Title & Date: Proposed 129 Parker Street Redevelopment, Maynard, MA, January 2013

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : MAYNARD COUNT DATE : 11/15/2012

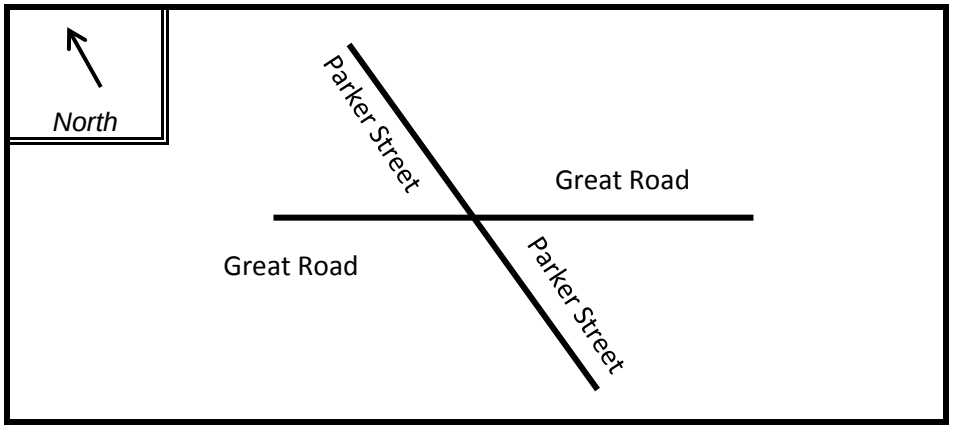
DISTRICT : 3 UNSIGNALIZED : SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : GREAT ROAD

MINOR STREET(S) : PARKER STREET

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	→	↘	←	↖		
PEAK HOURLY VOLUMES (AM/PM) :	278	517	635	555		1,985

" K " FACTOR : **0.099** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **20,091**

TOTAL # OF CRASHES : 10 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **3.33**

CRASH RATE CALCULATION : 0.45

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

Comments :

Project Title & Date: Proposed 129 Parker Street Redevelopment, Maynard, MA, January 2013

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : MAYNARD COUNT DATE : 11/15/2012

DISTRICT : 3 UNSIGNALIZED : SIGNALIZED : X

~ INTERSECTION DATA ~

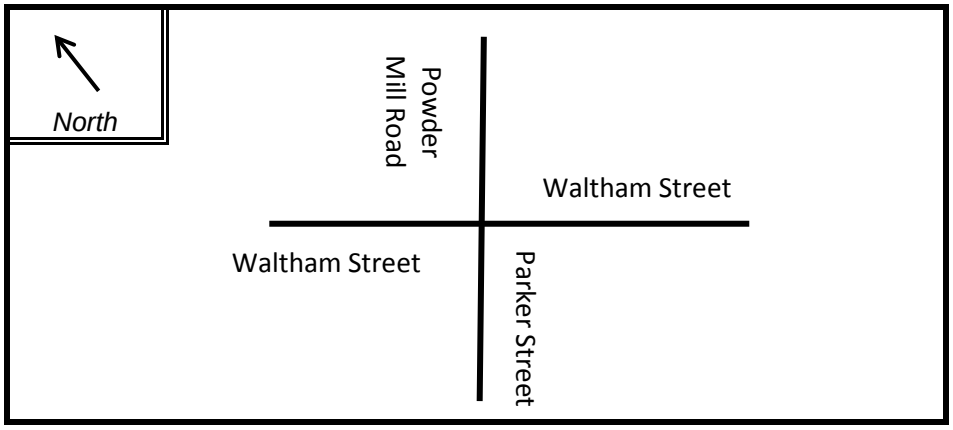
MAJOR STREET : PARKER STREET

MINOR STREET(S) : ACTON STREET

POWDER MILL ROAD

WALTHAM STREET

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	→	↓	←	↑		
PEAK HOURLY VOLUMES (AM/PM) :	633	579	251	301		**1,764**

" K " FACTOR : **0.099** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **17,855**

TOTAL # OF CRASHES : 30 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **10.00**

CRASH RATE CALCULATION : 1.53

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

Comments :

Project Title & Date: Proposed 129 Parker Street Redevelopment, Maynard, MA, January 2013

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : MAYNARD COUNT DATE : 11/15/2012

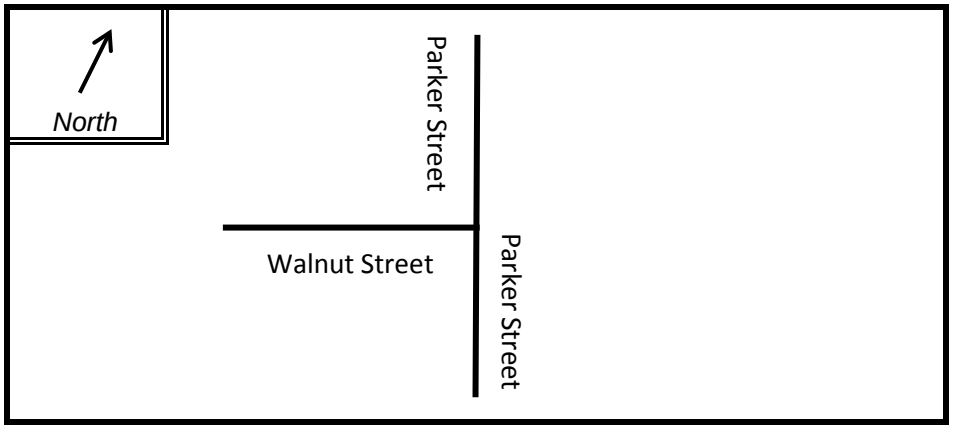
DISTRICT : 3 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : PARKER STREET

MINOR STREET(S) : WALNUT STREET

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	→	↓	↑			
PEAK HOURLY VOLUMES (AM/PM) :	181	472	435			1,088

" K " FACTOR : **0.099** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **11,012**

TOTAL # OF CRASHES : 7 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **2.33**

CRASH RATE CALCULATION : 0.58

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

Comments :

Project Title & Date: Proposed 129 Parker Street Redevelopment, Maynard, MA, January 2013

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : MAYNARD COUNT DATE : 11/15/2012

DISTRICT : 3 UNSIGNALIZED : X SIGNALIZED :

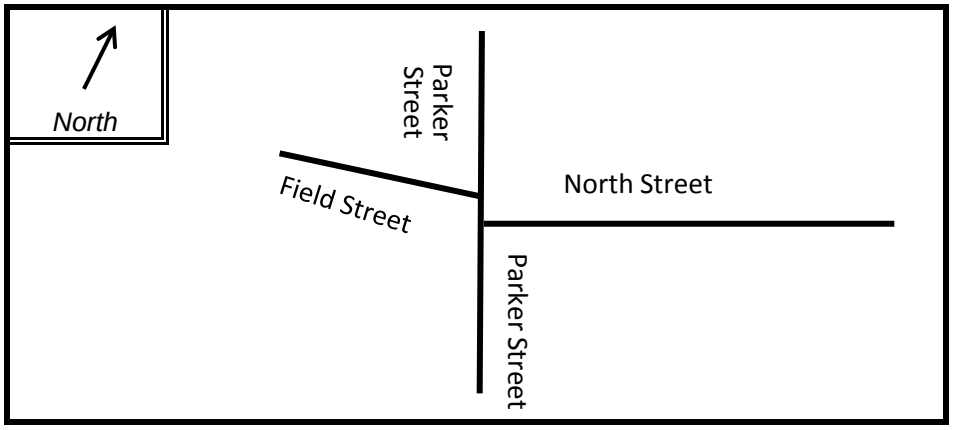
~ INTERSECTION DATA ~

MAJOR STREET : PARKER STREET

MINOR STREET(S) : FIELD STREET

NORTH STREET

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	→	↓	←	↑		
PEAK HOURLY VOLUMES (AM/PM) :	12	513	5	533		**1,063**

" K " FACTOR : **0.099** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **10,759**

TOTAL # OF CRASHES : 2 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.67**

CRASH RATE CALCULATION : 0.17

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

Comments :

Project Title & Date: Proposed 129 Parker Street Redevelopment, Maynard, MA, January 2013

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : MAYNARD COUNT DATE : 11/15/2012

DISTRICT : 3 UNSIGNALIZED : X SIGNALIZED :

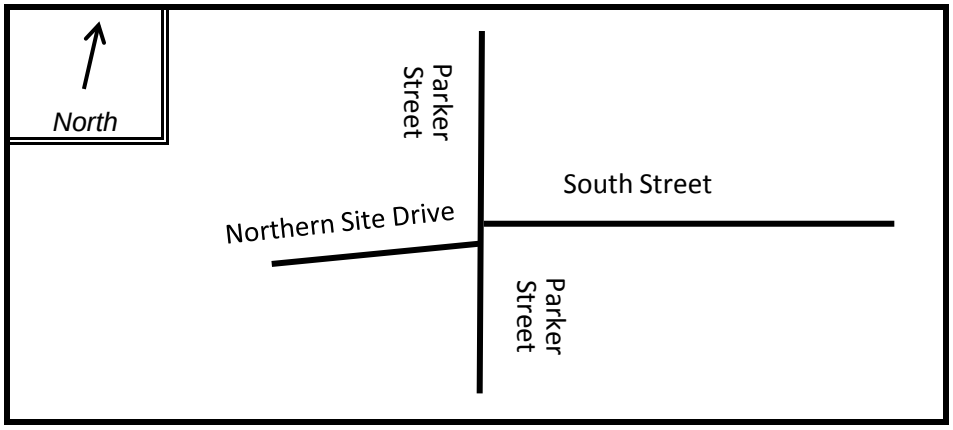
~ INTERSECTION DATA ~

MAJOR STREET : PARKER STREET

MINOR STREET(S) : SOUTH STREET

NORTHERN SITE DRIVE

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	→	↓	←	↑		
PEAK HOURLY VOLUMES (AM/PM) :	1	502	10	537		1,050

" K " FACTOR : **0.099** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **10,628**

TOTAL # OF CRASHES : 0 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.00**

CRASH RATE CALCULATION : 0.00

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

Comments :

Project Title & Date: Proposed 129 Parker Street Redevelopment, Maynard, MA, January 2013

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : MAYNARD COUNT DATE : 11/15/2012

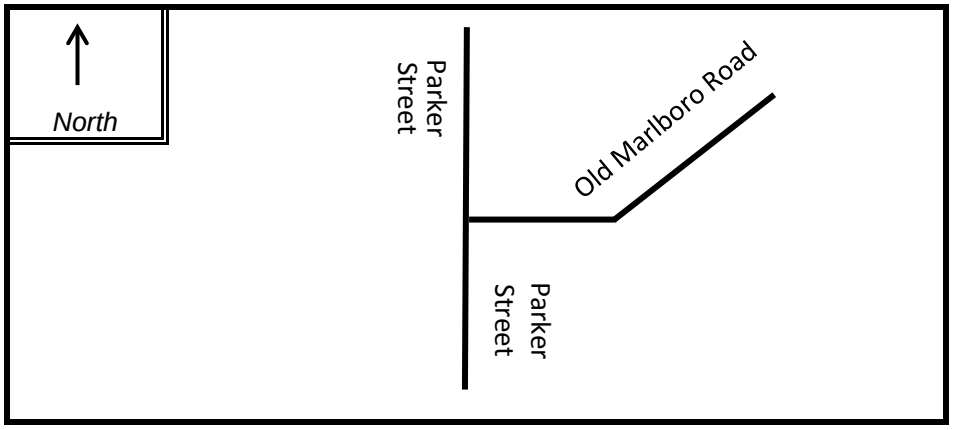
DISTRICT : 3 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : PARKER STREET

MINOR STREET(S) : OLD MARLBORO ROAD

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	↓	←	↑			
PEAK HOURLY VOLUMES (AM/PM) :	495	14	554			1,063

" K " FACTOR : **0.099** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **10,759**

TOTAL # OF CRASHES : 2 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.67**

CRASH RATE CALCULATION : 0.17

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

Comments :

Project Title & Date:

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : MAYNARD COUNT DATE : 11/15/2012

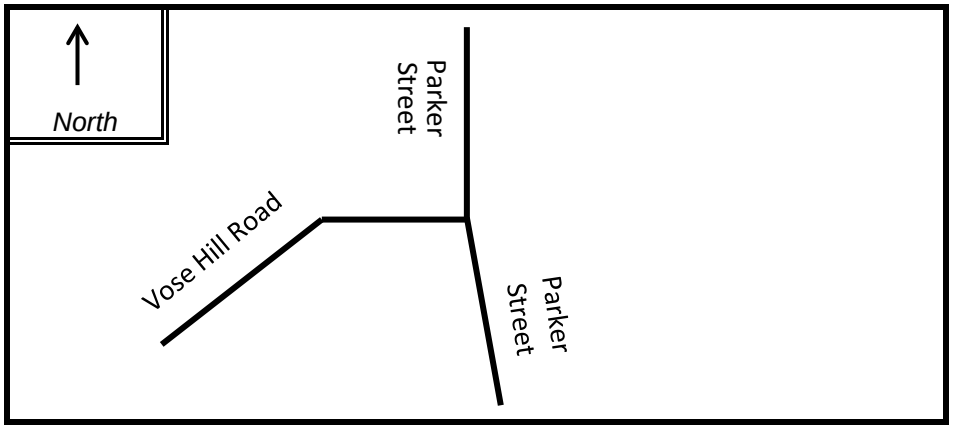
DISTRICT : 3 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : PARKER STREET

MINOR STREET(S) : VOSE HILL ROAD

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	→	↓	↑			
PEAK HOURLY VOLUMES (AM/PM) :	490	21	509			1,020

" K " FACTOR : **0.099** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **10,324**

TOTAL # OF CRASHES : 0 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.00**

CRASH RATE CALCULATION : 0.00

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

Comments :

Project Title & Date:

MassDOT Season Adjustment Factors and Historical Growth

Annual Growth and Monthly Variation of Region Around Maynard, MA

STATION 5 - STERLING - RTE.12 - NORTH OF RTE.I-190

YR	JAN	JAN/yr	FEB	FEB/yr	MAR	MAR/yr	APR	APR/yr	MAY	MAY/yr	JUN	JUN/yr	JUL	JUL/yr	AUG	AUG/yr	SEP	SEP/yr	OCT	OCT/yr	NOV	NOV/yr	DEC	DEC/yr	YEAR	Growth
05	7,333	0.87	8,200	0.97	8,308	0.98	8,194	0.97	9,300	1.10	9,439	1.12	8,516	1.01	8,669	1.03	8,559	1.01	8,500	1.01	8,300	0.98	8,100	0.96	8,452	
	6%		-4%		3%		4%		-6%		-4%		-4%		-1%		-1%		-2%		-3%		-3%		-1%	
06	7,800	0.94	7,909	0.95	8,517	1.02	8,504	1.02	8,752	1.05	9,024	1.08	8,197	0.98	8,580	1.03	8,507	1.02	8,291	1.00	8,019	0.96	7,838	0.94	8,328	-1.5%
	-2%		-3%		-5%		-2%		3%		0%		6%		2%		2%		6%		2%		-1%		1%	
07	7,615	0.91	7,693	0.92	8,091	0.97	8,322	0.99	8,987	1.07	8,988	1.07	8,700	1.04	8,742	1.04	8,658	1.03	8,754	1.05	8,169	0.98	7,767	0.93	8,374	0.5%
	8%		4%		3%		10%		1%		0%		-1%		-4%		-2%		-4%		-4%		-1%		1%	
08	8,243	0.98	7,993	0.95	8,296	0.98	9,168	1.09	9,115	1.08	8,992	1.07	8,578	1.02	8,425	1.00	8,482	1.01	8,400	1.00	7,839	0.93	7,700	0.91	8,436	0.7%
	-7%		0%		-1%		-4%		-3%		0%		1%		1%		0%		0%		2%		2%		-1%	
09	7,685	0.92	8,011	0.96	8,189	0.98	8,776	1.05	8,819	1.05	8,997	1.07	8,654	1.03	8,533	1.02	8,519	1.02	8,434	1.01	7,969	0.95	7,858	0.94	8,370	-0.8%

STATION 4114 - CHELMSFORD - LOWELL CONNECTOR - SOUTH OF RTE.I-495

YR	JAN	JAN/yr	FEB	FEB/yr	MAR	MAR/yr	APR	APR/yr	MAY	MAY/yr	JUN	JUN/yr	JUL	JUL/yr	AUG	AUG/yr	SEP	SEP/yr	OCT	OCT/yr	NOV	NOV/yr	DEC	DEC/yr	YEAR	
06	24,000	0.99	24,426	1.00	26,340	1.08	24,316	1.00	24,030	0.99	24,620	1.01	23,036	0.95	23,217	0.95	24,200	1.00	25,148	1.03	25,140	1.03	23,281	0.96	24,313	
	-2%		-1%		-5%		2%		5%		1%		1%		6%		3%		6%		-1%		6%		2%	
07	23,503	0.95	24,074	0.98	25,046	1.01	24,685	1.00	25,137	1.02	24,905	1.01	23,225	0.94	24,568	1.00	24,868	1.01	26,610	1.08	24,930	1.01	24,633	1.00	24,682	1.5%
	14%		3%		4%		5%		0%		0%		4%		-2%		3%		0%		-3%		-3%		2%	
08	26,823	1.06	24,798	0.98	26,000	1.03	26,021	1.03	25,223	1.00	24,987	0.99	24,237	0.96	23,980	0.95	25,730	1.02	26,585	1.05	24,120	0.96	24,000	0.95	25,209	2.1%
	-14%		1%		-3%		-1%		-2%		2%		2%		-1%		2%		2%		5%		4%		0%	
09	23,134	0.92	24,965	0.99	25,163	1.00	25,832	1.03	24,792	0.99	25,548	1.02	24,720	0.98	23,857	0.95	26,189	1.04	27,028	1.08	25,256	1.01	24,945	0.99	25,119	-0.4%

STATION 307 - WESTBOROUGH - RTE.9 - EAST OF NORTHBOROUGH T.L.

YR	JAN	JAN/yr	FEB	FEB/yr	MAR	MAR/yr	APR	APR/yr	MAY	MAY/yr	JUN	JUN/yr	JUL	JUL/yr	AUG	AUG/yr	SEP	SEP/yr	OCT	OCT/yr	NOV	NOV/yr	DEC	DEC/yr	YEAR	
05	45,180	0.89	49,366	0.98	50,060	0.99	52,971	1.05	53,408	1.06	55,189	1.09	52,365	1.04	50,468	1.00	50,556	1.00	50,848	1.01	47,901	0.95	48,515	0.96	50,569	
	-2%		-9%		1%		-3%		-3%		-5%		-8%		0%		1%		-1%		4%		3%		-2%	
06	44,301	0.89	44,854	0.91	50,326	1.02	51,170	1.03	51,729	1.04	52,438	1.06	48,052	0.97	50,270	1.01	50,998	1.03	50,194	1.01	50,043	1.01	50,032	1.01	49,534	-2.0%
	7%		5%		-2%		-4%		-3%		-1%		10%		4%		-4%		1%		-1%		-6%		0%	
07	47,505	0.96	47,283	0.95	49,268	0.99	49,136	0.99	50,000	1.01	52,000	1.05	53,000	1.07	52,322	1.05	49,031	0.99	50,571	1.02	49,662	1.00	47,007	0.95	49,732	0.4%
	-4%		-2%		-3%		1%		1%		-4%		-8%		-7%		-1%		-3%		-4%		-1%		-3%	
08	45,614	0.95	46,112	0.96	47,829	0.99	49,816	1.03	50,518	1.05	49,936	1.04	48,629	1.01	48,759	1.01	48,531	1.01	49,009	1.02	47,490	0.98	46,696	0.97	48,245	-3.0%
	-3%		1%		-3%		-2%		-2%		0%		-2%		-3%		-2%		-1%		0%		2%		-1%	
09	44,103	0.93	46,434	0.97	46,455	0.98	49,049	1.03	49,474	1.04	49,934	1.05	47,638	1.00	47,056	0.99	47,762	1.00	48,663	1.02	47,379	0.99	47,564	1.00	47,626	-1.3%

STATION 3295 - STERLING - RTE.I-190 - NORTH OF RTE.12 (EXIT 6)

YR	JAN	JAN/yr	FEB	FEB/yr	MAR	MAR/yr	APR	APR/yr	MAY	MAY/yr	JUN	JUN/yr	JUL	JUL/yr	AUG	AUG/yr	SEP	SEP/yr	OCT	OCT/yr	NOV	NOV/yr	DEC	DEC/yr	YEAR	
05	27,990	0.86	31,065	0.95	31,837	0.98	33,213	1.02	33,937	1.04	35,223	1.08	32,478	0.99	34,231	1.05	33,750	1.03	32,766	1.00	32,965	1.01	32,301	0.99	32,646	
	5%		0%		3%		-1%		-2%		-3%		-3%		-2%		0%		4%		1%		0%		0%	
06	29,445	0.90	31,000	0.95	32,830	1.00	32,810	1.00	33,350	1.02	34,309	1.05	31,531	0.96	33,440	1.02	33,831	1.04	34,062	1.04	33,341	1.02	32,285	0.99	32,686	0.1%
	3%		4%		-2%		0%		3%		1%		4%		3%		0%		1%		-7%		-17%		-1%	
07	30,272	0.93	32,188	0.99	32,109	0.99	32,769	1.01	34,484	1.06	34,793	1.07	32,656	1.00	34,410	1.06	33,994	1.05	34,559	1.06	30,969	0.95	26,779	0.82	32,499	-0.6%
	19%		-17%		-13%		-13%		-4%		-3%		-1%		-10%		-5%		-4%		7%		24%		-2%	
08	36,006	1.13	26,802	0.84	28,000	0.88	28,405	0.89	33,040	1.04	33,790	1.06	32,482	1.02	30,850	0.97	32,413	1.02	33,274	1.05	33,278	1.05	33,283	1.05	31,802	-2.1%

STATION 3293 - WEST BOYLSTON - RTE.I-190 - NORTH OF RTE. 12 (EXIT 4)

YR	JAN	JAN/yr	FEB	FEB/yr	MAR	MAR/yr	APR	APR/yr	MAY	MAY/yr	JUN	JUN/yr	JUL	JUL/yr	AUG	AUG/yr	SEP	SEP/yr	OCT	OCT/yr	NOV	NOV/yr	DEC	DEC/yr	YEAR	
05	24,689	0.87	27,605	0.97	28,225	0.99	29,257	1.03	29,324	1.03	30,541	1.07	28,131	0.99	29,330	1.03	29,485	1.04	28,620	1.01	28,674	1.01	27,316	0.96	28,433	
	7%		0%		4%		-2%		0%		-2%		1%		1%		5%		14%		9%		13%		4%	
06	26,303	0.89	27,505	0.93	29,220	0.99	28,646	0.97	29,231	0.99	29,868	1.01	28,305	0.96	29,648	1.00	31,070	1.05	32,764	1.11	31,377	1.06	30,826	1.04	29,564	4.0%
	18%		17%		9%		7%		10%		8%		7%		8%		3%		1%		1%		-4%		7%	
07	31,023	0.98	32,192	1.02	31,920	1.01	30,763	0.97	32,207	1.02	32,292	1.02	30,380	0.96	31,971	1.01	32,026	1.01	33,245	1.05	31,847	1.01	29,646	0.94	31,626	7.0%
	-1%		-3%		-3%		5%		-1%		-2%		0%		-2%		1%		1%		-1%		3%		0%	
08	30,847	0.98	31,120	0.99	31,000	0.98	32,228	1.02	32,026	1.02	31,663	1.00	30,499	0.97	31,226	0.99	32,468	1.03	33,473	1.06	31,477	1.00	30,526	0.97	31,546	-0.3%
	3%		6%		4%		2%		2%		4%		6%		3%		3%		0%		1%		3%		3%	
09	31,781	0.98	33,025	1.02	32,108	0.99	32,959	1.01	32,563	1.00	32,846	1.01	32,229	0.99	32,176	0.99	33,599	1.03	33,374	1.03	31,720	0.98	31,589	0.97	32,497	3.0%

Avg. November/Annual Avg.	***0.99***

Avg. Ann. Growth	**0.4%**

Commuter Rail Schedules and Fares

Fitchburg Line Effective July 1, 2012

Monday through Friday

Inbound to North Station

Zone	Train No.	404	406	408	410	412	454	456	418	420	422	424	466	468	426	434	436	438
		A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
8	Fitchburg	5 15	6 00	6 30	6 55	7 20	----	----	10 27	11 24	1 05	3 05	----	----	6 40	7 30	8 25	10 25
8	North Leominster	5 22	6 07	6 37	7 02	7 27	----	----	10 34	11 31	1 14	3 14	----	----	6 47	7 37	8 32	10 33
8	Shirley	5 29	6 15	6 44	7 09	7 35	----	----	f 10 41	f 11 38	1 21	3 21	----	----	6 54	f 7 44	8 40	f 10 41
8	Ayer	5 34	6 21	6 51	7 15	7 41	----	----	f 10 46	11 43	1 26	3 26	----	----	6 59	7 49	8 44	10 45
7	Littleton/Rte 495	5 43	6 30	7 00	7 24	7 50	----	----	10 54	11 51	f 1 34	f 3 34	----	----	7 08	f 7 57	f 8 52	f 10 53
6	South Acton	5 51	6 38	7 08	7 32	7 58	8 41	9 25	11 02	11 59	1 42	3 42	4 17	5 09	7 14	8 05	8 59	11 00
5	West Concord	5 56	6 43	----	7 37	8 03	8 46	9 30	11 07	12 04	1 47	3 47	4 22	5 14	7 22	8 10	9 04	11 06
5	Concord	6 02	6 49	----	7 44	8 09	8 52	9 36	11 13	12 10	1 53	3 53	4 28	5 20	7 28	8 16	9 10	11 12
4	Lincoln	6 08	6 55	----	7 50	8 15	8 58	9 42	f 11 19	f 12 16	1 59	3 59	4 34	5 26	f 7 34	8 22	9 16	11 16
3	Hastings	6 12	7 00	----	----	8 20	----	f 9 46	f 11 23	----	----	----	----	----	----	----	----	----
3	Kendal Green	6 14	7 02	----	----	8 22	9 02	f 9 48	f 11 25	----	2 05	4 05	4 40	5 32	7 40	f 8 28	f 9 22	f 11 21
2	Brandeis/Roberts	6 17	7 06	----	----	8 26	9 05	9 51	f 11 28	12 24	2 08	4 08	4 43	5 38	7 43	8 31	f 9 25	11 25
2	Waltham	6 22	7 10	----	8 00	8 30	9 09	9 55	11 32	12 29	2 12	4 12	4 47	5 44	7 47	8 35	9 29	11 28
1	Waverley	6 27	7 15	----	----	8 35	9 14	f 10 00	f 11 37	----	----	----	4 51	5 48	----	----	f 9 34	----
1	Belmont	6 30	7 17	----	----	8 37	9 16	f 10 02	f 11 39	f 12 34	f 2 17	f 4 16	f 4 54	f 5 51	7 53	----	f 9 36	----
1A	Porter Square	6 36	7 23	7 40	8 11	8 43	9 21	10 07	11 44	12 39	2 22	4 22	4 59	5 56	7 58	8 44	9 41	11 37
	NORTH STATION	6 47	7 34	7 50	8 22	8 54	9 32	10 18	11 55	12 50	2 33	4 33	5 10	6 07	8 09	8 55	9 52	11 48

Silver Hill These trains stop at Silver Hill (Zone 3): **406** - 6 58 A.M. **412** - 8 18 A.M.

Outbound from North Station

Zone	Train No.	453	455	417	419	421	423	465	467	425	427	429	431	433	435	437	439	401
		A.M.	A.M.	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	A.M.
	NORTH STATION	7 27	8 12	8 55	9 35	11 20	1 15	3 00	4 00	4 40	4 50	5 20	5 40	6 25	7 35	8 45	10 40	12 10
1A	Porter Square	7 37	8 22	9 05	9 45	11 30	1 25	3 10	4 10	4 50	5 00	5 30	5 50	6 35	7 45	8 55	10 50	12 20
1	Belmont	f 7 42	f 8 27	----	f9 50	----	f 1 30	f 3 15	f 4 15	----	5 05	----	5 55	6 40	f 7 50	f 8 59	f 10 55	f 12 25
1	Waverley	f 7 44	f 8 29	----	f9 52	----	----	f 3 17	f 4 17	----	5 07	----	5 57	6 42	f 7 52	f 9 02	f 10 57	f 12 27
2	Waltham	7 50	8 35	9 15	10 00	11 40	1 37	3 23	4 23	----	5 13	5 41	6 03	6 48	7 58	9 07	11 03	12 33
2	Brandeis/Roberts	f 7 54	8 39	9 19	10 05	11 44	1 41	3 27	f 4 27	----	5 17	----	6 08	6 53	8 03	9 11	11 07	12 37
3	Kendal Green	7 57	f 8 42	----	f 10 08	f 11 47	f 1 44	f 3 30	f 4 30	----	5 20	----	6 10	6 55	f 8 06	f 9 14	f 11 10	f 12 40
3	Hastings	----	----	----	f 10 10	f 11 49	----	----	f 4 32	----	f 5 22	----	f 6 12	----	f 8 08	----	----	----
4	Lincoln	f 8 04	f 8 49	----	f10 14	f 11 53	f 1 50	f 3 37	4 38	----	5 28	5 53	6 20	7 05	f 8 13	f 9 20	f 11 16	f 12 46
5	Concord	f 8 10	8 55	9 27	10 20	11 59	1 56	3 43	4 44	----	5 34	5 59	6 26	7 11	8 19	9 24	11 22	12 52
5	West Concord	L 8 16	L 9 01	----	f 10 26	12 05	2 02	L 3 49	L 4 50	----	5 40	6 05	6 32	7 17	8 25	9 30	f 11 28	f 12 58
6	South Acton	8 24	9 09	9 34	10 32	12 11	2 08	3 57	4 58	5 22	5 47	6 12	6 39	7 24	8 32	9 36	11 34	1 04
7	Littleton/Rte 495	----	----	f 9 42	f 10 40	f 12 18	2 15	----	----	5 29	5 54	6 19	6 46	7 31	8 39	9 43	f 11 42	f 1 12
8	Ayer	----	----	9 50	10 48	12 26	2 23	----	----	5 37	6 02	6 27	6 54	7 39	8 48	9 52	11 50	1 20
8	Shirley	----	----	9 55	f 10 53	12 31	2 28	----	----	5 42	6 07	6 32	6 59	7 44	8 53	9 57	f 11 55	f 1 25
8	North Leominster	----	----	10 02	11 00	12 38	2 35	----	----	5 49	6 14	6 39	7 06	7 51	9 00	10 04	12 02	1 32
8	Fitchburg	----	----	10 15	11 12	12 51	2 49	----	----	5 59	6 26	6 49	7 16	8 01	9 10	10 14	12 12	1 42

Silver Hill These trains stop at Silver Hill (Zone 3): **431** - 6 14 P.M. **433** - 6 58 P.M. **435** - 8 10 P.M.

Saturday and Sunday

Inbound to North Station

Zone	Train No Saturday. / Train No Sunday.	1402	1406	1408	1460	1410	1466	1412	1414
		2402	2406	2408	2460	2410	2466	2412	2414
		A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.
8	Fitchburg	6 50	9 25	11 00	----	2 45	----	5 35	9 45
8	North Leominster	6 57	9 32	11 07	----	2 52	----	5 42	9 52
8	Shirley	f 7 04	f 9 39	f 11 14	----	f 2 59	----	f 5 49	f 9 59
8	Ayer	7 09	9 44	11 19	----	3 04	----	5 54	10 04
7	Littleton/Rte 495	7 17	9 52	11 27	----	3 12	----	6 02	10 12
6	South Acton	7 25	10 00	11 35	2 25	3 20	5 47	6 10	10 20
5	West Concord	f 7 30	f 10 05	f 11 40	f 2 30	f 3 25	f 5 52	f 6 15	f 10 25
5	Concord	7 36	10 11	11 46	2 36	3 31	5 58	6 21	10 31
4	Lincoln	7 42	10 17	11 52	2 42	3 37	6 04	6 27	10 37
3	Kendal Green	f 7 48	f 10 23	f 11 58	f 2 48	f 3 43	f 6 10	f 6 33	f 10 43
2	Brandeis/Roberts	f 7 51	f 10 26	f 12 01	f 2 51	f 3 46	f 6 13	f 6 36	f 10 46
2	Waltham	7 55	10 30	12 05	2 55	3 50	6 17	6 40	10 50
1	Waverley	f 8 00	f 10 35	f 12 10	f 3 00	f 3 55	f 6 22	f 6 45	f 10 55
1	Belmont	f 8 02	f 10 37	f 12 12	f 3 02	f 3 57	f 6 24	f 6 47	f 10 57
1A	Porter Square	8 07	10 42	12 17	3 07	4 02	6 29	6 52	11 02
	NORTH STATION	8 18	10 53	12 28	3 18	4 13	6 40	7 02	11 12
								Ski-Train	

Outbound from North Station

Zone	Train No Saturday. / Train No Sunday.	1405	1407	1459	1409	1463	1411	1413	1415
		2405	2407	2459	2409	2463	2411	2413	2415
		A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
	NORTH STATION	8 35	11 20	1 20	3 30	4 30	5 30	8 00	11 30
1A	Porter Square	8 45	11 30	1 30	3 40	4 40	5 40	8 10	11 40
1	Belmont	f 8 50	f 11 35	f 1 35	f 3 45	f 4 45	f 5 45	f 8 15	f 11 45
1	Waverley	f 8 52	f 11 37	f 1 37	f 3 47	f 4 47	f 5 47	f 8 17	f 11 47
2	Waltham	8 58	11 43	1 43	3 53	4 53	5 53	8 23	11 53
2	Brandeis/Roberts	f 9 03	f 11 48	f 1 48	f 3 58	f 4 58	f 5 58	f 8 28	f 11 58
3	Kendal Green	f 9 06	f 11 51	f 1 51	f 4 01	f 5 01	f 6 01	f 8 31	f 12 01
4	Lincoln	9 12	11 57	1 57	4 07	5 07	6 07	8 37	12 07
5	Concord	9 18	12 03	2 03	4 13	5 13	6 13	8 43	12 13
5	West Concord	f9 24	f 12 09	L 2 09	f 4 19	L 5 19	f 6 19	f 8 49	f 12 19
6	South Acton	9 30	12 15	2 15	4 25	5 25	6 25	8 55	12 25
7	Littleton/Rte 495	9 38	12 23	----	4 33	----	6 33	9 03	f 12 33
8	Ayer	9 46	12 31	----	4 41	----	6 41	9 11	12 41
8	Shirley	f9 51	f 12 36	----	f 4 46	----	f 6 46	f 9 16	f 12 46
8	North Leominster	9 58	12 43	----	4 53	----	6 53	9 23	12 53
8	Fitchburg	10 08	12 53	----	5 04	----	7 04	9 33	1 03
		Ski-Train							

Notes: This schedule is effective July 1, 2012 and replaces the schedule of November 22, 2010.

Times shown in this schedule are train departure times; customers are asked to arrive at the station platform for a prompt departure.

Holiday Service:
Trains will operate on a Saturday or Sunday service on the holidays indicated:

Saturday Service:
President's Day and 4th of July (train no. 1415 may be held for 45 minutes after the conclusion of the 4th of July fireworks)

Sunday Service:
New Year's Day, Memorial Day, Labor Day, Thanksgiving Day and Christmas Day.

All other holidays:
Regular service is provided on all other holidays. Consult 'Service Updates' at **www.mbta.com** or call Customer Service at **617-222-3200** for any extra service that may be provided.

Times in red indicate an f stop-
Passengers must notify the conductor that they wish to get off at these designated stations. Passengers who wish to board at these designated stations must be on the platform in full view of the engineer.

Times in blue indicate an L stop-
This is a regular stop to discharge or pick up passengers; however the train may leave ahead of schedule.

Ski Train- This train is available on weekend trains during the winter months to provide service to Wachusett Mountain. The trains indicated with the ski symbol feature a specially modified coach, equipped with racks for ski and snow board equipment. Please visit the MBTA's website for updated information about this service.

Bicycles are allowed on trains with the bicycle symbol shown above the train number.

Shaded area indicates peak hour trains.

Scan the QR code on your smartphone to load the MBTA's moblie web site and recieve access to schedules, T-Alerts and service updates.

Single Ride Fares Effective July 1, 2012

Fare Category	
CharlieCard	
Adult	
Local Bus	$1.50
Rapid Transit	$2.00
Bus + RT	$2.00
Inner Express	$3.50
Outer Express	$5.00
Senior	
Local Bus	$0.75
Rapid Transit	$1.00
Bus + RT	$1.00
Student	
Local Bus	$0.75
Rapid Transit	$1.00
Bus + RT	$1.00
CharlieTicket	
Adult	
Local Bus	$2.00
Rapid Transit	$2.50
Bus + RT	$4.50
Inner Express	$4.50
Outer Express	$6.50
Commuter Rail	
Zone 1A	$2.00
Zone 1	$5.50
Zone 2	$6.00
Zone 3	$6.75
Zone 4	$7.25
Zone 5	$8.00
Zone 6	$8.75
Zone 7	$9.25
Zone 8	$10.00
Zone 9	$10.50
Zone 10	$11.00
InterZone 1	$2.50
InterZone 2	$3.00
InterZone 3	$3.25
InterZone 4	$3.50
InterZone 5	$4.00
InterZone 6	$4.50
InterZone 7	$5.00
InterZone 8	$5.50
InterZone 9	$6.00
InterZone 10	$6.50

On Board Fares

A $3 surcharge will be added to tickets purchased on-board all trains departing from North Station, South Station and Back Bay Station.

Monday-through-Friday customers will be charged $3 surcharge by the conductor when a ticket is purchased on board from a station with an MBTA ticket vending machine or where a Ticket Vendor is open.

A list of these stations can be found on the MBTA website here:
http://www.mbta.com/fares_and_passes/sales_locations/

Source: Massachusetts Bay Transit Authority website, Schedules & Maps, 2013

Trip Generation Calculations

TRIP GENERATION WORKSHEET

LAND USE: *Apartment*
LAND USE CODE: 220 Independent Variable---Dwelling Units

PROJECT NAME: Traffic Impact & Access Study for the Shoppes at Maynard Crossing
PROJECT #: 12072 Number of Units: 250

WEEKDAY

RATES:	Total Trip Ends			Directional Dist.		Number
	Average	Low	High	Enter	Exit	of Studies
DAILY	6.65	1.27	12.50	50%	50%	88
AM PEAK	0.51	0.10	1.02	20%	80%	78
PM PEAK	0.62	0.10	1.64	65%	35%	90
PK GEN AM	0.55	0.10	1.08	29%	71%	83
PK GEN PM	0.67	0.10	1.64	61%	39%	85

	BY AVERAGE			BY REGRESSION			
	Total	Enter	Exit	Total	Enter	Exit	R^2
DAILY	1663	832	832	1639	820	820	0.87
AM PEAK	128	26	102	126	25	101	0.83
PM PEAK	155	101	54	155	101	54	0.77
PK GEN AM	138	40	98	137	40	97	0.82
PK GEN PM	168	102	66	165	101	64	0.80

SATURDAY

RATES:	Total Trip Ends			Directional Dist.		Number
	Average	Low	High	Enter	Exit	of Studies
DAILY	6.39	2.84	8.40	50%	50%	15
PEAK HR	0.52	0.26	1.05	-	-	14

	BY AVERAGE			BY REGRESSION			
	Total	Enter	Exit	Total	Enter	Exit	R^2
DAILY	1598	799	799	1706	853	853	0.85
PEAK HR	130	-	-	122	-	-	0.56

SUNDAY

RATES:	Total Trip Ends			Directional Dist.		Number
	Average	Low	High	Enter	Exit	of Studies
DAILY	5.86	3.21	7.53	50%	50%	14
PEAK HR	0.51	0.26	1.43	-	-	13

	BY AVERAGE			BY REGRESSION			
	Total	Enter	Exit	Total	Enter	Exit	R^2
DAILY	1465	733	733	1504	752	752	0.82
PEAK HR	128	-	-	*** Not Given ***			

SOURCE: Trip Generation, 9th Edition, Institute of Transportation Engineers, 2012.

TRIP GENERATION WORKSHEET

LAND USE: *Recreational Community Center*
LAND USE CODE: 495 Independent Variable---Trips per 1000 SF Gross Floor Area

JOB: Traffic Impact & Access Study for the Shoppes at Maynard Crossing
JOB NUMBER: 12072 Gross Floor Area (KSF) 25

WEEKDAY

RATES:	Total Trip Ends			Directional Dist.		Number
	Average	Low	High	Enter	Exit	of Studies
DAILY	33.82	22.88	36.71	50%	50%	3
AM PEAK	2.05	1.08	3.18	66%	34%	6
PM PEAK	2.74	1.05	5.37	49%	51%	7
PK GEN AM	2.89	2.61	3.41	57%	43%	5
PK GEN PM	3.35	2.31	5.37	48%	52%	4

	BY AVERAGE			BY REGRESSION			
	Total	Enter	Exit	Total	Enter	Exit	R2
DAILY*	851	426	426	<---NOT GIVEN--->			
AM PEAK	52	34	18	<---NOT GIVEN--->			
PM PEAK	69	34	35	<---NOT GIVEN--->			
PK GEN AM*	73	42	31	75	43	32	0.96
PK GEN PM*	84	40	44	23	11	12	0.61

SATURDAY

RATES:	Total Trip Ends			Directional Dist.		Number
	Average	Low	High	Enter	Exit	of Studies
DAILY	9.1	7.39	15.40	50%	50%	2
PEAK HR	1.07	0.58	2.18	54%	46%	4

	BY AVERAGE			BY REGRESSION			
	Total	Enter	Exit	Total	Enter	Exit	R2
DAILY*	229	115	115	<---NOT GIVEN--->			
PEAK HR*	27	15	12	<---NOT GIVEN--->			

* Use with caution. Small sample size.

SUNDAY

RATES:	Total Trip Ends			Directional Dist.		Number
	Average	Low	High	Enter	Exit	of Studies
DAILY	13.6	10.1	14.55	50%	50%	2
PEAK HR	1.48	1.39	1.51	56%	44%	2

	BY AVERAGE			BY REGRESSION*			
	Total	Enter	Exit	Total	Enter	Exit	R2
DAILY*	342	171	171	<---NOT GIVEN--->			
PEAK HR*	37	21	16	<---NOT GIVEN--->			

* Use with caution. Regression not valid for small developments.

SOURCE: Trip Generation, 9th Edition, Institute of Transportation Engineers, 2012

TRIP GENERATION WORKSHEET

LAND USE: *General Office Building*
LAND USE CODE: 710 Independant Variable---Trips per 1000 SF Gross Floor Area

PROJECT NAME: Traffic Impact & Access Study for the Shoppes at Maynard Crossing
PROJECT #: 12072 Gross Floor Area (KSF): 25

WEEKDAY

RATES:	Total Trip Ends			Directional Dist.		Number
	Average	Low	High	Enter	Exit	of Studies
DAILY	11.03	3.58	58.80	50%	50%	79
AM PEAK HR	1.56	0.60	5.98	88%	12%	218
PM PEAK HR	1.49	0.49	6.39	17%	83%	236

TRIPS:	BY AVERAGE			BY REGRESSION			
	Total	Enter	Exit	Total	Enter	Exit	R^2
DAILY	277	139	139	460	230	230	0.81
AM PEAK	39	34	5	63	55	8	0.83
PM PEAK	37	6	31	107	18	88	0.82

SATURDAY

RATES:	Total Trip Ends			Directional Dist.		Number
	Average	Low	High	Enter	Exit	of Studies
DAILY	2.46	0.59	14.67	50%	50%	18
GEN PEAK HR	0.43	0.16	1.77	54%	46%	11

TRIPS:	BY AVERAGE			BY REGRESSION			
	Total	Enter	Exit	Total	Enter	Exit	R^2
DAILY	62	31	31	83	41	41	0.72
PEAK HR	11	6	6		NOT GIVEN		-

SUNDAY

RATES:	Total Trip Ends			Directional Dist.		Number
	Average	Low	High	Enter	Exit	of Studies
DAILY	1.05	0.19	7.33	50%	50%	18
GEN PEAK HR	0.16	0.06	1.37	58%	42%	11

	BY AVERAGE			BY REGRESSION			
	Total	Enter	Exit	Total	Enter	Exit	R^2
DAILY	26	13	13		NOT GIVEN		-
PEAK HR	4	2	2		NOT GIVEN		-

SOURCE: Trip Generation, 9th Edition, Institute of Transportation Engineers, 2012.

TRIP GENERATION WORKSHEET

LAND USE: *Shopping Center*
LAND USE CODE: 820 Independent Variable---Trips per 1000 SF GLA

PROJECT NAME: Traffic Impact & Access Study for the Shoppes at Maynard Crossing
PROJECT # : 12072
Gross Leasable Area (KSF): 348.1

WEEKDAY

RATES:	Total Trip Ends			Directional Dist.		Number
	Average	Low	High	Enter	Exit	of Studies
DAILY	42.70	12.50	270.89	50%	50%	302
AM PEAK HOUR	0.96	0.10	9.05	62%	38%	104
PM PEAK HOUR	3.71	0.68	29.27	48%	52%	426

TRIPS:	BY AVERAGE			BY REGRESSION			
	Total	Enter	Exit	Total	Enter	Exit	R^2
DAILY	14864	7432	7432	15277	7639	7639	0.79
AM PEAK	334	207	127	334	207	127	0.56
PM PEAK	1291	620	671	1382	663	719	0.81

SATURDAY

RATES:	Total Trip Ends			Directional Dist.		Number
	Average	Low	High	Enter	Exit	of Studies
DAILY	49.97	16.70	227.50	50%	50%	123
GEN PEAK HR	4.82	1.46	18.32	52%	48%	128

TRIPS:	BY AVERAGE			BY REGRESSION			
	Total	Enter	Exit	Total	Enter	Exit	R^2
DAILY	17395	8698	8698	20274	10137	10137	0.82
PEAK HR	1678	873	805	1967	1023	944	0.83

SUNDAY

RATES:	Total Trip Ends			Directional Dist.		Number
	Average	Low	High	Enter	Exit	of Studies
DAILY	25.24	4.15	148.15	50%	50%	77
PEAK HR	3.12	0.39	12.40	49%	51%	39

TRIPS:	BY AVERAGE			BY REGRESSION			
	Total	Enter	Exit	Total	Enter	Exit	R^2
DAILY	8786	4393	4393	9655	4828	4828	0.52
PEAK HR	1086	532	554	<---- NOT GIVEN ---->			

SOURCE: Trip Generation, 9th Edition, Institute of Transportation Engineers, 2012.

Weekday

Internal Trip Capture Calculations

Scenario:
Time Period: Weekday Total
Analyst: YC
Date: 2/5/2013

LAND USE A - RETAIL

ITE LUC: 820
Size: 348K SF

	Total	Internal	External
Enter	7639	339	7300
Exit	7639	359	7279
Total	15277	698	14579
%	100%	5%	95%

A to B				B to A			
	% Demand	Trips			% Demand	Trips	
Retail	11%	840		Retail	9%	687	
			Balanced				Balanced
			275				316
	% Demand	Trips			% Demand	Trips	
Retail	33%	275		Retail	38%	316	

A to C				C to A			
	% Demand	Trips			% Demand	Trips	
Retail	3%	229		Retail	22%	1680	
			Balanced				Balanced
			85				23
	% Demand	Trips			% Demand	Trips	
Retail	15%	85		Retail	4%	23	

LAND USE B - RESIDENTIAL

ITE LUC: 220
Size: 250 Units

	Total	Internal	External
Enter	832	286	546
Exit	832	316	516
Total	1664	602	1062
%	100%	36%	64%

LAND USE C - Office

ITE LUC: 495 & 710
Size: 25K SF School Admin & 25K SF Recreational

	Total	Internal	External
Enter	565	85	480
Exit	565	34	531
Total	1130	119	1011
%	100%	11%	90%

B to C				C to B			
	% Demand	Trips			% Demand	Trips	
Retail	0%	0		Retail	2%	11	
			Balanced				Balanced
			0				11
	% Demand	Trips			% Demand	Trips	
Retail	0%	0		Retail	3%	25	

Net External Trips for Multi-Use Development

	Land Use A	Land Use B	Land Use C	Total
Enter	7300	546	480	8326
Exit	7279	516	531	8326
Total	14579	1062	1011	16652
Single-Use Trip Gen Est.	15277	1664	1130	18071
Internal Capture Rate				7.85%

Weekday AM

Internal Trip Capture Calculations

Scenario:
Time Period: Weekday AM Peak Hour
Analyst: YC
Date: 2/5/2013

LAND USE A - RETAIL

ITE LUC: 820
Size: 348K SF

	Total	Internal	External
Enter	207	10	197
Exit	127	12	115
Total	334	22	312
%	100%	6%	94%

A to B				B to A			
	% Demand	Trips			% Demand	Trips	
Retail	12%	15		Retail	53%	110	
			Balanced				Balanced
			8				9
	% Demand	Trips			% Demand	Trips	
Retail	31%	8		Retail	9%	9	

A to C				C to A			
	% Demand	Trips			% Demand	Trips	
Retail	3%	4		Retail	23%	48	
			Balanced				Balanced
			4				0
	% Demand	Trips			% Demand	Trips	
Retail	31%	21		Retail	2%	0	

LAND USE B - RESIDENTIAL

ITE LUC: 220
Size: 250 Units

	Total	Internal	External
Enter	26	9	17
Exit	102	9	93
Total	128	18	110
%	100%	14%	86%

LAND USE C - Office

ITE LUC: 495 & 710
Size: 25K SF School Admin & 25K SF Recreational

	Total	Internal	External
Enter	68	4	64
Exit	23	1	22
Total	91	5	86
%	100%	5%	95%

B to C				C to B			
	% Demand	Trips			% Demand	Trips	
Retail	0%	0		Retail	2%	0	
			Balanced				Balanced
			0				0
	% Demand	Trips			% Demand	Trips	
Retail	0%	0		Retail	2%	1	

Net External Trips for Multi-Use Development

	Land Use A	Land Use B	Land Use C	Total
Enter	197	17	64	279
Exit	115	93	22	230
Total	312	110	86	509
Single-Use Trip Gen Est.	334	128	91	553
Internal Capture Rate				7.95%

Weekday PM

Internal Trip Capture Calculations

Scenario:
Time Period: Weekday PM Peak Hour
Analyst: YC
Date: 2/5/2013

LAND USE A - RETAIL

ITE LUC: 820
Size: 348K SF

	Total	Internal	External
Enter	663	6	657
Exit	719	44	675
Total	1382	50	1332
%	100%	4%	96%

A to B			
	% Demand	Trips	
Retail	12%	86	
			Balanced
			31
	% Demand	Trips	
Retail	31%	31	

B to A			
	% Demand	Trips	
Retail	53%	351	
			Balanced
			5
	% Demand	Trips	
Retail	9%	5	

A to C			
	% Demand	Trips	
Retail	3%	22	
			Balanced
			12
	% Demand	Trips	
Retail	31%	12	

C to A			
	% Demand	Trips	
Retail	23%	152	
			Balanced
			1
	% Demand	Trips	
Retail	2%	1	

LAND USE B - RESIDENTIAL

ITE LUC: 220
Size: 250 Units

	Total	Internal	External
Enter	101	33	68
Exit	54	5	49
Total	155	37	118
%	100%	24%	76%

LAND USE C - Office

ITE LUC: 495 & 710
Size: 25K SF School Admin & 25K SF Recreational

	Total	Internal	External
Enter	40	12	28
Exit	66	3	63
Total	106	15	91
%	100%	14%	86%

B to C			
	% Demand	Trips	
Retail	0%	0	
			Balanced
			0
	% Demand	Trips	
Retail	0%	0	

C to B			
	% Demand	Trips	
Retail	2%	1	
			Balanced
			1
	% Demand	Trips	
Retail	2%	2	

Net External Trips for Multi-Use Development

	Land Use A	Land Use B	Land Use C	Total
Enter	657	68	28	753
Exit	675	49	63	788
Total	1332	118	91	1541
Single-Use Trip Gen Est.	1382	155	106	1643
Internal Capture Rate				6.23%

Saturday

Internal Trip Capture Calculations

Scenario:
Time Period: Saturday Daily Total
Analyst: YC
Date: 2/5/2013

LAND USE A - RETAIL

ITE LUC: 820
Size: 348K SF

	Total	Internal	External
Enter	10137	308	9829
Exit	10137	281	9856
Total	20274	589	19685
%	100%	3%	97%

A to B				B to A			
	% Demand	Trips			% Demand	Trips	
Retail	11%	1115		Retail	9%	912	
			Balanced				Balanced
			264				304
	% Demand	Trips			% Demand	Trips	
Retail	33%	264		Retail	38%	304	

A to C				C to A			
	% Demand	Trips			% Demand	Trips	
Retail	3%	304		Retail	22%	2230	
			Balanced				Balanced
			17				5
	% Demand	Trips			% Demand	Trips	
Retail	15%	17		Retail	4%	5	

LAND USE B - RESIDENTIAL

ITE LUC: 220
Size: 250 Units

	Total	Internal	External
Enter	799	266	533
Exit	799	304	495
Total	1598	570	1028
%	100%	36%	64%

LAND USE C - Office

ITE LUC: 495 & 710
Size: 25K SF School Admin & 25K SF Recreational

	Total	Internal	External
Enter	115	17	98
Exit	115	7	108
Total	230	24	206
%	100%	11%	90%

B to C				C to B			
	% Demand	Trips			% Demand	Trips	
Retail	0%	0		Retail	2%	2	
			Balanced				Balanced
			0				2
	% Demand	Trips			% Demand	Trips	
Retail	0%	0		Retail	3%	24	

Net External Trips for Multi-Use Development

	Land Use A	Land Use B	Land Use C	Total
Enter	9829	533	98	10460
Exit	9856	495	108	10460
Total	19685	1028	206	20919
Single-Use Trip Gen Est.	20274	1598	230	22102
Internal Capture Rate				5.35%

Internal Trip Capture Calculations

Scenario:
Time Period: Saturday Midday Peak Hour
Analyst: YC
Date: 2/5/2013

LAND USE A - RETAIL

ITE LUC: 820
Size: 348K SF

	Total	Internal	External
Enter	1023	3	1020
Exit	944	32	912
Total	1967	35	1932
%	100%	2%	98%

A to B				B to A			
	% Demand	Trips			% Demand	Trips	
Retail	7%	66		Retail	34%	348	
			Balanced				Balanced
			26				3
	% Demand	Trips			% Demand	Trips	
Retail	37%	26		Retail	5%	3	

A to C				C to A			
	% Demand	Trips			% Demand	Trips	
Retail	3%	28		Retail	20%	205	
			Balanced				Balanced
			6				0
	% Demand	Trips			% Demand	Trips	
Retail	38%	6		Retail	4%	0	

LAND USE B - RESIDENTIAL

ITE LUC: 220
Size: 250 Units

	Total	Internal	External
Enter	70	26	44
Exit	60	3	57
Total	130	29	101
%	100%	22%	78%

LAND USE C - Office

ITE LUC: 495 & 710
Size: 25K SF School Admin & 25K SF Recreational

	Total	Internal	External
Enter	15	6	9
Exit	12	0	12
Total	27	6	21
%	100%	23%	77%

B to C				C to B			
	% Demand	Trips			% Demand	Trips	
Retail	0%	0		Retail	0%	0	
			Balanced				Balanced
			0				0
	% Demand	Trips			% Demand	Trips	
Retail	0%	0		Retail	0%	0	

Net External Trips for Multi-Use Development

	Land Use A	Land Use B	Land Use C	Total
Enter	1020	44	9	1073
Exit	912	57	12	981
Total	1932	101	21	2054
Single-Use Trip Gen Est.	1967	130	27	2124
Internal Capture Rate				3.30%

Trip Generation Summary [a]
The Shoppes at Maynard Crossing

Location/Approach	Trips								
	Residential [b]	Office		Retail [e]	Retail Internal Capture	Pass-By [f]	Diverted Linked [g]	Residential and Office Internal Capture	Total Net External Trips
		Recreational Community Center [c]	School Administration [d]						
Weekday Morning Peak Hour									
Entering	26	34	34	207	-10	-30	-20	-13	278
Exiting	102	18	5	127	-12	-17	-11	-10	230
Total	128	52	39	334	-22	-47	-31	-23	508
Weekday Afternoon Peak Hour									
Entering	101	34	6	663	-6	-99	-66	-45	753
Exiting	54	35	31	719	-44	-101	-67	-8	787
Total	155	69	37	1,382	-50	-200	-133	-53	1,540
Saturday Midday Peak Hour									
Entering	70	15		1,023	-3	-153	-102	-32	1,073
Exiting	60	12		944	-32	-137	-91	-3	981
Total	130	27		1,967	-35	-290	-193	-35	2,054
Weekday Daily	1,663	851	277	15,277	-698	-2,187	-1,458	-721	16,649
Saturday Daily	1,598	229		20,274	-589	-2,953	-1,969	-594	20,918

a. Source: Institute of Transportation Engineers (ITE) Trip Generation Handbook, 9th Edition, 2012.

b. ITE LUC 220 trip rates applied to 250 Units.

c. ITE LUC 495 trip rate applied to 25,150 SF of recreational community center.

d. ITE LUC 710 trip rate applied to 25,150 SF of school administration office.

e. ITE LUC 820 trip rates applied to 348,109 SF of retail space.

f. Pass-by trips factor of 15% applied to retail trips.

g. Diverted-linked trip factor of 10% applied to retail trips.

Net External Trip Generation Comparison

Location/Approach	Net External Trip Generation [a]		
	Previous Proposed Project [b]		Proposed Project
	Phase I Redevelopment	*Phase II Redevelopment*	
Weekday Morning Peak Hour			
Entering	224	311	278
Exiting	146	68	230
Total	370	379	508
Weekday Afternoon Peak Hour			
Entering	515	55	753
Exiting	549	247	787
Total	1,064	302	1,540
Saturday Midday Peak Hour			
Entering	632	14	1,073
Exiting	586	26	981
Total	1,218	40	2,054
Weekday Daily	11,982	1,922	16,649
Saturday Daily	17,136	386	20,918

a. Net external trip equals the total generated trip minus the internal capture. It does include the pass-by and diverted linked trips.

b. From the preliminary traffic impact and access study of "129 Parker Street Redevelopment" conducted by Vanasse & Associates, Inc. in 2006.

Trip Assignment Worksheets

Maynard town Place of Residence to Place of Work
2000 Census Work Flow for Workers 16 Years and Older

	Workers 16 years old and over	
	Number	Percent
Total Residents in Maynard town	5,837	100.00%
Where Maynard town Residents Work		
Massachusetts	**5,809**	**99.52%**
Maynard town Middlesex Co. MA	**1,002**	**17.17%**
Acton town Middlesex Co. MA	371	6.36%
Andover town Essex Co. MA	40	0.69%
Arlington town Middlesex Co. MA	11	0.19%
Ashland town Middlesex Co. MA	10	0.17%
Avon town Norfolk Co. MA	5	0.09%
Ayer town Middlesex Co. MA	72	1.23%
Bedford town Middlesex Co. MA	136	2.33%
Belmont town Middlesex Co. MA	23	0.39%
Beverly city Essex Co. MA	6	0.10%
Billerica town Middlesex Co. MA	44	0.75%
Bolton town Worcester Co. MA	19	0.33%
Boston city Suffolk Co. MA	387	6.63%
Boxbor. town Middlesex Co. MA	70	1.20%
Braintree town Norfolk Co. MA	10	0.17%
Brookline town Norfolk Co. MA	8	0.14%
Burlington town Middlesex Co. MA	139	2.38%
Cambridge city Middlesex Co. MA	189	3.24%
Canton town Norfolk Co. MA	9	0.15%
Chelmsford town Middlesex Co. MA	27	0.46%
Clinton town Worcester Co. MA	19	0.33%
Concord town Middlesex Co. MA	352	6.03%
Dracut town Middlesex Co. MA	6	0.10%
Everett city Middlesex Co. MA	10	0.17%
Foxbor. town Norfolk Co. MA	9	0.15%
Framingham town Middlesex Co. MA	203	3.48%
Georgetown town Essex Co. MA	12	0.21%
Harvard town Worcester Co. MA	7	0.12%
Holliston town Middlesex Co. MA	8	0.14%
Hopkinton town Middlesex Co. MA	14	0.24%
Hudson town Middlesex Co. MA	99	1.70%
Lancaster town Worcester Co. MA	12	0.21%
Lawrence city Essex Co. MA	18	0.31%
Lexington town Middlesex Co. MA	130	2.23%
Lincoln town Middlesex Co. MA	52	0.89%
Littleton town Middlesex Co. MA	95	1.63%
Lowell city Middlesex Co. MA	70	1.20%
Lunenburg town Worcester Co. MA	8	0.14%
Marlbor. city Middlesex Co. MA	237	4.06%
Medford city Middlesex Co. MA	27	0.46%
Melrose city Middlesex Co. MA	37	0.63%
Middleton town Essex Co. MA	7	0.12%
Milford town Worcester Co. MA	6	0.10%
Natick town Middlesex Co. MA	47	0.81%
Needham town Norfolk Co. MA	21	0.36%

Prepared by the Massacusetts Division of Unemployment Assistance, Economic Analysis Department.
Source: U.S. Census Bureau
Internet Release data:July 25, 2003

Newton city Middlesex Co. MA	144	2.47%
North Andover town Essex Co. MA	16	0.27%
North Reading town Middlesex Co. MA	8	0.14%
Northbor. town Worcester Co. MA	8	0.14%
Norwood town Norfolk Co. MA	15	0.26%
Oxford town Worcester Co. MA	6	0.10%
Paxton town Worcester Co. MA	20	0.34%
Peabody city Essex Co. MA	5	0.09%
Quincy city Norfolk Co. MA	13	0.22%
Revere city Suffolk Co. MA	11	0.19%
Shrewsbury town Worcester Co. MA	26	0.45%
Somerville city Middlesex Co. MA	66	1.13%
Southbor. town Worcester Co. MA	39	0.67%
Stoneham town Middlesex Co. MA	15	0.26%
Stow town Middlesex Co. MA	180	3.08%
Sturbridge town Worcester Co. MA	29	0.50%
Sudbury town Middlesex Co. MA	188	3.22%
Tewksbury town Middlesex Co. MA	19	0.33%
Tyngsbor. town Middlesex Co. MA	6	0.10%
Wakefield town Middlesex Co. MA	25	0.43%
Waltham city Middlesex Co. MA	375	6.42%
Watertown city Middlesex Co. MA	36	0.62%
Wayland town Middlesex Co. MA	42	0.72%
Wellesley town Norfolk Co. MA	58	0.99%
Westbor. town Worcester Co. MA	90	1.54%
Westford town Middlesex Co. MA	91	1.56%
Weston town Middlesex Co. MA	32	0.55%
Westwood town Norfolk Co. MA	8	0.14%
Wilmington town Middlesex Co. MA	18	0.31%
Winchester town Middlesex Co. MA	16	0.27%
Woburn city Middlesex Co. MA	78	1.34%
Worcester city Worcester Co. MA	42	0.72%

Mew England States and New York	28	0.48%
Connecticut	7	0.12%
Farmington town Hartford Co. CT	7	0.12%
New Hampshire	21	0.36%
Nashua city Hillsborough Co. NH	21	0.36%

Prepared by the Massacusetts Division of Unemployment Assistance, Economic Analysis Department.
Source: U.S. Census Bureau
Internet Release data:July 25, 2003

Site Generated Trip Distribution - Weekday AM Peak Hour

Intersection		*Residential*						Site Generated Net External Trips		Enter 17		Exit 93	
		EB			WB			NB			SB		
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Parker St at	Vose Hill Rd												
	Old Marlboro Rd								5			26	
	Prop Main (South) Drive	67		26				5					6
	B Street								67			6	
	Prop Small (North) Drive/South St								67			6	6
	Field St/North St								67			12	
	Great Rd (Rt. 117)			3	2			14	41	12		7	
	Walnut St								41			7	
	Waltham St			4				21	20			4	
Great Rd at	Sudbury St		3			14							
	Main St												

Intersection		*Office*						Site Generated Net External Trips		Enter 64		Exit 22	
		EB			WB			NB			SB		
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Parker St at	Vose Hill Rd												
	Old Marlboro Rd								16			6	
	Prop Main (South) Drive	12		5				14	2			1	19
	B Street								13			20	
	Prop Small (North) Drive/South St	4		1				2	12			19	29
	Field St/North St								16			48	
	Great Rd (Rt. 117)			10	6			4	11	2		32	
	Walnut St								11			32	
	Waltham St			24				8	3			8	
Great Rd at	Sudbury St		10			4							
	Main St												

Intersection		*Retail*						Site Generated Net External Trips (EXCLUDE pass-by & diverted)		Enter 147		Exit 87	
		EB			WB			NB			SB		
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Parker St at	Vose Hill Rd												
	Old Marlboro Rd								44			26	
	Prop Main (South) Drive	43		23				40	4			3	41
	B Street								47			44	
	Prop Small (North) Drive/South St	18		3				4	43			41	62
	Field St/North St								61			103	
	Great Rd (Rt. 117)			25	18			15	36	10		60	
	Walnut St								36			60	
	Waltham St			44				26	10			16	
Great Rd at	Sudbury St		25			15							
	Main St												

Intersection		Total						Site Generated Net External Trips (EXCLUDE Pass-By & Diverted-Linked)		Enter 228		Exit 202	
		EB			WB			NB			SB		
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Parker St at	Vose Hill Rd	0	0	0	0	0	0	0	0	0	0	0	0
	Old Marlboro Rd	0	0	0	0	0	0	0	65	0	0	58	0
	Prop Main (South) Drive	121	0	54	0	0	0	59	6	0	0	3	66
	B Street	0	0	0	0	0	0	0	127	0	0	70	0
	Prop Small (North) Drive/South St	23	0	3	0	0	0	6	121	0	0	66	97
	Field St/North St	0	0	0	0	0	0	0	144	0	0	163	0
	Great Rd (Rt. 117)	0	0	38	26	0	0	32	87	25	0	100	0
	Walnut St	0	0	0	0	0	0	0	87	0	0	100	0
	Waltham St	0	0	72	0	0	0	55	32	0	0	27	0
Great Rd at	Sudbury St	0	38	0	0	32	0	0	0	0	0	0	0
	Main St	0	0	0	0	0	0	0	0	0	0	0	0

Site Generated Trip Distribution - Weekday PM Peak Hour

Intersection		*Residential*						Site Generated Net External Trips		Enter 68		Exit 49	
		EB			WB			NB			SB		
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Parker St at	Vose Hill Rd												
	Old Marlboro Rd								19			14	
	Prop Main (South) Drive	35		14				19					24
	B Street								35			24	
	Prop Small (North) Drive/South St								35			24	24
	Field St/North St								35			49	
	Great Rd (Rt. 117)			10	9			7	22	6		30	
	Walnut St								22			30	
	Waltham St			16				11	10			14	
Great Rd at	Sudbury St		10			7							
	Main St												

Intersection		Office						Site Generated Net External Trips		Enter 28		Exit 63	
		EB			WB			NB			SB		
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Parker St at	Vose Hill Rd												
	Old Marlboro Rd								7			16	
	Prop Main (South) Drive	33		14				6	1			2	8
	B Street								34			10	
	Prop Small (North) Drive/South St	14		2				1	33			8	13
	Field St/North St								47			21	
	Great Rd (Rt. 117)			4	3			10	32	6		14	
	Walnut St								32			14	
	Waltham St			10				24	8			3	
Great Rd at	Sudbury St		4			10							
	Main St												

Intersection		Retail			Site Generated Net External Trips (EXCLUDE pass-by & diverted)					Enter 492		Exit 507	
		EB			WB			NB			SB		
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Parker St at	Vose Hill Rd												
	Old Marlboro Rd								148			152	
	Prop Main (South) Drive	248		137				133	15			15	138
	B Street								263			153	
	Prop Small (North) Drive/South St	106		15				15	248			138	207
	Field St/North St								355			344	
	Great Rd (Rt. 117)			84	59			86	208	61		202	
	Walnut St								208			202	
	Waltham St			148				152	56			54	
Great Rd at	Sudbury St		84			86							
	Main St												

Intersection		Total			Site Generated Net External Trips (EXCLUDE Pass-By & Diverted-Linked)					Enter 588		Exit 619	
		EB			WB			NB			SB		
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Parker St at	Vose Hill Rd	0	0	0	0	0	0	0	0	0	0	0	0
	Old Marlboro Rd	0	0	0	0	0	0	0	174	0	0	182	0
	Prop Main (South) Drive	317	0	165	0	0	0	158	15	0	0	17	171
	B Street	0	0	0	0	0	0	0	332	0	0	187	0
	Prop Small (North) Drive/South St	121	0	17	0	0	0	15	317	0	0	171	244
	Field St/North St	0	0	0	0	0	0	0	437	0	0	414	0
	Great Rd (Rt. 117)	0	0	98	70	0	0	104	261	73	0	246	0
	Walnut St	0	0	0	0	0	0	0	261	0	0	246	0
	Waltham St	0	0	174	0	0	0	187	74	0	0	72	0
Great Rd at	Sudbury St	0	98	0	0	104	0	0	0	0	0	0	0
	Main St	0	0	0	0	0	0	0	0	0	0	0	0

Site Generated Trip Distribution - Saturday Mid-Day Peak Hour

Intersection		*Residential*						Site Generated Net External Trips		Enter 44		Exit 57	
		EB			WB			NB			SB		
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Parker St at	Vose Hill Rd												
	Old Marlboro Rd								12			16	
	Prop Main (South) Drive	41		16				12					16
	B Street								41			16	
	Prop Small (North) Drive/South St								41			16	16
	Field St/North St								41			32	
	Great Rd (Rt. 117)			7	6			9	25	7		19	
	Walnut St								25			19	
	Waltham St			10				13	12			9	
Great Rd at	Sudbury St		7			9							
	Main St												

Intersection		Office						Site Generated Net External Trips		Enter 9		Exit 12	
		EB			WB			NB			SB		
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Parker St at	Vose Hill Rd												
	Old Marlboro Rd								2			3	
	Prop Main (South) Drive	6		3				2	0			0	3
	B Street								7			3	
	Prop Small (North) Drive/South St	3		0				0	6			3	4
	Field St/North St								9			7	
	Great Rd (Rt. 117)			1	1			2	6	1		5	
	Walnut St								6			5	
	Waltham St			3				5	1			1	
Great Rd at	Sudbury St		1			2							
	Main St												

Intersection		Retail			Site Generated Net External Trips (EXCLUDE pass-by & diverted)					Enter 765		Exit 684	
		EB			WB			NB			SB		
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Parker St at	Vose Hill Rd												
	Old Marlboro Rd								230			205	
	Prop Main (South) Drive	335		185				207	23			21	214
	B Street								358			235	
	Prop Small (North) Drive/South St	144		21				23	335			214	321
	Field St/North St								479			536	
	Great Rd (Rt. 117)			130	92			116	280	82		314	
	Walnut St								280			314	
	Waltham St			230				205	75			84	
Great Rd at	Sudbury St		130			116							
	Main St												

Intersection		Total			Site Generated Net External Trips (EXCLUDE Pass-By & Diverted-Linked)					Enter 818		Exit 753	
		EB			WB			NB			SB		
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Parker St at	Vose Hill Rd	0	0	0	0	0	0	0	0	0	0	0	0
	Old Marlboro Rd	0	0	0	0	0	0	0	244	0	0	224	0
	Prop Main (South) Drive	383	0	203	0	0	0	221	23	0	0	21	233
	B Street	0	0	0	0	0	0	0	406	0	0	254	0
	Prop Small (North) Drive/South St	146	0	21	0	0	0	23	383	0	0	233	341
	Field St/North St	0	0	0	0	0	0	0	529	0	0	574	0
	Great Rd (Rt. 117)	0	0	138	98	0	0	127	312	91	0	338	0
	Walnut St	0	0	0	0	0	0	0	312	0	0	338	0
	Waltham St	0	0	243	0	0	0	223	89	0	0	94	0
Great Rd at	Sudbury St	0	138	0	0	127	0	0	0	0	0	0	0
	Main St	0	0	0	0	0	0	0	0	0	0	0	0

Retail Trip Distribution, Maynard, MA

Town	Population (2010)[1]	Portion in 10-min. Drive	Portion in 20-min. Drive	Portion in 30-min. Drive	Factor	∑ Factor x Population x Portion of Town[2]	% by Town	Road Selection					Trip Distribution				
								Rt 27 (North of the Site)	Rt 27 (South of the Site)	Rt 62 (East of the Site)	Rt 117 (West of the Site)	Rt 117 (East of the Site)	% of Town via Rt 27 North	% of Town via Rt 27 South	% of Town via Rt 62 East	% of Town via Rt 117 West	% of Town via Rt 117 East
Shrewsbury	35,608	0%	0%	7%	0.05	125	0.1				125					100%	
Northborough	14,155	0%	0%	40%	0.05	283	0.3				283					100%	
Westborough	18,272	0%	0%	20%	0.01	37	0.0				37					100%	
Hopkinton	14,925	0%	0%	5%	0.05	37	0.0				37					100%	
Ashland	16,593	0%	0%	70%	0.05	581	0.6		290		290			50%		50%	
Sherborn	4,119	0%	0%	6%	0.05	12	0.0		12					100%			
Natick	33,006	0%	0%	80%	0.01	264	0.3		264					100%			
Wellesley	27,982	0%	0%	60%	0.05	839	0.8		420			420		50%			50%
Needham	28,886	0%	0%	6%	0.01	17	0.0		17					100%			
Newton	85,146	0%	0%	50%	0.01	426	0.4		426					100%			
Waltham	60,632	0%	0%	85%	0.05	2,577	2.5		1,288			1,288		50%			50%
Belmont	24,729	0%	0%	6%	0.01	15	0.0					15					100%
Arlington	42,844	0%	0%	3%	0.01	13	0.0			13					100%		
Lexington	31,394	0%	0%	70%	0.05	1,099	1.1			1,099					100%		
Bedford	13,320	0%	0%	90%	0.05	599	0.6			599					100%		
Billerica	40,243	0%	0%	4%	0.05	80	0.1			80					100%		
Chelmsford	33,802	0%	0%	50%	0.05	845	0.8	845					100%				
Westford	21,951	0%	0%	70%	0.05	768	0.7	768					100%				
Groton	10,646	0%	0%	30%	0.05	160	0.2	160					100%				
Ayer	7,427	0%	0%	90%	0.05	334	0.3	334					100%				
Shirley	7,211	0%	0%	4%	0.05	14	0.0	14					100%				
Lancaster	8,055	0%	0%	80%	0.05	322	0.3				322					100%	
Clinton	13,606	0%	0%	85%	0.05	578	0.6				578					100%	
Boylston	4,355	0%	0%	35%	0.05	76	0.1				76					100%	
Berlin	2,866	0%	2%	100%	0.3	860	0.8				860					100%	
Marlborough	38,499	0%	30%	100%	0.3	11,550	11.2		11,550					100%			
Southborough	9,767	0%	0%	100%	0.3	2,930	2.8		1,465		1,465			50%		50%	
Framingham	68,318	0%	45%	100%	0.01	683	0.7		683					100%			
Weston	11,261	0%	20%	100%	0.05	563	0.5		282			282		50%			50%
Lincoln	6,362	0%	70%	100%	0.3	1,909	1.9					1,909					100%
Carlisle	4,852	0%	0%	95%	0.05	230	0.2	115		115			50%		50%		
Littleton	8,924	0%	25%	100%	0.3	2,677	2.6	2,677					100%				
Harvard	6,520	0%	20%	100%	0.3	1,956	1.9	1,956					100%				
Bolton	4,897	0%	55%	100%	0.3	1,469	1.4				1,469					100%	
Hudson	19,063	0%	70%	100%	0.3	5,719	5.6		1,144		4,575			20%		80%	
Wayland	12,994	0%	85%	100%	0.3	3,898	3.8		2,339			1,559		60%			40%
Concord	17,668	20%	95%	100%	0.7	12,368	12.0			8,657		3,710			70%		30%
Acton	21,924	40%	100%	100%	0.7	15,347	14.9	14,579		767			95%		5%		
Boxborough	4,996	0%	100%	100%	0.7	3,497	3.4	3,497					100%				
Stow	6,590	25%	100%	100%	0.7	4,613	4.5				4,613					100%	
Sudbury	17,659	60%	100%	100%	0.7	12,361	12.0		9,889			2,472		80%			20%
Maynard	10,106	100%	100%	100%	1	10,106	9.8	6,367	505		2,527	707	63%	5%		25%	7%
Total						*102,839*	*100*	*31,314*	*30,574*	*11,331*	*17,257*	*12,362*					
Percentage of New Trips Coming to/from Site:								**30%**	**30%**	**11%**	**17%**	**12%**					

[1] - US Census Bureau

[2] - Within 30-minute driving time to/from site

Regional Route Distribution - Residential

Maynard town Place of Residence to Place of Work [a]	Number	Percent	Regional Route Distribution					
			% Using Rt 27 (North of the Site)	% Using Rt 27 (South of the Site)	% Using Rt 62 (East of the Site)	% Using Rt 117 (West of the Site)	% Using Rt 117 (East of the Site)	% Using Summer St/ Waltham St (North of the Site)
Maynard town Middlesex Co. MA	1,002	17.17%	5.00	1.00	4.00	4.00	1.58	1.59
Acton town Middlesex Co. MA	371	6.36%	6.36					
Andover town Essex Co. MA	40	0.69%	0.69					
Arlington town Middlesex Co. MA	11	0.19%			0.19			
Ashland town Middlesex Co. MA	10	0.17%		0.17				
Avon town Norfolk Co. MA	5	0.09%		0.09				
Ayer town Middlesex Co. MA	72	1.23%	1.23					
Bedford town Middlesex Co. MA	136	2.33%			2.33			
Belmont town Middlesex Co. MA	23	0.39%					0.39	
Beverly city Essex Co. MA	6	0.10%					0.10	
Billerica town Middlesex Co. MA	44	0.75%			0.75			
Bolton town Worcester Co. MA	19	0.33%				0.33		
Boston city Suffolk Co. MA	387	6.63%		6.63				
Boxbor. town Middlesex Co. MA	70	1.20%	1.20					
Braintree town Norfolk Co. MA	10	0.17%		0.17				
Brookline town Norfolk Co. MA	8	0.14%		0.14				
Burlington town Middlesex Co. MA	139	2.38%			2.38			
Cambridge city Middlesex Co. MA	189	3.24%		1.62	1.62			
Canton town Norfolk Co. MA	9	0.15%		0.15				
Chelmsford town Middlesex Co. MA	27	0.46%	0.46					
Clinton town Worcester Co. MA	19	0.33%				0.33		
Concord town Middlesex Co. MA	352	6.03%			4.22		1.81	
Dracut town Middlesex Co. MA	6	0.10%	0.10					
Everett city Middlesex Co. MA	10	0.17%			0.09		0.09	
Foxbor. town Norfolk Co. MA	9	0.15%		0.15				
Framingham town Middlesex Co. MA	203	3.48%		3.48				
Georgetown town Essex Co. MA	12	0.21%	0.21					
Harvard town Worcester Co. MA	7	0.12%	0.12					
Holliston town Middlesex Co. MA	8	0.14%				0.14		
Hopkinton town Middlesex Co. MA	14	0.24%				0.24		
Hudson town Middlesex Co. MA	99	1.70%				1.70		
Lancaster town Worcester Co. MA	12	0.21%				0.21		
Lawrence city Essex Co. MA	18	0.31%	0.31					
Lexington town Middlesex Co. MA	130	2.23%			2.23			
Lincoln town Middlesex Co. MA	52	0.89%					0.89	
Littleton town Middlesex Co. MA	95	1.63%	1.63					
Lowell city Middlesex Co. MA	70	1.20%	1.20					
Lunenburg town Worcester Co. MA	8	0.14%	0.14					
Marlbor. city Middlesex Co. MA	237	4.06%		4.06				
Medford city Middlesex Co. MA	27	0.46%			0.23		0.23	
Melrose city Middlesex Co. MA	37	0.63%			0.32		0.32	
Middleton town Essex Co. MA	7	0.12%			0.06		0.06	
Milford town Worcester Co. MA	6	0.10%				0.10		
Natick town Middlesex Co. MA	47	0.81%		0.81				
Needham town Norfolk Co. MA	21	0.36%		0.36				
Newton city Middlesex Co. MA	144	2.47%		2.47				
North Andover town Essex Co. MA	16	0.27%	0.27					
North Reading town Middlesex Co. MA	8	0.14%			0.07		0.07	
Northbor. town Worcester Co. MA	8	0.14%				0.14		
Norwood town Norfolk Co. MA	15	0.26%			0.26			
Oxford town Worcester Co. MA	6	0.10%				0.10		
Paxton town Worcester Co. MA	20	0.34%				0.34		
Peabody city Essex Co. MA	5	0.09%			0.09			
Quincy city Norfolk Co. MA	13	0.22%		0.22				
Revere city Suffolk Co. MA	11	0.19%		0.19				
Shrewsbury town Worcester Co. MA	26	0.45%				0.45		
Somerville city Middlesex Co. MA	66	1.13%			1.13			
Southbor. town Worcester Co. MA	39	0.67%		0.33		0.33		
Stoneham town Middlesex Co. MA	15	0.26%			0.13	0.13		
Stow town Middlesex Co. MA	180	3.08%				3.08		
Sturbridge town Worcester Co. MA	29	0.50%				0.50		
Sudbury town Middlesex Co. MA	188	3.22%		1.61			1.61	
Tewksbury town Middlesex Co. MA	19	0.33%	0.33					
Tyngsbor. town Middlesex Co. MA	6	0.10%	0.10					
Wakefield town Middlesex Co. MA	25	0.43%					0.43	
Waltham city Middlesex Co. MA	375	6.42%		3.21			3.21	
Watertown city Middlesex Co. MA	36	0.62%		0.31			0.31	
Wayland town Middlesex Co. MA	42	0.72%		0.43			0.29	
Wellesley town Norfolk Co. MA	58	0.99%		0.50			0.50	
Westbor. town Worcester Co. MA	90	1.54%				1.54		
Westford town Middlesex Co. MA	91	1.56%	1.56					
Weston town Middlesex Co. MA	32	0.55%		0.27			0.27	
Westwood town Norfolk Co. MA	8	0.14%				0.14		
Wilmington town Middlesex Co. MA	18	0.31%			0.15		0.15	
Winchester town Middlesex Co. MA	16	0.27%			0.14		0.14	
Woburn city Middlesex Co. MA	78	1.34%			0.67		0.67	
Worcester city Worcester Co. MA	42	0.72%				0.72		
Farmington town Hartford Co. CT	7	0.12%				0.12		
Nashua city Hillsborough Co. NH	21	0.36%	0.36					
Total Residents in Maynard town	5,837	100.00%	21%	28%	21%	15%	13%	2%

a. 2000 Census Work Flow for Workers 16 Years and Older

Regional Route Distribution - Office

Residence	Number	Percent	Regional Route Distribution					
			Using Rt 27 (North of the Site)	Using Rt 27 (South of the Site)	Using Rt 62 (East of the Site)	Using Rt 117 (West of the Site)	Using Rt 117 (East of the Site)	Using Summer St/ Waltham St (North of the Site)
			%	%	%	%	%	%
Total	**3,259**	**100%**	34	25	12	16	9	3
Maynard town Middlesex Co. MA	501	15.37%	3.00	1.00	3.00	3.00	2.00	3.00
Acton town Middlesex Co. MA	107	3.28%	3.28					
Andover town Essex Co. MA	32	0.98%	0.98					
Arlington town Middlesex Co. MA	86	2.64%			2.64			
Ayer town Middlesex Co. MA	58	1.78%	1.78					
Boston city Suffolk Co. MA	154	4.73%		4.73				
Boxbor. town Middlesex Co. MA	42	1.29%	1.29					
Cambridge city Middlesex Co. MA	40	1.23%		0.61	0.61			
Chelmsford town Middlesex Co. MA	33	1.01%	1.01					
Clinton town Worcester Co. MA	85	2.61%				2.61		
Concord town Middlesex Co. MA	117	3.59%			2.33		1.26	
Danvers town Essex Co. MA	40	1.23%			0.61		0.61	
Fitchburg city Worcester Co. MA	60	1.84%	1.84					
Framingham town Middlesex Co. MA	120	3.68%		3.68				
Gardner city Worcester Co. MA	46	1.41%	1.41					
Groton town Middlesex Co. MA	34	1.04%	1.04					
Holden town Worcester Co. MA	34	1.04%				1.04		
Hudson town Middlesex Co. MA	84	2.58%				2.58		
Leominster town Worcester Co. MA	94	2.88%	2.88					
Lawrence city Essex Co. MA	32	0.98%	0.98					
Lexington town Middlesex Co. MA	33	1.01%			1.01			
Littleton town Middlesex Co. MA	90	2.76%	2.76					
Lowell city Middlesex Co. MA	53	1.63%	1.63					
Lynn city Essex Co. MA	34	1.04%			0.52		0.52	
Marlbor. city Middlesex Co. MA	159	4.88%		4.88				
Melrose. city Middlesex Co. MA	35	1.07%			0.54		0.54	
Merrimack town Hillsborough Co. NH	45	1.38%	1.38					
Milford town Worcester Co. MA	39	1.20%				1.20		
Natick town Middlesex Co. MA	48	1.47%		1.47				
Newton city Middlesex Co. MA	51	1.56%		1.56				
Northbridge town Worcester Co. MA	30	0.92%				0.92		
Reading town Middlesex Co. MA	32	0.98%			0.49		0.49	
Pepperell town Middlesex Co. MA	80	2.45%	2.45					
Quincy city Norfolk Co. MA	35	1.07%		1.07				
Stow town Middlesex Co. MA	70	2.15%				2.15		
Sudbury town Middlesex Co. MA	102	3.13%		1.56			1.56	
Tyngsbor. town Middlesex Co. MA	32	0.98%	0.98					
Walpole town Norfolk Co. MA	31	0.95%		0.95				
Waltham city Middlesex Co. MA	64	1.96%		0.98			0.98	
Watertown city Middlesex Co. MA	95	2.92%		1.46			1.46	
Wayland town Middlesex Co. MA	36	1.10%		1.10				
Westford town Middlesex Co. MA	59	1.81%	1.81					
Westminster town Worcester Co. MA	47	1.44%	1.44					
Worcester city Worcester Co. MA	85	2.61%				2.61		
Nashua city Hillsborough Co. NH	75	2.30%	2.30					

Source: 2000 U.S. Census Journey to Work Data for the Town of Maynard

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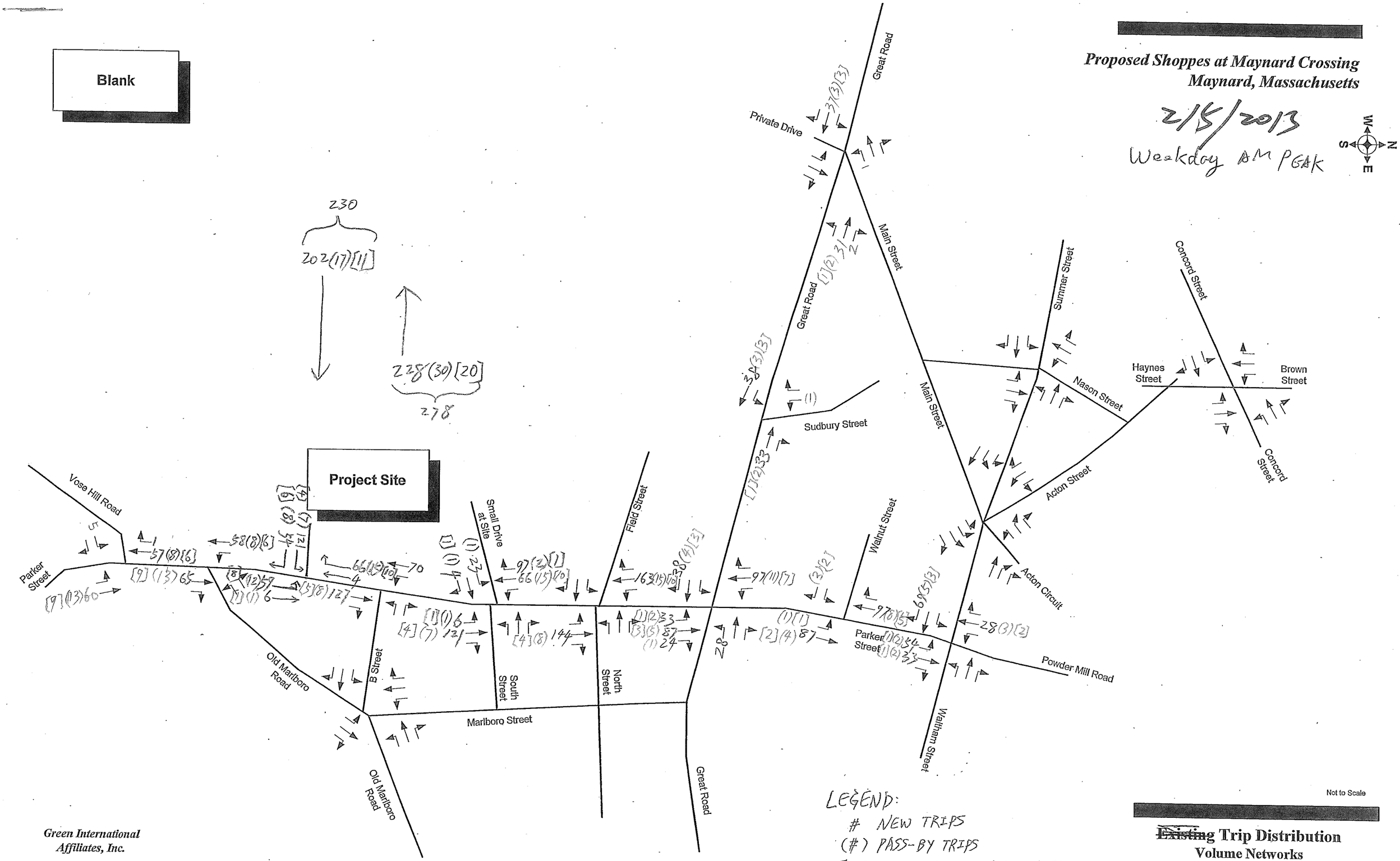
Proposed Shoppes at Maynard Crossing
Maynard, Massachusetts

2/15/2013
Weekday AM PEAK



Green International Affiliates, Inc.

~~Existing~~ Trip Distribution
Volume Networks
Figure â

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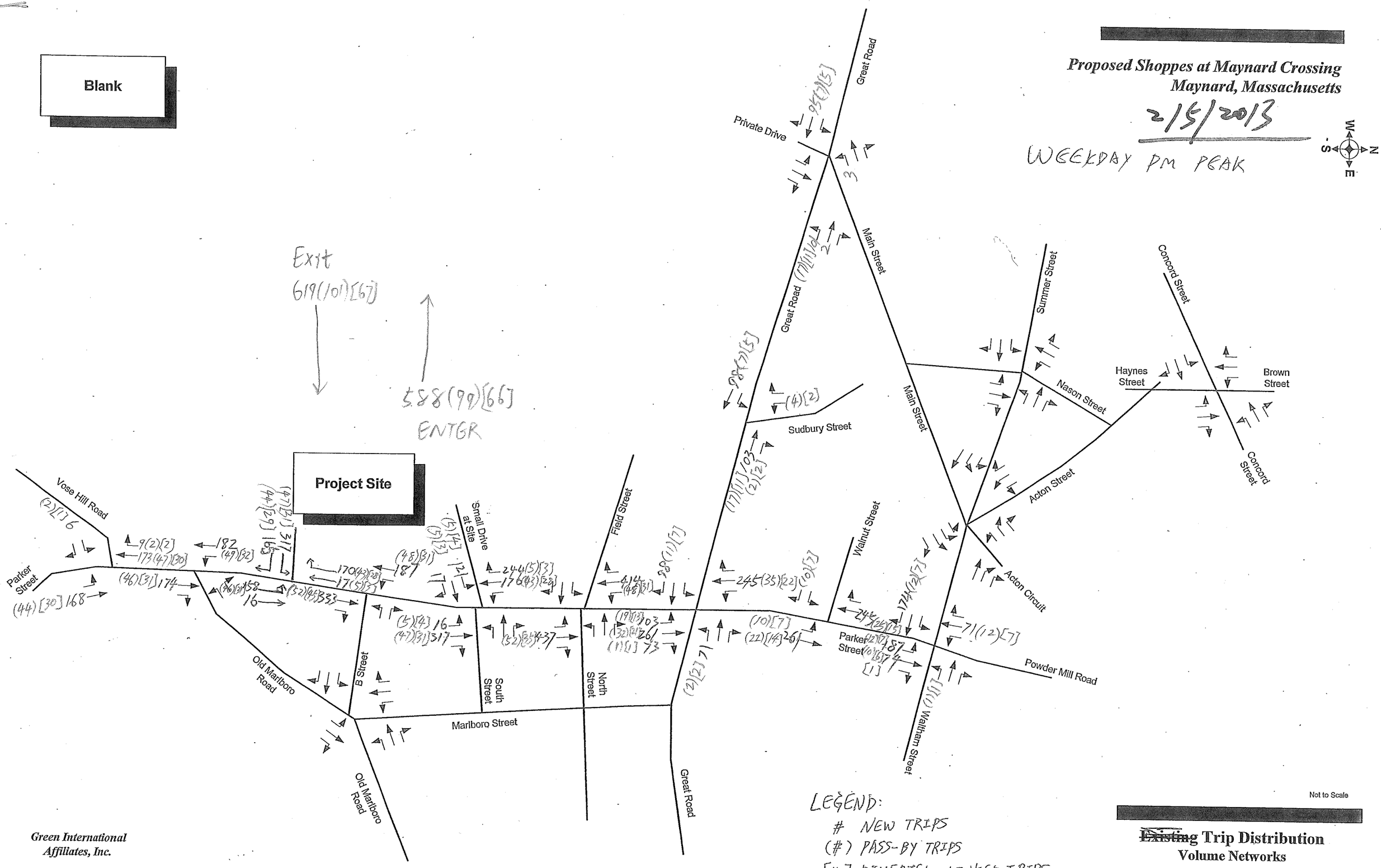
Proposed Shoppes at Maynard Crossing
Maynard, Massachusetts

2/5/2013

WEEKDAY PM PEAK



Green International Affiliates, Inc.

~~Existing~~ Trip Distribution
Volume Networks
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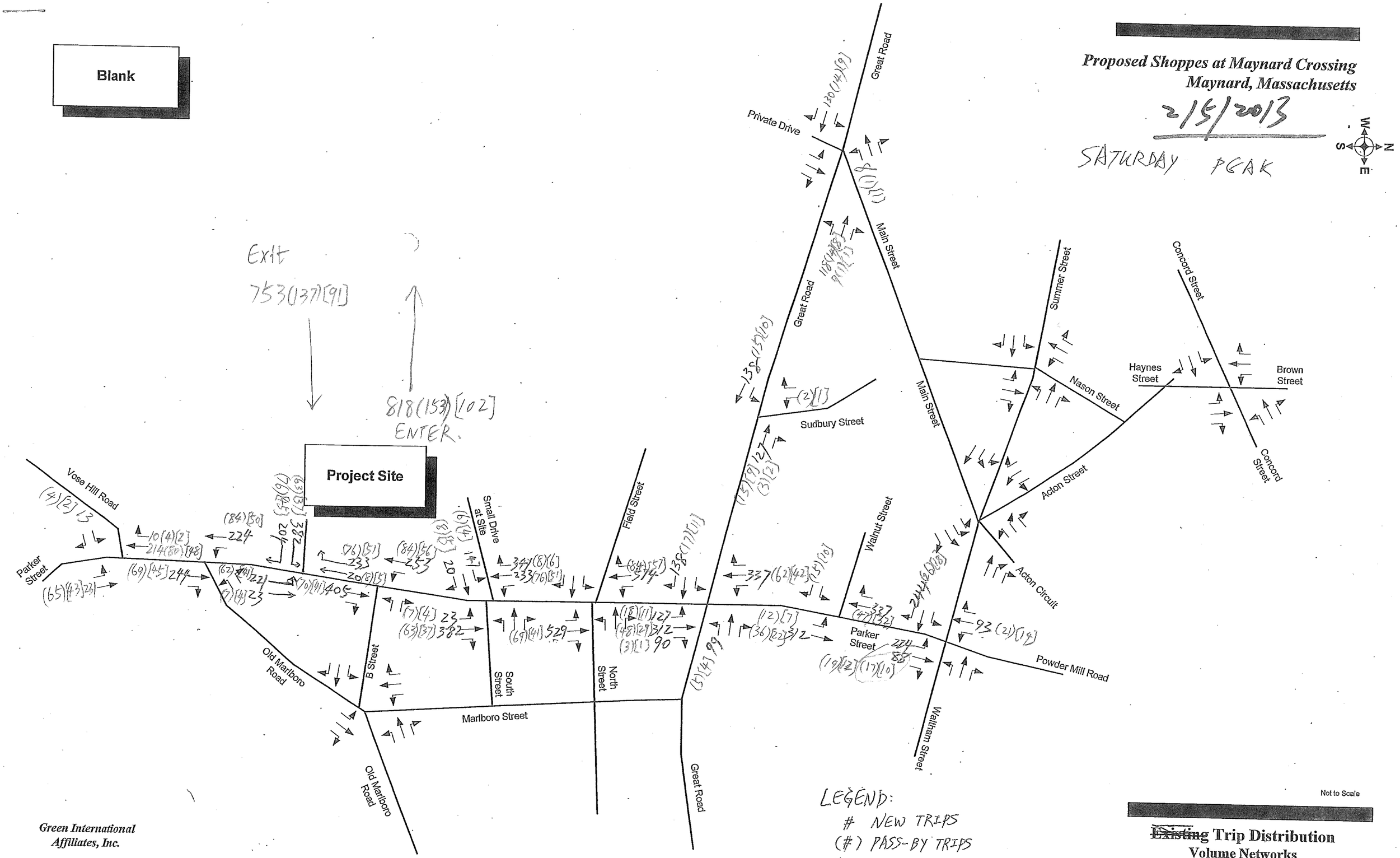
Proposed Shoppes at Maynard Crossing
Maynard, Massachusetts

2/5/2013

SATURDAY PEAK



Not to Scale

Green International Affiliates, Inc.

~~Existing~~ Trip Distribution
Volume Networks
Figure â

Level of Service Computation Sheets

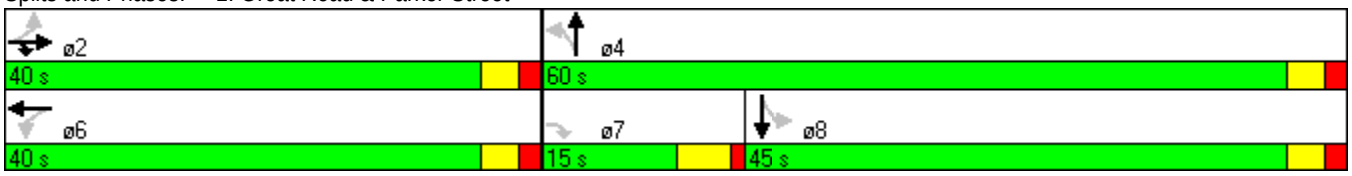
Level of Service Computation Sheets

- **Existing Conditions**

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	75	476	155	16	176	48	126	299	24	77	395	37
Turn Type	Perm		custom	Perm		Free	Perm		Free	Perm		Free
Protected Phases		2	2		6			4			8	
Permitted Phases	2		7	6		Free	4		Free	8		Free
Detector Phase	2	2	2	6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Total Split (s)	40.0	40.0	40.0	40.0	40.0	0.0	60.0	60.0	0.0	45.0	45.0	0.0
Total Split (%)	40.0%	40.0%	40.0%	40.0%	40.0%	0.0%	60.0%	60.0%	0.0%	45.0%	45.0%	0.0%
Yellow Time (s)	2.8	2.8	2.8	2.8	2.8		2.8	2.8		2.8	2.8	
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8		1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6	4.6	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lead/Lag										Lag	Lag	
Lead-Lag Optimize?												
Recall Mode	Min	Min	Min	Min	Min		Min	Min		Min	Min	
Act Effct Green (s)	29.0	29.0	29.0	29.0	29.0	71.7	32.3	32.3	71.7	32.3	32.3	71.7
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40	1.00	0.45	0.45	1.00	0.45	0.45	1.00
v/c Ratio	0.33	0.74	0.32	0.13	0.29	0.03	0.49	0.44	0.02	0.29	0.50	0.04
Control Delay	22.0	29.1	13.8	21.6	19.4	0.0	20.2	15.0	0.0	14.8	15.7	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.0	29.1	13.8	21.6	19.4	0.0	20.2	15.0	0.0	14.8	15.7	0.0
LOS	C	C	B	C	B	A	C	B	A	B	B	A
Approach Delay		24.4			15.9			15.4			13.9	
Approach LOS		C			B			B			B	

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 71.7	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.74	
Intersection Signal Delay: 18.6	Intersection LOS: B
Intersection Capacity Utilization 71.5%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Great Road & Parker Street



Lane Group	ø7
Lane Configurations	
Volume (vph)	
Turn Type	
Protected Phases	7
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	15.0
Total Split (s)	15.0
Total Split (%)	15%
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	139	553	212	24	212	56	148	365	36	100	416	62
v/c Ratio	0.33	0.74	0.32	0.13	0.29	0.03	0.49	0.44	0.02	0.29	0.50	0.04
Control Delay	22.0	29.1	13.8	21.6	19.4	0.0	20.2	15.0	0.0	14.8	15.7	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.0	29.1	13.8	21.6	19.4	0.0	20.2	15.0	0.0	14.8	15.7	0.0
Queue Length 50th (ft)	41	200	37	6	61	0	47	112	0	28	132	0
Queue Length 95th (ft)	65	#465	86	22	143	0	93	162	0	51	212	0
Internal Link Dist (ft)		465			321			895			490	
Turn Bay Length (ft)	80		45	90			95		80	80		75
Base Capacity (vph)	586	1038	878	248	1018	1615	522	1420	1545	514	1237	1695
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.53	0.24	0.10	0.21	0.03	0.28	0.26	0.02	0.19	0.34	0.04

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	75	476	155	16	176	48	126	299	24	77	395	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	12	11	11	12	12	9	12	13	10	12	16
Total Lost time (s)	4.6	4.6	4.6	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1636	1845	1501	1745	1810	1615	1562	1827	1545	1604	1863	1695
Flt Permitted	0.61	1.00	1.00	0.24	1.00	1.00	0.41	1.00	1.00	0.46	1.00	1.00
Satd. Flow (perm)	1042	1845	1501	440	1810	1615	671	1827	1545	773	1863	1695
Peak-hour factor, PHF	0.54	0.86	0.73	0.67	0.83	0.86	0.85	0.82	0.67	0.77	0.95	0.60
Adj. Flow (vph)	139	553	212	24	212	56	148	365	36	100	416	62
RTOR Reduction (vph)	0	0	46	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	139	553	166	24	212	56	148	365	36	100	416	62
Heavy Vehicles (%)	3%	3%	4%	0%	5%	0%	4%	4%	8%	5%	2%	8%
Turn Type	Perm		custom	Perm		Free	Perm		Free	Perm		Free
Protected Phases		2	2		6			4			8	
Permitted Phases	2		7	6		Free	4		Free	8		Free
Actuated Green, G (s)	29.0	29.0	29.0	29.0	29.0	70.5	32.3	32.3	70.5	32.3	32.3	70.5
Effective Green, g (s)	29.0	29.0	29.0	29.0	29.0	70.5	32.3	32.3	70.5	32.3	32.3	70.5
Actuated g/C Ratio	0.41	0.41	0.41	0.41	0.41	1.00	0.46	0.46	1.00	0.46	0.46	1.00
Clearance Time (s)	4.6	4.6	4.6	4.6	4.6		4.6	4.6		4.6	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	429	759	617	181	745	1615	307	837	1545	354	854	1695
v/s Ratio Prot		c0.30	0.11		0.12			0.20			c0.22	
v/s Ratio Perm	0.13			0.05		0.03	0.22		0.02	0.13		0.04
v/c Ratio	0.32	0.73	0.27	0.13	0.28	0.03	0.48	0.44	0.02	0.28	0.49	0.04
Uniform Delay, d1	14.1	17.4	13.7	12.9	13.8	0.0	13.3	12.9	0.0	11.9	13.3	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	3.5	0.2	0.3	0.2	0.0	1.2	0.4	0.0	0.4	0.4	0.0
Delay (s)	14.5	21.0	14.0	13.3	14.0	0.0	14.5	13.3	0.0	12.3	13.8	0.0
Level of Service	B	C	B	B	B	A	B	B	A	B	B	A
Approach Delay (s)		18.3			11.3			12.7			12.0	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	70.5	Sum of lost time (s)	9.2
Intersection Capacity Utilization	71.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	17	0	1	0	0	4	0	398	0	1	571	8
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.71	0.25	0.25	0.25	0.25	0.33	0.25	0.93	0.25	0.25	0.92	0.67
Hourly flow rate (vph)	24	0	4	0	0	12	0	428	0	4	621	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											975	
pX, platoon unblocked	0.87	0.87	0.87	0.87	0.87		0.87					
vC, conflicting volume	1075	1063	627	1067	1069	428	633			428		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1012	998	497	1002	1005	428	504			428		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	87	100	99	100	100	98	100			100		
cM capacity (veh/h)	187	213	502	192	211	631	933			1142		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	28	12	428	637
Volume Left	24	0	0	4
Volume Right	4	12	0	12
cSH	206	631	933	1142
Volume to Capacity	0.14	0.02	0.00	0.00
Queue Length 95th (ft)	12	1	0	0
Control Delay (s)	25.2	10.8	0.0	0.1
Lane LOS	D	B		A
Approach Delay (s)	25.2	10.8	0.0	0.1
Approach LOS	D	B		

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	45.7%	ICU Level of Service	A
Analysis Period (min)	15		
Description: North St EB closed 3:30 PM - 5:30 PM			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	1	0	5	0	419	0	0	550	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.42	0.25	0.95	0.25	0.25	0.97	0.25
Hourly flow rate (vph)	0	0	0	4	0	12	0	441	0	0	567	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											1226	
pX, platoon unblocked	0.94	0.94	0.94	0.94	0.94		0.94					
vC, conflicting volume	1020	1008	567	1008	1008	441	567			441		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	991	978	511	978	978	441	511			441		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	98	100	98	100			100		
cM capacity (veh/h)	210	238	535	218	238	620	1004			1130		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	16	441	567
Volume Left	0	4	0	0
Volume Right	0	12	0	0
cSH	1700	424	1004	1130
Volume to Capacity	0.00	0.04	0.00	0.00
Queue Length 95th (ft)	0	3	0	0
Control Delay (s)	0.0	13.8	0.0	0.0
Lane LOS	A	B		
Approach Delay (s)	0.0	13.8	0.0	0.0
Approach LOS	A	B		

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	38.9%	ICU Level of Service	A
Analysis Period (min)	15		
Description: South St EB closed 3:30 PM - 5:30 PM			

Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (veh/h)	419	18	0	561	12	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.93	0.64	0.25	0.92	0.75	0.38
Hourly flow rate (vph)	451	28	0	610	16	8
Pedestrians	1			1		
Lane Width (ft)	11.0			12.0		
Walking Speed (ft/s)	3.5			3.5		
Percent Blockage	0			0		
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			479		1075	466
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			479		1075	466
tC, single (s)			4.1		6.5	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.3
p0 queue free %			100		93	99
cM capacity (veh/h)			1094		236	601

Direction, Lane #	NB 1	SB 1	SW 1
Volume Total	479	610	24
Volume Left	0	0	16
Volume Right	28	0	8
cSH	1700	1094	296
Volume to Capacity	0.28	0.00	0.08
Queue Length 95th (ft)	0	0	7
Control Delay (s)	0.0	0.0	18.2
Lane LOS			C
Approach Delay (s)	0.0	0.0	18.2
Approach LOS			C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	31	1	1	400	568	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.70	0.25	0.25	0.91	0.93	0.58
Hourly flow rate (vph)	44	4	4	440	611	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1064	617	623			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1064	617	623			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	82	99	100			
cM capacity (veh/h)	248	494	968			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	48	444	623
Volume Left	44	4	0
Volume Right	4	0	12
cSH	259	968	1700
Volume to Capacity	0.19	0.00	0.37
Queue Length 95th (ft)	17	0	0
Control Delay (s)	22.1	0.1	0.0
Lane LOS	C	A	
Approach Delay (s)	22.1	0.1	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	40.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	1	4	415	1	3	549
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.25	0.33	0.94	0.25	0.38	0.95
Hourly flow rate (vph)	4	12	441	4	8	578
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1037	443			445	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1037	443			445	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	98			99	
cM capacity (veh/h)	257	619			1125	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	16	445	586
Volume Left	4	0	8
Volume Right	12	4	0
cSH	458	1700	1125
Volume to Capacity	0.04	0.26	0.01
Queue Length 95th (ft)	3	0	1
Control Delay (s)	13.1	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	13.1	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	1	663	181	86	126	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.25	0.88	0.68	0.69	0.70	0.25
Hourly flow rate (vph)	4	753	266	125	180	4
Pedestrians			4		1	
Lane Width (ft)			12.0		15.0	
Walking Speed (ft/s)			3.5		3.5	
Percent Blockage			0		0	
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	392				1095	329
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	392				1095	329
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				22	99
cM capacity (veh/h)	1176				231	716

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	757	391	184
Volume Left	4	0	180
Volume Right	0	125	4
cSH	1176	1700	235
Volume to Capacity	0.00	0.23	0.78
Queue Length 95th (ft)	0	0	142
Control Delay (s)	0.1	0.0	59.5
Lane LOS	A		F
Approach Delay (s)	0.1	0.0	59.5
Approach LOS			F

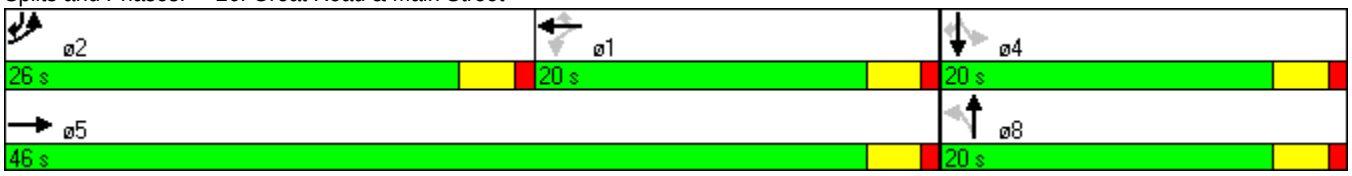
Intersection Summary			
Average Delay	8.3		
Intersection Capacity Utilization	49.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBT	SBR	ø8
Lane Configurations								
Volume (vph)	326	535	201	12	8	0	120	
Turn Type	Prot			Perm	Perm		pm+ov	
Protected Phases	2	5	1			4	2	8
Permitted Phases				1	4		4	
Detector Phase	2	5	1	1	4	4	2	
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	15.0	15.0	12.0	12.0	15.0	15.0	15.0	15.0
Total Split (s)	26.0	46.0	20.0	20.0	20.0	20.0	26.0	20.0
Total Split (%)	39.4%	69.7%	30.3%	30.3%	30.3%	30.3%	39.4%	30%
Yellow Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	
Lead/Lag	Lead		Lag	Lag			Lead	
Lead-Lag Optimize?	Yes						Yes	
Recall Mode	Min	Min	None	None	None	None	Min	None
Act Effct Green (s)	16.3	34.3	10.5	10.5		8.7	17.3	
Actuated g/C Ratio	0.45	0.94	0.29	0.29		0.24	0.48	
v/c Ratio	0.48	0.38	0.40	0.03		0.04	0.18	
Control Delay	11.1	1.9	13.6	8.6		15.6	1.9	
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	11.1	1.9	13.6	8.6		15.6	1.9	
LOS	B	A	B	A		B	A	
Approach Delay		5.4	13.3			3.3		
Approach LOS		A	B			A		

Intersection Summary

Cycle Length: 66
Actuated Cycle Length: 36.3
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.48
Intersection Signal Delay: 6.6 — Intersection LOS: A
Intersection Capacity Utilization 55.5% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 26: Great Road & Main Street



Lane Group	EBL	EBT	WBT	WBR	SBT	SBR
Lane Group Flow (vph)	384	626	231	16	16	140
v/c Ratio	0.48	0.38	0.40	0.03	0.04	0.18
Control Delay	11.1	1.9	13.6	8.6	15.6	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.1	1.9	13.6	8.6	15.6	1.9
Queue Length 50th (ft)	36	0	24	1	2	0
Queue Length 95th (ft)	156	103	113	10	5	14
Internal Link Dist (ft)		376	660		340	
Turn Bay Length (ft)	112			31		95
Base Capacity (vph)	1182	1632	977	766	831	1086
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.38	0.24	0.02	0.02	0.13

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	326	535	1	0	201	12	0	0	0	8	0	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	16	16	12	9	12	9	9	11
Total Lost time (s)	3.7	3.7			3.7	3.7					3.7	3.7
Lane Util. Factor	1.00	1.00			1.00	1.00					1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00	1.00					1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00					1.00	1.00
Frt	1.00	1.00			1.00	0.85					1.00	0.85
Flt Protected	0.95	1.00			1.00	1.00					0.95	1.00
Satd. Flow (prot)	1770	1720			2012	1564					1624	1499
Flt Permitted	0.95	1.00			1.00	1.00					1.00	1.00
Satd. Flow (perm)	1770	1720			2012	1564					1710	1499
Peak-hour factor, PHF	0.85	0.86	0.25	0.25	0.87	0.75	0.92	0.92	0.92	0.50	0.25	0.86
Adj. Flow (vph)	384	622	4	0	231	16	0	0	0	16	0	140
RTOR Reduction (vph)	0	0	0	0	0	8	0	0	0	0	0	78
Lane Group Flow (vph)	384	626	0	0	231	8	0	0	0	0	16	62
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	2%	3%	0%	0%	7%	17%	2%	2%	2%	0%	0%	4%
Turn Type	Prot			Perm		Perm	Perm			Perm		pm+ov
Protected Phases	2	5			1			8			4	2
Permitted Phases				1		1	8			4		4
Actuated Green, G (s)	16.3	30.8			10.8	10.8					1.0	17.3
Effective Green, g (s)	16.3	30.8			10.8	10.8					1.0	17.3
Actuated g/C Ratio	0.42	0.79			0.28	0.28					0.03	0.44
Clearance Time (s)	3.7	3.7			3.7	3.7					3.7	3.7
Vehicle Extension (s)	3.0	3.0			3.0	3.0					3.0	3.0
Lane Grp Cap (vph)	736	1351			554	431					44	803
v/s Ratio Prot	c0.22	c0.36			0.11							0.03
v/s Ratio Perm						0.01					c0.01	0.01
v/c Ratio	0.52	0.46			0.42	0.02					0.36	0.08
Uniform Delay, d1	8.5	1.4			11.6	10.3					18.8	6.3
Progression Factor	1.00	1.00			1.00	1.00					1.00	1.00
Incremental Delay, d2	0.7	0.3			0.5	0.0					5.1	0.0
Delay (s)	9.2	1.7			12.1	10.4					23.8	6.4
Level of Service	A	A			B	B					C	A
Approach Delay (s)		4.5			12.0			0.0			8.2	
Approach LOS		A			B			A			A	

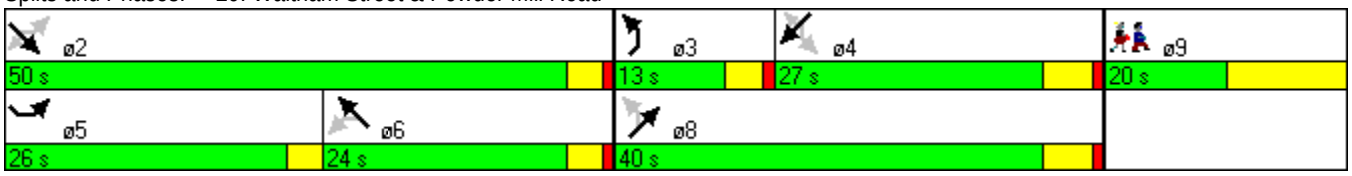
Intersection Summary			
HCM Average Control Delay	6.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	39.2	Sum of lost time (s)	7.4
Intersection Capacity Utilization	55.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWL	SWT	SWR	ø9
Lane Configurations											
Volume (vph)	330	202	240	12	119	197	141	17	130	167	
Turn Type	pm+pt		Perm	Perm		pm+pt		Perm		Perm	
Protected Phases	5	2			6	3	8		4		9
Permitted Phases	2		2	6		8		4		4	
Detector Phase	5	2	2	6	6	3	8	4	4	4	
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	15.0	15.0	15.0	15.0	9.0	15.0	15.0	15.0	15.0	20.0
Total Split (s)	26.0	50.0	50.0	24.0	24.0	13.0	40.0	27.0	27.0	27.0	20.0
Total Split (%)	23.6%	45.5%	45.5%	21.8%	21.8%	11.8%	36.4%	24.5%	24.5%	24.5%	18%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	10.0
All-Red Time (s)	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	
Lead/Lag	Lead			Lag	Lag	Lead		Lag	Lag	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes	Yes		Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)		46.1	46.1		46.1	29.1	28.1		15.0	15.0	
Actuated g/C Ratio		0.55	0.55		0.55	0.35	0.34		0.18	0.18	
v/c Ratio		0.82	0.32		0.17	0.73	0.31		0.63	0.45	
Control Delay		27.5	7.5		10.1	34.7	21.0		41.2	7.8	
Queue Delay		4.4	0.0		0.0	0.0	0.0		0.0	0.0	
Total Delay		31.9	7.5		10.1	34.7	21.0		41.2	7.8	
LOS		C	A		B	C	C		D	A	
Approach Delay		24.2			10.1		29.0		24.0		
Approach LOS		C			B		C		C		

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 83.2	
Natural Cycle: 100	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 23.9	Intersection LOS: C
Intersection Capacity Utilization 71.4%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 29: Waltham Street & Powder Mill Road



Lane Group	SET	SER	NWT	NEL	NET	SWT	SWR
Lane Group Flow (vph)	642	296	183	249	180	189	201
v/c Ratio	0.82	0.32	0.17	0.73	0.31	0.63	0.45
Control Delay	27.5	7.5	10.1	34.7	21.0	41.2	7.8
Queue Delay	4.4	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.9	7.5	10.1	34.7	21.0	41.2	7.8
Queue Length 50th (ft)	250	42	41	98	66	92	0
Queue Length 95th (ft)	#501	87	86	136	113	134	41
Internal Link Dist (ft)	365		548		1021	443	
Turn Bay Length (ft)		90		60			105
Base Capacity (vph)	781	926	1071	342	714	438	562
Starvation Cap Reductn	84	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.92	0.32	0.17	0.73	0.25	0.43	0.36

Intersection Summary

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

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	330	202	240	12	119	28	197	141	16	17	130	167
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	14	12	12	15	12	9	9	12	12	11	11
Grade (%)		3%			-4%			-6%			0%	
Total Lost time (s)		4.0	4.0		4.0		4.0	5.0			5.0	5.0
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frt		1.00	0.85		0.98		1.00	0.98			1.00	0.85
Flt Protected		0.97	1.00		1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)		1914	1575		2034		1624	1687			1748	1561
Flt Permitted		0.71	1.00		0.94		0.40	1.00			0.94	1.00
Satd. Flow (perm)		1408	1575		1926		692	1687			1653	1561
Peak-hour factor, PHF	0.81	0.86	0.81	0.75	0.88	0.88	0.79	0.88	0.80	0.71	0.79	0.83
Adj. Flow (vph)	407	235	296	16	135	32	249	160	20	24	165	201
RTOR Reduction (vph)	0	0	53	0	4	0	0	4	0	0	0	165
Lane Group Flow (vph)	0	642	243	0	179	0	249	176	0	0	189	36
Confl. Peds. (#/hr)	1					1	1			1		
Heavy Vehicles (%)	1%	1%	1%	17%	0%	0%	3%	3%	0%	0%	5%	0%
Turn Type	pm+pt		Perm	Perm			pm+pt			Perm		Perm
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2		2	6			8			4		4
Actuated Green, G (s)		46.1	46.1		46.1		28.1	28.1			15.1	15.1
Effective Green, g (s)		46.1	46.1		46.1		28.1	28.1			15.1	15.1
Actuated g/C Ratio		0.55	0.55		0.55		0.34	0.34			0.18	0.18
Clearance Time (s)		4.0	4.0		4.0		4.0	5.0			5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		780	873		1067		335	570			300	283
v/s Ratio Prot							c0.08	0.10				
v/s Ratio Perm		c0.46	0.15		0.09		c0.17				0.11	0.02
v/c Ratio		0.82	0.28		0.17		0.74	0.31			0.63	0.13
Uniform Delay, d1		15.2	9.8		9.1		22.5	20.4			31.5	28.5
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		7.0	0.2		0.1		8.6	0.3			4.3	0.2
Delay (s)		22.2	10.0		9.2		31.2	20.7			35.7	28.7
Level of Service		C	A		A		C	C			D	C
Approach Delay (s)		18.4			9.2			26.8			32.1	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM Average Control Delay	22.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	83.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	17	149	101	344	346	80
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.71	0.83	0.87	0.97	0.95	0.67
Hourly flow rate (vph)	24	180	116	355	364	119
Pedestrians	4					
Lane Width (ft)	15.0					
Walking Speed (ft/s)	3.5					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					1101	
pX, platoon unblocked						
vC, conflicting volume	1015	428	488			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1015	428	488			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	71	89			
cM capacity (veh/h)	237	622	1081			

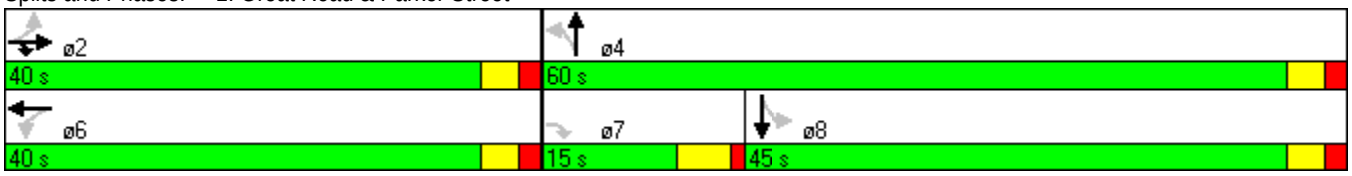
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	203	471	484
Volume Left	24	116	0
Volume Right	180	0	119
cSH	522	1081	1700
Volume to Capacity	0.39	0.11	0.28
Queue Length 95th (ft)	46	9	0
Control Delay (s)	16.2	3.0	0.0
Lane LOS	C	A	
Approach Delay (s)	16.2	3.0	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	67.0%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	140	112	33	552	50	201	337	17	53	373	91
Turn Type	Perm		custom	Perm		Free	Perm		Free	Perm		Free
Protected Phases		2	2		6			4			8	
Permitted Phases	2		7	6		Free	4		Free	8		Free
Detector Phase	2	2	2	6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Total Split (s)	40.0	40.0	40.0	40.0	40.0	0.0	60.0	60.0	0.0	45.0	45.0	0.0
Total Split (%)	40.0%	40.0%	40.0%	40.0%	40.0%	0.0%	60.0%	60.0%	0.0%	45.0%	45.0%	0.0%
Yellow Time (s)	2.8	2.8	2.8	2.8	2.8		2.8	2.8		2.8	2.8	
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8		1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6	4.6	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lead/Lag										Lag	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	None		None	None	
Act Effct Green (s)	35.4	35.4	35.4	35.4	35.4	100.0	55.4	55.4	100.0	55.4	55.4	100.0
Actuated g/C Ratio	0.35	0.35	0.35	0.35	0.35	1.00	0.55	0.55	1.00	0.55	0.55	1.00
v/c Ratio	0.56	0.26	0.20	0.10	1.01	0.04	0.59	0.37	0.02	0.16	0.38	0.09
Control Delay	60.5	24.4	4.9	22.7	71.1	0.0	22.1	13.9	0.0	12.1	14.0	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	60.5	24.4	4.9	22.7	71.1	0.0	22.1	13.9	0.0	12.1	14.0	0.1
LOS	E	C	A	C	E	A	C	B	A	B	B	A
Approach Delay		21.4			63.2			16.4			10.2	
Approach LOS		C			E			B			B	

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 100	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.01	
Intersection Signal Delay: 30.8	Intersection LOS: C
Intersection Capacity Utilization 71.3%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Great Road & Parker Street



Lane Group	ø7
Lane Configurations	
Volume (vph)	
Turn Type	
Protected Phases	7
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	15.0
Total Split (s)	15.0
Total Split (%)	15%
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	40	175	127	40	681	60	245	379	28	68	393	157
v/c Ratio	0.56	0.26	0.20	0.10	1.01	0.04	0.59	0.37	0.02	0.16	0.38	0.09
Control Delay	60.5	24.4	4.9	22.7	71.1	0.0	22.1	13.9	0.0	12.1	14.0	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	60.5	24.4	4.9	22.7	71.1	0.0	22.1	13.9	0.0	12.1	14.0	0.1
Queue Length 50th (ft)	20	79	0	17	~441	0	98	128	0	20	134	0
Queue Length 95th (ft)	40	115	35	37	#567	0	156	189	0	37	199	0
Internal Link Dist (ft)		465			321			895			490	
Turn Bay Length (ft)	80		45	90			95		80	80		75
Base Capacity (vph)	71	666	635	393	673	1615	414	1012	1545	436	1032	1695
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.26	0.20	0.10	1.01	0.04	0.59	0.37	0.02	0.16	0.38	0.09

Intersection Summary

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

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	140	112	33	552	50	201	337	17	53	373	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	12	11	11	12	12	9	12	13	10	12	16
Total Lost time (s)	4.6	4.6	4.6	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1685	1881	1561	1745	1900	1615	1560	1827	1545	1604	1863	1695
Flt Permitted	0.11	1.00	1.00	0.60	1.00	1.00	0.45	1.00	1.00	0.47	1.00	1.00
Satd. Flow (perm)	200	1881	1561	1109	1900	1615	747	1827	1545	787	1863	1695
Peak-hour factor, PHF	0.65	0.80	0.88	0.82	0.81	0.83	0.82	0.89	0.61	0.78	0.95	0.58
Adj. Flow (vph)	40	175	127	40	681	60	245	379	28	68	393	157
RTOR Reduction (vph)	0	0	82	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	40	175	45	40	681	60	245	379	28	68	393	157
Confl. Peds. (#/hr)	1						1					
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	4%	4%	8%	5%	2%	8%
Turn Type	Perm		custom	Perm		Free	Perm		Free	Perm		Free
Protected Phases		2	2		6			4			8	
Permitted Phases	2		7	6		Free	4		Free	8		Free
Actuated Green, G (s)	35.4	35.4	35.4	35.4	35.4	100.0	55.4	55.4	100.0	55.4	55.4	100.0
Effective Green, g (s)	35.4	35.4	35.4	35.4	35.4	100.0	55.4	55.4	100.0	55.4	55.4	100.0
Actuated g/C Ratio	0.35	0.35	0.35	0.35	0.35	1.00	0.55	0.55	1.00	0.55	0.55	1.00
Clearance Time (s)	4.6	4.6	4.6	4.6	4.6		4.6	4.6		4.6	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	71	666	553	393	673	1615	414	1012	1545	436	1032	1695
v/s Ratio Prot		0.09	0.03		c0.36			0.21			0.21	
v/s Ratio Perm	0.20			0.04		0.04	c0.33		0.02	0.09		0.09
v/c Ratio	0.56	0.26	0.08	0.10	1.01	0.04	0.59	0.37	0.02	0.16	0.38	0.09
Uniform Delay, d1	26.1	23.0	21.5	21.6	32.3	0.0	14.8	12.5	0.0	10.9	12.6	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.8	0.2	0.1	0.1	37.7	0.0	2.3	0.2	0.0	0.2	0.2	0.1
Delay (s)	35.9	23.2	21.5	21.8	70.0	0.0	17.1	12.8	0.0	11.1	12.8	0.1
Level of Service	D	C	C	C	E	A	B	B	A	B	B	A
Approach Delay (s)		24.1			62.1			13.8			9.4	
Approach LOS		C			E			B			A	

Intersection Summary			
HCM Average Control Delay	29.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	9.2
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	11	0	1	1	0	4	1	531	1	4	497	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.55	0.25	0.25	0.25	0.25	0.50	0.25	0.92	0.25	0.33	0.91	1.00
Hourly flow rate (vph)	20	0	4	4	0	8	4	577	4	12	546	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											975	
pX, platoon unblocked	0.89	0.89	0.89	0.89	0.89		0.89					
vC, conflicting volume	1172	1166	552	1168	1170	579	558			581		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1132	1125	438	1128	1130	579	445			581		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	87	100	99	98	100	98	100			99		
cM capacity (veh/h)	158	182	556	160	180	519	1005			1003		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	24	12	585	570
Volume Left	20	4	4	12
Volume Right	4	8	4	12
cSH	179	297	1005	1003
Volume to Capacity	0.13	0.04	0.00	0.01
Queue Length 95th (ft)	11	3	0	1
Control Delay (s)	28.2	17.6	0.1	0.3
Lane LOS	D	C	A	A
Approach Delay (s)	28.2	17.6	0.1	0.3
Approach LOS	D	C		

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		
Description: North St EB closed 3:30 PM - 5:30 PM			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	2	1	7	0	534	3	4	498	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.58	0.25	0.91	0.38	0.50	0.91	0.25
Hourly flow rate (vph)	0	0	0	8	4	12	0	587	8	8	547	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											1226	
pX, platoon unblocked	0.92	0.92	0.92	0.92	0.92		0.92					
vC, conflicting volume	1168	1158	547	1154	1154	591	547			595		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1138	1127	462	1123	1123	591	462			595		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	95	98	98	100			99		
cM capacity (veh/h)	158	188	554	168	189	511	1019			991		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	24	595	555
Volume Left	0	8	0	8
Volume Right	0	12	8	0
cSH	1700	261	1019	991
Volume to Capacity	0.00	0.09	0.00	0.01
Queue Length 95th (ft)	0	8	0	1
Control Delay (s)	0.0	20.2	0.0	0.2
Lane LOS	A	C		A
Approach Delay (s)	0.0	20.2	0.0	0.2
Approach LOS	A	C		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	39.4%	ICU Level of Service	A
Analysis Period (min)	15		
Description: South St EB closed 3:30 PM - 5:30 PM			

Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (veh/h)	543	11	7	488	11	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.55	0.58	0.91	0.55	0.38
Hourly flow rate (vph)	590	20	12	536	20	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			610		1161	600
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			610		1161	600
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		91	98
cM capacity (veh/h)			978		215	505

Direction, Lane #	NB 1	SB 1	SW 1
Volume Total	610	548	28
Volume Left	0	12	20
Volume Right	20	0	8
cSH	1700	978	257
Volume to Capacity	0.36	0.01	0.11
Queue Length 95th (ft)	0	1	9
Control Delay (s)	0.0	0.3	20.7
Lane LOS		A	C
Approach Delay (s)	0.0	0.3	20.7
Approach LOS			C

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	18	3	1	508	467	23
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.56	0.75	0.25	0.93	0.93	0.64
Hourly flow rate (vph)	32	4	4	546	502	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1074	520	538			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1074	520	538			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	87	99	100			
cM capacity (veh/h)	245	560	1040			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	36	550	538
Volume Left	32	4	0
Volume Right	4	0	36
cSH	261	1040	1700
Volume to Capacity	0.14	0.00	0.32
Queue Length 95th (ft)	12	0	0
Control Delay (s)	21.0	0.1	0.0
Lane LOS	C	A	
Approach Delay (s)	21.0	0.1	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	2	2	538	0	2	498
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.50	0.93	0.25	0.25	0.91
Hourly flow rate (vph)	4	4	578	0	8	547
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1142	578			578	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1142	578			578	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	99			99	
cM capacity (veh/h)	222	519			1005	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	8	578	555
Volume Left	4	0	8
Volume Right	4	0	0
cSH	311	1700	1005
Volume to Capacity	0.03	0.34	0.01
Queue Length 95th (ft)	2	0	1
Control Delay (s)	16.9	0.0	0.2
Lane LOS	C		A
Approach Delay (s)	16.9	0.0	0.2
Approach LOS	C		

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	38.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	1	253	666	89	131	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.25	0.89	0.93	0.89	0.66	0.33
Hourly flow rate (vph)	4	284	716	100	198	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	816				1058	766
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	816				1058	766
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				21	97
cM capacity (veh/h)	820				250	406

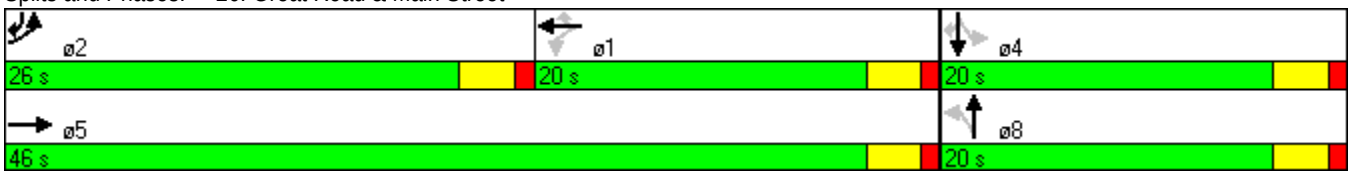
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	288	816	211
Volume Left	4	0	198
Volume Right	0	100	12
cSH	820	1700	258
Volume to Capacity	0.00	0.48	0.82
Queue Length 95th (ft)	0	0	160
Control Delay (s)	0.2	0.0	60.5
Lane LOS	A		F
Approach Delay (s)	0.2	0.0	60.5
Approach LOS			F

Intersection Summary			
Average Delay	9.7		
Intersection Capacity Utilization	54.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Volume (vph)	143	246	651	12	3	4	7	0	320
Turn Type	Prot			Perm	Perm		Perm		pm+ov
Protected Phases	2	5	1			8		4	2
Permitted Phases				1	8		4		4
Detector Phase	2	5	1	1	8	8	4	4	2
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	15.0	15.0	12.0	12.0	15.0	15.0	15.0	15.0	15.0
Total Split (s)	26.0	46.0	20.0	20.0	20.0	20.0	20.0	20.0	26.0
Total Split (%)	39.4%	69.7%	30.3%	30.3%	30.3%	30.3%	30.3%	30.3%	39.4%
Yellow Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Lead/Lag	Lead		Lag	Lag					Lead
Lead-Lag Optimize?	Yes		Yes	Yes					Yes
Recall Mode	None	None	None	None	None	None	None	None	None
Act Effct Green (s)	12.8	12.3	16.7	16.7		8.2		8.2	14.6
Actuated g/C Ratio	0.33	0.32	0.43	0.43		0.21		0.21	0.38
v/c Ratio	0.29	0.50	0.76	0.02		0.04		0.04	0.63
Control Delay	12.1	13.3	20.2	8.5		15.7		15.7	14.0
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Delay	12.1	13.3	20.2	8.5		15.7		15.7	14.0
LOS	B	B	C	A		B		B	B
Approach Delay		12.9	19.9			15.7		14.1	
Approach LOS		B	B			B		B	

Intersection Summary	
Cycle Length: 66	
Actuated Cycle Length: 38.8	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 16.4	Intersection LOS: B
Intersection Capacity Utilization 70.7%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 26: Great Road & Main Street



Lane Group	EBL	EBT	WBT	WBR	NBT	SBT	SBR
Lane Group Flow (vph)	168	276	700	16	16	16	376
v/c Ratio	0.29	0.50	0.76	0.02	0.04	0.04	0.63
Control Delay	12.1	13.3	20.2	8.5	15.7	15.7	14.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.1	13.3	20.2	8.5	15.7	15.7	14.0
Queue Length 50th (ft)	23	53	107	1	3	3	56
Queue Length 95th (ft)	73	40	#392	10	9	5	99
Internal Link Dist (ft)		376	660		36	340	
Turn Bay Length (ft)	112			31			95
Base Capacity (vph)	1050	1701	925	771	734	734	989
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.16	0.76	0.02	0.02	0.02	0.38

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	143	246	0	0	651	12	3	4	0	7	0	320
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	16	16	12	9	12	9	9	11
Total Lost time (s)	3.7	3.7			3.7	3.7		3.7			3.7	3.7
Lane Util. Factor	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.98		1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00			1.00	0.85		1.00			1.00	0.85
Flt Protected	0.95	1.00			1.00	1.00		0.98			0.95	1.00
Satd. Flow (prot)	1787	1756			2153	1791		1668			1624	1546
Flt Permitted	0.95	1.00			1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)	1787	1756			2153	1791		1710			1710	1546
Peak-hour factor, PHF	0.85	0.89	0.25	0.25	0.93	0.75	0.38	0.50	0.25	0.44	0.25	0.85
Adj. Flow (vph)	168	276	0	0	700	16	8	8	0	16	0	376
RTOR Reduction (vph)	0	0	0	0	0	2	0	0	0	0	0	15
Lane Group Flow (vph)	168	276	0	0	700	14	0	16	0	0	16	361
Confl. Peds. (#/hr)						1						
Heavy Vehicles (%)	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Turn Type	Prot			Perm		Perm	Perm			Perm		pm+ov
Protected Phases	2	5			1			8			4	2
Permitted Phases				1		1	8			4		4
Actuated Green, G (s)	12.8	33.2			16.7	16.7		1.2			1.2	14.0
Effective Green, g (s)	12.8	33.2			16.7	16.7		1.2			1.2	14.0
Actuated g/C Ratio	0.31	0.79			0.40	0.40		0.03			0.03	0.33
Clearance Time (s)	3.7	3.7			3.7	3.7		3.7			3.7	3.7
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)	547	1395			860	716		49			49	655
v/s Ratio Prot	0.09	0.16			c0.33							c0.17
v/s Ratio Perm						0.01		0.01			0.01	0.06
v/c Ratio	0.31	0.20			0.81	0.02		0.33			0.33	0.55
Uniform Delay, d1	11.1	1.0			11.2	7.6		19.9			19.9	11.3
Progression Factor	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.3	0.1			6.0	0.0		3.9			3.9	1.0
Delay (s)	11.4	1.1			17.1	7.6		23.8			23.8	12.3
Level of Service	B	A			B	A		C			C	B
Approach Delay (s)		5.0			16.9			23.8			12.8	
Approach LOS		A			B			C			B	

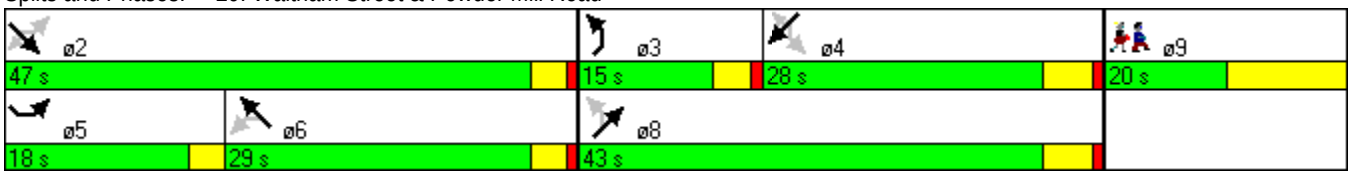
Intersection Summary			
HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	41.8	Sum of lost time (s)	7.4
Intersection Capacity Utilization	70.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWL	SWT	SWR	ø9
Lane Configurations											
Volume (vph)	281	147	205	16	208	160	135	15	214	350	
Turn Type	pm+pt		Perm	Perm		pm+pt		Perm		Perm	
Protected Phases	5	2			6	3	8		4		9
Permitted Phases	2		2	6		8		4		4	
Detector Phase	5	2	2	6	6	3	8	4	4	4	
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	15.0	15.0	15.0	15.0	9.0	15.0	15.0	15.0	15.0	20.0
Total Split (s)	18.0	47.0	47.0	29.0	29.0	15.0	43.0	28.0	28.0	28.0	20.0
Total Split (%)	16.4%	42.7%	42.7%	26.4%	26.4%	13.6%	39.1%	25.5%	25.5%	25.5%	18%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	10.0
All-Red Time (s)	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	
Lead/Lag	Lead			Lag	Lag	Lead		Lag	Lag	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes	Yes		Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)		43.2	43.2		43.2	33.5	32.5		18.1	18.1	
Actuated g/C Ratio		0.51	0.51		0.51	0.40	0.38		0.21	0.21	
v/c Ratio		0.90	0.26		0.29	0.52	0.24		0.67	0.64	
Control Delay		41.4	8.1		13.7	22.6	17.8		39.9	11.6	
Queue Delay		0.5	0.0		0.0	0.0	0.0		0.0	0.0	
Total Delay		41.9	8.1		13.7	22.6	17.8		39.9	11.6	
LOS		D	A		B	C	B		D	B	
Approach Delay		32.2			13.7		20.4		23.2		
Approach LOS		C			B		C		C		

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 84.7	
Natural Cycle: 110	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 24.8	Intersection LOS: C
Intersection Capacity Utilization 72.8%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 29: Waltham Street & Powder Mill Road



Lane Group	SET	SER	NWT	NEL	NET	SWT	SWR
Lane Group Flow (vph)	547	220	295	188	156	253	365
v/c Ratio	0.90	0.26	0.29	0.52	0.24	0.67	0.64
Control Delay	41.4	8.1	13.7	22.6	17.8	39.9	11.6
Queue Delay	0.5	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.9	8.1	13.7	22.6	17.8	39.9	11.6
Queue Length 50th (ft)	261	34	88	66	53	125	24
Queue Length 95th (ft)	#490	82	146	106	95	203	107
Internal Link Dist (ft)	365		548		1021	443	
Turn Bay Length (ft)		90		60			105
Base Capacity (vph)	608	834	1010	370	772	480	640
Starvation Cap Reductn	5	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.26	0.29	0.51	0.20	0.53	0.57

Intersection Summary

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

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	281	147	205	16	208	27	160	135	6	15	214	350
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	14	12	12	15	12	9	9	12	12	11	11
Grade (%)		3%			-4%			-6%			0%	
Total Lost time (s)		4.0	4.0		4.0		4.0	5.0			5.0	5.0
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.97		1.00		1.00	1.00			1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frt		1.00	0.85		0.99		1.00	0.99			1.00	0.85
Flt Protected		0.97	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)		1927	1545		2086		1655	1709			1812	1522
Flt Permitted		0.60	1.00		0.94		0.33	1.00			0.97	1.00
Satd. Flow (perm)		1190	1545		1977		583	1709			1761	1522
Peak-hour factor, PHF	0.74	0.88	0.93	0.67	0.87	0.84	0.85	0.94	0.50	0.75	0.92	0.96
Adj. Flow (vph)	380	167	220	24	239	32	188	144	12	20	233	365
RTOR Reduction (vph)	0	0	49	0	2	0	0	2	0	0	0	243
Lane Group Flow (vph)	0	547	171	0	293	0	188	154	0	0	253	122
Confl. Peds. (#/hr)	1		3	2		2	2			1		2
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	2%	0%	0%	1%	0%
Turn Type	pm+pt		Perm	Perm			pm+pt			Perm		Perm
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2		2	6			8			4		4
Actuated Green, G (s)		43.2	43.2		43.2		32.5	32.5			18.2	18.2
Effective Green, g (s)		43.2	43.2		43.2		32.5	32.5			18.2	18.2
Actuated g/C Ratio		0.51	0.51		0.51		0.38	0.38			0.21	0.21
Clearance Time (s)		4.0	4.0		4.0		4.0	5.0			5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		607	788		1008		354	656			378	327
v/s Ratio Prot							c0.06	0.09				
v/s Ratio Perm		c0.46	0.11		0.15		0.14				c0.14	0.08
v/c Ratio		0.90	0.22		0.29		0.53	0.23			0.67	0.37
Uniform Delay, d1		18.8	11.4		11.9		18.8	17.7			30.5	28.4
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		16.6	0.1		0.2		1.5	0.2			4.5	0.7
Delay (s)		35.4	11.6		12.1		20.4	17.9			34.9	29.1
Level of Service		D	B		B		C	B			C	C
Approach Delay (s)		28.5			12.1			19.2			31.5	
Approach LOS		C			B			B			C	

Intersection Summary			
HCM Average Control Delay	25.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	84.7	Sum of lost time (s)	13.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	13	168	141	294	384	88
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.65	0.88	0.78	0.92	0.94	0.71
Hourly flow rate (vph)	20	191	181	320	409	124
Pedestrians					1	
Lane Width (ft)					11.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					1101	
pX, platoon unblocked	0.95	0.95	0.95			
vC, conflicting volume	1153	470	532			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1136	422	487			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	89	68	82			
cM capacity (veh/h)	177	605	1033			

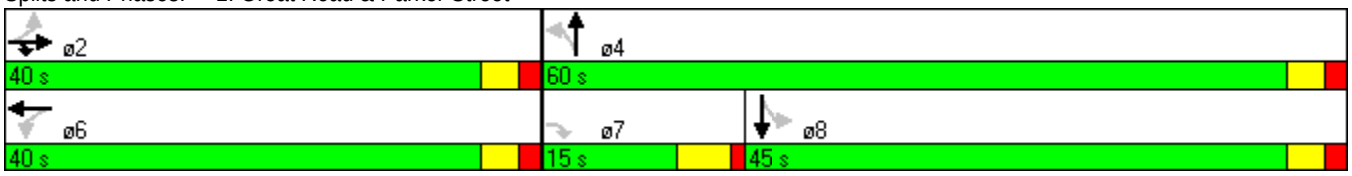
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	211	500	532
Volume Left	20	181	0
Volume Right	191	0	124
cSH	493	1033	1700
Volume to Capacity	0.43	0.18	0.31
Queue Length 95th (ft)	53	16	0
Control Delay (s)	17.7	4.6	0.0
Lane LOS	C	A	
Approach Delay (s)	17.7	4.6	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	69.9%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	111	84	23	144	31	96	260	17	32	310	52
Turn Type	Perm		custom	Perm		Free	Perm		Free	Perm		Free
Protected Phases		2	2		6			4			8	
Permitted Phases	2		7	6		Free	4		Free	8		Free
Detector Phase	2	2	2	6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Total Split (s)	40.0	40.0	40.0	40.0	40.0	0.0	60.0	60.0	0.0	45.0	45.0	0.0
Total Split (%)	40.0%	40.0%	40.0%	40.0%	40.0%	0.0%	60.0%	60.0%	0.0%	45.0%	45.0%	0.0%
Yellow Time (s)	2.8	2.8	2.8	2.8	2.8		2.8	2.8		2.8	2.8	
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8		1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6	4.6	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lead/Lag										Lag	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	None		None	None	
Act Effct Green (s)	10.1	10.1	10.1	10.4	10.4	30.7	16.8	16.8	30.7	16.8	16.8	30.7
Actuated g/C Ratio	0.33	0.33	0.33	0.34	0.34	1.00	0.55	0.55	1.00	0.55	0.55	1.00
v/c Ratio	0.12	0.20	0.18	0.08	0.29	0.03	0.21	0.28	0.02	0.08	0.33	0.04
Control Delay	11.6	11.5	4.4	11.2	12.1	0.0	7.6	7.0	0.0	6.2	7.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.6	11.5	4.4	11.2	12.1	0.0	7.6	7.0	0.0	6.2	7.5	0.0
LOS	B	B	A	B	B	A	A	A	A	A	A	A
Approach Delay		8.9			9.8			6.7			6.2	
Approach LOS		A			A			A			A	

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 30.7	
Natural Cycle: 50	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.33	
Intersection Signal Delay: 7.6	Intersection LOS: A
Intersection Capacity Utilization 47.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Great Road & Parker Street



Lane Group	ø7
Lane Configurations	
Volume (vph)	
Turn Type	
Protected Phases	7
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	15.0
Total Split (s)	15.0
Total Split (%)	15%
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	44	123	100	32	187	48	108	289	28	44	344	68
v/c Ratio	0.12	0.20	0.18	0.08	0.29	0.03	0.21	0.28	0.02	0.08	0.33	0.04
Control Delay	11.6	11.5	4.4	11.2	12.1	0.0	7.6	7.0	0.0	6.2	7.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.6	11.5	4.4	11.2	12.1	0.0	7.6	7.0	0.0	6.2	7.5	0.0
Queue Length 50th (ft)	5	15	0	4	23	0	10	29	0	4	36	0
Queue Length 95th (ft)	17	56	21	17	67	0	36	77	0	13	92	0
Internal Link Dist (ft)		465			321			895			490	
Turn Bay Length (ft)	80		45	90			95		80	80		75
Base Capacity (vph)	1071	1797	1425	1178	1780	1582	929	1900	1635	1003	1825	1792
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.07	0.07	0.03	0.11	0.03	0.12	0.15	0.02	0.04	0.19	0.04

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	111	84	23	144	31	96	260	17	32	310	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	12	11	11	12	12	9	12	13	10	12	16
Total Lost time (s)	4.6	4.6	4.6	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1683	1900	1501	1745	1881	1582	1593	1900	1635	1685	1881	1792
Flt Permitted	0.64	1.00	1.00	0.68	1.00	1.00	0.55	1.00	1.00	0.58	1.00	1.00
Satd. Flow (perm)	1134	1900	1501	1245	1881	1582	929	1900	1635	1034	1881	1792
Peak-hour factor, PHF	0.59	0.90	0.84	0.72	0.77	0.65	0.89	0.90	0.61	0.73	0.90	0.77
Adj. Flow (vph)	44	123	100	32	187	48	108	289	28	44	344	68
RTOR Reduction (vph)	0	0	77	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	44	123	23	32	187	48	108	289	28	44	344	68
Confl. Peds. (#/hr)	1											
Confl. Bikes (#/hr)			4			1			1			3
Heavy Vehicles (%)	0%	0%	4%	0%	1%	0%	2%	0%	0%	0%	1%	0%
Turn Type	Perm		custom	Perm		Free	Perm		Free	Perm		Free
Protected Phases		2	2		6			4			8	
Permitted Phases	2		7	6		Free	4		Free	8		Free
Actuated Green, G (s)	7.1	7.1	7.1	7.1	7.1	30.9	14.6	14.6	30.9	14.6	14.6	30.9
Effective Green, g (s)	7.1	7.1	7.1	7.1	7.1	30.9	14.6	14.6	30.9	14.6	14.6	30.9
Actuated g/C Ratio	0.23	0.23	0.23	0.23	0.23	1.00	0.47	0.47	1.00	0.47	0.47	1.00
Clearance Time (s)	4.6	4.6	4.6	4.6	4.6		4.6	4.6		4.6	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	261	437	345	286	432	1582	439	898	1635	489	889	1792
v/s Ratio Prot		0.06	0.02		c0.10			0.15			c0.18	
v/s Ratio Perm	0.04			0.03		0.03	0.12		0.02	0.04		0.04
v/c Ratio	0.17	0.28	0.07	0.11	0.43	0.03	0.25	0.32	0.02	0.09	0.39	0.04
Uniform Delay, d1	9.5	9.8	9.3	9.4	10.2	0.0	4.9	5.1	0.0	4.5	5.3	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.4	0.1	0.2	0.7	0.0	0.3	0.2	0.0	0.1	0.3	0.0
Delay (s)	9.8	10.2	9.4	9.6	10.9	0.0	5.2	5.3	0.0	4.6	5.5	0.0
Level of Service	A	B	A	A	B	A	A	A	A	A	A	A
Approach Delay (s)		9.8			8.8			4.9			4.6	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	6.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	30.9	Sum of lost time (s)	9.2
Intersection Capacity Utilization	47.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	0	1	1	0	4	0	362	1	2	392	7
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.50	0.25	0.25	0.25	0.25	0.50	0.25	0.90	0.25	0.50	0.90	0.44
Hourly flow rate (vph)	12	0	4	4	0	8	0	402	4	4	436	16
Pedestrians		1										
Lane Width (ft)		11.0										
Walking Speed (ft/s)		3.5										
Percent Blockage		0										
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											975	
pX, platoon unblocked												
vC, conflicting volume	865	859	445	860	865	404	452			406		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	865	859	445	860	865	404	452			406		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	100	99	99	100	99	100			100		
cM capacity (veh/h)	272	295	617	276	293	651	1118			1163		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	16	12	406	455
Volume Left	12	4	0	4
Volume Right	4	8	4	16
cSH	316	448	1118	1163
Volume to Capacity	0.05	0.03	0.00	0.00
Queue Length 95th (ft)	4	2	0	0
Control Delay (s)	17.0	13.3	0.0	0.1
Lane LOS	C	B		A
Approach Delay (s)	17.0	13.3	0.0	0.1
Approach LOS	C	B		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	32.7%	ICU Level of Service	A
Analysis Period (min)	15		
Description: North St EB closed 3:30 PM - 5:30 PM			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	0	0	2	0	4	1	330	1	2	425	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.50	0.25	0.86	0.25	0.50	0.91	0.25
Hourly flow rate (vph)	4	0	0	8	0	8	4	384	4	4	467	0
Pedestrians		1									1	
Lane Width (ft)		16.0									11.0	
Walking Speed (ft/s)		3.5									3.5	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											1226	
pX, platoon unblocked												
vC, conflicting volume	879	872	468	869	870	387	468			388		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	879	872	468	869	870	387	468			388		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	100	97	100	99	100			100		
cM capacity (veh/h)	265	289	598	273	290	665	1103			1182		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	4	16	392	471
Volume Left	4	8	4	4
Volume Right	0	8	4	0
cSH	265	387	1103	1182
Volume to Capacity	0.02	0.04	0.00	0.00
Queue Length 95th (ft)	1	3	0	0
Control Delay (s)	18.8	14.7	0.1	0.1
Lane LOS	C	B	A	A
Approach Delay (s)	18.8	14.7	0.1	0.1
Approach LOS	C	B		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		
Description: South St EB closed 3:30 PM - 5:30 PM			

Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (veh/h)	354	12	2	381	17	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.93	0.75	0.50	0.93	0.61	0.25
Hourly flow rate (vph)	381	16	4	410	28	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			397		806	389
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			397		806	389
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		92	100
cM capacity (veh/h)			1173		353	664

Direction, Lane #	NB 1	SB 1	SW 1
Volume Total	397	414	28
Volume Left	0	4	28
Volume Right	16	0	0
cSH	1700	1173	353
Volume to Capacity	0.23	0.00	0.08
Queue Length 95th (ft)	0	0	6
Control Delay (s)	0.0	0.1	16.1
Lane LOS		A	C
Approach Delay (s)	0.0	0.1	16.1
Approach LOS			C

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	31.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	20	7	8	346	373	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.71	0.88	0.50	0.94	0.86	0.61
Hourly flow rate (vph)	28	8	16	368	434	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	848	448	462			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	848	448	462			
tC, single (s)	6.4	6.3	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.2			
p0 queue free %	91	99	99			
cM capacity (veh/h)	330	587	1110			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	36	384	462
Volume Left	28	16	0
Volume Right	8	0	28
cSH	365	1110	1700
Volume to Capacity	0.10	0.01	0.27
Queue Length 95th (ft)	8	1	0
Control Delay (s)	15.9	0.5	0.0
Lane LOS	C	A	
Approach Delay (s)	15.9	0.5	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	34.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	1	2	330	0	3	425
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.25	0.50	0.86	0.25	0.38	0.92
Hourly flow rate (vph)	4	4	384	0	8	462
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	861	384			384	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	861	384			384	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	99			99	
cM capacity (veh/h)	326	668			1186	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	8	384	470
Volume Left	4	0	8
Volume Right	4	0	0
cSH	438	1700	1186
Volume to Capacity	0.02	0.23	0.01
Queue Length 95th (ft)	1	0	1
Control Delay (s)	13.4	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	13.4	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	34.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	4	242	221	42	35	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.33	0.82	0.91	0.81	0.88	0.62
Hourly flow rate (vph)	12	295	243	52	40	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	295				588	269
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	295				588	269
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				92	99
cM capacity (veh/h)	1278				470	775

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	307	295	48
Volume Left	12	0	40
Volume Right	0	52	8
cSH	1278	1700	566
Volume to Capacity	0.01	0.17	0.08
Queue Length 95th (ft)	1	0	7
Control Delay (s)	0.4	0.0	12.7
Lane LOS	A		B
Approach Delay (s)	0.4	0.0	12.7
Approach LOS			B

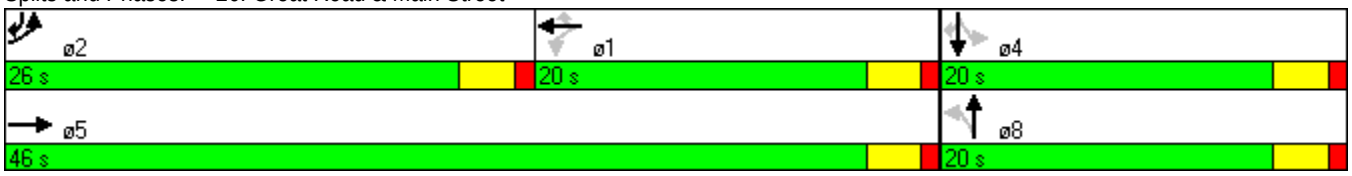
Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	25.9%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	NBT	SBL	SBT	SBR
Lane Configurations								
Volume (vph)	180	214	224	18	0	13	0	156
Turn Type	Prot			Perm		Perm		pm+ov
Protected Phases	2	5	1		8		4	2
Permitted Phases				1		4		4
Detector Phase	2	5	1	1	8	4	4	2
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	15.0	15.0	12.0	12.0	15.0	15.0	15.0	15.0
Total Split (s)	26.0	46.0	20.0	20.0	20.0	20.0	20.0	26.0
Total Split (%)	39.4%	69.7%	30.3%	30.3%	30.3%	30.3%	30.3%	39.4%
Yellow Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Lead/Lag	Lead		Lag	Lag				Lead
Lead-Lag Optimize?	Yes		Yes	Yes				Yes
Recall Mode	None	None	None	None	None	None	None	None
Act Effct Green (s)	11.0	12.8	11.1	11.1	10.2		10.2	12.3
Actuated g/C Ratio	0.42	0.49	0.43	0.43	0.39		0.39	0.47
v/c Ratio	0.25	0.28	0.27	0.04	0.01		0.03	0.23
Control Delay	9.7	6.0	9.3	6.2	0.0		11.8	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	9.7	6.0	9.3	6.2	0.0		11.8	1.9
LOS	A	A	A	A	A		B	A
Approach Delay		7.6	8.9		0.0		2.9	
Approach LOS		A	A		A		A	

Intersection Summary

Cycle Length: 66
Actuated Cycle Length: 25.9
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.28
Intersection Signal Delay: 6.8 — Intersection LOS: A
Intersection Capacity Utilization 40.5% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 26: Great Road & Main Street



Lane Group	EBL	EBT	WBT	WBR	NBT	SBT	SBR
Lane Group Flow (vph)	188	243	243	32	8	20	195
v/c Ratio	0.25	0.28	0.27	0.04	0.01	0.03	0.23
Control Delay	9.7	6.0	9.3	6.2	0.0	11.8	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.7	6.0	9.3	6.2	0.0	11.8	1.9
Queue Length 50th (ft)	14	19	18	1	0	1	0
Queue Length 95th (ft)	81	35	98	8	0	5	14
Internal Link Dist (ft)		376	660		36	340	
Turn Bay Length (ft)	112			31			95
Base Capacity (vph)	1515	1722	1422	1212	1215	1064	1421
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.14	0.17	0.03	0.01	0.02	0.14

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	180	214	0	0	224	18	0	0	3	13	0	156
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	16	16	12	9	12	9	9	11
Total Lost time (s)	3.7	3.7			3.7	3.7		3.7			3.7	3.7
Lane Util. Factor	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.98		1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00			1.00	0.85		0.86			1.00	0.85
Flt Protected	0.95	1.00			1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)	1787	1756			2111	1792		1479			1503	1561
Flt Permitted	0.95	1.00			1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)	1787	1756			2111	1792		1479			1582	1561
Peak-hour factor, PHF	0.96	0.88	0.25	0.25	0.92	0.56	0.25	0.25	0.38	0.65	0.25	0.80
Adj. Flow (vph)	188	243	0	0	243	32	0	0	8	20	0	195
RTOR Reduction (vph)	0	0	0	0	0	15	0	8	0	0	0	136
Lane Group Flow (vph)	188	243	0	0	243	17	0	0	0	0	20	59
Confl. Peds. (#/hr)	1			1		1				1		
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	1%	1%	0%	0%	2%	0%	0%	0%	0%	8%	0%	0%
Turn Type	Prot			Perm		Perm	Perm			Perm		pm+ov
Protected Phases	2	5			1			8			4	2
Permitted Phases				1		1	8			4		4
Actuated Green, G (s)	6.9	17.6			7.0	7.0		0.9			0.9	7.8
Effective Green, g (s)	6.9	17.6			7.0	7.0		0.9			0.9	7.8
Actuated g/C Ratio	0.27	0.68			0.27	0.27		0.03			0.03	0.30
Clearance Time (s)	3.7	3.7			3.7	3.7		3.7			3.7	3.7
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)	476	1193			571	484		51			55	693
v/s Ratio Prot	c0.11	0.14			c0.12			0.00				0.02
v/s Ratio Perm						0.01					c0.01	0.02
v/c Ratio	0.39	0.20			0.43	0.03		0.01			0.36	0.08
Uniform Delay, d1	7.8	1.5			7.8	7.0		12.1			12.2	6.5
Progression Factor	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.5	0.1			0.5	0.0		0.0			4.1	0.1
Delay (s)	8.3	1.6			8.3	7.0		12.1			16.3	6.5
Level of Service	A	A			A	A		B			B	A
Approach Delay (s)		4.6			8.2			12.1			7.4	
Approach LOS		A			A			B			A	

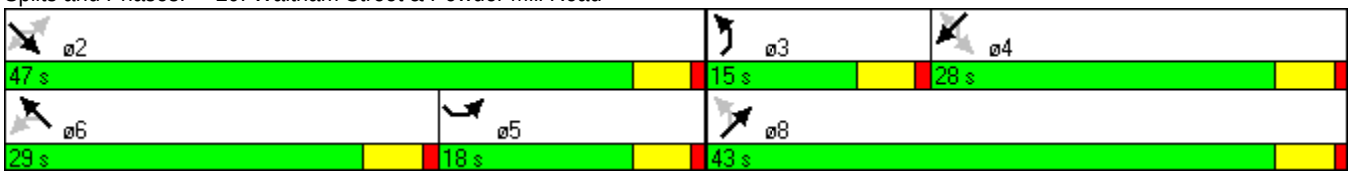
Intersection Summary			
HCM Average Control Delay	6.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	25.9	Sum of lost time (s)	11.1
Intersection Capacity Utilization	40.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWL	SWT	SWR
Lane Configurations										
Volume (vph)	303	137	209	4	140	144	124	12	159	306
Turn Type	pm+pt		Perm	Perm		pm+pt		Perm		Perm
Protected Phases	5	2			6	3	8		4	
Permitted Phases	2		2	6		8		4		4
Detector Phase	5	2	2	6	6	3	8	4	4	4
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	15.0	15.0	15.0	15.0	10.0	15.0	15.0	15.0	15.0
Total Split (s)	18.0	47.0	47.0	29.0	29.0	15.0	43.0	28.0	28.0	28.0
Total Split (%)	20.0%	52.2%	52.2%	32.2%	32.2%	16.7%	47.8%	31.1%	31.1%	31.1%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag			Lead	Lead	Lead		Lag	Lag	Lag
Lead-Lag Optimize?	Yes			Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)		35.6	35.6		35.6	29.4	29.4		15.0	15.0
Actuated g/C Ratio		0.47	0.47		0.47	0.39	0.39		0.20	0.20
v/c Ratio		0.81	0.28		0.21	0.41	0.22		0.56	0.60
Control Delay		30.3	5.9		12.2	20.4	17.3		35.5	8.2
Queue Delay		0.3	0.0		0.0	0.0	0.0		0.0	0.0
Total Delay		30.6	5.9		12.2	20.4	17.3		35.5	8.2
LOS		C	A		B	C	B		D	A
Approach Delay		22.9			12.2		18.9		18.1	
Approach LOS		C			B		B		B	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 75.5
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 19.6 — Intersection LOS: B
Intersection Capacity Utilization 67.6% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 29: Waltham Street & Powder Mill Road



Lane Group	SET	SER	NWT	NEL	NET	SWT	SWR
Lane Group Flow (vph)	517	232	207	160	147	197	348
v/c Ratio	0.81	0.28	0.21	0.41	0.22	0.56	0.60
Control Delay	30.3	5.9	12.2	20.4	17.3	35.5	8.2
Queue Delay	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.6	5.9	12.2	20.4	17.3	35.5	8.2
Queue Length 50th (ft)	200	19	51	57	50	94	0
Queue Length 95th (ft)	#419	66	103	100	89	159	60
Internal Link Dist (ft)	365		548		1021	443	
Turn Bay Length (ft)		90		60			105
Base Capacity (vph)	781	967	987	406	904	560	716
Starvation Cap Reductn	41	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.70	0.24	0.21	0.39	0.16	0.35	0.49

Intersection Summary

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

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	303	137	209	4	140	27	144	124	3	12	159	306
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	14	12	12	15	12	9	9	12	12	11	11
Grade (%)		3%			-4%			-6%			0%	
Total Lost time (s)		5.0	5.0		5.0		5.0	5.0			5.0	5.0
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.98		0.99		1.00	1.00			1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frt		1.00	0.85		0.97		1.00	0.99			1.00	0.85
Flt Protected		0.97	1.00		1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)		1911	1553		2061		1656	1714			1827	1505
Flt Permitted		0.68	1.00		0.98		0.40	1.00			0.96	1.00
Satd. Flow (perm)		1345	1553		2026		706	1714			1760	1505
Peak-hour factor, PHF	0.84	0.88	0.90	0.50	0.88	0.68	0.90	0.89	0.38	0.60	0.90	0.88
Adj. Flow (vph)	361	156	232	8	159	40	160	139	8	20	177	348
RTOR Reduction (vph)	0	0	81	0	7	0	0	2	0	0	0	277
Lane Group Flow (vph)	0	517	151	0	200	0	160	145	0	0	197	71
Confl. Peds. (#/hr)	2		3	2		3	1			1		2
Confl. Bikes (#/hr)			1									1
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%	1%	2%	0%	0%	0%	1%
Turn Type	pm+pt		Perm	Perm			pm+pt			Perm		Perm
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2		2	6			8			4		4
Actuated Green, G (s)		35.6	35.6		35.6		29.4	29.4			15.3	15.3
Effective Green, g (s)		35.6	35.6		35.6		29.4	29.4			15.3	15.3
Actuated g/C Ratio		0.47	0.47		0.47		0.39	0.39			0.20	0.20
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		638	737		962		392	672			359	307
v/s Ratio Prot							c0.05	0.08				
v/s Ratio Perm		c0.38	0.10		0.10		0.11				c0.11	0.05
v/c Ratio		0.81	0.20		0.21		0.41	0.22			0.55	0.23
Uniform Delay, d1		16.8	11.5		11.5		15.8	15.1			26.8	24.9
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		7.7	0.1		0.1		0.7	0.2			1.7	0.4
Delay (s)		24.5	11.6		11.6		16.5	15.3			28.5	25.3
Level of Service		C	B		B		B	B			C	C
Approach Delay (s)		20.5			11.6			15.9			26.5	
Approach LOS		C			B			B			C	

Intersection Summary			
HCM Average Control Delay	20.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	13	102	90	276	333	48
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.65	0.82	0.75	0.91	0.94	0.86
Hourly flow rate (vph)	20	124	120	303	354	56
Pedestrians	1			1		
Lane Width (ft)	15.0			11.0		
Walking Speed (ft/s)	3.5			3.5		
Percent Blockage	0			0		
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					1101	
pX, platoon unblocked						
vC, conflicting volume	926	384	411			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	926	384	411			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	81	90			
cM capacity (veh/h)	269	666	1157			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	144	423	410
Volume Left	20	120	0
Volume Right	124	0	56
cSH	553	1157	1700
Volume to Capacity	0.26	0.10	0.24
Queue Length 95th (ft)	26	9	0
Control Delay (s)	13.8	3.2	0.0
Lane LOS	B	A	
Approach Delay (s)	13.8	3.2	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		

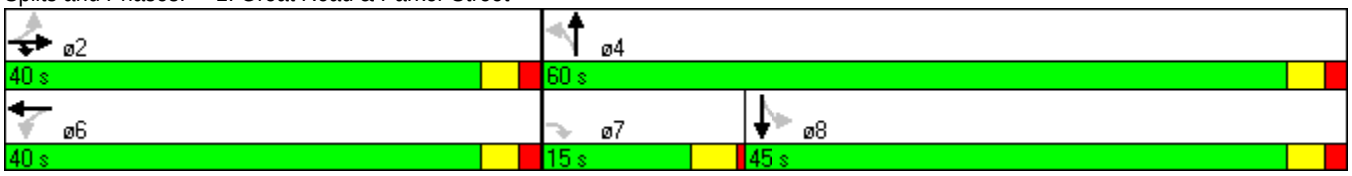
Level of Service Computation Sheets

- **Future No-Build Conditions**

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	79	513	172	17	188	56	135	319	25	60	438	85
Turn Type	Perm		custom	Perm		Free	Perm		Free	Perm		Free
Protected Phases		2	2		6			4			8	
Permitted Phases	2		7	6		Free	4		Free	8		Free
Detector Phase	2	2	2	6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Total Split (s)	40.0	40.0	40.0	40.0	40.0	0.0	60.0	60.0	0.0	45.0	45.0	0.0
Total Split (%)	40.0%	40.0%	40.0%	40.0%	40.0%	0.0%	60.0%	60.0%	0.0%	45.0%	45.0%	0.0%
Yellow Time (s)	2.8	2.8	2.8	2.8	2.8		2.8	2.8		2.8	2.8	
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8		1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6	4.6	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lead/Lag										Lag	Lag	
Lead-Lag Optimize?												
Recall Mode	Min	Min	Min	Min	Min		Min	Min		Min	Min	
Act Effct Green (s)	32.4	32.4	32.4	32.4	32.4	85.3	43.0	43.0	85.3	43.0	43.0	85.3
Actuated g/C Ratio	0.38	0.38	0.38	0.38	0.38	1.00	0.50	0.50	1.00	0.50	0.50	1.00
v/c Ratio	0.40	0.85	0.38	0.24	0.33	0.04	0.50	0.42	0.02	0.21	0.49	0.08
Control Delay	27.2	40.6	16.9	29.9	23.3	0.1	20.3	14.6	0.0	13.1	15.6	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.2	40.6	16.9	29.9	23.3	0.1	20.3	14.6	0.0	13.1	15.6	0.1
LOS	C	D	B	C	C	A	C	B	A	B	B	A
Approach Delay		32.9			19.1			15.2			12.1	
Approach LOS		C			B			B			B	

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 85.3	
Natural Cycle: 65	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.85	
Intersection Signal Delay: 21.6	Intersection LOS: C
Intersection Capacity Utilization 76.2%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 1: Great Road & Parker Street



Lane Group	ø7
Lane Configurations	
Volume (vph)	
Turn Type	
Protected Phases	7
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	8.0
Total Split (s)	15.0
Total Split (%)	15%
Yellow Time (s)	3.5
All-Red Time (s)	0.5
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	146	597	236	25	227	65	159	389	37	78	461	142
v/c Ratio	0.40	0.85	0.38	0.24	0.33	0.04	0.50	0.42	0.02	0.21	0.49	0.08
Control Delay	27.2	40.6	16.9	29.9	23.3	0.1	20.3	14.6	0.0	13.1	15.6	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.2	40.6	16.9	29.9	23.3	0.1	20.3	14.6	0.0	13.1	15.6	0.1
Queue Length 50th (ft)	67	345	68	11	101	0	57	133	0	23	164	0
Queue Length 95th (ft)	68	#526	98	25	154	0	105	174	0	41	241	0
Internal Link Dist (ft)		465			321			895			490	
Turn Bay Length (ft)	80		45	90			95		80	80		75
Base Capacity (vph)	431	824	714	123	808	1615	427	1233	1545	449	1109	1695
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.72	0.33	0.20	0.28	0.04	0.37	0.32	0.02	0.17	0.42	0.08

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	79	513	172	17	188	56	135	319	25	60	438	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	12	11	11	12	12	9	12	13	10	12	16
Total Lost time (s)	4.6	4.6	4.6	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1636	1845	1501	1745	1810	1615	1562	1827	1545	1604	1863	1695
Flt Permitted	0.56	1.00	1.00	0.15	1.00	1.00	0.39	1.00	1.00	0.45	1.00	1.00
Satd. Flow (perm)	966	1845	1501	276	1810	1615	633	1827	1545	755	1863	1695
Peak-hour factor, PHF	0.54	0.86	0.73	0.67	0.83	0.86	0.85	0.82	0.67	0.77	0.95	0.60
Adj. Flow (vph)	146	597	236	25	227	65	159	389	37	78	461	142
RTOR Reduction (vph)	0	0	49	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	146	597	187	25	227	65	159	389	37	78	461	142
Heavy Vehicles (%)	3%	3%	4%	0%	5%	0%	4%	4%	8%	5%	2%	8%
Turn Type	Perm		custom	Perm		Free	Perm		Free	Perm		Free
Protected Phases		2	2		6			4			8	
Permitted Phases	2		7	6		Free	4		Free	8		Free
Actuated Green, G (s)	32.4	32.4	32.4	32.4	32.4	84.6	43.0	43.0	84.6	43.0	43.0	84.6
Effective Green, g (s)	32.4	32.4	32.4	32.4	32.4	84.6	43.0	43.0	84.6	43.0	43.0	84.6
Actuated g/C Ratio	0.38	0.38	0.38	0.38	0.38	1.00	0.51	0.51	1.00	0.51	0.51	1.00
Clearance Time (s)	4.6	4.6	4.6	4.6	4.6		4.6	4.6		4.6	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	370	707	575	106	693	1615	322	929	1545	384	947	1695
v/s Ratio Prot		c0.32	0.12		0.13			0.21			0.25	
v/s Ratio Perm	0.15			0.09		0.04	c0.25		0.02	0.10		0.08
v/c Ratio	0.39	0.84	0.32	0.24	0.33	0.04	0.49	0.42	0.02	0.20	0.49	0.08
Uniform Delay, d1	19.0	23.8	18.4	17.7	18.4	0.0	13.7	13.0	0.0	11.4	13.6	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	9.1	0.3	1.1	0.3	0.0	1.2	0.3	0.0	0.3	0.4	0.1
Delay (s)	19.7	32.9	18.7	18.9	18.7	0.0	14.8	13.3	0.0	11.7	14.0	0.1
Level of Service	B	C	B	B	B	A	B	B	A	B	B	A
Approach Delay (s)		27.5			14.9			12.9			10.8	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	18.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	84.6	Sum of lost time (s)	9.2
Intersection Capacity Utilization	76.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	18	0	1	0	0	4	0	424	0	1	632	8
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.71	0.25	0.25	0.25	0.25	0.33	0.25	0.93	0.25	0.25	0.92	0.67
Hourly flow rate (vph)	25	0	4	0	0	12	0	456	0	4	687	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											975	
pX, platoon unblocked	0.85	0.85	0.85	0.85	0.85		0.85					
vC, conflicting volume	1169	1157	693	1161	1163	456	699			456		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1110	1096	549	1100	1103	456	556			456		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	84	100	99	100	100	98	100			100		
cM capacity (veh/h)	156	182	458	160	180	609	869			1116		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	29	12	456	703
Volume Left	25	0	0	4
Volume Right	4	12	0	12
cSH	172	609	869	1116
Volume to Capacity	0.17	0.02	0.00	0.00
Queue Length 95th (ft)	15	2	0	0
Control Delay (s)	30.3	11.0	0.0	0.1
Lane LOS	D	B		A
Approach Delay (s)	30.3	11.0	0.0	0.1
Approach LOS	D	B		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	48.9%	ICU Level of Service	A
Analysis Period (min)	15		
Description: North St EB closed 3:30 PM - 5:30 PM			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	1	0	5	0	446	0	0	610	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.42	0.25	0.95	0.25	0.25	0.97	0.25
Hourly flow rate (vph)	0	0	0	4	0	12	0	469	0	0	629	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											1226	
pX, platoon unblocked	0.90	0.90	0.90	0.90	0.90		0.90					
vC, conflicting volume	1110	1098	629	1098	1098	469	629			469		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1068	1055	535	1055	1055	469	535			469		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	98	100	98	100			100		
cM capacity (veh/h)	178	205	496	185	205	598	942			1103		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	16	469	629
Volume Left	0	4	0	0
Volume Right	0	12	0	0
cSH	1700	383	942	1103
Volume to Capacity	0.00	0.04	0.00	0.00
Queue Length 95th (ft)	0	3	0	0
Control Delay (s)	0.0	14.8	0.0	0.0
Lane LOS	A	B		
Approach Delay (s)	0.0	14.8	0.0	0.0
Approach LOS	A	B		

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		
Description: South St EB closed 3:30 PM - 5:30 PM			

Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (veh/h)	446	19	0	622	13	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.93	0.64	0.25	0.92	0.75	0.38
Hourly flow rate (vph)	480	30	0	676	17	8
Pedestrians	1			1		
Lane Width (ft)	11.0			12.0		
Walking Speed (ft/s)	3.5			3.5		
Percent Blockage	0			0		
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			509		1172	495
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			509		1172	495
tC, single (s)			4.1		6.5	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.3
p0 queue free %			100		92	99
cM capacity (veh/h)			1066		207	578

Direction, Lane #	NB 1	SB 1	SW 1
Volume Total	509	676	25
Volume Left	0	0	17
Volume Right	30	0	8
cSH	1700	1066	259
Volume to Capacity	0.30	0.00	0.10
Queue Length 95th (ft)	0	0	8
Control Delay (s)	0.0	0.0	20.4
Lane LOS			C
Approach Delay (s)	0.0	0.0	20.4
Approach LOS			C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	32	1	1	426	629	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.70	0.25	0.25	0.91	0.93	0.58
Hourly flow rate (vph)	46	4	4	468	676	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1159	682	688			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1159	682	688			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	79	99	100			
cM capacity (veh/h)	218	453	915			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	50	472	688
Volume Left	46	4	0
Volume Right	4	0	12
cSH	227	915	1700
Volume to Capacity	0.22	0.00	0.40
Queue Length 95th (ft)	20	0	0
Control Delay (s)	25.2	0.1	0.0
Lane LOS	D	A	
Approach Delay (s)	25.2	0.1	0.0
Approach LOS	D		

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	43.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	1	4	442	1	3	579
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.25	0.33	0.94	0.25	0.38	0.95
Hourly flow rate (vph)	4	12	470	4	8	609
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1097	472			474	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1097	472			474	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	98			99	
cM capacity (veh/h)	236	596			1098	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	16	474	617
Volume Left	4	0	8
Volume Right	12	4	0
cSH	432	1700	1098
Volume to Capacity	0.04	0.28	0.01
Queue Length 95th (ft)	3	0	1
Control Delay (s)	13.6	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	13.6	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	9	698	198	92	147	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.25	0.88	0.68	0.69	0.70	0.25
Hourly flow rate (vph)	36	793	291	133	210	24
Pedestrians			4		1	
Lane Width (ft)			12.0		15.0	
Walking Speed (ft/s)			3.5		3.5	
Percent Blockage			0		0	
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	426				1228	359
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	426				1228	359
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				0	97
cM capacity (veh/h)	1143				187	689

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	829	425	234
Volume Left	36	0	210
Volume Right	0	133	24
cSH	1143	1700	203
Volume to Capacity	0.03	0.25	1.16
Queue Length 95th (ft)	2	0	288
Control Delay (s)	0.8	0.0	159.9
Lane LOS	A		F
Approach Delay (s)	0.8	0.0	159.9
Approach LOS			F

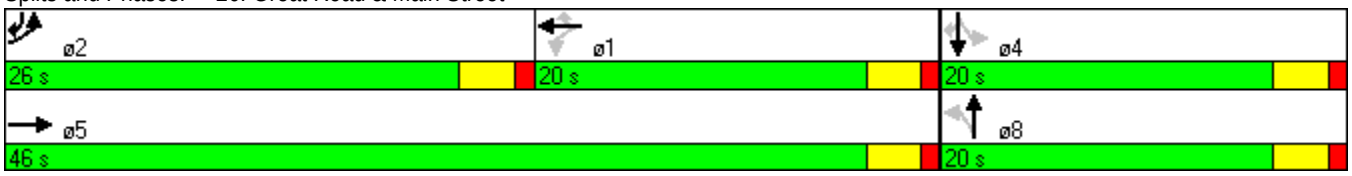
Intersection Summary			
Average Delay	25.6		
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBT	SBR	ø8
Lane Configurations								
Volume (vph)	355	573	224	14	8	0	130	
Turn Type	Prot			Perm	Perm		pm+ov	
Protected Phases	2	5	1			4	2	8
Permitted Phases				1	4		4	
Detector Phase	2	5	1	1	4	4	2	
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	15.0	15.0	12.0	12.0	15.0	15.0	15.0	15.0
Total Split (s)	26.0	46.0	20.0	20.0	20.0	20.0	26.0	20.0
Total Split (%)	39.4%	69.7%	30.3%	30.3%	30.3%	30.3%	39.4%	30%
Yellow Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	
Lead/Lag	Lead		Lag	Lag			Lead	
Lead-Lag Optimize?	Yes						Yes	
Recall Mode	Min	Min	None	None	None	None	Min	None
Act Effct Green (s)	16.1	34.5	10.9	10.9		8.6	17.1	
Actuated g/C Ratio	0.44	0.95	0.30	0.30		0.24	0.47	
v/c Ratio	0.54	0.41	0.43	0.04		0.04	0.19	
Control Delay	12.1	2.0	14.0	8.7		16.4	1.9	
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	12.1	2.0	14.0	8.7		16.4	1.9	
LOS	B	A	B	A		B	A	
Approach Delay		5.9	13.6			3.3		
Approach LOS		A	B			A		

Intersection Summary

Cycle Length: 66
Actuated Cycle Length: 36.4
Natural Cycle: 50
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.54
Intersection Signal Delay: 7.0 — Intersection LOS: A
Intersection Capacity Utilization 58.7% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 26: Great Road & Main Street



Lane Group	EBL	EBT	WBT	WBR	SBT	SBR
Lane Group Flow (vph)	418	670	257	19	16	151
v/c Ratio	0.54	0.41	0.43	0.04	0.04	0.19
Control Delay	12.1	2.0	14.0	8.7	16.4	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.1	2.0	14.0	8.7	16.4	1.9
Queue Length 50th (ft)	43	0	29	1	2	0
Queue Length 95th (ft)	177	114	125	11	5	16
Internal Link Dist (ft)		376	660		340	
Turn Bay Length (ft)	112			31		95
Base Capacity (vph)	1165	1628	968	759	823	1077
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.41	0.27	0.03	0.02	0.14

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	355	573	1	0	224	14	0	0	0	8	0	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	16	16	12	9	12	9	9	11
Total Lost time (s)	3.7	3.7			3.7	3.7					3.7	3.7
Lane Util. Factor	1.00	1.00			1.00	1.00					1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00	1.00					1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00					1.00	1.00
Frt	1.00	1.00			1.00	0.85					1.00	0.85
Flt Protected	0.95	1.00			1.00	1.00					0.95	1.00
Satd. Flow (prot)	1770	1720			2012	1564					1624	1499
Flt Permitted	0.95	1.00			1.00	1.00					1.00	1.00
Satd. Flow (perm)	1770	1720			2012	1564					1710	1499
Peak-hour factor, PHF	0.85	0.86	0.25	0.25	0.87	0.75	0.92	0.92	0.92	0.50	0.25	0.86
Adj. Flow (vph)	418	666	4	0	257	19	0	0	0	16	0	151
RTOR Reduction (vph)	0	0	0	0	0	9	0	0	0	0	0	85
Lane Group Flow (vph)	418	670	0	0	257	10	0	0	0	0	16	66
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	2%	3%	0%	0%	7%	17%	2%	2%	2%	0%	0%	4%
Turn Type	Prot			Perm		Perm	Perm			Perm		pm+ov
Protected Phases	2	5			1			8			4	2
Permitted Phases				1		1	8			4		4
Actuated Green, G (s)	16.1	30.9			11.1	11.1					1.0	17.1
Effective Green, g (s)	16.1	30.9			11.1	11.1					1.0	17.1
Actuated g/C Ratio	0.41	0.79			0.28	0.28					0.03	0.44
Clearance Time (s)	3.7	3.7			3.7	3.7					3.7	3.7
Vehicle Extension (s)	3.0	3.0			3.0	3.0					3.0	3.0
Lane Grp Cap (vph)	725	1352			568	442					44	793
v/s Ratio Prot	c0.24	c0.39			0.13							0.03
v/s Ratio Perm						0.01					c0.01	0.01
v/c Ratio	0.58	0.50			0.45	0.02					0.36	0.08
Uniform Delay, d1	9.0	1.5			11.6	10.2					18.8	6.5
Progression Factor	1.00	1.00			1.00	1.00					1.00	1.00
Incremental Delay, d2	1.1	0.3			0.6	0.0					5.1	0.0
Delay (s)	10.1	1.8			12.2	10.2					23.9	6.5
Level of Service	B	A			B	B					C	A
Approach Delay (s)		5.0			12.0			0.0			8.2	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	6.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	39.3	Sum of lost time (s)	7.4
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		

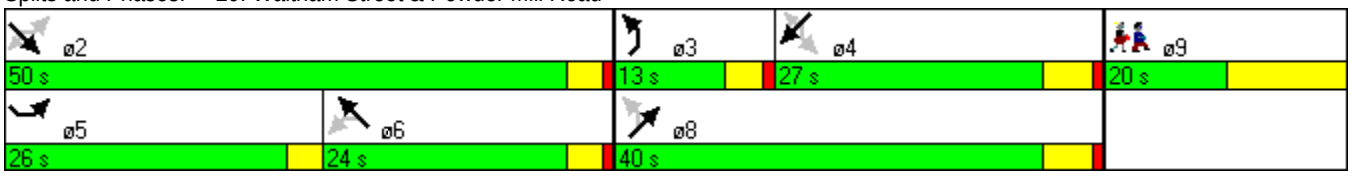
c Critical Lane Group

Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWL	SWT	SWR	ø9
Lane Configurations											
Volume (vph)	358	214	254	12	126	206	161	18	175	189	
Turn Type	pm+pt		Perm	Perm		pm+pt		Perm		Perm	
Protected Phases	5	2			6	3	8		4		9
Permitted Phases	2		2	6		8		4		4	
Detector Phase	5	2	2	6	6	3	8	4	4	4	
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	15.0	15.0	15.0	15.0	9.0	15.0	15.0	15.0	15.0	20.0
Total Split (s)	26.0	50.0	50.0	24.0	24.0	13.0	40.0	27.0	27.0	27.0	20.0
Total Split (%)	23.6%	45.5%	45.5%	21.8%	21.8%	11.8%	36.4%	24.5%	24.5%	24.5%	18%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	10.0
All-Red Time (s)	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	
Lead/Lag	Lead			Lag	Lag	Lead		Lag	Lag	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes	Yes		Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)		46.1	46.1		46.1	32.1	31.1		18.0	18.0	
Actuated g/C Ratio		0.53	0.53		0.53	0.37	0.36		0.21	0.21	
v/c Ratio		0.93	0.35		0.18	0.81	0.34		0.71	0.47	
Control Delay		42.0	8.7		11.2	42.1	20.9		43.3	10.0	
Queue Delay		18.6	0.3		0.0	0.0	0.0		0.0	0.0	
Total Delay		60.6	9.0		11.2	42.1	20.9		43.3	10.0	
LOS		E	A		B	D	C		D	B	
Approach Delay		44.4			11.2		32.7		27.3		
Approach LOS		D			B		C		C		

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 86.2
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 35.1 — Intersection LOS: D
Intersection Capacity Utilization 76.9% — ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 29: Waltham Street & Powder Mill Road



Lane Group	SET	SER	NWT	NEL	NET	SWT	SWR
Lane Group Flow (vph)	691	314	191	261	208	247	228
v/c Ratio	0.93	0.35	0.18	0.81	0.34	0.71	0.47
Control Delay	42.0	8.7	11.2	42.1	20.9	43.3	10.0
Queue Delay	18.6	0.3	0.0	0.0	0.0	0.0	0.0
Total Delay	60.6	9.0	11.2	42.1	20.9	43.3	10.0
Queue Length 50th (ft)	338	55	50	104	78	125	14
Queue Length 95th (ft)	#568	95	89	#146	128	174	58
Internal Link Dist (ft)	365		548		1021	443	
Turn Bay Length (ft)		90		60			105
Base Capacity (vph)	740	898	1033	323	690	427	545
Starvation Cap Reductn	68	193	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	1.03	0.45	0.18	0.81	0.30	0.58	0.42

Intersection Summary

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

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	358	214	254	12	126	28	206	161	20	18	175	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	14	12	12	15	12	9	9	12	12	11	11
Grade (%)		3%			-4%			-6%			0%	
Total Lost time (s)		4.0	4.0		4.0		4.0	5.0			5.0	5.0
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frt		1.00	0.85		0.98		1.00	0.98			1.00	0.85
Flt Protected		0.97	1.00		1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)		1913	1575		2038		1624	1685			1748	1561
Flt Permitted		0.70	1.00		0.94		0.34	1.00			0.95	1.00
Satd. Flow (perm)		1384	1575		1924		573	1685			1670	1561
Peak-hour factor, PHF	0.81	0.86	0.81	0.75	0.88	0.88	0.79	0.88	0.80	0.71	0.79	0.83
Adj. Flow (vph)	442	249	314	16	143	32	261	183	25	25	222	228
RTOR Reduction (vph)	0	0	55	0	4	0	0	4	0	0	0	155
Lane Group Flow (vph)	0	691	259	0	187	0	261	204	0	0	247	73
Confl. Peds. (#/hr)	1					1	1			1		
Heavy Vehicles (%)	1%	1%	1%	17%	0%	0%	3%	3%	0%	0%	5%	0%
Turn Type	pm+pt		Perm	Perm			pm+pt			Perm		Perm
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2		2	6			8			4		4
Actuated Green, G (s)		46.1	46.1		46.1		31.0	31.0			18.0	18.0
Effective Green, g (s)		46.1	46.1		46.1		31.0	31.0			18.0	18.0
Actuated g/C Ratio		0.54	0.54		0.54		0.36	0.36			0.21	0.21
Clearance Time (s)		4.0	4.0		4.0		4.0	5.0			5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		741	843		1030		316	607			349	326
v/s Ratio Prot							c0.09	0.12				
v/s Ratio Perm		c0.50	0.16		0.10		c0.21				0.15	0.05
v/c Ratio		0.93	0.31		0.18		0.83	0.34			0.71	0.22
Uniform Delay, d1		18.6	11.1		10.3		23.1	20.1			31.6	28.3
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		18.5	0.2		0.1		16.0	0.3			6.4	0.3
Delay (s)		37.1	11.3		10.4		39.0	20.4			38.0	28.6
Level of Service		D	B		B		D	C			D	C
Approach Delay (s)		29.0			10.4			30.8			33.5	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	28.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	86.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	15	170	108	370	400	88
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.71	0.83	0.87	0.97	0.95	0.67
Hourly flow rate (vph)	21	205	124	381	421	131
Pedestrians	4					
Lane Width (ft)	15.0					
Walking Speed (ft/s)	3.5					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					1101	
pX, platoon unblocked	0.97	0.97	0.97			
vC, conflicting volume	1120	491	556			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1108	456	524			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	89	65	88			
cM capacity (veh/h)	198	579	1013			

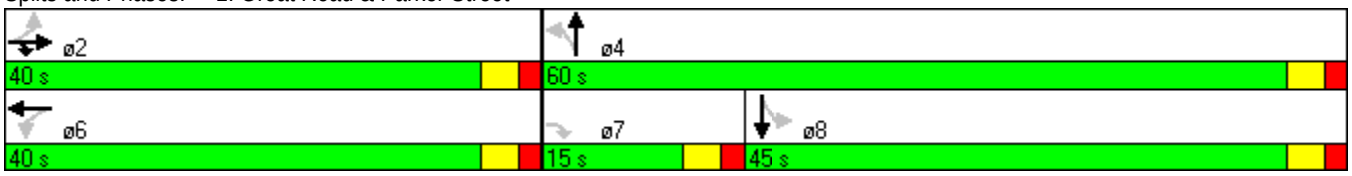
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	226	506	552
Volume Left	21	124	0
Volume Right	205	0	131
cSH	491	1013	1700
Volume to Capacity	0.46	0.12	0.32
Queue Length 95th (ft)	60	10	0
Control Delay (s)	18.4	3.3	0.0
Lane LOS	C	A	
Approach Delay (s)	18.4	3.3	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	150	123	32	635	103	220	374	18	65	400	97
Turn Type	Perm		custom	Perm		Free	Perm		Free	Perm		Free
Protected Phases		2	2		6			4			8	
Permitted Phases	2		7	6		Free	4		Free	8		Free
Detector Phase	2	2	2	6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0		9.0	9.0		15.0	15.0	
Total Split (s)	40.0	40.0	40.0	40.0	40.0	0.0	60.0	60.0	0.0	45.0	45.0	0.0
Total Split (%)	40.0%	40.0%	40.0%	40.0%	40.0%	0.0%	60.0%	60.0%	0.0%	45.0%	45.0%	0.0%
Yellow Time (s)	2.8	2.8	2.8	2.8	2.8		2.8	2.8		2.8	2.8	
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8		1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6	4.6	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lead/Lag										Lag	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	None		None	None	
Act Effct Green (s)	35.4	35.4	35.4	35.4	35.4	100.0	55.4	55.4	100.0	55.4	55.4	100.0
Actuated g/C Ratio	0.35	0.35	0.35	0.35	0.35	1.00	0.55	0.55	1.00	0.55	0.55	1.00
v/c Ratio	0.68	0.28	0.22	0.10	1.16	0.08	0.68	0.42	0.02	0.20	0.41	0.10
Control Delay	75.1	24.6	4.8	22.7	121.2	0.1	26.9	14.5	0.0	12.9	14.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	75.1	24.6	4.8	22.7	121.2	0.1	26.9	14.5	0.0	12.9	14.4	0.1
LOS	E	C	A	C	F	A	C	B	A	B	B	A
Approach Delay		23.7			101.3			18.5			10.6	
Approach LOS		C			F			B			B	

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 100	
Natural Cycle: 110	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.16	
Intersection Signal Delay: 46.2	Intersection LOS: D
Intersection Capacity Utilization 78.2%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 1: Great Road & Parker Street



Lane Group	ø7
Lane Configurations	
Volume (vph)	
Turn Type	
Protected Phases	7
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	9.0
Total Split (s)	15.0
Total Split (%)	15%
Yellow Time (s)	2.8
All-Red Time (s)	1.8
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	48	188	140	39	784	124	268	420	30	83	421	167
v/c Ratio	0.68	0.28	0.22	0.10	1.16	0.08	0.68	0.42	0.02	0.20	0.41	0.10
Control Delay	75.1	24.6	4.8	22.7	121.2	0.1	26.9	14.5	0.0	12.9	14.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	75.1	24.6	4.8	22.7	121.2	0.1	26.9	14.5	0.0	12.9	14.4	0.1
Queue Length 50th (ft)	26	85	0	17	~597	0	116	146	0	25	146	0
Queue Length 95th (ft)	#53	122	37	37	#697	0	188	213	0	45	216	0
Internal Link Dist (ft)		465			321			895			490	
Turn Bay Length (ft)	80		45	90			95		80	80		75
Base Capacity (vph)	71	666	643	381	673	1615	393	1012	1545	405	1032	1695
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.28	0.22	0.10	1.16	0.08	0.68	0.42	0.02	0.20	0.41	0.10

Intersection Summary

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

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	150	123	32	635	103	220	374	18	65	400	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	12	11	11	12	12	9	12	13	10	12	16
Total Lost time (s)	4.6	4.6	4.6	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1685	1881	1561	1745	1900	1615	1560	1827	1545	1604	1863	1695
Flt Permitted	0.11	1.00	1.00	0.59	1.00	1.00	0.43	1.00	1.00	0.43	1.00	1.00
Satd. Flow (perm)	200	1881	1561	1077	1900	1615	710	1827	1545	732	1863	1695
Peak-hour factor, PHF	0.65	0.80	0.88	0.82	0.81	0.83	0.82	0.89	0.61	0.78	0.95	0.58
Adj. Flow (vph)	48	188	140	39	784	124	268	420	30	83	421	167
RTOR Reduction (vph)	0	0	90	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	48	188	50	39	784	124	268	420	30	83	421	167
Confl. Peds. (#/hr)	1						1					
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	4%	4%	8%	5%	2%	8%
Turn Type	Perm		custom	Perm		Free	Perm		Free	Perm		Free
Protected Phases		2	2		6			4			8	
Permitted Phases	2		7	6		Free	4		Free	8		Free
Actuated Green, G (s)	35.4	35.4	35.4	35.4	35.4	100.0	55.4	55.4	100.0	55.4	55.4	100.0
Effective Green, g (s)	35.4	35.4	35.4	35.4	35.4	100.0	55.4	55.4	100.0	55.4	55.4	100.0
Actuated g/C Ratio	0.35	0.35	0.35	0.35	0.35	1.00	0.55	0.55	1.00	0.55	0.55	1.00
Clearance Time (s)	4.6	4.6	4.6	4.6	4.6		4.6	4.6		4.6	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	71	666	553	381	673	1615	393	1012	1545	406	1032	1695
v/s Ratio Prot		0.10	0.03		c0.41			0.23			0.23	
v/s Ratio Perm	0.24			0.04		0.08	c0.38		0.02	0.11		0.10
v/c Ratio	0.68	0.28	0.09	0.10	1.16	0.08	0.68	0.42	0.02	0.20	0.41	0.10
Uniform Delay, d1	27.4	23.2	21.5	21.7	32.3	0.0	16.0	12.9	0.0	11.2	12.8	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	22.5	0.2	0.1	0.1	89.8	0.1	4.8	0.3	0.0	0.3	0.3	0.1
Delay (s)	50.0	23.4	21.6	21.8	122.1	0.1	20.8	13.2	0.0	11.5	13.1	0.1
Level of Service	D	C	C	C	F	A	C	B	A	B	B	A
Approach Delay (s)		26.1			102.0			15.5			9.7	
Approach LOS		C			F			B			A	

Intersection Summary			
HCM Average Control Delay	45.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	9.2
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	12	0	1	1	0	4	1	586	1	4	536	13
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.55	0.25	0.25	0.25	0.25	0.50	0.25	0.92	0.25	0.33	0.91	1.00
Hourly flow rate (vph)	22	0	4	4	0	8	4	637	4	12	589	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											975	
pX, platoon unblocked	0.88	0.88	0.88	0.88	0.88		0.88					
vC, conflicting volume	1275	1269	596	1271	1273	639	602			641		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1243	1236	468	1238	1241	639	476			641		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	83	100	99	97	100	98	100			99		
cM capacity (veh/h)	130	153	525	132	152	480	962			953		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	26	12	645	614
Volume Left	22	4	4	12
Volume Right	4	8	4	13
cSH	147	256	962	953
Volume to Capacity	0.18	0.05	0.00	0.01
Queue Length 95th (ft)	15	4	0	1
Control Delay (s)	34.6	19.8	0.1	0.3
Lane LOS	D	C	A	A
Approach Delay (s)	34.6	19.8	0.1	0.3
Approach LOS	D	C		

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	42.0%	ICU Level of Service	A
Analysis Period (min)	15		
Description: North St EB closed 3:30 PM - 5:30 PM			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	2	1	7	0	589	3	4	537	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.58	0.25	0.91	0.38	0.50	0.91	0.25
Hourly flow rate (vph)	0	0	0	8	4	12	0	647	8	8	590	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											1226	
pX, platoon unblocked	0.90	0.90	0.90	0.90	0.90		0.90					
vC, conflicting volume	1271	1261	590	1257	1257	651	590			655		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1246	1235	489	1230	1230	651	489			655		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	94	97	97	100			99		
cM capacity (veh/h)	130	159	525	139	160	472	976			942		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	24	655	598
Volume Left	0	8	0	8
Volume Right	0	12	8	0
cSH	1700	223	976	942
Volume to Capacity	0.00	0.11	0.00	0.01
Queue Length 95th (ft)	0	9	0	1
Control Delay (s)	0.0	23.1	0.0	0.2
Lane LOS	A	C		A
Approach Delay (s)	0.0	23.1	0.0	0.2
Approach LOS	A	C		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	41.4%	ICU Level of Service	A
Analysis Period (min)	15		
Description: South St EB closed 3:30 PM - 5:30 PM			

Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (veh/h)	599	12	7	526	12	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.55	0.58	0.91	0.55	0.38
Hourly flow rate (vph)	651	22	12	578	22	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			673		1264	662
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			673		1264	662
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		88	98
cM capacity (veh/h)			927		186	465

Direction, Lane #	NB 1	SB 1	SW 1
Volume Total	673	590	30
Volume Left	0	12	22
Volume Right	22	0	8
cSH	1700	927	222
Volume to Capacity	0.40	0.01	0.13
Queue Length 95th (ft)	0	1	11
Control Delay (s)	0.0	0.4	23.7
Lane LOS		A	C
Approach Delay (s)	0.0	0.4	23.7
Approach LOS			C

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	19	3	1	565	504	24
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.56	0.75	0.25	0.93	0.93	0.64
Hourly flow rate (vph)	34	4	4	608	542	38
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1176	561	579			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1176	561	579			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	84	99	100			
cM capacity (veh/h)	212	531	1004			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	38	612	579
Volume Left	34	4	0
Volume Right	4	0	38
cSH	227	1004	1700
Volume to Capacity	0.17	0.00	0.34
Queue Length 95th (ft)	15	0	0
Control Delay (s)	24.0	0.1	0.0
Lane LOS	C	A	
Approach Delay (s)	24.0	0.1	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	40.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	2	2	594	0	2	537
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.50	0.93	0.25	0.25	0.91
Hourly flow rate (vph)	4	4	639	0	8	590
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1245	639			639	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1245	639			639	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	99			99	
cM capacity (veh/h)	192	480			955	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	8	639	598
Volume Left	4	0	8
Volume Right	4	0	0
cSH	275	1700	955
Volume to Capacity	0.03	0.38	0.01
Queue Length 95th (ft)	2	0	1
Control Delay (s)	18.5	0.0	0.2
Lane LOS	C		A
Approach Delay (s)	18.5	0.0	0.2
Approach LOS	C		

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	6	275	708	106	141	11
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.25	0.89	0.93	0.89	0.66	0.33
Hourly flow rate (vph)	24	309	761	119	214	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	880				1178	821
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	880				1178	821
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				0	91
cM capacity (veh/h)	776				206	378

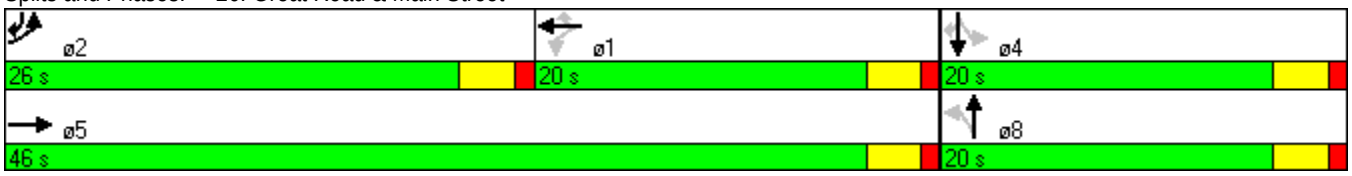
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	333	880	247
Volume Left	24	0	214
Volume Right	0	119	33
cSH	776	1700	222
Volume to Capacity	0.03	0.52	1.11
Queue Length 95th (ft)	2	0	283
Control Delay (s)	1.0	0.0	140.0
Lane LOS	A		F
Approach Delay (s)	1.0	0.0	140.0
Approach LOS			F

Intersection Summary			
Average Delay	23.9		
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Volume (vph)	161	272	699	13	3	4	8	0	353
Turn Type	Prot			Perm	Perm		Perm		pm+ov
Protected Phases	2	5	1			8		4	2
Permitted Phases				1	8		4		4
Detector Phase	2	5	1	1	8	8	4	4	2
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	15.0	15.0	12.0	12.0	15.0	15.0	15.0	15.0	15.0
Total Split (s)	26.0	46.0	20.0	20.0	20.0	20.0	20.0	20.0	26.0
Total Split (%)	39.4%	69.7%	30.3%	30.3%	30.3%	30.3%	30.3%	30.3%	39.4%
Yellow Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Lead/Lag	Lead		Lag	Lag					Lead
Lead-Lag Optimize?	Yes		Yes	Yes					Yes
Recall Mode	None	None	None	None	None	None	None	None	None
Act Effct Green (s)	14.4	12.7	16.7	16.7		8.2		8.2	16.2
Actuated g/C Ratio	0.36	0.31	0.41	0.41		0.20		0.20	0.40
v/c Ratio	0.30	0.56	0.85	0.02		0.05		0.05	0.66
Control Delay	11.6	16.5	26.6	9.5		17.0		17.0	14.5
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Delay	11.6	16.5	26.6	9.5		17.0		17.0	14.5
LOS	B	B	C	A		B		B	B
Approach Delay		14.6	26.2			17.0		14.6	
Approach LOS		B	C			B		B	

Intersection Summary	
Cycle Length: 66	
Actuated Cycle Length: 40.5	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.85	
Intersection Signal Delay: 19.9	Intersection LOS: B
Intersection Capacity Utilization 75.3%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 26: Great Road & Main Street



Lane Group	EBL	EBT	WBT	WBR	NBT	SBT	SBR
Lane Group Flow (vph)	189	306	752	17	16	18	415
v/c Ratio	0.30	0.56	0.85	0.02	0.05	0.05	0.66
Control Delay	11.6	16.5	26.6	9.5	17.0	17.0	14.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.6	16.5	26.6	9.5	17.0	17.0	14.5
Queue Length 50th (ft)	26	63	129	2	3	3	66
Queue Length 95th (ft)	80	44	#460	11	10	5	112
Internal Link Dist (ft)		376	660		36	340	
Turn Bay Length (ft)	112			31			95
Base Capacity (vph)	1009	1687	889	741	706	706	949
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.18	0.85	0.02	0.02	0.03	0.44

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	161	272	0	0	699	13	3	4	0	8	0	353
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	16	16	12	9	12	9	9	11
Total Lost time (s)	3.7	3.7			3.7	3.7		3.7			3.7	3.7
Lane Util. Factor	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.98		1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00			1.00	0.85		1.00			1.00	0.85
Flt Protected	0.95	1.00			1.00	1.00		0.98			0.95	1.00
Satd. Flow (prot)	1787	1756			2153	1791		1668			1624	1546
Flt Permitted	0.95	1.00			1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)	1787	1756			2153	1791		1710			1710	1546
Peak-hour factor, PHF	0.85	0.89	0.25	0.25	0.93	0.75	0.38	0.50	0.25	0.44	0.25	0.85
Adj. Flow (vph)	189	306	0	0	752	17	8	8	0	18	0	415
RTOR Reduction (vph)	0	0	0	0	0	2	0	0	0	0	0	11
Lane Group Flow (vph)	189	306	0	0	752	15	0	16	0	0	18	404
Confl. Peds. (#/hr)						1						
Heavy Vehicles (%)	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Turn Type	Prot			Perm		Perm	Perm			Perm		pm+ov
Protected Phases	2	5			1			8			4	2
Permitted Phases				1		1	8			4		4
Actuated Green, G (s)	14.4	34.8			16.7	16.7		1.2			1.2	15.6
Effective Green, g (s)	14.4	34.8			16.7	16.7		1.2			1.2	15.6
Actuated g/C Ratio	0.33	0.80			0.38	0.38		0.03			0.03	0.36
Clearance Time (s)	3.7	3.7			3.7	3.7		3.7			3.7	3.7
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)	593	1408			828	689		47			47	688
v/s Ratio Prot	0.11	0.17			c0.35							c0.20
v/s Ratio Perm						0.01		0.01			0.01	0.07
v/c Ratio	0.32	0.22			0.91	0.02		0.34			0.38	0.59
Uniform Delay, d1	10.8	1.0			12.6	8.3		20.7			20.7	11.3
Progression Factor	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.3	0.1			13.6	0.0		4.3			5.1	1.3
Delay (s)	11.1	1.1			26.2	8.3		25.0			25.9	12.6
Level of Service	B	A			C	A		C			C	B
Approach Delay (s)		4.9			25.8			25.0			13.1	
Approach LOS		A			C			C			B	

Intersection Summary			
HCM Average Control Delay	16.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	43.4	Sum of lost time (s)	7.4
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		

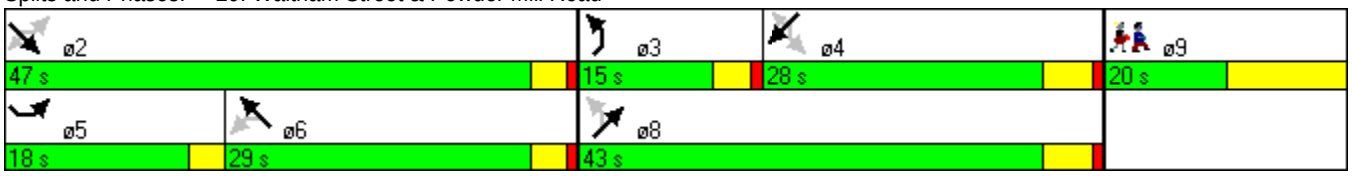
c Critical Lane Group

Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWL	SWT	SWR	ø9
Lane Configurations											
Volume (vph)	308	154	214	19	221	167	181	16	252	383	
Turn Type	pm+pt		Perm	Perm		pm+pt		Perm		Perm	
Protected Phases	5	2			6	3	8		4		9
Permitted Phases	2		2	6		8		4		4	
Detector Phase	5	2	2	6	6	3	8	4	4	4	
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	15.0	15.0	15.0	15.0	9.0	15.0	15.0	15.0	15.0	20.0
Total Split (s)	18.0	47.0	47.0	29.0	29.0	15.0	43.0	28.0	28.0	28.0	20.0
Total Split (%)	16.4%	42.7%	42.7%	26.4%	26.4%	13.6%	39.1%	25.5%	25.5%	25.5%	18%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	10.0
All-Red Time (s)	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	
Lead/Lag	Lead			Lag	Lag	Lead		Lag	Lag	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes	Yes		Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)		43.1	43.1		43.1	35.6	34.6		20.0	20.0	
Actuated g/C Ratio		0.50	0.50		0.50	0.41	0.40		0.23	0.23	
v/c Ratio		1.04	0.28		0.32	0.56	0.30		0.73	0.69	
Control Delay		73.0	8.9		14.8	23.6	18.6		42.0	15.7	
Queue Delay		0.0	0.0		0.0	0.0	0.0		0.0	0.0	
Total Delay		73.0	8.9		14.8	23.6	18.6		42.0	15.7	
LOS		E	A		B	C	B		D	B	
Approach Delay		55.0			14.8		21.0		26.9		
Approach LOS		E			B		C		C		

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 86.8
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.04
Intersection Signal Delay: 34.5 — Intersection LOS: C
Intersection Capacity Utilization 78.7% — ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 29: Waltham Street & Powder Mill Road



Lane Group	SET	SER	NWT	NEL	NET	SWT	SWR
Lane Group Flow (vph)	591	230	315	196	207	295	399
v/c Ratio	1.04	0.28	0.32	0.56	0.30	0.73	0.69
Control Delay	73.0	8.9	14.8	23.6	18.6	42.0	15.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	73.0	8.9	14.8	23.6	18.6	42.0	15.7
Queue Length 50th (ft)	~375	41	104	70	74	150	49
Queue Length 95th (ft)	#561	88	157	110	124	239	150
Internal Link Dist (ft)	365		548		1021	443	
Turn Bay Length (ft)		90		60			105
Base Capacity (vph)	570	814	972	353	754	468	618
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	1.04	0.28	0.32	0.56	0.27	0.63	0.65

Intersection Summary

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

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

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	308	154	214	19	221	28	167	181	7	16	252	383
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	14	12	12	15	12	9	9	12	12	11	11
Grade (%)		3%			-4%			-6%			0%	
Total Lost time (s)		4.0	4.0		4.0		4.0	5.0			5.0	5.0
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.97		1.00		1.00	1.00			1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frt		1.00	0.85		0.99		1.00	0.99			1.00	0.85
Flt Protected		0.97	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)		1927	1545		2087		1656	1712			1813	1522
Flt Permitted		0.57	1.00		0.93		0.29	1.00			0.97	1.00
Satd. Flow (perm)		1144	1545		1951		502	1712			1760	1522
Peak-hour factor, PHF	0.74	0.88	0.93	0.67	0.87	0.84	0.85	0.94	0.50	0.75	0.92	0.96
Adj. Flow (vph)	416	175	230	28	254	33	196	193	14	21	274	399
RTOR Reduction (vph)	0	0	48	0	3	0	0	2	0	0	0	224
Lane Group Flow (vph)	0	591	182	0	312	0	196	205	0	0	295	175
Confl. Peds. (#/hr)	1		3	2		2	2			1		2
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	2%	0%	0%	1%	0%
Turn Type	pm+pt		Perm	Perm			pm+pt			Perm		Perm
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2		2	6			8			4		4
Actuated Green, G (s)		43.1	43.1		43.1		34.6	34.6			20.0	20.0
Effective Green, g (s)		43.1	43.1		43.1		34.6	34.6			20.0	20.0
Actuated g/C Ratio		0.50	0.50		0.50		0.40	0.40			0.23	0.23
Clearance Time (s)		4.0	4.0		4.0		4.0	5.0			5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		569	768		970		341	683			406	351
v/s Ratio Prot							c0.07	0.12				
v/s Ratio Perm		c0.52	0.12		0.16		0.16				c0.17	0.12
v/c Ratio		1.04	0.24		0.32		0.57	0.30			0.73	0.50
Uniform Delay, d1		21.8	12.4		13.1		18.8	17.8			30.8	29.0
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		48.1	0.2		0.2		2.3	0.2			6.4	1.1
Delay (s)		69.9	12.6		13.2		21.1	18.0			37.2	30.1
Level of Service		E	B		B		C	B			D	C
Approach Delay (s)		53.9			13.2			19.5			33.1	
Approach LOS		D			B			B			C	

Intersection Summary			
HCM Average Control Delay	35.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	86.7	Sum of lost time (s)	13.0
Intersection Capacity Utilization	78.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	20	179	158	344	421	103
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.65	0.88	0.78	0.92	0.94	0.71
Hourly flow rate (vph)	31	203	203	374	448	145
Pedestrians					1	
Lane Width (ft)					11.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					1101	
pX, platoon unblocked	0.91	0.91	0.91			
vC, conflicting volume	1300	520	593			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1282	429	508			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	77	65	79			
cM capacity (veh/h)	133	575	971			

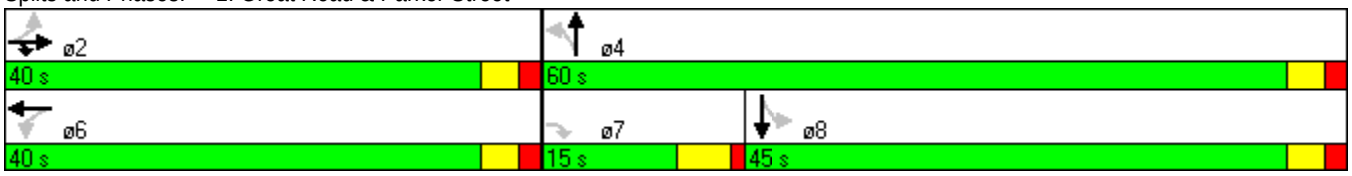
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	234	576	593
Volume Left	31	203	0
Volume Right	203	0	145
cSH	400	971	1700
Volume to Capacity	0.58	0.21	0.35
Queue Length 95th (ft)	90	20	0
Control Delay (s)	25.9	5.1	0.0
Lane LOS	D	A	
Approach Delay (s)	25.9	5.1	0.0
Approach LOS	D		

Intersection Summary			
Average Delay	6.4		
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	126	97	24	165	34	110	292	19	37	345	59
Turn Type	Perm		custom	Perm		Free	Perm		Free	Perm		Free
Protected Phases		2	2		6			4			8	
Permitted Phases	2		7	6		Free	4		Free	8		Free
Detector Phase	2	2	2	6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Total Split (s)	40.0	40.0	40.0	40.0	40.0	0.0	60.0	60.0	0.0	45.0	45.0	0.0
Total Split (%)	40.0%	40.0%	40.0%	40.0%	40.0%	0.0%	60.0%	60.0%	0.0%	45.0%	45.0%	0.0%
Yellow Time (s)	2.8	2.8	2.8	2.8	2.8		2.8	2.8		2.8	2.8	
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8		1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6	4.6	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lead/Lag										Lag	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	None		None	None	
Act Effct Green (s)	11.2	11.2	11.2	11.2	11.2	38.8	17.3	17.3	38.8	17.3	17.3	38.8
Actuated g/C Ratio	0.29	0.29	0.29	0.29	0.29	1.00	0.45	0.45	1.00	0.45	0.45	1.00
v/c Ratio	0.16	0.25	0.22	0.09	0.39	0.03	0.33	0.38	0.02	0.11	0.46	0.04
Control Delay	14.6	14.3	5.1	14.0	15.6	0.0	9.5	8.4	0.0	6.8	9.2	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.6	14.3	5.1	14.0	15.6	0.0	9.5	8.4	0.0	6.8	9.2	0.1
LOS	B	B	A	B	B	A	A	A	A	A	A	A
Approach Delay		10.9			12.7			8.1			7.6	
Approach LOS		B			B			A			A	

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 38.8	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.46	
Intersection Signal Delay: 9.3	Intersection LOS: A
Intersection Capacity Utilization 51.6%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Great Road & Parker Street



Lane Group	ø7
Lane Configurations	
Volume (vph)	
Turn Type	
Protected Phases	7
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	15.0
Total Split (s)	15.0
Total Split (%)	15%
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	51	140	115	33	214	52	124	324	31	51	383	77
v/c Ratio	0.16	0.25	0.22	0.09	0.39	0.03	0.33	0.38	0.02	0.11	0.46	0.04
Control Delay	14.6	14.3	5.1	14.0	15.6	0.0	9.5	8.4	0.0	6.8	9.2	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.6	14.3	5.1	14.0	15.6	0.0	9.5	8.4	0.0	6.8	9.2	0.1
Queue Length 50th (ft)	7	20	0	5	32	0	13	36	0	5	44	0
Queue Length 95th (ft)	24	79	26	21	96	0	50	102	0	17	123	0
Internal Link Dist (ft)		465			321			895			490	
Turn Bay Length (ft)	80		45	90			95		80	80		75
Base Capacity (vph)	967	1665	1329	1075	1648	1582	830	1856	1635	915	1721	1792
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.08	0.09	0.03	0.13	0.03	0.15	0.17	0.02	0.06	0.22	0.04

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	126	97	24	165	34	110	292	19	37	345	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	12	11	11	12	12	9	12	13	10	12	16
Total Lost time (s)	4.6	4.6	4.6	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1683	1900	1501	1745	1881	1582	1593	1900	1635	1685	1881	1792
Flt Permitted	0.62	1.00	1.00	0.67	1.00	1.00	0.51	1.00	1.00	0.56	1.00	1.00
Satd. Flow (perm)	1106	1900	1501	1226	1881	1582	849	1900	1635	1001	1881	1792
Peak-hour factor, PHF	0.59	0.90	0.84	0.72	0.77	0.65	0.89	0.90	0.61	0.73	0.90	0.77
Adj. Flow (vph)	51	140	115	33	214	52	124	324	31	51	383	77
RTOR Reduction (vph)	0	0	81	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	51	140	34	33	214	52	124	324	31	51	383	77
Confl. Peds. (#/hr)	1											
Confl. Bikes (#/hr)			4			1			1			3
Heavy Vehicles (%)	0%	0%	4%	0%	1%	0%	2%	0%	0%	0%	1%	0%
Turn Type	Perm		custom	Perm		Free	Perm		Free	Perm		Free
Protected Phases		2	2		6			4			8	
Permitted Phases	2		7	6		Free	4		Free	8		Free
Actuated Green, G (s)	11.2	11.2	11.2	11.2	11.2	37.8	17.4	17.4	37.8	17.4	17.4	37.8
Effective Green, g (s)	11.2	11.2	11.2	11.2	11.2	37.8	17.4	17.4	37.8	17.4	17.4	37.8
Actuated g/C Ratio	0.30	0.30	0.30	0.30	0.30	1.00	0.46	0.46	1.00	0.46	0.46	1.00
Clearance Time (s)	4.6	4.6	4.6	4.6	4.6		4.6	4.6		4.6	4.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	328	563	445	363	557	1582	391	875	1635	461	866	1792
v/s Ratio Prot		0.07	0.02		c0.11			0.17			c0.20	
v/s Ratio Perm	0.05			0.03		0.03	0.15		0.02	0.05		0.04
v/c Ratio	0.16	0.25	0.08	0.09	0.38	0.03	0.32	0.37	0.02	0.11	0.44	0.04
Uniform Delay, d1	9.8	10.1	9.6	9.6	10.6	0.0	6.4	6.6	0.0	5.8	6.9	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.2	0.1	0.1	0.4	0.0	0.5	0.3	0.0	0.1	0.4	0.0
Delay (s)	10.0	10.3	9.7	9.7	11.0	0.0	6.9	6.9	0.0	5.9	7.3	0.0
Level of Service	B	B	A	A	B	A	A	A	A	A	A	A
Approach Delay (s)		10.0			9.0			6.5			6.0	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	7.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	37.8	Sum of lost time (s)	9.2
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	0	1	1	0	4	0	410	1	2	440	7
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.50	0.25	0.25	0.25	0.25	0.50	0.25	0.90	0.25	0.50	0.90	0.44
Hourly flow rate (vph)	12	0	4	4	0	8	0	456	4	4	489	16
Pedestrians		1										
Lane Width (ft)		11.0										
Walking Speed (ft/s)		3.5										
Percent Blockage		0										
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											975	
pX, platoon unblocked												
vC, conflicting volume	971	965	498	966	971	458	506			460		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	971	965	498	966	971	458	506			460		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	100	99	98	100	99	100			100		
cM capacity (veh/h)	230	256	576	233	254	607	1068			1112		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	16	12	460	509
Volume Left	12	4	0	4
Volume Right	4	8	4	16
cSH	271	396	1068	1112
Volume to Capacity	0.06	0.03	0.00	0.00
Queue Length 95th (ft)	5	2	0	0
Control Delay (s)	19.1	14.4	0.0	0.1
Lane LOS	C	B		A
Approach Delay (s)	19.1	14.4	0.0	0.1
Approach LOS	C	B		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	35.2%	ICU Level of Service	A
Analysis Period (min)	15		
Description: North St EB closed 3:30 PM - 5:30 PM			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	0	0	2	0	4	1	376	1	2	474	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.50	0.25	0.86	0.25	0.50	0.91	0.25
Hourly flow rate (vph)	4	0	0	8	0	8	4	437	4	4	521	0
Pedestrians		1									1	
Lane Width (ft)		16.0									11.0	
Walking Speed (ft/s)		3.5									3.5	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											1226	
pX, platoon unblocked												
vC, conflicting volume	986	979	522	976	977	440	522			441		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	986	979	522	976	977	440	522			441		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	100	97	100	99	100			100		
cM capacity (veh/h)	224	250	558	231	251	621	1053			1129		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	4	16	445	525
Volume Left	4	8	4	4
Volume Right	0	8	4	0
cSH	224	336	1053	1129
Volume to Capacity	0.02	0.05	0.00	0.00
Queue Length 95th (ft)	1	4	0	0
Control Delay (s)	21.4	16.2	0.1	0.1
Lane LOS	C	C	A	A
Approach Delay (s)	21.4	16.2	0.1	0.1
Approach LOS	C	C		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	36.4%	ICU Level of Service	A
Analysis Period (min)	15		
Description: South St EB closed 3:30 PM - 5:30 PM			

Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (veh/h)	401	13	2	428	18	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.93	0.75	0.50	0.93	0.61	0.25
Hourly flow rate (vph)	431	17	4	460	30	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			449		908	440
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			449		908	440
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		90	100
cM capacity (veh/h)			1123		307	621

Direction, Lane #	NB 1	SB 1	SW 1
Volume Total	449	464	30
Volume Left	0	4	30
Volume Right	17	0	0
cSH	1700	1123	307
Volume to Capacity	0.26	0.00	0.10
Queue Length 95th (ft)	0	0	8
Control Delay (s)	0.0	0.1	18.0
Lane LOS		A	C
Approach Delay (s)	0.0	0.1	18.0
Approach LOS			C

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	34.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	21	7	8	393	419	19
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.71	0.88	0.50	0.94	0.86	0.61
Hourly flow rate (vph)	30	8	16	418	487	31
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	953	503	518			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	953	503	518			
tC, single (s)	6.4	6.3	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.2			
p0 queue free %	90	99	98			
cM capacity (veh/h)	286	545	1058			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	38	434	518
Volume Left	30	16	0
Volume Right	8	0	31
cSH	318	1058	1700
Volume to Capacity	0.12	0.02	0.30
Queue Length 95th (ft)	10	1	0
Control Delay (s)	17.8	0.5	0.0
Lane LOS	C	A	
Approach Delay (s)	17.8	0.5	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	37.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	1	2	376	0	3	474
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.25	0.50	0.86	0.25	0.38	0.92
Hourly flow rate (vph)	4	4	437	0	8	515
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	968	437			437	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	968	437			437	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	99			99	
cM capacity (veh/h)	282	624			1133	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	8	437	523
Volume Left	4	0	8
Volume Right	4	0	0
cSH	388	1700	1133
Volume to Capacity	0.02	0.26	0.01
Queue Length 95th (ft)	2	0	1
Control Delay (s)	14.5	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	14.5	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	37.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	10	269	239	53	43	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.33	0.82	0.91	0.81	0.88	0.62
Hourly flow rate (vph)	30	328	263	65	49	19
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	328				684	295
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	328				684	295
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				88	97
cM capacity (veh/h)	1243				407	749

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	358	328	68
Volume Left	30	0	49
Volume Right	0	65	19
cSH	1243	1700	569
Volume to Capacity	0.02	0.19	0.12
Queue Length 95th (ft)	2	0	10
Control Delay (s)	0.9	0.0	13.6
Lane LOS	A		B
Approach Delay (s)	0.9	0.0	13.6
Approach LOS			B

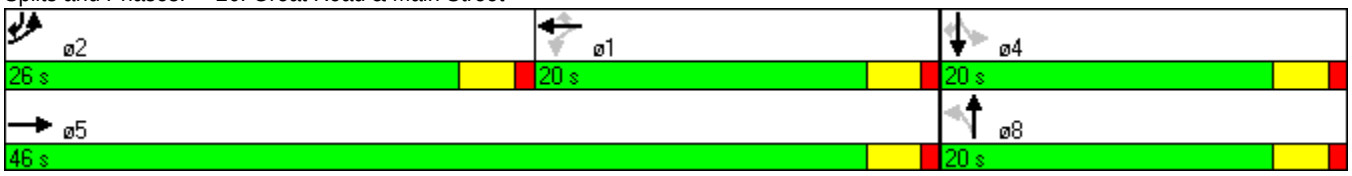
Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	32.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	NBT	SBL	SBT	SBR
Lane Configurations								
Volume (vph)	224	246	270	19	0	14	0	189
Turn Type	Prot			Perm		Perm		pm+ov
Protected Phases	2	5	1		8		4	2
Permitted Phases				1		4		4
Detector Phase	2	5	1	1	8	4	4	2
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	15.0	15.0	12.0	12.0	15.0	15.0	15.0	15.0
Total Split (s)	26.0	46.0	20.0	20.0	20.0	20.0	20.0	26.0
Total Split (%)	39.4%	69.7%	30.3%	30.3%	30.3%	30.3%	30.3%	39.4%
Yellow Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Lead/Lag	Lead		Lag	Lag				Lead
Lead-Lag Optimize?	Yes		Yes	Yes				Yes
Recall Mode	None	None	None	None	None	None	None	None
Act Effct Green (s)	11.1	12.6	11.1	11.1	9.5		9.5	12.5
Actuated g/C Ratio	0.39	0.44	0.39	0.39	0.33		0.33	0.43
v/c Ratio	0.34	0.36	0.36	0.05	0.01		0.04	0.29
Control Delay	10.6	7.2	10.5	6.9	0.0		13.6	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	10.6	7.2	10.5	6.9	0.0		13.6	2.3
LOS	B	A	B	A	A		B	A
Approach Delay		8.7	10.1		0.0		3.3	
Approach LOS		A	B		A		A	

Intersection Summary

Cycle Length: 66
Actuated Cycle Length: 28.8
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.36
Intersection Signal Delay: 7.8 — Intersection LOS: A
Intersection Capacity Utilization 44.6% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 26: Great Road & Main Street



Lane Group	EBL	EBT	WBT	WBR	NBT	SBT	SBR
Lane Group Flow (vph)	233	280	293	34	8	22	236
v/c Ratio	0.34	0.36	0.36	0.05	0.01	0.04	0.29
Control Delay	10.6	7.2	10.5	6.9	0.0	13.6	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.6	7.2	10.5	6.9	0.0	13.6	2.3
Queue Length 50th (ft)	19	27	25	1	0	2	1
Queue Length 95th (ft)	105	41	128	10	0	6	17
Internal Link Dist (ft)		376	660		36	340	
Turn Bay Length (ft)	112			31			95
Base Capacity (vph)	1445	1688	1361	1161	1175	1019	1367
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.17	0.22	0.03	0.01	0.02	0.17

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	224	246	0	0	270	19	0	0	3	14	0	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	16	16	12	9	12	9	9	11
Total Lost time (s)	3.7	3.7			3.7	3.7		3.7			3.7	3.7
Lane Util. Factor	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.98		1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00			1.00	0.85		0.86			1.00	0.85
Flt Protected	0.95	1.00			1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)	1787	1756			2111	1792		1479			1503	1561
Flt Permitted	0.95	1.00			1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)	1787	1756			2111	1792		1479			1582	1561
Peak-hour factor, PHF	0.96	0.88	0.25	0.25	0.92	0.56	0.25	0.25	0.38	0.65	0.25	0.80
Adj. Flow (vph)	233	280	0	0	293	34	0	0	8	22	0	236
RTOR Reduction (vph)	0	0	0	0	0	14	0	8	0	0	0	140
Lane Group Flow (vph)	233	280	0	0	293	20	0	0	0	0	22	96
Confl. Peds. (#/hr)	1			1		1				1		
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	1%	1%	0%	0%	2%	0%	0%	0%	0%	8%	0%	0%
Turn Type	Prot			Perm		Perm	Perm			Perm		pm+ov
Protected Phases	2	5			1			8			4	2
Permitted Phases				1		1	8			4		4
Actuated Green, G (s)	11.2	22.8			7.9	7.9		0.9			0.9	12.1
Effective Green, g (s)	11.2	22.8			7.9	7.9		0.9			0.9	12.1
Actuated g/C Ratio	0.36	0.73			0.25	0.25		0.03			0.03	0.39
Clearance Time (s)	3.7	3.7			3.7	3.7		3.7			3.7	3.7
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)	644	1287			536	455		43			46	793
v/s Ratio Prot	c0.13	0.16			c0.14			0.00				0.04
v/s Ratio Perm						0.01					c0.01	0.02
v/c Ratio	0.36	0.22			0.55	0.04		0.01			0.48	0.12
Uniform Delay, d1	7.3	1.3			10.0	8.8		14.7			14.9	6.1
Progression Factor	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.3	0.1			1.1	0.0		0.0			7.6	0.1
Delay (s)	7.7	1.4			11.2	8.8		14.7			22.5	6.2
Level of Service	A	A			B	A		B			C	A
Approach Delay (s)		4.2			10.9			14.7			7.6	
Approach LOS		A			B			B			A	

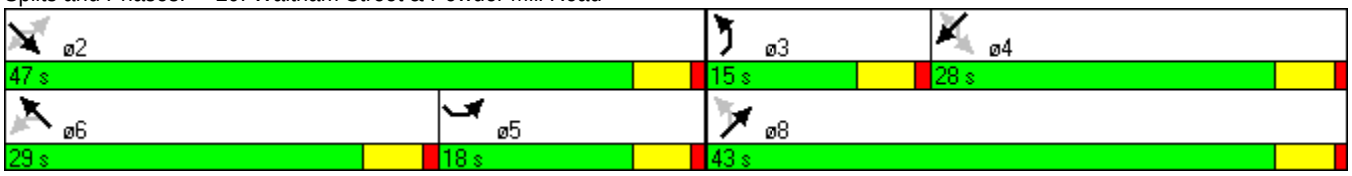
Intersection Summary			
HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	31.1	Sum of lost time (s)	11.1
Intersection Capacity Utilization	44.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWL	SWT	SWR
Lane Configurations										
Volume (vph)	377	147	221	7	150	151	160	17	204	325
Turn Type	pm+pt		Perm	Perm		pm+pt		Perm		Perm
Protected Phases	5	2			6	3	8		4	
Permitted Phases	2		2	6		8		4		4
Detector Phase	5	2	2	6	6	3	8	4	4	4
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	15.0	15.0	15.0	15.0	10.0	15.0	15.0	15.0	15.0
Total Split (s)	18.0	47.0	47.0	29.0	29.0	15.0	43.0	28.0	28.0	28.0
Total Split (%)	20.0%	52.2%	52.2%	32.2%	32.2%	16.7%	47.8%	31.1%	31.1%	31.1%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag			Lead	Lead	Lead		Lag	Lag	Lag
Lead-Lag Optimize?	Yes			Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)		42.2	42.2		42.2	32.5	32.5		18.1	18.1
Actuated g/C Ratio		0.50	0.50		0.50	0.38	0.38		0.21	0.21
v/c Ratio		0.97	0.29		0.23	0.50	0.29		0.69	0.60
Control Delay		54.2	7.3		13.1	23.0	18.5		40.8	7.8
Queue Delay		5.3	0.0		0.0	0.0	0.0		0.0	0.0
Total Delay		59.5	7.3		13.1	23.0	18.5		40.8	7.8
LOS		E	A		B	C	B		D	A
Approach Delay		44.6			13.1		20.6		21.3	
Approach LOS		D			B		C		C	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 84.8
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 29.9 — Intersection LOS: C
Intersection Capacity Utilization 76.4% — ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 29: Waltham Street & Powder Mill Road



Lane Group	SET	SER	NWT	NEL	NET	SWT	SWR
Lane Group Flow (vph)	616	246	233	168	193	255	369
v/c Ratio	0.97	0.29	0.23	0.50	0.29	0.69	0.60
Control Delay	54.2	7.3	13.1	23.0	18.5	40.8	7.8
Queue Delay	5.3	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.5	7.3	13.1	23.0	18.5	40.8	7.8
Queue Length 50th (ft)	319	31	65	60	67	127	0
Queue Length 95th (ft)	#564	81	116	105	115	205	61
Internal Link Dist (ft)	365		548		1021	443	
Turn Bay Length (ft)		90		60			105
Base Capacity (vph)	633	842	992	342	774	474	678
Starvation Cap Reductn	16	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	1.00	0.29	0.23	0.49	0.25	0.54	0.54

Intersection Summary

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

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	377	147	221	7	150	33	151	160	5	17	204	325
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	14	12	12	15	12	9	9	12	12	11	11
Grade (%)		3%			-4%			-6%			0%	
Total Lost time (s)		5.0	5.0		5.0		5.0	5.0			5.0	5.0
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.98		0.99		1.00	1.00			1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frt		1.00	0.85		0.97		1.00	0.99			1.00	0.85
Flt Protected		0.96	1.00		1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)		1907	1553		2053		1656	1712			1826	1504
Flt Permitted		0.64	1.00		0.96		0.32	1.00			0.95	1.00
Satd. Flow (perm)		1272	1553		1976		549	1712			1738	1504
Peak-hour factor, PHF	0.84	0.88	0.90	0.50	0.88	0.68	0.90	0.89	0.38	0.60	0.90	0.88
Adj. Flow (vph)	449	167	246	14	170	49	168	180	13	28	227	369
RTOR Reduction (vph)	0	0	69	0	8	0	0	3	0	0	0	290
Lane Group Flow (vph)	0	616	177	0	225	0	168	190	0	0	255	79
Confl. Peds. (#/hr)	2		3	2		3	1			1		2
Confl. Bikes (#/hr)			1									1
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%	1%	2%	0%	0%	0%	1%
Turn Type	pm+pt		Perm	Perm			pm+pt			Perm		Perm
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2		2	6			8			4		4
Actuated Green, G (s)		42.2	42.2		42.2		32.5	32.5			18.1	18.1
Effective Green, g (s)		42.2	42.2		42.2		32.5	32.5			18.1	18.1
Actuated g/C Ratio		0.50	0.50		0.50		0.38	0.38			0.21	0.21
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		634	774		985		334	657			371	321
v/s Ratio Prot							c0.06	0.11				
v/s Ratio Perm		c0.48	0.11		0.11		0.14				c0.15	0.05
v/c Ratio		0.97	0.23		0.23		0.50	0.29			0.69	0.25
Uniform Delay, d1		20.7	12.0		12.0		18.8	18.1			30.7	27.6
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		28.6	0.2		0.1		1.2	0.2			5.2	0.4
Delay (s)		49.2	12.2		12.2		19.9	18.3			35.9	28.0
Level of Service		D	B		B		B	B			D	C
Approach Delay (s)		38.7			12.2			19.1			31.3	
Approach LOS		D			B			B			C	

Intersection Summary			
HCM Average Control Delay	30.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	84.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	76.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	23	111	96	313	374	65
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.65	0.82	0.75	0.91	0.94	0.86
Hourly flow rate (vph)	35	135	128	344	398	76
Pedestrians	1			1		
Lane Width (ft)	15.0			11.0		
Walking Speed (ft/s)	3.5			3.5		
Percent Blockage	0			0		
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					1101	
pX, platoon unblocked	0.97	0.97	0.97			
vC, conflicting volume	1037	438	474			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1023	407	444			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	84	78	88			
cM capacity (veh/h)	226	629	1093			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	171	472	473
Volume Left	35	128	0
Volume Right	135	0	76
cSH	459	1093	1700
Volume to Capacity	0.37	0.12	0.28
Queue Length 95th (ft)	42	10	0
Control Delay (s)	17.4	3.3	0.0
Lane LOS	C	A	
Approach Delay (s)	17.4	3.3	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	63.8%	ICU Level of Service	B
Analysis Period (min)	15		

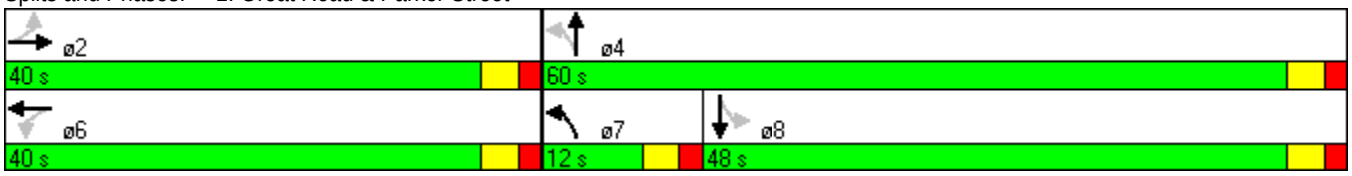
Level of Service Computation Sheets

- **Future Build Conditions with Signal**

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	79	510	172	45	188	56	169	409	49	58	542	80
Turn Type	Perm		Free	Perm		Free	pm+pt		Free	Perm		Free
Protected Phases		2			6		7	4			8	
Permitted Phases	2		Free	6		Free	4		Free	8		Free
Detector Phase	2	2		6	6		7	4		8	8	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	15.0	15.0		15.0	15.0		8.6	15.0		15.0	15.0	
Total Split (s)	40.0	40.0	0.0	40.0	40.0	0.0	12.0	60.0	0.0	48.0	48.0	0.0
Total Split (%)	40.0%	40.0%	0.0%	40.0%	40.0%	0.0%	12.0%	60.0%	0.0%	48.0%	48.0%	0.0%
Yellow Time (s)	2.8	2.8		2.8	2.8		2.8	2.8		2.8	2.8	
All-Red Time (s)	1.8	1.8		1.8	1.8		1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes					
Recall Mode	Min	Min		Min	Min		None	Min		Min	Min	
Act Effct Green (s)	33.1	33.1	86.8	33.1	33.1	86.8	44.3	44.3	86.8	32.0	32.0	86.8
Actuated g/C Ratio	0.38	0.38	1.00	0.38	0.38	1.00	0.51	0.51	1.00	0.37	0.37	1.00
v/c Ratio	0.40	0.84	0.16	0.63	0.33	0.04	0.85	0.53	0.05	0.25	0.83	0.08
Control Delay	25.7	38.9	0.2	54.8	22.3	0.1	47.7	16.9	0.1	21.5	36.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.7	38.9	0.2	54.8	22.3	0.1	47.7	16.9	0.1	21.5	36.4	0.1
LOS	C	D	A	D	C	A	D	B	A	C	D	A
Approach Delay		27.6			24.3			23.3			28.8	
Approach LOS		C			C			C			C	

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 86.8	
Natural Cycle: 70	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.85	
Intersection Signal Delay: 26.3	Intersection LOS: C
Intersection Capacity Utilization 83.4%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 1: Great Road & Parker Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	146	593	236	67	227	65	199	499	73	75	571	133
v/c Ratio	0.40	0.84	0.16	0.63	0.33	0.04	0.85	0.53	0.05	0.25	0.83	0.08
Control Delay	25.7	38.9	0.2	54.8	22.3	0.1	47.7	16.9	0.1	21.5	36.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.7	38.9	0.2	54.8	22.3	0.1	47.7	16.9	0.1	21.5	36.4	0.1
Queue Length 50th (ft)	58	296	0	30	88	0	61	184	0	29	290	0
Queue Length 95th (ft)	68	#520	0	#63	154	0	#140	234	0	51	418	0
Internal Link Dist (ft)		465			321			895			490	
Turn Bay Length (ft)	80		45	90			95		80	80		75
Base Capacity (vph)	402	771	1501	117	757	1615	233	1195	1545	416	955	1695
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.77	0.16	0.57	0.30	0.04	0.85	0.42	0.05	0.18	0.60	0.08

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	79	510	172	45	188	56	169	409	49	58	542	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	12	11	11	12	12	9	12	13	10	12	16
Total Lost time (s)	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1636	1845	1501	1745	1810	1615	1562	1827	1545	1604	1863	1695
Flt Permitted	0.56	1.00	1.00	0.15	1.00	1.00	0.14	1.00	1.00	0.48	1.00	1.00
Satd. Flow (perm)	962	1845	1501	279	1810	1615	229	1827	1545	812	1863	1695
Peak-hour factor, PHF	0.54	0.86	0.73	0.67	0.83	0.86	0.85	0.82	0.67	0.77	0.95	0.60
Adj. Flow (vph)	146	593	236	67	227	65	199	499	73	75	571	133
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	146	593	236	67	227	65	199	499	73	75	571	133
Heavy Vehicles (%)	3%	3%	4%	0%	5%	0%	4%	4%	8%	5%	2%	8%
Turn Type	Perm		Free	Perm		Free	pm+pt		Free	Perm		Free
Protected Phases		2			6		7	4			8	
Permitted Phases	2		Free	6		Free	4		Free	8		Free
Actuated Green, G (s)	33.1	33.1	86.6	33.1	33.1	86.6	44.3	44.3	86.6	32.1	32.1	86.6
Effective Green, g (s)	33.1	33.1	86.6	33.1	33.1	86.6	44.3	44.3	86.6	32.1	32.1	86.6
Actuated g/C Ratio	0.38	0.38	1.00	0.38	0.38	1.00	0.51	0.51	1.00	0.37	0.37	1.00
Clearance Time (s)	4.6	4.6		4.6	4.6		4.6	4.6		4.6	4.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	368	705	1501	107	692	1615	234	935	1545	301	691	1695
v/s Ratio Prot		c0.32			0.13		c0.07	0.27			0.31	
v/s Ratio Perm	0.15		0.16	0.24		0.04	c0.36		0.05	0.09		0.08
v/c Ratio	0.40	0.84	0.16	0.63	0.33	0.04	0.85	0.53	0.05	0.25	0.83	0.08
Uniform Delay, d1	19.5	24.4	0.0	21.7	18.9	0.0	16.9	14.2	0.0	18.9	24.7	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	8.9	0.2	10.9	0.3	0.0	24.4	0.6	0.1	0.4	8.0	0.1
Delay (s)	20.2	33.3	0.2	32.6	19.2	0.0	41.3	14.8	0.1	19.3	32.7	0.1
Level of Service	C	C	A	C	B	A	D	B	A	B	C	A
Approach Delay (s)		23.3			18.2			20.2			25.9	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	22.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	86.6	Sum of lost time (s)	9.2
Intersection Capacity Utilization	83.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	18	0	1	0	0	4	0	572	0	8	805	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.71	0.25	0.25	0.25	0.25	0.33	0.25	0.93	0.25	0.25	0.92	0.67
Hourly flow rate (vph)	25	0	4	0	0	12	0	615	0	32	875	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								778			975	
pX, platoon unblocked	0.71	0.71	0.70	0.71	0.71	0.97	0.70			0.97		
vC, conflicting volume	1567	1555	876	1559	1556	615	876			615		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1513	1495	606	1501	1497	592	607			592		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	62	100	99	100	100	98	100			97		
cM capacity (veh/h)	67	85	350	69	85	497	685			968		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	29	12	615	908
Volume Left	25	0	0	32
Volume Right	4	12	0	1
cSH	76	497	685	968
Volume to Capacity	0.39	0.02	0.00	0.03
Queue Length 95th (ft)	38	2	0	3
Control Delay (s)	80.1	12.4	0.0	0.9
Lane LOS	F	B		A
Approach Delay (s)	80.1	12.4	0.0	0.9
Approach LOS	F	B		

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	63.2%	ICU Level of Service	B
Analysis Period (min)	15		
Description: North St EB closed 3:30 PM - 5:30 PM			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	1	0	5	0	595	0	0	686	100
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.42	0.25	0.95	0.25	0.25	0.97	0.25
Hourly flow rate (vph)	0	0	0	4	0	12	0	626	0	0	707	400
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								527			1226	
pX, platoon unblocked	0.76	0.76	0.71	0.76	0.76	0.91	0.71			0.91		
vC, conflicting volume	1545	1534	907	1534	1734	626	1107			626		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1304	1288	668	1288	1553	544	949			544		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	96	100	98	100			100		
cM capacity (veh/h)	102	125	329	107	87	496	522			946		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	16	626	1107
Volume Left	0	4	0	0
Volume Right	0	12	0	400
cSH	1700	260	522	946
Volume to Capacity	0.00	0.06	0.00	0.00
Queue Length 95th (ft)	0	5	0	0
Control Delay (s)	0.0	19.8	0.0	0.0
Lane LOS	A	C		
Approach Delay (s)	0.0	19.8	0.0	0.0
Approach LOS	A	C		

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		
Description: South St EB closed 3:30 PM - 5:30 PM			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	156	74	93	435	552	91
Turn Type		Prot	pm+pt			Perm
Protected Phases	4	4	5	2	6	
Permitted Phases			2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	25.0	25.0	9.0	25.0	25.0	25.0
Total Split (s)	25.0	25.0	10.0	45.0	35.0	35.0
Total Split (%)	35.7%	35.7%	14.3%	64.3%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None	None	Min	Min	Min	Min
Act Effct Green (s)	11.0	11.0	33.8	35.6	22.8	22.8
Actuated g/C Ratio	0.21	0.21	0.66	0.69	0.44	0.44
v/c Ratio	0.45	0.20	0.25	0.37	0.72	0.13
Control Delay	24.7	7.2	6.3	6.5	18.7	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.7	7.2	6.3	6.5	18.7	3.1
LOS	C	A	A	A	B	A
Approach Delay	19.1			6.4	16.5	
Approach LOS	B			A	B	

Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 51.5	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 13.1	Intersection LOS: B
Intersection Capacity Utilization 55.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 5: Site Drive & Parker Street

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	170	80	101	473	600	99
v/c Ratio	0.45	0.20	0.25	0.37	0.72	0.13
Control Delay	24.7	7.2	6.3	6.5	18.7	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.7	7.2	6.3	6.5	18.7	3.1
Queue Length 50th (ft)	49	0	11	65	152	0
Queue Length 95th (ft)	109	29	31	141	292	22
Internal Link Dist (ft)	107			616	216	
Turn Bay Length (ft)						
Base Capacity (vph)	755	721	407	1430	1177	1037
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.11	0.25	0.33	0.51	0.10

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	156	74	93	435	552	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1881	1599
Flt Permitted	0.95	1.00	0.21	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	398	1863	1881	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	170	80	101	473	600	99
RTOR Reduction (vph)	0	67	0	0	0	55
Lane Group Flow (vph)	170	13	101	473	600	44
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%
Turn Type		Prot	pm+pt			Perm
Protected Phases	4	4	5	2	6	
Permitted Phases			2			6
Actuated Green, G (s)	8.5	8.5	33.8	33.8	23.3	23.3
Effective Green, g (s)	8.5	8.5	33.8	33.8	23.3	23.3
Actuated g/C Ratio	0.16	0.16	0.65	0.65	0.45	0.45
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	288	257	401	1204	838	712
v/s Ratio Prot	c0.10	0.01	0.03	c0.25	c0.32	
v/s Ratio Perm			0.14			0.03
v/c Ratio	0.59	0.05	0.25	0.39	0.72	0.06
Uniform Delay, d1	20.3	18.5	5.8	4.4	11.8	8.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.2	0.1	0.3	0.2	2.9	0.0
Delay (s)	23.5	18.6	6.1	4.6	14.7	8.3
Level of Service	C	B	A	A	B	A
Approach Delay (s)	21.9			4.9	13.8	
Approach LOS	C			A	B	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	52.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	55.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (veh/h)	520	19	0	686	13	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.93	0.64	0.25	0.92	0.75	0.38
Hourly flow rate (vph)	559	30	0	746	17	8
Pedestrians	1			1		
Lane Width (ft)	11.0			12.0		
Walking Speed (ft/s)	3.5			3.5		
Percent Blockage	0			0		
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				696		
pX, platoon unblocked					0.71	
vC, conflicting volume			589		1321	575
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			589		1248	575
tC, single (s)			4.1		6.5	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.3
p0 queue free %			100		87	98
cM capacity (veh/h)			996		132	521

Direction, Lane #	NB 1	SB 1	SW 1
Volume Total	589	746	25
Volume Left	0	0	17
Volume Right	30	0	8
cSH	1700	996	172
Volume to Capacity	0.35	0.00	0.15
Queue Length 95th (ft)	0	0	13
Control Delay (s)	0.0	0.0	29.4
Lane LOS			D
Approach Delay (s)	0.0	0.0	29.4
Approach LOS			D

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	37	1	1	493	692	8
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.70	0.25	0.25	0.91	0.93	0.58
Hourly flow rate (vph)	53	4	4	542	744	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					1038	
pX, platoon unblocked	0.73	0.73	0.73			
vC, conflicting volume	1301	751	758			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1226	469	479			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	63	99	99			
cM capacity (veh/h)	144	435	795			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	57	546	758
Volume Left	53	4	0
Volume Right	4	0	14
cSH	151	795	1700
Volume to Capacity	0.38	0.01	0.45
Queue Length 95th (ft)	40	0	0
Control Delay (s)	42.5	0.1	0.0
Lane LOS	E	A	
Approach Delay (s)	42.5	0.1	0.0
Approach LOS	E		

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	46.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	1	4	600	1	3	643
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.25	0.33	0.94	0.25	0.38	0.95
Hourly flow rate (vph)	4	12	638	4	8	677
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			296			
pX, platoon unblocked	0.88	0.88			0.88	
vC, conflicting volume	1333	640			642	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1310	520			523	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	98			99	
cM capacity (veh/h)	154	491			925	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	16	642	685
Volume Left	4	0	8
Volume Right	12	4	0
cSH	319	1700	925
Volume to Capacity	0.05	0.38	0.01
Queue Length 95th (ft)	4	0	1
Control Delay (s)	16.9	0.0	0.2
Lane LOS	C		A
Approach Delay (s)	16.9	0.0	0.2
Approach LOS	C		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	46.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	9	736	226	90	147	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.25	0.88	0.68	0.69	0.70	0.25
Hourly flow rate (vph)	36	836	332	130	210	24
Pedestrians			4		1	
Lane Width (ft)			12.0		15.0	
Walking Speed (ft/s)			3.5		3.5	
Percent Blockage			0		0	
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	464				1311	399
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	464				1311	399
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				0	96
cM capacity (veh/h)	1107				166	655

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	872	463	234
Volume Left	36	0	210
Volume Right	0	130	24
cSH	1107	1700	180
Volume to Capacity	0.03	0.27	1.30
Queue Length 95th (ft)	3	0	332
Control Delay (s)	0.9	0.0	218.8
Lane LOS	A		F
Approach Delay (s)	0.9	0.0	218.8
Approach LOS			F

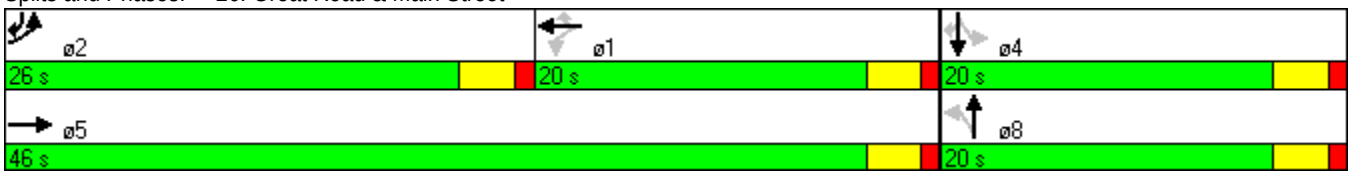
Intersection Summary			
Average Delay	33.1		
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBT	SBR	ø8
Lane Configurations								
Volume (vph)	355	610	252	16	8	0	130	
Turn Type	Prot			Perm	Perm		pm+ov	
Protected Phases	2	5	1			4	2	8
Permitted Phases				1	4		4	
Detector Phase	2	5	1	1	4	4	2	
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	15.0	15.0	12.0	12.0	15.0	15.0	15.0	15.0
Total Split (s)	26.0	46.0	20.0	20.0	20.0	20.0	26.0	20.0
Total Split (%)	39.4%	69.7%	30.3%	30.3%	30.3%	30.3%	39.4%	30%
Yellow Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	
Lead/Lag	Lead		Lag	Lag			Lead	
Lead-Lag Optimize?	Yes						Yes	
Recall Mode	Min	Min	None	None	None	None	Min	None
Act Effct Green (s)	15.4	34.2	11.3	11.3		8.6	16.4	
Actuated g/C Ratio	0.43	0.95	0.31	0.31		0.24	0.45	
v/c Ratio	0.55	0.44	0.46	0.04		0.04	0.20	
Control Delay	12.7	2.2	14.2	8.9		16.6	2.0	
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	12.7	2.2	14.2	8.9		16.6	2.0	
LOS	B	A	B	A		B	A	
Approach Delay		6.1	13.9			3.4		
Approach LOS		A	B			A		

Intersection Summary

Cycle Length: 66
Actuated Cycle Length: 36.1
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 7.3 — Intersection LOS: A
Intersection Capacity Utilization 62.1% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 26: Great Road & Main Street



Lane Group	EBL	EBT	WBT	WBR	SBT	SBR
Lane Group Flow (vph)	418	713	290	21	16	151
v/c Ratio	0.55	0.44	0.46	0.04	0.04	0.20
Control Delay	12.7	2.2	14.2	8.9	16.6	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.7	2.2	14.2	8.9	16.6	2.0
Queue Length 50th (ft)	45	0	34	1	2	0
Queue Length 95th (ft)	177	128	140	12	5	16
Internal Link Dist (ft)		376	660		340	
Turn Bay Length (ft)	112			31		95
Base Capacity (vph)	1174	1628	976	765	829	1083
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.44	0.30	0.03	0.02	0.14

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	355	610	1	0	252	16	0	0	0	8	0	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	16	16	12	9	12	9	9	11
Total Lost time (s)	3.7	3.7			3.7	3.7					3.7	3.7
Lane Util. Factor	1.00	1.00			1.00	1.00					1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00	1.00					1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00					1.00	1.00
Frt	1.00	1.00			1.00	0.85					1.00	0.85
Flt Protected	0.95	1.00			1.00	1.00					0.95	1.00
Satd. Flow (prot)	1770	1721			2012	1564					1624	1499
Flt Permitted	0.95	1.00			1.00	1.00					1.00	1.00
Satd. Flow (perm)	1770	1721			2012	1564					1710	1499
Peak-hour factor, PHF	0.85	0.86	0.25	0.25	0.87	0.75	0.92	0.92	0.92	0.50	0.25	0.86
Adj. Flow (vph)	418	709	4	0	290	21	0	0	0	16	0	151
RTOR Reduction (vph)	0	0	0	0	0	8	0	0	0	0	0	88
Lane Group Flow (vph)	418	713	0	0	290	13	0	0	0	0	16	63
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	2%	3%	0%	0%	7%	17%	2%	2%	2%	0%	0%	4%
Turn Type	Prot			Perm		Perm	Perm			Perm		pm+ov
Protected Phases	2	5			1			8			4	2
Permitted Phases				1		1	8			4		4
Actuated Green, G (s)	15.4	30.7			11.6	11.6					1.0	16.4
Effective Green, g (s)	15.4	30.7			11.6	11.6					1.0	16.4
Actuated g/C Ratio	0.39	0.79			0.30	0.30					0.03	0.42
Clearance Time (s)	3.7	3.7			3.7	3.7					3.7	3.7
Vehicle Extension (s)	3.0	3.0			3.0	3.0					3.0	3.0
Lane Grp Cap (vph)	697	1351			597	464					44	771
v/s Ratio Prot	c0.24	c0.41			0.14							0.03
v/s Ratio Perm						0.01					c0.01	0.01
v/c Ratio	0.60	0.53			0.49	0.03					0.36	0.08
Uniform Delay, d1	9.4	1.5			11.3	9.7					18.7	6.8
Progression Factor	1.00	1.00			1.00	1.00					1.00	1.00
Incremental Delay, d2	1.4	0.4			0.6	0.0					5.1	0.0
Delay (s)	10.8	1.9			11.9	9.8					23.8	6.9
Level of Service	B	A			B	A					C	A
Approach Delay (s)		5.2			11.8			0.0			8.5	
Approach LOS		A			B			A			A	

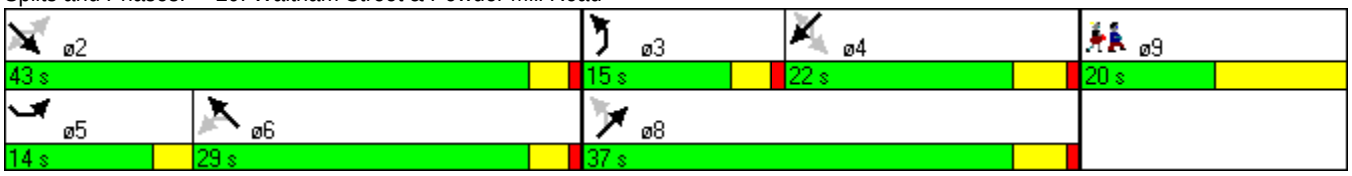
Intersection Summary			
HCM Average Control Delay	6.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	39.1	Sum of lost time (s)	7.4
Intersection Capacity Utilization	62.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWL	SWT	SWR	ø9
Lane Configurations											
Volume (vph)	358	214	323	12	126	260	194	18	203	189	
Turn Type	pm+pt		Perm	Perm		pm+pt		Perm		Perm	
Protected Phases	5	2			6	3	8		4		9
Permitted Phases	2		2	6		8		4		4	
Detector Phase	5	2	2	6	6	3	8	4	4	4	
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	15.0	15.0	15.0	15.0	9.0	15.0	15.0	15.0	15.0	20.0
Total Split (s)	14.0	43.0	43.0	29.0	29.0	15.0	37.0	22.0	22.0	22.0	20.0
Total Split (%)	14.0%	43.0%	43.0%	29.0%	29.0%	15.0%	37.0%	22.0%	22.0%	22.0%	20%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	10.0
All-Red Time (s)	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	
Lead/Lag	Lead			Lag	Lag	Lead		Lag	Lag	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes	Yes		Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)		39.0	39.0		39.0	33.0	32.0		17.0	17.0	
Actuated g/C Ratio		0.49	0.49		0.49	0.41	0.40		0.21	0.21	
v/c Ratio		1.03	0.47		0.21	0.82	0.29		0.79	0.48	
Control Delay		65.3	10.0		11.8	37.0	17.0		48.2	11.2	
Queue Delay		9.0	0.3		0.0	0.0	0.0		0.0	0.0	
Total Delay		74.3	10.3		11.8	37.0	17.0		48.2	11.2	
LOS		E	B		B	D	B		D	B	
Approach Delay		50.9			11.8		28.5		31.7		
Approach LOS		D			B		C		C		

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 80	
Natural Cycle: 140	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.03	
Intersection Signal Delay: 38.1	Intersection LOS: D
Intersection Capacity Utilization 81.3%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 29: Waltham Street & Powder Mill Road



Lane Group	SET	SER	NWT	NEL	NET	SWT	SWR
Lane Group Flow (vph)	691	399	191	329	245	282	228
v/c Ratio	1.03	0.47	0.21	0.82	0.29	0.79	0.48
Control Delay	65.3	10.0	11.8	37.0	17.0	48.2	11.2
Queue Delay	9.0	0.3	0.0	0.0	0.0	0.0	0.0
Total Delay	74.3	10.3	11.8	37.0	17.0	48.2	11.2
Queue Length 50th (ft)	~375	70	49	115	78	134	19
Queue Length 95th (ft)	#537	113	84	#167	127	#202	64
Internal Link Dist (ft)	365		548		1021	443	
Turn Bay Length (ft)		90		60			105
Base Capacity (vph)	672	848	928	399	854	355	475
Starvation Cap Reductn	17	98	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	1.05	0.53	0.21	0.82	0.29	0.79	0.48

Intersection Summary

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

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

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	358	214	323	12	126	28	260	194	20	18	203	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	14	12	12	15	12	12	16	12	12	11	11
Grade (%)		3%			-4%			-6%			0%	
Total Lost time (s)		4.0	4.0		4.0		4.0	5.0			5.0	5.0
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frt		1.00	0.85		0.98		1.00	0.98			1.00	0.85
Flt Protected		0.97	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)		1913	1575		2038		1804	2127			1749	1561
Flt Permitted		0.70	1.00		0.93		0.29	1.00			0.95	1.00
Satd. Flow (perm)		1378	1575		1894		546	2127			1672	1561
Peak-hour factor, PHF	0.81	0.86	0.81	0.75	0.88	0.88	0.79	0.88	0.80	0.71	0.79	0.83
Adj. Flow (vph)	442	249	399	16	143	32	329	220	25	25	257	228
RTOR Reduction (vph)	0	0	80	0	5	0	0	4	0	0	0	143
Lane Group Flow (vph)	0	691	319	0	186	0	329	241	0	0	282	85
Confl. Peds. (#/hr)	1					1	1			1		
Heavy Vehicles (%)	1%	1%	1%	17%	0%	0%	3%	3%	0%	0%	5%	0%
Turn Type	pm+pt		Perm	Perm			pm+pt			Perm		Perm
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2		2	6			8			4		4
Actuated Green, G (s)		39.0	39.0		39.0		32.0	32.0			17.0	17.0
Effective Green, g (s)		39.0	39.0		39.0		32.0	32.0			17.0	17.0
Actuated g/C Ratio		0.49	0.49		0.49		0.40	0.40			0.21	0.21
Clearance Time (s)		4.0	4.0		4.0		4.0	5.0			5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		672	768		923		391	851			355	332
v/s Ratio Prot							c0.12	0.11				
v/s Ratio Perm		c0.50	0.20		0.10		c0.22				0.17	0.05
v/c Ratio		1.03	0.41		0.20		0.84	0.28			0.79	0.26
Uniform Delay, d1		20.5	13.2		11.6		18.6	16.2			29.8	26.2
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		42.1	0.4		0.1		15.0	0.2			11.6	0.4
Delay (s)		62.6	13.5		11.8		33.6	16.4			41.4	26.6
Level of Service		E	B		B		C	B			D	C
Approach Delay (s)		44.7			11.8			26.3			34.8	
Approach LOS		D			B			C			C	

Intersection Summary			
HCM Average Control Delay	35.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	32	170	108	457	497	88
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.71	0.83	0.87	0.97	0.95	0.67
Hourly flow rate (vph)	45	205	124	471	523	131
Pedestrians	4					
Lane Width (ft)	15.0					
Walking Speed (ft/s)	3.5					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					1101	
pX, platoon unblocked	0.95	0.95	0.95			
vC, conflicting volume	1312	593	659			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1303	547	616			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	69	60	87			
cM capacity (veh/h)	147	507	922			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	250	595	655
Volume Left	45	124	0
Volume Right	205	0	131
cSH	351	922	1700
Volume to Capacity	0.71	0.13	0.39
Queue Length 95th (ft)	131	12	0
Control Delay (s)	36.9	3.4	0.0
Lane LOS	E	A	
Approach Delay (s)	36.9	3.4	0.0
Approach LOS	E		

Intersection Summary			
Average Delay	7.5		
Intersection Capacity Utilization	83.8%	ICU Level of Service	E
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	144	123	108	577	52	336	656	92	57	667	97
Turn Type	Perm		Free	Perm		Free	pm+pt		Free	Perm		Free
Protected Phases		2			6		7	4			8	
Permitted Phases	2		Free	6		Free	4		Free	8		Free
Detector Phase	2	2		6	6		7	4		8	8	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	15.0	15.0		15.0	15.0		8.6	15.0		15.0	15.0	
Total Split (s)	37.0	37.0	0.0	37.0	37.0	0.0	24.0	63.0	0.0	39.0	39.0	0.0
Total Split (%)	37.0%	37.0%	0.0%	37.0%	37.0%	0.0%	24.0%	63.0%	0.0%	39.0%	39.0%	0.0%
Yellow Time (s)	2.8	2.8		2.8	2.8		2.8	2.8		2.8	2.8	
All-Red Time (s)	1.8	1.8		1.8	1.8		1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes					
Recall Mode	Min	Min		Min	Min		None	Min		Min	Min	
Act Effct Green (s)	32.4	32.4	100.0	32.4	32.4	100.0	58.4	58.4	100.0	34.4	34.4	100.0
Actuated g/C Ratio	0.32	0.32	1.00	0.32	0.32	1.00	0.58	0.58	1.00	0.34	0.34	1.00
v/c Ratio	0.65	0.30	0.09	0.38	1.16	0.04	1.11	0.69	0.10	0.33	1.10	0.10
Control Delay	72.5	26.9	0.1	30.0	120.2	0.0	109.0	18.8	0.1	29.5	97.1	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.5	26.9	0.1	30.0	120.2	0.0	109.0	18.8	0.1	29.5	97.1	0.1
LOS	E	C	A	C	F	A	F	B	A	C	F	A
Approach Delay		22.4			98.7			45.1			74.6	
Approach LOS		C			F			D			E	

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 100	
Natural Cycle: 120	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.16	
Intersection Signal Delay: 64.5	Intersection LOS: E
Intersection Capacity Utilization 102.8%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 1: Great Road & Parker Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	46	180	140	132	712	63	410	737	151	73	702	167
v/c Ratio	0.65	0.30	0.09	0.38	1.16	0.04	1.11	0.69	0.10	0.33	1.10	0.10
Control Delay	72.5	26.9	0.1	30.0	120.2	0.0	109.0	18.8	0.1	29.5	97.1	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.5	26.9	0.1	30.0	120.2	0.0	109.0	18.8	0.1	29.5	97.1	0.1
Queue Length 50th (ft)	25	85	0	64	~539	0	~256	306	0	34	~509	0
Queue Length 95th (ft)	#50	123	0	106	#643	0	#379	433	0	62	#730	0
Internal Link Dist (ft)		465			321			895			490	
Turn Bay Length (ft)	80		45	90			95		80	80		75
Base Capacity (vph)	71	609	1561	349	616	1615	369	1067	1545	223	641	1695
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.30	0.09	0.38	1.16	0.04	1.11	0.69	0.10	0.33	1.10	0.10

Intersection Summary

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

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	144	123	108	577	52	336	656	92	57	667	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	12	11	11	12	12	9	12	13	10	12	16
Total Lost time (s)	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1685	1881	1561	1745	1900	1615	1562	1827	1545	1604	1863	1695
Flt Permitted	0.12	1.00	1.00	0.59	1.00	1.00	0.10	1.00	1.00	0.38	1.00	1.00
Satd. Flow (perm)	219	1881	1561	1076	1900	1615	169	1827	1545	646	1863	1695
Peak-hour factor, PHF	0.65	0.80	0.88	0.82	0.81	0.83	0.82	0.89	0.61	0.78	0.95	0.58
Adj. Flow (vph)	46	180	140	132	712	63	410	737	151	73	702	167
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	46	180	140	132	712	63	410	737	151	73	702	167
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	4%	4%	8%	5%	2%	8%
Turn Type	Perm		Free	Perm		Free	pm+pt		Free	Perm		Free
Protected Phases		2			6		7	4			8	
Permitted Phases	2		Free	6		Free	4		Free	8		Free
Actuated Green, G (s)	32.4	32.4	100.0	32.4	32.4	100.0	58.4	58.4	100.0	34.4	34.4	100.0
Effective Green, g (s)	32.4	32.4	100.0	32.4	32.4	100.0	58.4	58.4	100.0	34.4	34.4	100.0
Actuated g/C Ratio	0.32	0.32	1.00	0.32	0.32	1.00	0.58	0.58	1.00	0.34	0.34	1.00
Clearance Time (s)	4.6	4.6		4.6	4.6		4.6	4.6		4.6	4.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	71	609	1561	349	616	1615	369	1067	1545	222	641	1695
v/s Ratio Prot		0.10			c0.37		c0.22	0.40			0.38	
v/s Ratio Perm	0.21		0.09	0.12		0.04	c0.43		0.10	0.11		0.10
v/c Ratio	0.65	0.30	0.09	0.38	1.16	0.04	1.11	0.69	0.10	0.33	1.10	0.10
Uniform Delay, d1	28.9	25.3	0.0	26.0	33.8	0.0	30.8	14.5	0.0	24.3	32.8	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	18.5	0.3	0.1	0.7	87.5	0.0	80.4	1.9	0.1	0.9	64.3	0.1
Delay (s)	47.5	25.5	0.1	26.7	121.3	0.0	111.2	16.5	0.1	25.1	97.1	0.1
Level of Service	D	C	A	C	F	A	F	B	A	C	F	A
Approach Delay (s)		18.6			99.1			44.5			74.4	
Approach LOS		B			F			D			E	

Intersection Summary			
HCM Average Control Delay	63.9	HCM Level of Service	E
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	9.2
Intersection Capacity Utilization	102.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	12	0	1	1	0	4	1	1058	1	4	981	13
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.55	0.25	0.25	0.25	0.25	0.50	0.25	0.92	0.25	0.33	0.91	1.00
Hourly flow rate (vph)	22	0	4	4	0	8	4	1150	4	12	1078	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								778			975	
pX, platoon unblocked	0.78	0.78	0.67	0.78	0.78	0.77	0.67			0.77		
vC, conflicting volume	2277	2271	1085	2273	2275	1152	1091			1154		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1844	1837	877	1839	1842	1050	887			1053		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	49	100	98	91	100	96	99			98		
cM capacity (veh/h)	43	58	234	44	57	215	515			518		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	26	12	1158	1103
Volume Left	22	4	4	12
Volume Right	4	8	4	13
cSH	49	94	515	518
Volume to Capacity	0.53	0.13	0.01	0.02
Queue Length 95th (ft)	50	11	1	2
Control Delay (s)	142.0	49.0	0.3	0.9
Lane LOS	F	E	A	A
Approach Delay (s)	142.0	49.0	0.3	0.9
Approach LOS	F	E		

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	66.5%	ICU Level of Service	C
Analysis Period (min)	15		
Description: North St EB closed 3:30 PM - 5:30 PM			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	2	1	7	0	1077	3	4	735	252
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.58	0.25	0.91	0.38	0.50	0.91	0.25
Hourly flow rate (vph)	0	0	0	8	4	12	0	1184	8	8	808	1008
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								527			1226	
pX, platoon unblocked	0.79	0.79	0.67	0.79	0.79	0.77	0.67			0.77		
vC, conflicting volume	2529	2519	1312	2515	3019	1187	1816			1191		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2135	2122	1219	2117	2756	1092	1970			1097		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	72	74	94	100			98		
cM capacity (veh/h)	21	39	149	29	15	202	200			493		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	24	1191	1824
Volume Left	0	8	0	8
Volume Right	0	12	8	1008
cSH	1700	41	200	493
Volume to Capacity	0.00	0.59	0.00	0.02
Queue Length 95th (ft)	0	54	0	1
Control Delay (s)	0.0	181.5	0.0	0.1
Lane LOS	A	F		A
Approach Delay (s)	0.0	181.5	0.0	0.1
Approach LOS	A	F		

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	67.3%	ICU Level of Service	C
Analysis Period (min)	15		
Description: South St EB closed 3:30 PM - 5:30 PM			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	525	267	260	548	485	241
Turn Type		Perm	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	25.0	25.0	9.0	25.0	25.0	25.0
Total Split (s)	34.0	34.0	17.0	56.0	39.0	39.0
Total Split (%)	37.8%	37.8%	18.9%	62.2%	43.3%	43.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None	None	Min	Min	Min	Min
Act Effct Green (s)	29.2	29.2	45.4	45.4	28.5	28.5
Actuated g/C Ratio	0.35	0.35	0.54	0.54	0.34	0.34
v/c Ratio	0.94	0.39	0.80	0.60	0.83	0.37
Control Delay	53.7	4.7	33.4	16.1	38.0	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.7	4.7	33.4	16.1	38.0	4.2
LOS	D	A	C	B	D	A
Approach Delay	37.2			21.6	26.8	
Approach LOS	D			C	C	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 84.6	
Natural Cycle: 75	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.94	
Intersection Signal Delay: 28.5	Intersection LOS: C
Intersection Capacity Utilization 81.5%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 5: Site Drive & Parker Street

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	571	290	283	596	527	262
v/c Ratio	0.94	0.39	0.80	0.60	0.83	0.37
Control Delay	53.7	4.7	33.4	16.1	38.0	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.7	4.7	33.4	16.1	38.0	4.2
Queue Length 50th (ft)	306	0	81	201	254	0
Queue Length 95th (ft)	#541	54	#210	298	378	47
Internal Link Dist (ft)	107			616	216	
Turn Bay Length (ft)						
Base Capacity (vph)	610	736	359	1130	761	803
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.94	0.39	0.79	0.53	0.69	0.33

Intersection Summary

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

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	525	267	260	548	485	241
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1881	1599
Flt Permitted	0.95	1.00	0.15	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	270	1863	1881	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	571	290	283	596	527	262
RTOR Reduction (vph)	0	190	0	0	0	173
Lane Group Flow (vph)	571	100	283	596	527	89
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%
Turn Type		Perm	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	29.2	29.2	45.4	45.4	28.6	28.6
Effective Green, g (s)	29.2	29.2	45.4	45.4	28.6	28.6
Actuated g/C Ratio	0.35	0.35	0.54	0.54	0.34	0.34
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	611	546	354	1000	636	541
v/s Ratio Prot	c0.32		c0.11	0.32	0.28	
v/s Ratio Perm		0.06	c0.32			0.06
v/c Ratio	0.93	0.18	0.80	0.60	0.83	0.16
Uniform Delay, d1	26.8	19.4	16.3	13.4	25.7	19.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	21.6	0.2	11.9	1.0	8.7	0.1
Delay (s)	48.3	19.5	28.3	14.3	34.5	19.8
Level of Service	D	B	C	B	C	B
Approach Delay (s)	38.6			18.8	29.6	
Approach LOS	D			B	C	

Intersection Summary			
HCM Average Control Delay	28.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	84.6	Sum of lost time (s)	10.0
Intersection Capacity Utilization	81.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (veh/h)	808	12	7	740	12	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.55	0.58	0.91	0.55	0.38
Hourly flow rate (vph)	878	22	12	813	22	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				696		
pX, platoon unblocked					0.73	
vC, conflicting volume			900		1726	889
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			900		1812	889
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		65	98
cM capacity (veh/h)			763		62	345

Direction, Lane #	NB 1	SB 1	SW 1
Volume Total	900	825	30
Volume Left	0	12	22
Volume Right	22	0	8
cSH	1700	763	80
Volume to Capacity	0.53	0.02	0.37
Queue Length 95th (ft)	0	1	36
Control Delay (s)	0.0	0.4	74.9
Lane LOS		A	F
Approach Delay (s)	0.0	0.4	74.9
Approach LOS			F

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	25	3	1	763	676	31
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.56	0.75	0.25	0.93	0.93	0.64
Hourly flow rate (vph)	45	4	4	820	727	48
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					1038	
pX, platoon unblocked	0.75	0.75	0.75			
vC, conflicting volume	1580	751	775			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1606	501	534			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	49	99	99			
cM capacity (veh/h)	87	430	783			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	49	824	775
Volume Left	45	4	0
Volume Right	4	0	48
cSH	93	783	1700
Volume to Capacity	0.52	0.01	0.46
Queue Length 95th (ft)	58	0	0
Control Delay (s)	79.5	0.1	0.0
Lane LOS	F	A	
Approach Delay (s)	79.5	0.1	0.0
Approach LOS	F		

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	51.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	2	2	1073	0	2	726
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.50	0.93	0.25	0.25	0.91
Hourly flow rate (vph)	4	4	1154	0	8	798
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			296			
pX, platoon unblocked	0.77	0.77			0.77	
vC, conflicting volume	1968	1154			1154	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2107	1051			1051	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	98			98	
cM capacity (veh/h)	43	214			517	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	8	1154	806
Volume Left	4	0	8
Volume Right	4	0	0
cSH	72	1700	517
Volume to Capacity	0.11	0.68	0.02
Queue Length 95th (ft)	9	0	1
Control Delay (s)	61.0	0.0	0.5
Lane LOS	F		A
Approach Delay (s)	61.0	0.0	0.5
Approach LOS	F		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	66.5%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	7	373	823	104	141	22
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.25	0.89	0.93	0.89	0.66	0.33
Hourly flow rate (vph)	28	419	885	117	214	67
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1002				1418	943
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1002				1418	943
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				0	79
cM capacity (veh/h)	699				146	321

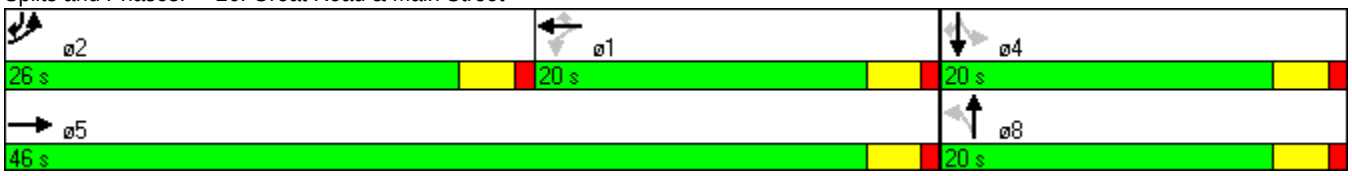
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	447	1002	280
Volume Left	28	0	214
Volume Right	0	117	67
cSH	699	1700	169
Volume to Capacity	0.04	0.59	1.66
Queue Length 95th (ft)	3	0	483
Control Delay (s)	1.2	0.0	368.2
Lane LOS	A		F
Approach Delay (s)	1.2	0.0	368.2
Approach LOS			F

Intersection Summary			
Average Delay	60.0		
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Volume (vph)	161	367	778	15	3	4	11	0	353
Turn Type	Prot			Perm	Perm		Perm		pm+ov
Protected Phases	2	5	1			8		4	2
Permitted Phases				1	8		4		4
Detector Phase	2	5	1	1	8	8	4	4	2
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	15.0	15.0	12.0	12.0	15.0	15.0	15.0	15.0	15.0
Total Split (s)	26.0	46.0	20.0	20.0	20.0	20.0	20.0	20.0	26.0
Total Split (%)	39.4%	69.7%	30.3%	30.3%	30.3%	30.3%	30.3%	30.3%	39.4%
Yellow Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Lead/Lag	Lead		Lag	Lag					Lead
Lead-Lag Optimize?	Yes								Yes
Recall Mode	Min	Min	None	None	None	None	None	None	Min
Act Effct Green (s)	14.4	38.1	16.7	16.7		8.2		8.2	16.2
Actuated g/C Ratio	0.36	0.94	0.41	0.41		0.20		0.20	0.40
v/c Ratio	0.30	0.25	0.94	0.03		0.05		0.07	0.66
Control Delay	11.7	1.5	37.9	9.5		16.9		17.1	14.8
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Delay	11.7	1.5	37.9	9.5		16.9		17.1	14.8
LOS	B	A	D	A		B		B	B
Approach Delay		4.7	37.3			16.9		14.9	
Approach LOS		A	D			B		B	

Intersection Summary	
Cycle Length: 66	
Actuated Cycle Length: 40.5	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.94	
Intersection Signal Delay: 21.7	Intersection LOS: C
Intersection Capacity Utilization 79.5%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 26: Great Road & Main Street



Lane Group	EBL	EBT	WBT	WBR	NBT	SBT	SBR
Lane Group Flow (vph)	189	412	837	20	16	25	415
v/c Ratio	0.30	0.25	0.94	0.03	0.05	0.07	0.66
Control Delay	11.7	1.5	37.9	9.5	16.9	17.1	14.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.7	1.5	37.9	9.5	16.9	17.1	14.8
Queue Length 50th (ft)	26	0	154	2	3	4	67
Queue Length 95th (ft)	80	63	#522	12	10	6	114
Internal Link Dist (ft)		376	660		36	340	
Turn Bay Length (ft)	112			31			95
Base Capacity (vph)	1007	1688	887	756	704	704	946
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.24	0.94	0.03	0.02	0.04	0.44

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	161	367	0	0	778	15	3	4	0	11	0	353
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	16	16	12	9	12	9	9	11
Total Lost time (s)	3.7	3.7			3.7	3.7		3.7			3.7	3.7
Lane Util. Factor	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00			1.00	0.85		1.00			1.00	0.85
Flt Protected	0.95	1.00			1.00	1.00		0.98			0.95	1.00
Satd. Flow (prot)	1787	1756			2153	1830		1668			1624	1546
Flt Permitted	0.95	1.00			1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)	1787	1756			2153	1830		1710			1710	1546
Peak-hour factor, PHF	0.85	0.89	0.25	0.25	0.93	0.75	0.38	0.50	0.25	0.44	0.25	0.85
Adj. Flow (vph)	189	412	0	0	837	20	8	8	0	25	0	415
RTOR Reduction (vph)	0	0	0	0	0	2	0	0	0	0	0	6
Lane Group Flow (vph)	189	412	0	0	837	18	0	16	0	0	25	409
Heavy Vehicles (%)	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Turn Type	Prot			Perm		Perm	Perm			Perm		pm+ov
Protected Phases	2	5			1			8			4	2
Permitted Phases				1		1	8			4		4
Actuated Green, G (s)	14.4	34.9			16.8	16.8		1.3			1.3	15.7
Effective Green, g (s)	14.4	34.9			16.8	16.8		1.3			1.3	15.7
Actuated g/C Ratio	0.33	0.80			0.39	0.39		0.03			0.03	0.36
Clearance Time (s)	3.7	3.7			3.7	3.7		3.7			3.7	3.7
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)	590	1406			830	705		51			51	688
v/s Ratio Prot	0.11	0.23			c0.39							c0.20
v/s Ratio Perm						0.01		0.01			0.01	0.07
v/c Ratio	0.32	0.29			1.01	0.02		0.31			0.49	0.59
Uniform Delay, d1	10.9	1.1			13.4	8.3		20.7			20.8	11.4
Progression Factor	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.3	0.1			33.3	0.0		3.5			7.2	1.4
Delay (s)	11.3	1.3			46.7	8.3		24.2			28.1	12.7
Level of Service	B	A			D	A		C			C	B
Approach Delay (s)		4.4			45.8			24.2			13.6	
Approach LOS		A			D			C			B	

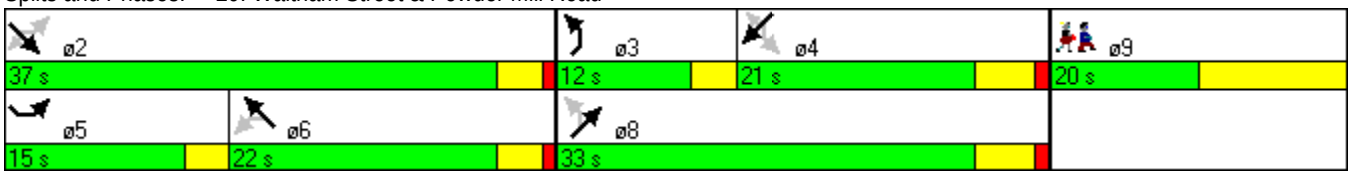
Intersection Summary			
HCM Average Control Delay	25.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	43.6	Sum of lost time (s)	7.4
Intersection Capacity Utilization	79.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWL	SWT	SWR	ø9
Lane Configurations											
Volume (vph)	308	154	388	19	221	353	255	16	323	383	
Turn Type	pm+pt		Perm	Perm		pm+pt		Perm		Perm	
Protected Phases	5	2			6	3	8		4		9
Permitted Phases	2		2	6		8		4		4	
Detector Phase	5	2	2	6	6	3	8	4	4	4	
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	15.0	15.0	15.0	15.0	9.0	15.0	15.0	15.0	15.0	20.0
Total Split (s)	15.0	37.0	37.0	22.0	22.0	12.0	33.0	21.0	21.0	21.0	20.0
Total Split (%)	16.7%	41.1%	41.1%	24.4%	24.4%	13.3%	36.7%	23.3%	23.3%	23.3%	22%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	10.0
All-Red Time (s)	0.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.0	4.0	4.0	4.0	4.0	3.0	5.0	5.0	5.0	5.0	
Lead/Lag	Lead			Lag	Lag	Lead		Lag	Lag	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes	Yes		Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)		33.0	33.0		33.0	30.0	28.0		16.0	16.0	
Actuated g/C Ratio		0.47	0.47		0.47	0.43	0.40		0.23	0.23	
v/c Ratio		1.08	0.50		0.34	1.28	0.41		0.92	0.72	
Control Delay		85.0	8.5		12.7	170.4	17.2		58.6	16.9	
Queue Delay		0.0	0.0		0.0	0.0	0.0		0.0	0.0	
Total Delay		85.0	8.5		12.7	170.4	17.2		58.6	16.9	
LOS		F	A		B	F	B		E	B	
Approach Delay		53.3			12.7		108.3		37.1		
Approach LOS		D			B		F		D		

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 70
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.28
Intersection Signal Delay: 58.0 — Intersection LOS: E
Intersection Capacity Utilization 92.0% — ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 29: Waltham Street & Powder Mill Road



Lane Group	SET	SER	NWT	NEL	NET	SWT	SWR
Lane Group Flow (vph)	591	417	315	415	283	372	399
v/c Ratio	1.08	0.50	0.34	1.28	0.41	0.92	0.72
Control Delay	85.0	8.5	12.7	170.4	17.2	58.6	16.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	85.0	8.5	12.7	170.4	17.2	58.6	16.9
Queue Length 50th (ft)	~292	53	79	~181	84	157	47
Queue Length 95th (ft)	#459	121	126	#315	144	#311	#155
Internal Link Dist (ft)	365		548		1021	443	
Turn Bay Length (ft)		90		60			105
Base Capacity (vph)	546	836	925	323	689	403	557
Starvation Cap Reductn	0	5	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	1.08	0.50	0.34	1.28	0.41	0.92	0.72

Intersection Summary

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

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

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	308	154	388	19	221	28	353	255	6	16	323	383
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	14	12	12	15	12	9	9	12	12	11	11
Grade (%)		3%			-4%			-6%			0%	
Total Lost time (s)		4.0	4.0		4.0		3.0	5.0			5.0	5.0
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.97		1.00		1.00	1.00			1.00	0.98
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frt		1.00	0.85		0.99		1.00	0.99			1.00	0.85
Flt Protected		0.97	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)		1927	1547		2087		1656	1717			1814	1523
Flt Permitted		0.58	1.00		0.93		0.21	1.00			0.97	1.00
Satd. Flow (perm)		1158	1547		1956		367	1717			1761	1523
Peak-hour factor, PHF	0.74	0.88	0.93	0.67	0.87	0.84	0.85	0.94	0.50	0.75	0.92	0.96
Adj. Flow (vph)	416	175	417	28	254	33	415	271	12	21	351	399
RTOR Reduction (vph)	0	0	108	0	3	0	0	2	0	0	0	209
Lane Group Flow (vph)	0	591	309	0	312	0	415	281	0	0	372	190
Confl. Peds. (#/hr)	1		3	2		2	2			1		2
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	2%	0%	0%	1%	0%
Turn Type	pm+pt		Perm	Perm			pm+pt			Perm		Perm
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2		2	6			8			4		4
Actuated Green, G (s)		33.0	33.0		33.0		28.0	28.0			16.0	16.0
Effective Green, g (s)		33.0	33.0		33.0		28.0	28.0			16.0	16.0
Actuated g/C Ratio		0.47	0.47		0.47		0.40	0.40			0.23	0.23
Clearance Time (s)		4.0	4.0		4.0		3.0	5.0			5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		546	729		922		313	687			403	348
v/s Ratio Prot							c0.17	0.16				
v/s Ratio Perm		c0.51	0.20		0.16		c0.36				0.21	0.12
v/c Ratio		1.08	0.42		0.34		1.33	0.41			0.92	0.55
Uniform Delay, d1		18.5	12.2		11.6		17.9	15.1			26.4	23.8
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		62.7	0.4		0.2		167.2	0.4			26.5	1.8
Delay (s)		81.2	12.6		11.9		185.1	15.5			52.9	25.5
Level of Service		F	B		B		F	B			D	C
Approach Delay (s)		52.8			11.9			116.3			38.7	
Approach LOS		D			B			F			D	

Intersection Summary			
HCM Average Control Delay	60.2	HCM Level of Service	E
HCM Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	92.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	20	197	158	604	666	103
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.65	0.88	0.78	0.92	0.94	0.71
Hourly flow rate (vph)	31	224	203	657	709	145
Pedestrians					1	
Lane Width (ft)					11.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					1101	
pX, platoon unblocked	0.87	0.87	0.87			
vC, conflicting volume	1844	781	854			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1894	676	759			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	38	44	73			
cM capacity (veh/h)	49	397	748			

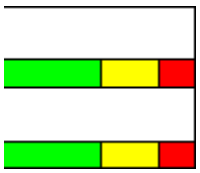
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	255	859	854
Volume Left	31	203	0
Volume Right	224	0	145
cSH	214	748	1700
Volume to Capacity	1.19	0.27	0.50
Queue Length 95th (ft)	315	27	0
Control Delay (s)	167.7	6.6	0.0
Lane LOS	F	A	
Approach Delay (s)	167.7	6.6	0.0
Approach LOS	F		

Intersection Summary			
Average Delay	24.6		
Intersection Capacity Utilization	105.1%	ICU Level of Service	G
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	28	117	246	127	153	33	248	631	110	21	724	33
Turn Type	Perm		Free	Perm		Free	pm+pt		Free	Perm		Free
Protected Phases		2			6		7	4			8	
Permitted Phases	2		Free	6		Free	4		Free	8		Free
Detector Phase	2	2		6	6		7	4		8	8	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	15.0	15.0		15.0	15.0		8.6	15.0		15.0	15.0	
Total Split (s)	18.0	18.0	0.0	18.0	18.0	0.0	12.0	47.0	0.0	35.0	35.0	0.0
Total Split (%)	27.7%	27.7%	0.0%	27.7%	27.7%	0.0%	18.5%	72.3%	0.0%	53.8%	53.8%	0.0%
Yellow Time (s)	2.8	2.8		2.8	2.8		2.8	2.8		2.8	2.8	
All-Red Time (s)	1.8	1.8		1.8	1.8		1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes					
Recall Mode	Min	Min		Min	Min		None	Min		Min	Min	
Act Effct Green (s)	12.0	12.0	62.2	12.0	12.0	62.2	40.9	40.9	62.2	28.8	28.8	62.2
Actuated g/C Ratio	0.19	0.19	1.00	0.19	0.19	1.00	0.66	0.66	1.00	0.46	0.46	1.00
v/c Ratio	0.25	0.35	0.20	0.74	0.55	0.03	0.93	0.56	0.11	0.09	0.92	0.02
Control Delay	25.6	25.3	0.3	44.7	29.4	0.0	54.7	8.2	0.1	10.6	34.8	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.6	25.3	0.3	44.7	29.4	0.0	54.7	8.2	0.1	10.6	34.8	0.0
LOS	C	C	A	D	C	A	D	A	A	B	C	A
Approach Delay		9.7			32.2			18.1			32.2	
Approach LOS		A			C			B			C	

Intersection Summary	
Cycle Length: 65	
Actuated Cycle Length: 62.2	
Natural Cycle: 75	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.93	
Intersection Signal Delay: 23.0	Intersection LOS: C
Intersection Capacity Utilization 80.4%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 1: Great Road & Parker Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	47	130	293	176	199	51	279	701	180	29	804	43
v/c Ratio	0.25	0.35	0.20	0.74	0.55	0.03	0.93	0.56	0.11	0.09	0.92	0.02
Control Delay	25.6	25.3	0.3	44.7	29.4	0.0	54.7	8.2	0.1	10.6	34.8	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.6	25.3	0.3	44.7	29.4	0.0	54.7	8.2	0.1	10.6	34.8	0.0
Queue Length 50th (ft)	16	44	0	65	71	0	62	128	0	6	279	0
Queue Length 95th (ft)	27	88	0	96	107	0	#197	207	0	15	#506	0
Internal Link Dist (ft)		465			321			895			490	
Turn Bay Length (ft)	80		45	90			95		80	80		75
Base Capacity (vph)	211	413	1501	269	409	1615	299	1305	1635	349	927	1792
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.31	0.20	0.65	0.49	0.03	0.93	0.54	0.11	0.08	0.87	0.02

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	28	117	246	127	153	33	248	631	110	21	724	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	12	11	11	12	12	9	12	13	10	12	16
Total Lost time (s)	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0	4.6	4.6	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1685	1900	1501	1745	1881	1615	1593	1900	1635	1685	1881	1792
Flt Permitted	0.55	1.00	1.00	0.67	1.00	1.00	0.12	1.00	1.00	0.40	1.00	1.00
Satd. Flow (perm)	970	1900	1501	1237	1881	1615	201	1900	1635	707	1881	1792
Peak-hour factor, PHF	0.59	0.90	0.84	0.72	0.77	0.65	0.89	0.90	0.61	0.73	0.90	0.77
Adj. Flow (vph)	47	130	293	176	199	51	279	701	180	29	804	43
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	47	130	293	176	199	51	279	701	180	29	804	43
Confl. Bikes (#/hr)									1			3
Heavy Vehicles (%)	0%	0%	4%	0%	1%	0%	2%	0%	0%	0%	1%	0%
Turn Type	Perm		Free	Perm		Free	pm+pt		Free	Perm		Free
Protected Phases		2			6		7	4			8	
Permitted Phases	2		Free	6		Free	4		Free	8		Free
Actuated Green, G (s)	12.0	12.0	62.1	12.0	12.0	62.1	40.9	40.9	62.1	28.8	28.8	62.1
Effective Green, g (s)	12.0	12.0	62.1	12.0	12.0	62.1	40.9	40.9	62.1	28.8	28.8	62.1
Actuated g/C Ratio	0.19	0.19	1.00	0.19	0.19	1.00	0.66	0.66	1.00	0.46	0.46	1.00
Clearance Time (s)	4.6	4.6		4.6	4.6		4.6	4.6		4.6	4.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	187	367	1501	239	363	1615	300	1251	1635	328	872	1792
v/s Ratio Prot		0.07			0.11		c0.11	0.37			0.43	
v/s Ratio Perm	0.05		0.20	c0.14		0.03	c0.50		0.11	0.04		0.02
v/c Ratio	0.25	0.35	0.20	0.74	0.55	0.03	0.93	0.56	0.11	0.09	0.92	0.02
Uniform Delay, d1	21.2	21.7	0.0	23.6	22.6	0.0	16.1	5.7	0.0	9.3	15.6	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	0.6	0.3	11.2	1.7	0.0	34.0	0.6	0.1	0.1	14.9	0.0
Delay (s)	22.0	22.3	0.3	34.8	24.3	0.0	50.2	6.3	0.1	9.4	30.5	0.0
Level of Service	C	C	A	C	C	A	D	A	A	A	C	A
Approach Delay (s)		8.5			25.7			15.9			28.3	
Approach LOS		A			C			B			C	

Intersection Summary			
HCM Average Control Delay	19.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	62.1	Sum of lost time (s)	9.2
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	0	1	1	0	4	1	980	0	2	1071	7
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.50	0.25	0.25	0.25	0.25	0.50	0.25	0.90	0.25	0.50	0.90	0.44
Hourly flow rate (vph)	12	0	4	4	0	8	4	1089	0	4	1190	16
Pedestrians		1										
Lane Width (ft)		11.0										
Walking Speed (ft/s)		3.5										
Percent Blockage		0										
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								778			975	
pX, platoon unblocked	0.65	0.65	0.60	0.65	0.65	0.90	0.60			0.90		
vC, conflicting volume	2312	2304	1199	2307	2312	1089	1207			1089		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2404	2392	997	2396	2404	1043	1011			1043		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	17	100	98	73	100	97	99			99		
cM capacity (veh/h)	14	22	179	15	21	253	415			607		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	16	12	1093	1210
Volume Left	12	4	4	4
Volume Right	4	8	0	16
cSH	19	40	415	607
Volume to Capacity	0.86	0.30	0.01	0.01
Queue Length 95th (ft)	57	25	1	0
Control Delay (s)	439.5	131.5	0.4	0.3
Lane LOS	F	F	A	A
Approach Delay (s)	439.5	131.5	0.4	0.3
Approach LOS	F	F		

Intersection Summary			
Average Delay	4.0		
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		
Description: North St EB closed 3:30 PM - 5:30 PM			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	2	0	4	0	953	1	2	758	355
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.25	0.25	0.25	0.25	0.50	0.25	0.86	0.25	0.50	0.91	0.25
Hourly flow rate (vph)	0	0	0	8	0	8	0	1108	4	4	833	1420
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								527			1226	
pX, platoon unblocked	0.68	0.68	0.62	0.68	0.68	0.88	0.62			0.88		
vC, conflicting volume	2669	2663	1543	2661	3371	1110	2253			1112		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2831	2822	1570	2819	3869	1057	2721			1059		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	0	100	97	100			99		
cM capacity (veh/h)	7	12	85	8	2	243	93			586		

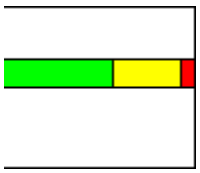
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	16	1112	2257
Volume Left	0	8	0	4
Volume Right	0	8	4	1420
cSH	1700	15	93	586
Volume to Capacity	0.00	1.06	0.00	0.01
Queue Length 95th (ft)	0	63	0	1
Control Delay (s)	0.0	592.8	0.0	0.0
Lane LOS	A	F		A
Approach Delay (s)	0.0	592.8	0.0	0.0
Approach LOS	A	F		

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		
Description: South St EB closed 3:30 PM - 5:30 PM			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	639	358	358	332	365	360
Turn Type		Perm	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	25.0	25.0	9.0	25.0	25.0	25.0
Total Split (s)	36.0	36.0	19.0	44.0	25.0	25.0
Total Split (%)	45.0%	45.0%	23.8%	55.0%	31.3%	31.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None	None	None	Min	Min	Min
Act Effct Green (s)	31.0	31.0	38.1	38.1	19.1	19.1
Actuated g/C Ratio	0.39	0.39	0.48	0.48	0.24	0.24
v/c Ratio	1.00	0.45	0.96	0.40	0.88	0.57
Control Delay	61.3	3.8	56.0	14.8	50.9	6.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.3	3.8	56.0	14.8	50.9	6.6
LOS	E	A	E	B	D	A
Approach Delay	40.6			36.2	28.9	
Approach LOS	D			D	C	

Intersection Summary	
Cycle Length: 80	
Actuated Cycle Length: 79.1	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.00	
Intersection Signal Delay: 35.8	Intersection LOS: D
Intersection Capacity Utilization 86.9%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 5: Site Drive & Parker Street



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	695	389	389	361	397	391
v/c Ratio	1.00	0.45	0.96	0.40	0.88	0.57
Control Delay	61.3	3.8	56.0	14.8	50.9	6.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.3	3.8	56.0	14.8	50.9	6.6
Queue Length 50th (ft)	~349	0	139	109	189	0
Queue Length 95th (ft)	#575	52	#312	173	#338	65
Internal Link Dist (ft)	107			616	216	
Turn Bay Length (ft)						
Base Capacity (vph)	694	857	407	919	476	697
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.00	0.45	0.96	0.39	0.83	0.56

Intersection Summary

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

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

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	639	358	358	332	365	360
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1881	1599
Flt Permitted	0.95	1.00	0.17	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	309	1863	1881	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	695	389	389	361	397	391
RTOR Reduction (vph)	0	237	0	0	0	297
Lane Group Flow (vph)	695	152	389	361	397	94
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%
Turn Type		Perm	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	31.0	31.0	38.1	38.1	19.1	19.1
Effective Green, g (s)	31.0	31.0	38.1	38.1	19.1	19.1
Actuated g/C Ratio	0.39	0.39	0.48	0.48	0.24	0.24
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	694	620	407	897	454	386
v/s Ratio Prot	c0.39		c0.17	0.19	0.21	
v/s Ratio Perm		0.10	c0.29			0.06
v/c Ratio	1.00	0.25	0.96	0.40	0.87	0.24
Uniform Delay, d1	24.0	16.2	19.8	13.2	28.8	24.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	34.5	0.2	33.0	0.3	16.8	0.3
Delay (s)	58.6	16.4	52.8	13.5	45.7	24.5
Level of Service	E	B	D	B	D	C
Approach Delay (s)	43.4			33.9	35.2	
Approach LOS	D			C	D	

Intersection Summary			
HCM Average Control Delay	38.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	79.1	Sum of lost time (s)	10.0
Intersection Capacity Utilization	86.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (veh/h)	690	13	2	702	18	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.93	0.75	0.50	0.93	0.61	0.25
Hourly flow rate (vph)	742	17	4	755	30	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				696		
pX, platoon unblocked					0.80	
vC, conflicting volume			759		1513	751
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			759		1517	751
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		72	100
cM capacity (veh/h)			861		106	414

Direction, Lane #	NB 1	SB 1	SW 1
Volume Total	759	759	30
Volume Left	0	4	30
Volume Right	17	0	0
cSH	1700	861	106
Volume to Capacity	0.45	0.00	0.28
Queue Length 95th (ft)	0	0	26
Control Delay (s)	0.0	0.1	51.5
Lane LOS		A	F
Approach Delay (s)	0.0	0.1	51.5
Approach LOS			F

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	34	7	8	667	671	29
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.71	0.88	0.50	0.94	0.86	0.61
Hourly flow rate (vph)	48	8	16	710	780	48
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					1038	
pX, platoon unblocked	0.82	0.82	0.82			
vC, conflicting volume	1546	804	828			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1556	651	680			
tC, single (s)	6.4	6.3	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.4	2.2			
p0 queue free %	52	98	98			
cM capacity (veh/h)	101	367	756			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	56	726	828
Volume Left	48	16	0
Volume Right	8	0	48
cSH	112	756	1700
Volume to Capacity	0.50	0.02	0.49
Queue Length 95th (ft)	56	2	0
Control Delay (s)	65.1	0.6	0.0
Lane LOS	F	A	
Approach Delay (s)	65.1	0.6	0.0
Approach LOS	F		

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	51.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	1	2	945	0	3	725
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.25	0.50	0.86	0.25	0.38	0.92
Hourly flow rate (vph)	4	4	1099	0	8	788
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			296			
pX, platoon unblocked	0.87	0.87			0.87	
vC, conflicting volume	1903	1099			1099	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1961	1041			1041	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	98			99	
cM capacity (veh/h)	61	246			591	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	8	1099	796
Volume Left	4	0	8
Volume Right	4	0	0
cSH	98	1700	591
Volume to Capacity	0.08	0.65	0.01
Queue Length 95th (ft)	7	0	1
Control Delay (s)	45.2	0.0	0.4
Lane LOS	E		A
Approach Delay (s)	45.2	0.0	0.4
Approach LOS	E		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	10	407	341	60	43	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.33	0.82	0.91	0.81	0.88	0.62
Hourly flow rate (vph)	30	496	375	74	49	19
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	449				969	412
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	449				969	412
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				82	97
cM capacity (veh/h)	1122				276	644

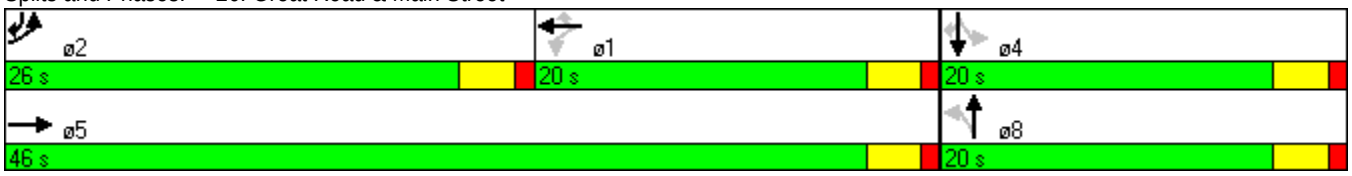
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	527	449	68
Volume Left	30	0	49
Volume Right	0	74	19
cSH	1122	1700	385
Volume to Capacity	0.03	0.26	0.18
Queue Length 95th (ft)	2	0	16
Control Delay (s)	0.8	0.0	18.0
Lane LOS	A		C
Approach Delay (s)	0.8	0.0	18.0
Approach LOS			C

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	39.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	NBT	SBL	SBT	SBR
Lane Configurations								
Volume (vph)	224	376	365	17	0	22	0	189
Turn Type	Prot			Perm		Perm		pm+ov
Protected Phases	2	5	1		8		4	2
Permitted Phases				1		4		4
Detector Phase	2	5	1	1	8	4	4	2
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	15.0	15.0	12.0	12.0	15.0	15.0	15.0	15.0
Total Split (s)	26.0	46.0	20.0	20.0	20.0	20.0	20.0	26.0
Total Split (%)	39.4%	69.7%	30.3%	30.3%	30.3%	30.3%	30.3%	39.4%
Yellow Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Lead/Lag	Lead		Lag	Lag				Lead
Lead-Lag Optimize?	Yes							Yes
Recall Mode	Min	Min	None	None	None	None	None	Min
Act Effct Green (s)	11.4	31.3	12.6	12.6	9.2		9.2	14.8
Actuated g/C Ratio	0.32	0.87	0.35	0.35	0.26		0.26	0.41
v/c Ratio	0.41	0.28	0.53	0.05	0.01		0.08	0.33
Control Delay	14.5	2.6	14.5	9.2	0.0		16.8	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	14.5	2.6	14.5	9.2	0.0		16.8	4.4
LOS	B	A	B	A	A		B	A
Approach Delay		6.8	14.1		0.0		6.0	
Approach LOS		A	B		A		A	

Intersection Summary	
Cycle Length: 66	
Actuated Cycle Length: 35.8	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.53	
Intersection Signal Delay: 8.9	Intersection LOS: A
Intersection Capacity Utilization 56.9%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 26: Great Road & Main Street



Lane Group	EBL	EBT	WBT	WBR	NBT	SBT	SBR
Lane Group Flow (vph)	233	427	397	30	8	34	236
v/c Ratio	0.41	0.28	0.53	0.05	0.01	0.08	0.33
Control Delay	14.5	2.6	14.5	9.2	0.0	16.8	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.5	2.6	14.5	9.2	0.0	16.8	4.4
Queue Length 50th (ft)	23	0	37	1	0	3	10
Queue Length 95th (ft)	108	72	183	10	0	8	32
Internal Link Dist (ft)		376	660		36	340	
Turn Bay Length (ft)	112			31			95
Base Capacity (vph)	1253	1637	1082	944	984	810	1273
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.26	0.37	0.03	0.01	0.04	0.19

Intersection Summary

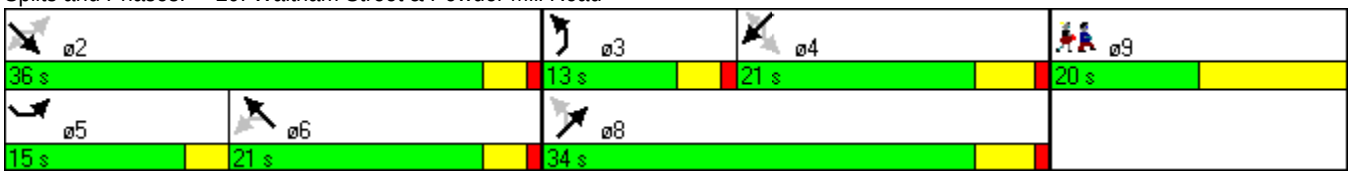
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	224	376	0	0	365	17	0	0	3	22	0	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	16	16	12	9	12	9	9	11
Total Lost time (s)	3.7	3.7			3.7	3.7		3.7			3.7	3.7
Lane Util. Factor	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00			1.00	0.85		0.86			1.00	0.85
Flt Protected	0.95	1.00			1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)	1787	1756			2111	1830		1479			1502	1561
Flt Permitted	0.95	1.00			1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)	1787	1756			2111	1830		1479			1581	1561
Peak-hour factor, PHF	0.96	0.88	0.25	0.25	0.92	0.56	0.92	0.92	0.38	0.65	0.25	0.80
Adj. Flow (vph)	233	427	0	0	397	30	0	0	8	34	0	236
RTOR Reduction (vph)	0	0	0	0	0	8	0	7	0	0	0	84
Lane Group Flow (vph)	233	427	0	0	397	22	0	1	0	0	34	152
Confl. Peds. (#/hr)										1		
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	1%	1%	0%	0%	2%	0%	2%	2%	0%	8%	0%	0%
Turn Type	Prot			Perm		Perm	Perm			Perm		pm+ov
Protected Phases	2	5			1			8			4	2
Permitted Phases				1		1	8			4		4
Actuated Green, G (s)	11.3	28.1			13.1	13.1		2.4			2.4	13.7
Effective Green, g (s)	11.3	28.1			13.1	13.1		2.4			2.4	13.7
Actuated g/C Ratio	0.30	0.74			0.35	0.35		0.06			0.06	0.36
Clearance Time (s)	3.7	3.7			3.7	3.7		3.7			3.7	3.7
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)	533	1302			730	633		94			100	717
v/s Ratio Prot	c0.13	0.24			c0.19			0.00				0.06
v/s Ratio Perm						0.01					c0.02	0.03
v/c Ratio	0.44	0.33			0.54	0.03		0.01			0.34	0.21
Uniform Delay, d1	10.7	1.7			10.0	8.2		16.6			17.0	8.4
Progression Factor	1.00	1.00			1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.6	0.1			0.8	0.0		0.0			2.0	0.1
Delay (s)	11.3	1.8			10.8	8.2		16.7			19.0	8.5
Level of Service	B	A			B	A		B			B	A
Approach Delay (s)		5.2			10.6			16.7			9.8	
Approach LOS		A			B			B			A	

Intersection Summary			
HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	37.9	Sum of lost time (s)	11.1
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	SEL	SET	SER	NWL	NWT	NEL	NET	SWL	SWT	SWR	ø9
Lane Configurations											
Volume (vph)	377	147	465	7	150	373	247	17	322	325	
Turn Type	pm+pt		Perm	Perm		pm+pt		Perm		Perm	
Protected Phases	5	2			6	3	8		4		9
Permitted Phases	2		2	6		8		4		4	
Detector Phase	5	2	2	6	6	3	8	4	4	4	
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	15.0	15.0	15.0	15.0	9.0	15.0	15.0	15.0	15.0	20.0
Total Split (s)	15.0	36.0	36.0	21.0	21.0	13.0	34.0	21.0	21.0	21.0	20.0
Total Split (%)	16.7%	40.0%	40.0%	23.3%	23.3%	14.4%	37.8%	23.3%	23.3%	23.3%	22%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	10.0
All-Red Time (s)	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	
Lead/Lag	Lead			Lag	Lag	Lead		Lag	Lag	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes	Yes		Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)		32.0	32.0		32.0	30.0	29.0		16.0	16.0	
Actuated g/C Ratio		0.46	0.46		0.46	0.43	0.41		0.23	0.23	
v/c Ratio		1.07	0.62		0.26	1.30	0.41		0.96	0.70	
Control Delay		81.3	11.1		11.9	177.6	16.5		66.6	17.0	
Queue Delay		0.0	0.0		0.0	0.0	0.0		0.0	0.0	
Total Delay		81.3	11.1		11.9	177.6	16.5		66.6	17.0	
LOS		F	B		B	F	B		E	B	
Approach Delay		49.2			11.9		111.1		42.4		
Approach LOS		D			B		F		D		

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 70	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.30	
Intersection Signal Delay: 59.8	Intersection LOS: E
Intersection Capacity Utilization 92.8%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 29: Waltham Street & Powder Mill Road



Lane Group	SET	SER	NWT	NEL	NET	SWT	SWR
Lane Group Flow (vph)	616	517	233	414	291	386	369
v/c Ratio	1.07	0.62	0.26	1.30	0.41	0.96	0.70
Control Delay	81.3	11.1	11.9	177.6	16.5	66.6	17.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	81.3	11.1	11.9	177.6	16.5	66.6	17.0
Queue Length 50th (ft)	~302	78	55	~186	84	165	46
Queue Length 95th (ft)	#471	173	95	#351	142	#326	129
Internal Link Dist (ft)	365		548		1021	443	
Turn Bay Length (ft)		90		60			105
Base Capacity (vph)	574	836	913	318	713	401	530
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	1.07	0.62	0.26	1.30	0.41	0.96	0.70

Intersection Summary

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

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

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	377	147	465	7	150	33	373	247	5	17	322	325
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	14	12	12	15	12	9	9	12	12	11	11
Grade (%)		3%			-4%			-6%			0%	
Total Lost time (s)		4.0	4.0		4.0		4.0	5.0			5.0	5.0
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.97		0.99		1.00	1.00			1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frt		1.00	0.85		0.97		1.00	0.99			1.00	0.85
Flt Protected		0.96	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)		1908	1547		2053		1656	1717			1830	1506
Flt Permitted		0.64	1.00		0.96		0.20	1.00			0.96	1.00
Satd. Flow (perm)		1256	1547		1981		349	1717			1755	1506
Peak-hour factor, PHF	0.84	0.88	0.90	0.50	0.88	0.68	0.90	0.89	0.38	0.60	0.90	0.88
Adj. Flow (vph)	449	167	517	14	170	49	414	278	13	28	358	369
RTOR Reduction (vph)	0	0	130	0	7	0	0	2	0	0	0	187
Lane Group Flow (vph)	0	616	387	0	226	0	414	289	0	0	386	182
Confl. Peds. (#/hr)	2		3	2		3	1			1		2
Confl. Bikes (#/hr)			1									1
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%	1%	2%	0%	0%	0%	1%
Turn Type	pm+pt		Perm	Perm			pm+pt			Perm		Perm
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2		2	6			8			4		4
Actuated Green, G (s)		32.0	32.0		32.0		29.0	29.0			16.0	16.0
Effective Green, g (s)		32.0	32.0		32.0		29.0	29.0			16.0	16.0
Actuated g/C Ratio		0.46	0.46		0.46		0.41	0.41			0.23	0.23
Clearance Time (s)		4.0	4.0		4.0		4.0	5.0			5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		574	707		906		313	711			401	344
v/s Ratio Prot							c0.17	0.17				
v/s Ratio Perm		c0.49	0.25		0.11		c0.38				0.22	0.12
v/c Ratio		1.07	0.55		0.25		1.32	0.41			0.96	0.53
Uniform Delay, d1		19.0	13.8		11.6		17.3	14.4			26.7	23.7
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		58.7	0.9		0.1		165.8	0.4			35.1	1.5
Delay (s)		77.7	14.6		11.8		183.2	14.8			61.8	25.2
Level of Service		E	B		B		F	B			E	C
Approach Delay (s)		48.9			11.8			113.7			43.9	
Approach LOS		D			B			F			D	

Intersection Summary			
HCM Average Control Delay	60.7	HCM Level of Service	E
HCM Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	92.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	23	111	96	616	711	65
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.65	0.82	0.75	0.91	0.94	0.86
Hourly flow rate (vph)	35	135	128	677	756	76
Pedestrians	1			1		
Lane Width (ft)	15.0			11.0		
Walking Speed (ft/s)	3.5			3.5		
Percent Blockage	0			0		
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					1101	
pX, platoon unblocked	0.89	0.89	0.89			
vC, conflicting volume	1728	796	833			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1756	710	751			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	50	65	83			
cM capacity (veh/h)	70	388	772			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	171	805	832
Volume Left	35	128	0
Volume Right	135	0	76
cSH	200	772	1700
Volume to Capacity	0.85	0.17	0.49
Queue Length 95th (ft)	159	15	0
Control Delay (s)	79.3	4.1	0.0
Lane LOS	F	A	
Approach Delay (s)	79.3	4.1	0.0
Approach LOS	F		

Intersection Summary			
Average Delay	9.3		
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		

Queue Tables

TABLE 15
SUMMARY OF QUEUES AT SIGNALIZED INTERSECTIONS
DURING PEAK HOURS

	AM PEAK HOUR				PM PEAK HOUR				SATURDAY PEAK HOUR			
	No-Build		Build		No-Build		Build		No-Build		Build	
	50th%	95t%	50th%	95th%	50th%	95th%	50th%	95th%	50th%	95th%	50th%	95th%
Parker Street at Site Drive (Signalized)												
Northbound Left	-	-	11	31	-	-	81	210	-	-	139	312
Northbound Thru	-	-	65	141	-	-	201	298	-	-	109	173
Southbound Thru	-	-	152	292	-	-	254	378	-	-	189	338
Southbound Right	-	-	0	22	-	-	0	47	-	-	0	65
Eastbound Left	-	-	49	109	-	-	306	541	-	-	349	575
Eastbound Right	-	-	0	29	-	-	0	54	-	-	0	52
Great Road at Main Street												
Northbound Left/Thru/Right	n/a	n/a	n/a	n/a	3	10	3	10	0	0	0	0
Southbound Left/Thru	2	5	2	5	3	5	4	6	2	6	3	8
Southbound Right	0	16	0	16	66	112	67	114	1	17	10	32
Eastbound Left	43	177	45	177	26	80	26	80	19	105	23	108
Eastbound Thru/Right	0	114	0	128	63	44	0	63	27	41	0	72
Westbound Left/Thru	29	125	34	140	129	460	154	522	25	128	37	183
Westbound Right	1	11	1	12	2	11	2	12	1	10	1	10
Parker Street at Waltham Street at Powder Mill Road												
Northbound Left	104	146	115	167	70	110	181	315	60	105	186	351
Northbound Thru/Right	78	128	78	127	74	124	84	144	67	115	84	142
Southbound Left/Thru	125	174	134	202	150	239	157	311	127	205	165	326
Southbound Right	14	58	19	64	49	150	47	155	0	61	46	129
Eastbound Left/Thru	423	614	375	537	375	561	292	459	319	564	302	471
Eastbound Right	55	95	70	113	41	88	53	121	31	81	78	173
Westbound Left/Thru/Right	178	367	49	84	104	157	79	126	65	116	55	95
Parker Street at Great Road												
Northbound Left	57	105	61	140	116	188	256	379	13	50	62	197
Northbound Thru	133	174	184	234	146	213	306	433	36	102	128	207
Northbound Right	0	0	0	0	0	0	0	0	0	0	0	0
Southbound Left	23	41	29	51	25	45	34	62	5	17	6	15
Southbound Thru	164	241	290	418	146	216	509	730	44	123	279	506
Southbound Right	0	0	0	0	0	0	0	0	0	0	0	0
Eastbound Left	67	68	58	68	26	53	25	50	7	24	16	27
Eastbound Thru	345	526	296	520	85	122	85	123	20	79	44	88
Eastbound Right	68	95	0	0	0	37	0	0	0	26	0	0
Westbound Left	11	25	30	63	17	37	64	106	5	21	65	96
Westbound Thru	101	154	88	154	597	697	539	643	32	96	71	107
Westbound Right	0	0	0	0	0	0	0	0	0	0	0	0

* n/a indicates that generally no vehicles exit from this approach during this time period

TABLE 16
SUMMARY OF QUEUES AT UNSIGNALIZED INTERSECTIONS
DURING PEAK HOURS

	AM Peak		PM Peak		Saturday Peak	
	No-Build	Build	No-Build	Build	No-Build	Build
	95th%	95th%	95th%	95th%	95th%	95th%
Parker Street at Walnut Street						
Northbound Left/Thru	10	12	20	27	10	15
Eastbound Left/Right	60	131	90	315	42	159
Great Road at Sudbury Street						
Southbound Left/Right	282	332	283	483	10	16
Eastbound Left/Thru	2	3	2	3	2	2
Parker Street at North Street at Field Street						
Northbound Left/Thru/Right	0	0	0	1	0	1
Southbound Left/Thru/Right	0	3	1	2	0	0
Eastbound Left/Thru/Right	15	38	15	50	5	57
Westbound Left/Thru/Right	2	2	4	11	2	25
Parker Street at South Street at Secondary Site Drive						
Northbound Thru/Right	0	0	0	0	0	0
Southbound Left/Thru/Right	0	0	1	1	0	1
Westbound Left/Right	3	5	9	54	4	63
Parker Street at Old Marlboro Road						
Southbound Left/Thru	0	0	1	1	0	0
Westbound Left/Right	8	13	11	36	8	26
Parker Street at Vose Hill Road						
Northbound Left/Thru	0	0	0	0	1	2
Eastbound Left/Right	20	40	15	58	10	56

Signal Warrants Worksheets

TRAFFIC SIGNAL WARRANTS ANALYSIS WORKSHEET

WEEKDAY BOSTON RD AT SITE DRIVE

Time	Parker St Present Volumes	Correction Factor (to match Peak Hour vol)	Parker St No-Build 2018	Additional Vol Due to Site	Parker St Build 2018	Hrly Var (%)	ITE Retail Hourly Var (%) Entering	ITE Retail Hourly Var (%) Exiting	Est. Exiting Total Site Traffic*	Est. Exiting Left Turn Site Traffic
6-7 AM	688	566	627	61	688	4.0%	0.8%	0.3%	14	9
7-8AM	1239	1019	1129	153	1282	7.1%	2.0%	0.9%	42	27
8-9AM	1115	917	1016	237	1253	6.4%	3.1%	1.2%	55	37
9-10AM	877	721	799	420	1219	5.0%	5.5%	2.0%	92	61
10-11AM	665	547	606	535	1141	3.8%	7.0%	4.3%	198	131
11-12PM	717	590	653	642	1295	4.1%	8.4%	6.2%	286	189
12-1PM	776	638	707	718	1425	4.5%	9.4%	8.3%	383	253
1-2PM	774	637	705	626	1332	4.5%	8.2%	8.6%	397	262
2-3PM	850	674	750	588	1338	4.7%	7.7%	8.9%	572	357
3-4PM	1053	835	929	596	1525	5.9%	7.8%	8.8%	565	353
4-5PM	1239	982	1093	611	1705	6.9%	8.0%	8.9%	572	357
5-6PM	1380	1094	1218	642	1860	7.7%	8.4%	9.2%	591	369
6-7PM	1132	897	999	611	1610	6.3%	8.0%	7.5%	482	301
7-8PM	602	477	531	603	1135	3.4%	7.9%	7.2%	463	289
8-9PM	457	362	403	328	732	2.5%	4.3%	7.7%	495	309
9-10PM	359	285	317	137	454	2.0%	1.8%	7.2%	463	289
						76.8%	98.3%	97.2%	5669	3590

Total Wkdy Parker Street Volume: 15843

Estimated Development Traffic:

Retail Trips To/From Site	All Site Drives
Entering	7639
Exiting	**7639**
Total	15277

* Additional Volume from Site (hourly) = New Traffic to Parker St = Portion of New Trips Exiting Left * 7639 Daily Entering Trips * ITE Hourly Variation Entering

MISCELLANEOUS CORRECTION FACTORS USED IN TRAFFIC SIGNAL WARRANT ANALYSIS

Projected Additional Volume from Other Projects	
60	AM Peak trips
63	PM Peak trips

Time	Projected Additional
6-7 AM	35
7-8AM	63
8-9AM	57
9-10AM	45
10-11AM	34
11-12PM	37
12-1PM	40
1-2PM	39
2-3PM	45
3-4PM	56
4-5PM	66
5-6PM	74
6-7PM	61
7-8PM	32
8-9PM	24
9-10PM	19
TOTAL	728

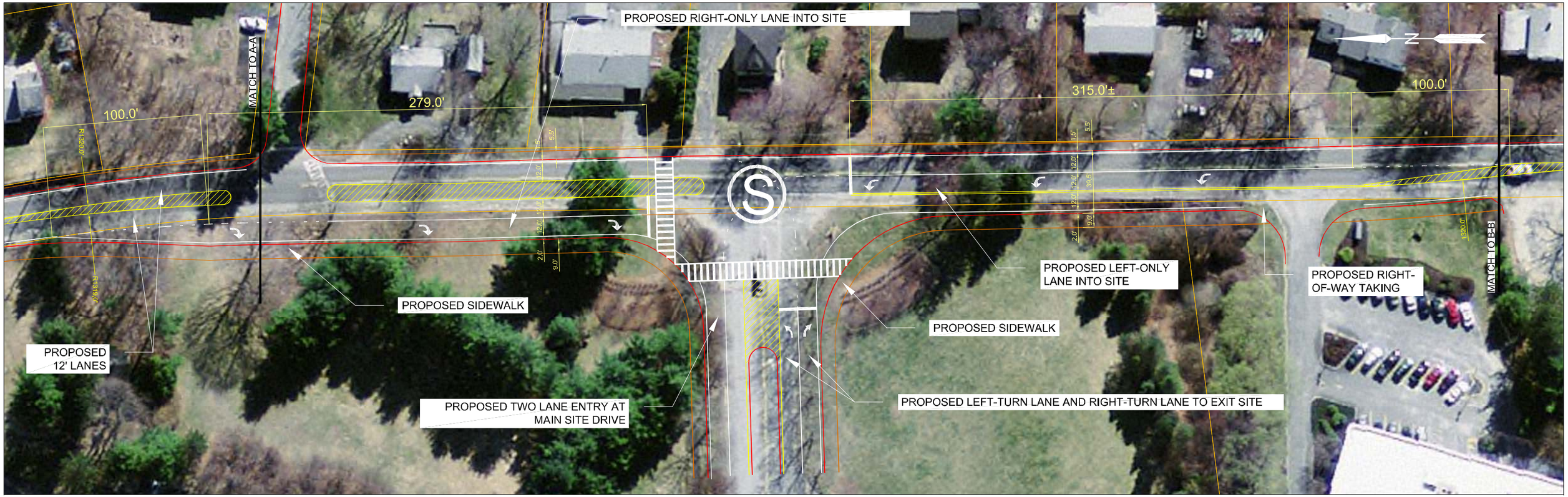
Portion Taking Left out of Major Site Drive	0.660	AM Peak	use for 1st 8 hours
	0.624	PM Peak	use for 2nd 8 hours

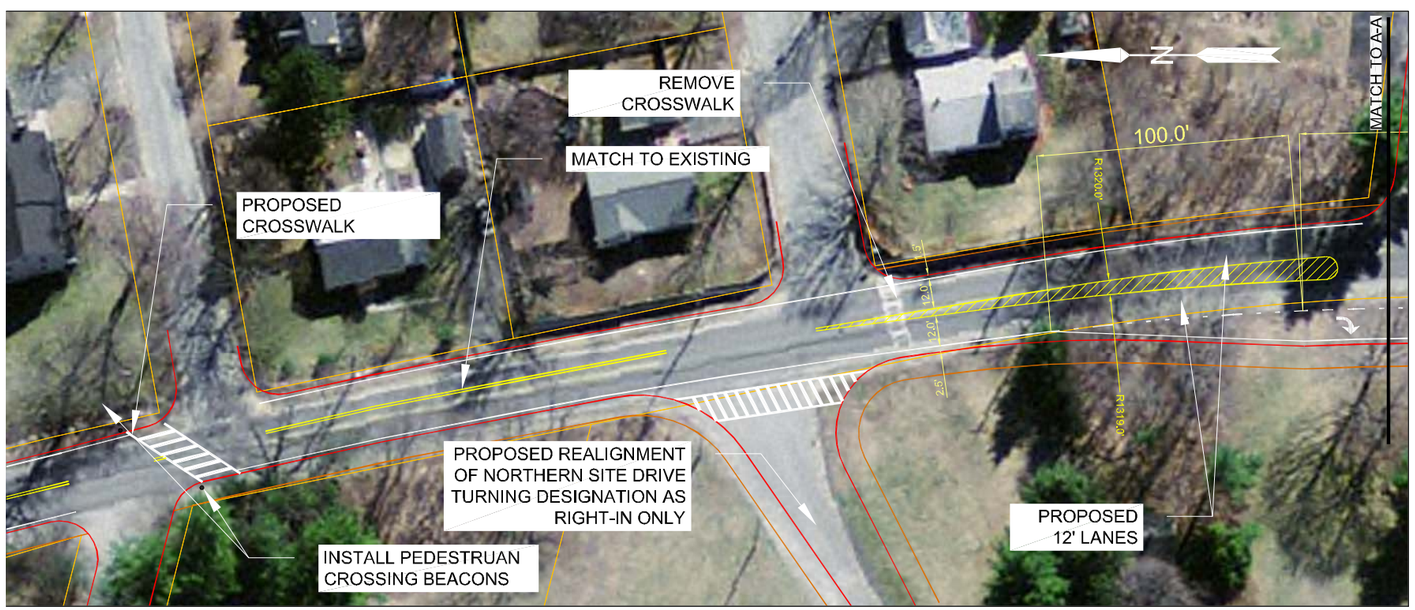
EXISTING VOLUMES			
correction factors	AM Peak	968	use for 1st 8 hours
	PM Peak	1038	use for 2nd 8 hours

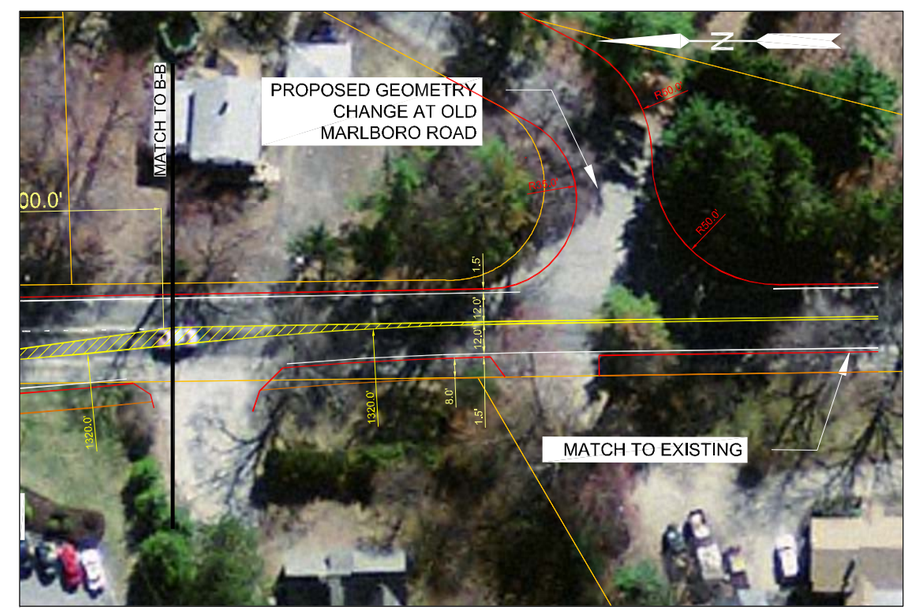
Reference: Project Peak Hour Build-Case Volumes	PARKER	LEFTS ONTO PARKER
AM Peak	1219	132
PM Peak	1641	395

	Retail	Other Uses	% Traffic due to Retail
AM Peak	334	219	0.6040
PM Peak	1382	261	0.8411

Preliminary Conceptual Access Plan







PROPOSED PAVEMENT MARKING
PROPOSED EDGE OF ROADWAY
PROPOSED EDGE OF SIDEWALK

CONCEPT PLAN

NOT FOR CONSTRUCTION

GREEN INTERNATIONAL AFFILIATES, INC.
CIVIL AND STRUCTURAL ENGINEERS
WESTFORD, MASSACHUSETTS

SCALE IN FEET
0 30 60 75 150 FEET