MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

PRINCIPALS
Robert J. Michaud, P.E.
Ronald D. Desrosiers, P.E., PTOE
Daniel J. Mills, P.E., PTOE

July 2, 2014

Mr. Marc Levin
Chestnut Hill Realty
300 Independence Drive
Chestnut Hill, MA 02446

Re: Updated Traffic Impact Assessment, Residences of South Brookline – 40B
Brookline, Massachusetts

Dear Marc:

MDM Transportation Consultants, Inc. (MDM) is pleased to submit the attached updated Traffic Impact Assessment (TIA) for the Residences of South Brookline development. This updated TIA updates the November 2013 traffic assessment to reflect revisions to the Site Plan, which reduces the proposed residential units from 192 to 184. MDM has also included a qualitative assessment of impact for potential access onto the VFW Parkway which would facilitate access to a limited number of units on the easterly portion of the project site.

In summary, the reduction of residential units for the project will result in a corresponding net reduction in trips and associated impacts for the development on area roadways. As with the original TIA findings, MDM concludes that traffic impacts associated with the proposed Residences of South Brookline will not result in any material change in traffic operations are study intersections which analysis shows operate at acceptable levels and below capacity. Likewise, there are no notable safety deficiencies on area roadways that would be exacerbated by the project. Implementation of recommended traffic calming improvements along Independence Way and other proposed actions as identified by the Proponent in the original TIA and subsequent peer review responses of April 29, 2014 will enhance safety for motorists and pedestrians.

Relative to potential access at VFW Parkway, MDM finds that there is likely to be only a limited re-orientation of site trips from the adjoining neighborhood streets (fewer than 10 vehicle-trips during peak hours). As such, no material change in impact to area roadways is anticipated should such access be achieved through approval of the Department of Conservation and Recreation (DCR).

Sincerely,

MDM TRANSPORTATION CONSULTANTS, INC.

Robert J. Michaud, P.E.
Managing Principal

28 Lord Road, Suite 280 · Marlborough, Massachusetts 01752
Phone (508) 303-0370 · Fax (508) 303-0371 · www.mdmtrans.com

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

PRINCIPALS
Robert J. Michaud, P.E.
Ronald D. Desrosiers, P.E., PTOE
Daniel J. Mills, P.E., PTOE

MEMORANDUM

DATE: July 1, 2014

TO: Mr. Marc Levin
Chestnut Hill Realty
300 Independence Drive
Chestnut Hill, MA 02446

FROM: Robert J. Michaud, P.E. – Managing Principal
Courtney E. Jones, P.E. – Senior Transportation Engineer

RE: **Updated Traffic Impact Assessment – 184 Units**
Proposed Residences of South Brookline - 40B
Brookline, MA

MDM Transportation Consultants, Inc. (MDM) has prepared this updated traffic impact assessment (TIA) for the proposed Residences of South Brookline to reflect modifications to the site plan for 184 apartment units. This memorandum documents existing (baseline) operational and safety-related characteristics of roadways serving the development Site, estimates future year operating characteristics of these roadways independent of the development, estimates development-related trip generation, and identifies incremental impacts of Site-related traffic. Access related improvements are identified for the development to meet operational needs of the Site and the adjacent roadways.

Key findings of the preliminary traffic assessment are as follows:

- *Existing Traffic Characteristics.* Independence Drive, a minor arterial roadway in the study area, carries approximately 14,000 vehicles per day (vpd) with peak hour volumes ranging from approximately 1,175 vehicles per hour (vph) to 1,275 vph. Directional flow of traffic exhibits commuter trends (eastbound in the AM peak hour and westbound in the PM peak hour).

- *Safety Characteristics.* Safe stopping sight distance (SSD) is available for oncoming vehicles to detect, react and stop for vehicles exiting the proposed site driveways onto Independence Drive and Russett Road based on the regulatory speed limits. No immediate safety countermeasures are required at the study intersections based on historic crash data and trends.

- *Traffic Generation.* The proposed residential development is estimated to generate approximately 94 vehicle trips (19 entering and 75 exiting) during the weekday morning peak hour and 119 vehicle trips (77 entering and 42 exiting) during the weekday evening peak hour. These trips are likely to be oriented 35% to/from the west (toward VFW Parkway) and 65% to/from the east (W. Roxbury Parkway and Newton Street) based on observed trends for the existing Hancock Village site. Empirical data collected at the site indicated that the site is generating trips at a lower rate than published by ITE during the weekday peak hours. However, as a conservative measure and to be consistent with standard industry practice, the higher-volume ITE-based estimates were used in this analysis rather than trip rates calculated using empirical data for the existing site. Furthermore, data published by the US Census, indicated that approximately 30 percent of residents in the immediate study area utilize modes of transportation other than single-occupancy vehicles. Again, as a conservative measure, no reduction in site trips is taken as a result of available public transportation.

- *Adequate Roadway Capacity.* Adequate capacity is available along Independence Drive, Russett Road and at study intersections to accommodate modest projected traffic increases for the proposed Residences of South Brookline. Signalized intersection operations are generally at LOS D or better (overall). No change in overall LOS at the study intersections expected as a result of the project. The mainline approaches to unsignalized intersections operate unimpeded at LOS A operations under existing and future year conditions.

- *Proposed Access and Pedestrian Improvements.* Driveway and sidewalk improvements are identified and proposed by the Applicant to ensure efficient traffic operations are achieved, adequate sight lines are provided to meet or exceed recommended safety standards and that pedestrian features (sidewalks) are expanded to integrate the Site with the surrounding roadway system. Travel demand management (TDM) programs already available to existing residents are shown to have a notable reduction in auto trip generation that is well below typical suburban standards and will be expanded to promote alternative travel modes and to accommodate the anticipated increase in resident use of the Hancock Village shuttle service connecting residents to the MBTA Cleveland Circle station, public transportation, ZIPCAR use and walking/bicycle travel.

PROJECT DESCRIPTION

Hancock Village currently includes 789 apartment units that are located on approximately 80.8 acres of land located off Independence Drive in Brookline and West Roxbury, MA. Access to the site is currently provided via Sherman Road, Gerry Road, Thornton Road and Asheville Road. The location of the site relative to adjacent roadways is shown in **Figure 1**.

Figure 1

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Site Location

Date: July 2014
Dwg No. 389 TIAS_40B_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.

The site primarily consists of one and two bedroom units with an effective occupancy that exceeds 98 percent at the time the traffic counts were conducted (April 2012). The 789 existing units at Hancock Village include the following breakdown in terms of bedrooms:

- 353 – One bedroom units
- 401 – Two bedroom units
- 35 – Three bedroom units

The site currently has approximately 1,073 on-site parking spaces (1.36 spaces per unit) for residents of Hancock Village. An additional supply of 46± on-street parking spaces (in West Roxbury) was also observed; however, these spaces are not specifically reserved for Hancock Village residents.

Under the proposed development program, the Brookline portion of the site will be expanded to include approximately 184 additional apartment units and approximately 422 additional on-site parking spaces (1.54 spaces per dwelling unit). As currently proposed, access to the additional residences will be provided by the existing site roadway network via Asheville Road and two additional driveway connections to undeveloped curb-cuts which exist along Independence Drive. The preliminary site layout is presented in **Figure 2.**

STUDY METHODOLOGY

This traffic impact assessment is conducted in accordance with industry standard traffic study guidelines and consists of several steps. The first step documents existing conditions in the transportation study area, including an inventory of roadway geometry, observed traffic volumes and safety characteristics. Next, future year traffic conditions are forecast that account for other planned area developments, normal area growth, and development-related traffic increases. The third step quantifies operating characteristics of study intersections. Specific attention is given to the incremental impacts of the proposed development. Finally, improvements are described that address specific development-related operational needs as required.

North
Scale: Not to Scale

Site Plan Source: Stantec

Figure 2

Preliminary Site Layout

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Date: July 2014
Dwg No. 389 TIAS_40B_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.

STUDY AREA

This TIA evaluates transportation characteristics of roadways and intersections that provide a primary means of access to the site, and that are likely to sustain a measurable level of traffic impact from the development. The study area includes the following intersections, which are also identified in **Figure 1**:

- ☐ Independence Drive at Sherman Road/ Thornton Road (Unsignalized)
- ☐ Independence Drive at Gerry Road (Unsignalized)
- ☐ Independence Drive at Beverly Road/ Russett Road (Signalized)
- ☐ Independence Drive at Proposed Site Driveways (Unsignalized)
- ☐ Grove Street at South Street (Signalized)
- ☐ Russett Road at Asheville Road (Unsignalized)
- ☐ South Street at Asheville Road (Unsignalized)

EXISTING TRAFFIC & SAFETY CHARACTERISTICS

An overview of existing roadway conditions, traffic volumes and safety characteristics is provided below.

Roadways

Independence Drive

Independence Drive is a roadway under local (Town) jurisdiction that is classified by the Massachusetts Department of Transportation (MassDOT) as an Urban Minor Arterial roadway. Independence Drive provides a connection between Grove Street in Brookline and VFW Parkway in West Roxbury. Within the site vicinity, Independence Drive has a generally straight alignment with roadway grades of less than 3 percent. Two travel lanes are provided in each direction with a total roadway width of approximately 48 feet. The regulatory speed limit along Independence Drive is 35 miles per hour (mph). Regulated on-street parking is provided along both sides of Independence Drive. Land use along Independence Drive is primarily residential with some commercial and medical uses near its intersection with VFW Parkway.

Grove Street

Grove Street is generally an east-west roadway under local (Town) jurisdiction. Grove Street is classified by the MassDOT as an Urban Minor Arterial roadway. The roadway provides a connection between Independence Drive, West Roxbury Parkway, and Newton Street in Brookline. Within the study area, Grove Street has a generally straight alignment and provides two lanes of travel in each direction. The regulatory speed limit along Grove Street in the study area ranges between 25 mph and 30 mph. Land use along Grove Street in the study area is primarily residential with some commercial and religious land uses near South Street.

Russett Road

Russett Road is generally a north-south roadway that is under local (Town) jurisdiction. Russett Road is classified by the MassDOT as an Urban Local roadway and provides a connection between Grove Street and VFW Parkway in Brookline. Russett Road provides one travel lane in each direction. Sidewalks are provided along both sides of the roadway. Land use along Russett Road includes residential homes.

Intersections

Independence Drive at Sherman Road/ Thornton Road

Independence Drive meets Sherman Road and Thornton Road to form a four-way, unsignalized intersection. The Independence Drive approaches both provide two general-purpose travel lanes in each direction. The Thornton Road approach provides a single lane departure lane to Independence Drive under "STOP" sign control. Sherman Road is restricted to one-way travel entering Hancock Village. Sidewalks are provided on both sides of all the approaches and brick crosswalks are provided across the eastern approach of Independence Drive as well as across the Sherman Road and Thorton Road approaches. A Massachusetts Bay Transportation Authority (MBTA) bus stop is located at the intersection. Land use at the intersection consists of residential apartments associated with Hancock Village.

Independence Drive at Gerry Road

Independence Drive meets Gerry Road to form a "T"-type unsignalized intersection. The Independence Drive approaches provide two travel lanes in each direction. The Gerry Road approach provides unmarked exclusive left and right turn departure lanes to Independence Drive under "STOP" sign control. Sidewalks are provided on both sides of all the approaches and brick crosswalks are provided across the eastern approach of Independence Drive as well as across the Gerry Road approach. An MBTA bus stop is located at the intersection. Land use at the intersection consists of residential apartments associated with Hancock Village.

Independence Drive/ Grove Street at Beverly Road/ Russett Road

Independence Drive/ Grove Street meet Beverly Road/ Russett Road to form a four-way, signalized intersection. The Independence Drive and Grove Street approaches provide a shared through/left-turn lane and a shared through/right-turn lane in each travel direction. The Beverly Road and Russett Road approaches each provide a single general-purpose travel lane. Sidewalks are provided on both sides of all the approaches and marked crosswalks are provided across each approach. An MBTA bus stop is located at the intersection. Land use at the intersection consists of residential homes.

Grove Street at South Street/ Walnut Hill Road

Independence Drive meets South Street/Walnut Hill Road to form a five-way, signalized intersection. The Grove Street approaches to the intersection provide a shared through/left-turn lane and a shared through/right-turn lane in each travel direction. The South Street and Walnut Hill Road southbound approaches each provide a single general-purpose travel lane. The South Street northbound approach generally operates as an exclusive left turn lane and a shared through/ right turn lane. Sidewalks are provided on both sides of all the approaches and marked crosswalks are provided across each approach. An MBTA bus stop is located at the intersection. Land use at the intersection consists of residential homes, commercial buildings, and a religious temple use.

Russett Road at Asheville Road

Russett Road meets Asheville Road to form a four-way, unsignalized intersection. The Russett Road approaches to the intersection both provide a single travel lane in each direction. The Ashville Road approaches are generally unmarked but are wide enough to provide a separate left/ through lane and exclusive right turn departure lanes under "STOP" sign control. Sidewalks are provided at each approach to the intersection. Land use at the intersection consists of residential use.

South Street at Asheville Road

South Street meets Asheville Road to form a three-way, unsignalized intersection. Each approach to the intersection provides a single travel lane in each direction with Asheville Road under STOP-control. Sidewalks are provided along Asheville Road and the easterly side of South Street. Land use at the intersection consists of residential uses and Bournewood Hospital.

Existing Traffic Data

Traffic volume data were collected at the study intersections during the weekday morning (7:00 AM - 9:00 AM) and weekday evening (4:00 PM – 6:00 PM) periods to coincide with peak traffic activity of the proposed residential uses and the adjacent streets. Traffic data used in this evaluation were collected in April 2012 and reflect typical area traffic conditions with schools in session. The month of April represents above-average traffic conditions based on review of MassDOT permanent count station data for the area. Therefore, as a conservative measure, no adjustment (reduction) to the observed traffic volumes was made to reflect average season conditions. Additionally, traffic volumes in the Brookline area have generally declined over the past few years based on MassDOT permanent count station data. However, in order to provide a conservative planning based analysis for the project, the observed traffic volumes were grown by an annual growth rate of one percent (1%) for one year to obtain the 2013 Existing (Baseline) conditions networks. Traffic count data and MassDOT permanent count station data are provided in the **Attachments.** The weekday morning and evening peak hours of traffic volumes for the study intersections are shown in **Figure 3** and **Figure 4**.

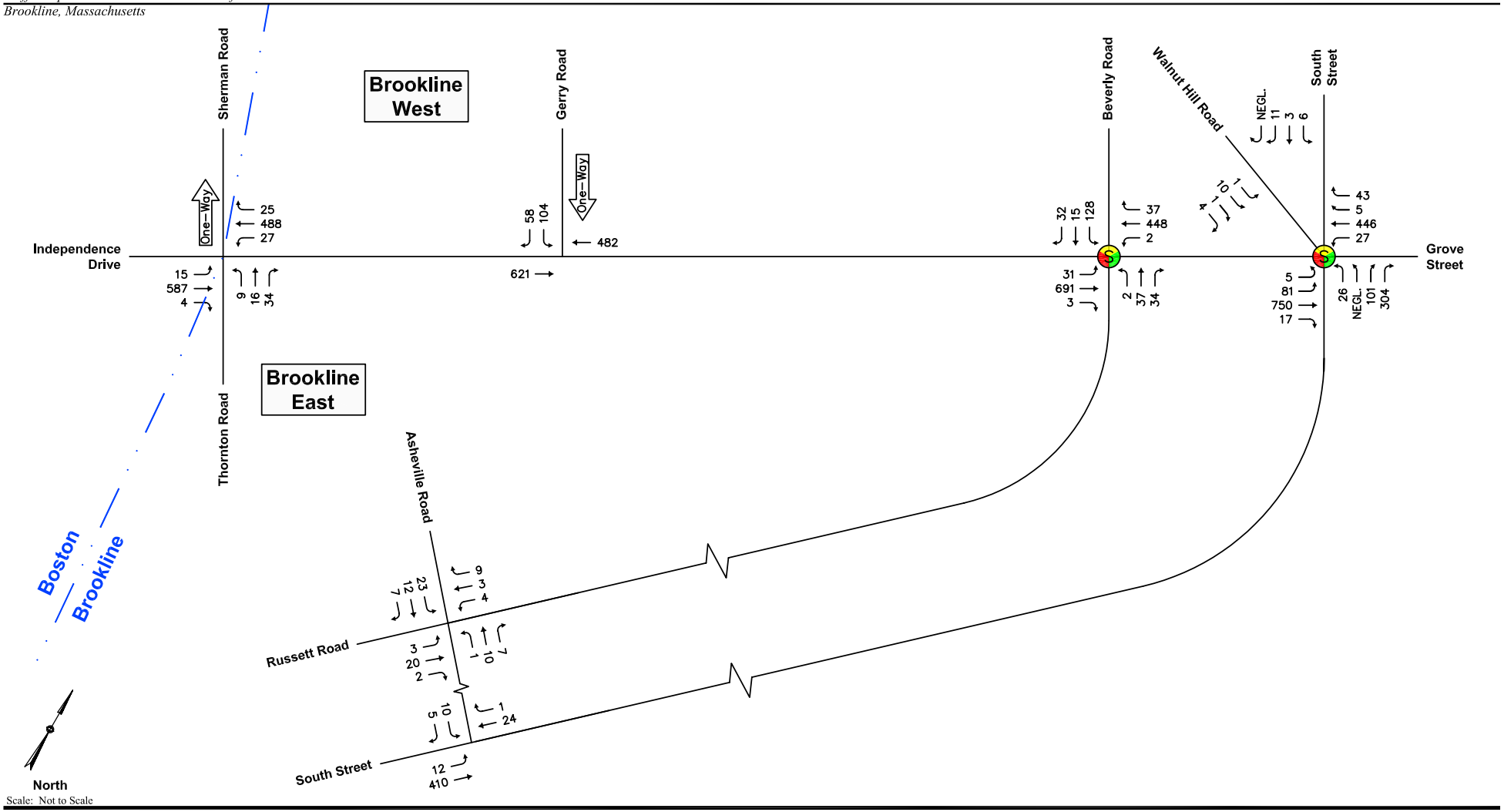
Historical daily traffic volumes along Independence Drive in the site vicinity were collected using an automated traffic recorder (ATR) in September 2007 with detailed count data provided in the **Attachments**. Independence Drive, a minor arterial roadway in the study area, carries approximately 14,000 vehicles per day with peak hour volumes of approximately 1,175 vph to 1,275 vph vehicles per hour. Directional flow of traffic exhibits commuter trends (eastbound in the AM peak hour and westbound in the PM peak hour).

Existing (Hancock Village) Trip Generation

Trip generation characteristics for the existing Hancock Village based on empirical data collected in April 2012 is summarized in **Table 1**. At the time of the collection of the empirical data approximately 700 apartment units were occupied along the observed driveways. Detailed trip generation calculations are included in the **Attachments**.

As summarized in **Table 1**, the following key trip characteristics for the existing Hancock Village apartments are noted:

- The existing Hancock Village generates approximately 356 vehicle trips per hour (vph) during a weekday morning peak hour and approximately 254 vph during the weekday evening peak hour.
- The Hancock Village generates approximately 0.51 trips per unit during the weekday morning peak hour and 0.36 trips per unit during the weekday evening peak hour.

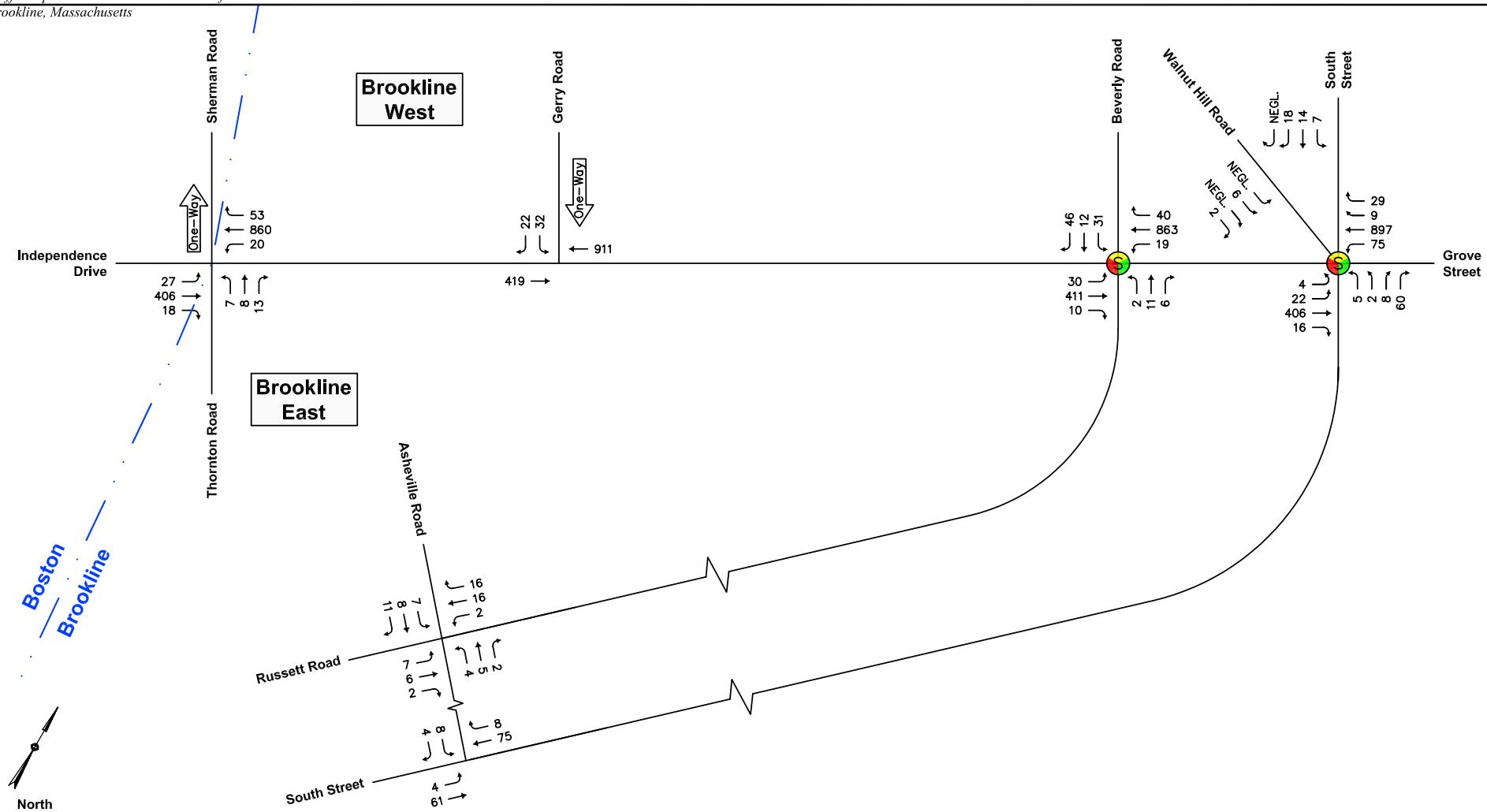


MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Figure 3

2013 Existing (Baseline) Weekday Morning Peak Hour Traffic Volumes

Date: July 2014
Dwg No. 389 TIAS_40B_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.



Scale: Not to Scale

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Figure 4

2013 Existing (Baseline) Weekday Evening Peak Hour Traffic Volumes

Date: July 2014
Dwg No. 389 TIAS_40B_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.

TABLE 1
EXISTING TRIP-GENERATION
HANCOCK VILLAGE APARTMENTS

Peak Hour/ Direction of Travel	Trip Generation[1]	Trip Rate (Empirical)[2]
Weekday Morning Peak Hour:		
Entering	93	0.13
Exiting	263	0.38
Total	356	0.51
Weekday Evening Peak Hour:		
Entering	146	0.21
Exiting	108	0.15
Total	254	0.36

[1] Based on empirical data collected in April 2012
[2] Empirical trip generation per unit based on 700 units in trips per unit.

Intersection Crash History

In order to identify crash trends and safety characteristics for study area intersections, crash data were obtained from MassDOT for the Town of Brookline for the three-year period 2009 through 2011 (the most recent data currently available from MassDOT). Crash data for the study intersections is summarized in **Table 2** with detailed data provided in the **Attachments.**

Crash rates were calculated for the study area intersections as reported in **Table 2**. This rate quantifies the number of crashes per million entering vehicles. MassDOT has determined the official District 6 (which includes the Town of Brookline) crash rate to be 0.58 for unsignalized intersections and 0.76 for signalized intersections. These rates represent MassDOT's "average" crash experience for District 6 communities and serves as a basis for comparing reported crash rates for the study intersections. Where calculated crash rates notably exceed the district average, some form of safety countermeasures may be warranted.

TABLE 2
INTERSECTION CRASH SUMMARY
2009 THROUGH 2011[1]

Data Category	Grove St at South St/ Walnut Hill Rd	Grove St at Beverly Rd/ Russett Rd	Independence Dr at Gerry Rd	Independence Dr at Sherman Rd/ Thornton Rd
Traffic Control	Signalized	Signalized	Unsignalized	Unsignalized
Crash Rate[2]	**0.21**	**0.06**	**0.18**	**0.17**
District 6 Avg[3]	0.76	0.76	0.58	0.58
Year:				
2009	2	0	2	1
2010	1	0	0	0
2011	1	1	1	2
Total	**4**	**1**	**3**	**3**
Type:				
Angle	1	1	0	1
Rear-End	1	0	1	2
Head-On	0	0	0	0
Sideswipe	0	0	0	0
Single Vehicle	2	0	1	0
Other/Unknown	0	0	1	0
Severity:				
P. Damage Only	3	0	2	0
Personal Injury	0	1	1	3
Fatality	0	0	0	0
Unknown	1	0	0	0
Conditions:				
Dry	3	1	2	2
Wet	1	0	0	1
Snow	0	0	0	0
Other	0	0	1	0
Time:				
7:00 to 9:00 AM	0	0	2	1
4:00 to 6:00 PM	1	0	0	1
Rest of Day	3	1	1	1

[1] Source: MassDOT Crash Database
[2] Crashes per million entering vehicles
[3] District 6 averages = 0.76 (signalized) and 0.58 (unsignalized)

Sight Line Evaluation

An evaluation of sight lines was conducted at the site driveway locations providing access to the proposed residential units to ensure that minimum recommended sight lines are available at the site driveway intersections with Independence Drive and Russett Road. The evaluation documents sight lines under proposed conditions for vehicles as they relate to Independence Drive and existing conditions for vehicles as they relate to Russett Road with comparison to recommended guidelines.

The American Association of State Highway and Transportation Officials' (AASHTO) standards[1] reference two types of sight distance which are relevant at the proposed site driveway intersections along Independence Drive and the existing site driveway along Russett Road: stopping sight distance (SSD) and intersection sight distance (ISD). Sight lines for critical vehicle movements at the site driveway intersections were compared to minimum SSD and ISD recommendations for the regulatory speed limit posted in the area near the site. As a point of reference, MDM has also evaluated SSD and ISD along Asheville Road within the Site in the vicinity of the proposed garage driveway that will serve the southeast apartment building complex using the latest available site layout and grading plans prepared by Stantec. An exhibit depicting proposed driveway layout and sight lines is presented in the **Appendix**.

Stopping Sight Distance

Sight distance is the length of roadway visible to the motorist to a fixed object. The minimum sight distance available on a roadway should be sufficiently long enough to enable a below-average operator, traveling at or near a regulatory speed limit, to stop safely before reaching a stationary object in its path, in this case, a vehicle exiting onto Independence Drive or Russett Road. The SSD criteria are defined by AASHTO based on design and operating speeds, anticipated driver behavior and vehicle performance, as well as physical roadway conditions. SSD includes the length of roadway traveled during the perception and reaction time of a driver to an object, and the distance traveled during brake application on wet level pavement. Adjustment factors are applied to account for roadway grades when applicable.

SSD was estimated in the field using AASHTO standards for driver's eye (3.5 feet) and object height equivalent to the taillight height of a passenger car (2.0 feet) for the northbound and southbound Independence Drive and Russett Road approaches to the site driveways. **Table 3** presents a summary of the available SSD as they relate to Independence Drive and Russett Road and AASHTO's recommended SSD based on posted speeds along Independence Drive and Russett Road.

---

[1] *A policy on Geometric Design of Highways and Streets*, American Association of State Highway and Transportation Officials (AASHTO), 2011.

As summarized in **Table 2**:

- *Grove Street/South Street.* A total of four (4) crashes were reported at the Grove Street/South Street signalized intersection during the three-year study period resulting in a crash rate of 0.21 which is well below the District 6 average of 0.76 for signalized intersections. Of the reported crashes, one (1) involved an angle-type collision, one (1) involved a rear-end collision and two (2) involved single vehicle crashes. The majority resulted in property damage only (75%) and occurred under dry roadway conditions (75%). Only one (1) reported crash occurred during the weekday peak periods. No fatalities were reported at this location during the three-year study period.

- *Grove Street/Beverly Road.* There was one (1) reported crash at the Grove Street/Beverly Road signalized intersection during the three-year study period resulting in a crash rate of 0.06 which is well below the District 6 average of 0.76 for signalized intersections. The reported crash involved an angle-type collision resulting in a non-fatal injury and occurring under dry roadway conditions. The crash occurred outside of the weekday morning and evening peak periods.

- *Independence Drive/Gerry Road.* A total of three (3) crashes were reported at the Independence Drive/Gerry Road unsignalized intersection during the three-year study period resulting in a crash rate of 0.18 which is well below the District 6 average of 0.58 for unsignalized intersections. Of the reported crashes, one (1) involved a rear-end type collision, one (1) involved a single vehicle crash and one (1) is of unknown severity. Two (2) of the crashes resulted in property damage only and occurred under dry roadway conditions. Two (2) of the reported crashes (67%) of crashes occurred during the weekday morning peak period. No fatalities were reported at this location during the three-year study period.

- *Independence Drive/Sherman Road/Thornton Road.* A total of three (3) crashes were reported at the Independence Drive/Sherman Road/Thornton Road unsignalized intersection during the three-year study period resulting in a crash rate of 0.17 which is well below the District 6 average of 0.58 for unsignalized intersections. Of the reported crashes, one (1) involved an angle-type collision and two (2) involved rear-end type collisions. All of the reported crashes resulted in non-fatal injuries. Two (2) of the reported crashes occurred under dry roadway conditions and one (1) of the reported crashes occurred under wet roadway conditions. Two (2) of the reported crashes (67%) of crashes occurred during the weekday morning and weekday evening peak periods. No fatalities were reported at this location during the three-year study period.

- There were no reported crashes at the unsignalized intersections of Asheville Road at Russett Road and at South Street during the three-year study period.

In summary, the study intersections all experienced crash rates well below the District 6 average and no immediate safety countermeasures are warranted based on the crash history at the study intersections.

TABLE 3
STOPPING SIGHT DISTANCE SUMMARY
APPROACHES TO SITE DRIVEWAYS

Approach/ Travel Direction	Available SSD	AASHTO Recommended[1] (Regulatory Speed Limit[2])
Independence Drive at Proposed Brookline West Drive		
Northbound	>500 Feet	250 Feet
Southbound	>500 Feet	250 Feet
Independence Drive at Proposed Brookline East Drive		
Northbound	>500 Feet	250 Feet
Southbound	>500 Feet	250 Feet
Russett Road at Site Drive (Asheville Road)		
Eastbound	>500 Feet	200 Feet
Westbound	300± Feet	200 Feet

[1]Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet to object height of 2.0 feet.
[2]Regulatory posted speed = 35 mph on Independence Drive & Regulatory prima facie speed = 30 mph on Russett Road

As summarized in **Table 3,** analysis results indicate that the existing available sight lines exceed AASHTO's recommended SSD criteria for both travel directions along Independence Drive and Russett Road. Stopping sight distance calculations are provided in the **Attachments.**

Intersection Sight Distance

Clear sight lines provide sufficient sight distance for a stopped driver on a minor-road approach to depart from the intersection and enter or cross the major road. As stated under AASHTO's Intersection Sight Distance (ISD) considerations, "*...If the available sight distance for an entering ...vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to avoid collisions...To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road.*" AASHTO's ISD criteria are defined into several "cases". In this case, the proposed site driveway approaches to the intersections are proposed to be under STOP signal control and the ISD in question relates to the ability to turn left or turn right onto Independence Drive or Russett Road.

Available ISD was estimated in the field using AASHTO standards for driver's eye (3.5 feet), object height (3.5 feet) and decision point (14.5 feet from the edge of travel lane) for the northbound and southbound directions along Independence Drive and Russett Road. **Table 4** presents a summary of the available ISD for the departure from the site driveways and AASHTO's recommended ISD.

TABLE 4
INTERSECTION SIGHT DISTANCE SUMMARY
SITE DRIVEWAY DEPARTURES

Approach/ Travel Direction	Available ISD	AASHTO Minimum[1] (Regulatory Speed Limit[2])
Independence Drive at Proposed Brookline West Drive		
Looking North	>500 Feet	250 Feet
Looking South	>500 Feet	250 Feet
Independence Drive at Proposed Brookline East Drive		
Looking North	>500 Feet	250 Feet
Looking South	>500 Feet	250 Feet
Russett Road at Site Drive (Asheville Road)		
Looking East	>225 Feet	200 Feet
Looking West	350± Feet	200 Feet

[1]Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet and an object height of 3.5 feet and adjustments for roadway grade if required. Minimum value as noted represents SSD per AASHTO guidance.
[2]Regulatory posted speed = 35 mph on Independence Drive & Regulatory prima facie speed = 30 mph on Russett Road

The results of the ISD analysis presented in **Table 4** indicate that the available ISD looking both directions from the proposed site driveways onto Independence Drive and Russett Road exceed the recommended minimum sight line requirements. MDM recommends that any new plantings (shrubs, bushes) or physical landscape features to be located within the driveway sight lines should also be maintained at a height of 2 feet or less to ensure unobstructed lines of sight.

PUBLIC TRANSPORTATION

Based on data published by the US Census, approximately 30 percent of residents in the immediate study area utilize modes of transportation other than single-occupancy vehicles. US Census transportation mode data for the area are provided in the **Attachments**. Alternative transportation modes include, but are not limited to, using public transportation, walking, bicycling, carpooling, and working at home. Alternative modes of transportation are available to Hancock Village residents and include MBTA Bus Route 51, the Hancock Village MBTA Shuttle and available on-site Zipcar with operating specifics as follows:

- **Route 51 – Reservoir (Cleveland Circle) – Forest Hills Station:** This Route provides a connection to the "T" at the Green Line (Reservoir Station) and Orange Line (Forest Hills Station). The Route generally provides Weekday service between 5:55 AM and 10:26 PM with 1 inbound and 1 outbound bus arriving at Hancock Village approximately every 25 minutes during the peak commuter hours. Saturday service is generally provided between 6:15 AM and 10:10 PM with 1 inbound and 1 outbound bus per hour. This Route does not currently operate on Sundays. Specific MBTA route and schedule information is provided in the **Attachments**.

- **Hancock Village MBTA Shuttle** – A shuttle service provided by Hancock Village to its residents transports passengers between the site and Reservoir Station (Cleveland Circle) during the weekday morning (6:00 AM to 9:00 AM) and evening (4:30 PM to 7:30 PM) commuter periods. The shuttle service runs every 20 minutes and experiences a rider-ship of approximately 3 to 8 passengers per trip.

- **Zipcar** – Zipcar is a privately-owned company providing rental cars stationed at various locations throughout select cities allowing local residents (with membership) access to rental vehicles without the traditional rental car protocol. Zipcar provides two vehicles on-site that are parked in the southeast portion of the site. These vehicles can be rented by the hour or by the day and the rental fee typically includes gas, reserved parking, insurance (deductible applies) and a pre-determined mileage limit. Specific information is available on the Zipcar website.

As summarized, the existing residents of Hancock Village have access to a wide variety of alternative modes of transportation. The existing sidewalk system onsite and in the neighborhood is extensive and provides access to nearby commercial establishments, on-site amenities, the Baker Elementary School and other area attractions. Thus, the site provides a well established alternative transportation program. As a conservative measure, no reduction in site trips is taken as a result of available public transportation.

PROJECTED FUTURE TRAFFIC CONDITIONS

Evaluation of the proposed development impacts requires the establishment of a future analysis condition. This section estimates future roadway and traffic conditions with and without the proposed development. For this evaluation, a five-year planning horizon (year 2018) was selected consistent with standard-industry practice.

To determine the impact of site-generated traffic volumes on the roadway network under future conditions, Existing (Baseline) traffic volumes in the study area were projected to a future year condition. Traffic volumes on the roadway network at that time, in the absence of the development (that is, the No-Build condition), includes existing traffic, new traffic due to general background traffic growth, and traffic related to specific developments by others that are currently under review at the local and/or state level. Consideration of these factors resulted in the development of No-Build traffic volumes. Anticipated site-generated traffic volumes were then superimposed upon these No-Build traffic-flow networks to develop future Build conditions.

The following sections provide an overview of the future traffic volumes.

Background Growth

Background traffic includes demand generated by other planned developments in the area as well as demand increases caused by external factors. External factors are general increases in traffic not attributable to a specific development and are determined using historical data.

Nearby permanent count station data published by MassDOT indicates a declining growth rate. For purposes of this evaluation, a 1 percent growth rate was used (approximate 5 percent increase over a 5-year horizon). This growth rate is higher than historic rates, and as such is also expected to account for any small fluctuation in hourly traffic as may occur from time to time in the study area. Background growth rate calculations are provided in the **Attachments.**

Also, Massachusetts Environmental Policy Act (MEPA) files and Boston Redevelopment Authority (BRA) files were reviewed to determine if any background projects are proposed in the area that may affect the study area intersections. Based on the files available, there are currently no known new developments proposed for the Town of Brookline and the surrounding areas likely to significantly impact the study area intersections. Therefore, only the 1 percent background growth rate was applied to determine the No-Build traffic volumes.

2018 No-Build Traffic Volume Networks

In summary, to account for future traffic growth in the study area future No-Build traffic volumes are developed by increasing the existing (baseline) volumes by approximately 5

percent (1 percent compounded annually over 5 years). The resulting No-Build traffic volumes are displayed in **Figure 5** and **Figure 6**.

Site Traffic

The trip generation estimates for the proposed residential development are provided for the weekday morning and weekday evening periods, which correspond to the critical weekday analysis periods for the proposed use and adjacent street traffic flow. New traffic generated by the project was estimated using trip rates published in ITE's *Trip Generation*[2] for Land Use Codes (LUCs) that most closely reflect the characteristics of individual residential uses within the site. **Table 5** presents the trip-generation estimates for the proposed development based on ITE methodology.

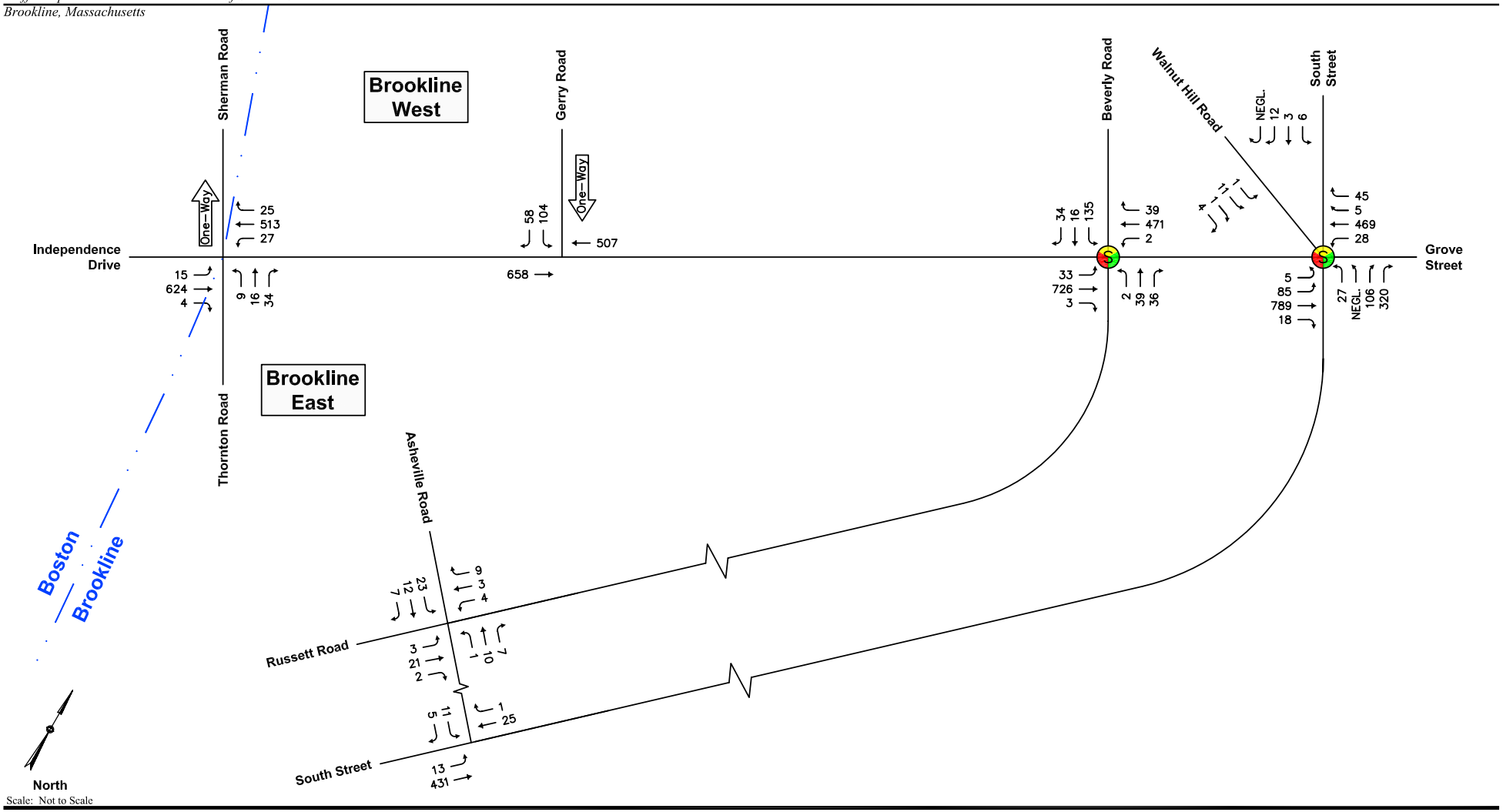
As summarized in **Table 5**, the proposed development is estimated to generate approximately 94 vehicle trips (19 entering and 75 exiting) during the weekday morning peak hour and 119 vehicle trips (77 entering and 42 exiting) during the weekday evening peak hour. On a daily basis, the proposed residential uses are estimated to generate approximately 1,238 vehicle trips on a weekday with 50 percent entering and exiting. Trip generation calculations are provided in the **Attachments**.

TABLE 5
UPDATED TRIP-GENERATION SUMMARY (184 Units)

Period/Direction	ITE Basis Apartment Trips[1]
Weekday Morning Peak Hour	
Entering	19
Exiting	75
Total	94
Weekday Evening Peak Hour	
Entering	77
Exiting	42
Total	119
Weekday Daily	1,238

Source: ITE *Trip Generation*, Ninth Edition; 2012.
[1]Based on ITE LUC 220 (Apartment) applied to 184 units.

[2]*Trip Generation*, Ninth Edition; Institute of Transportation Engineers; Washington, DC; 2012.

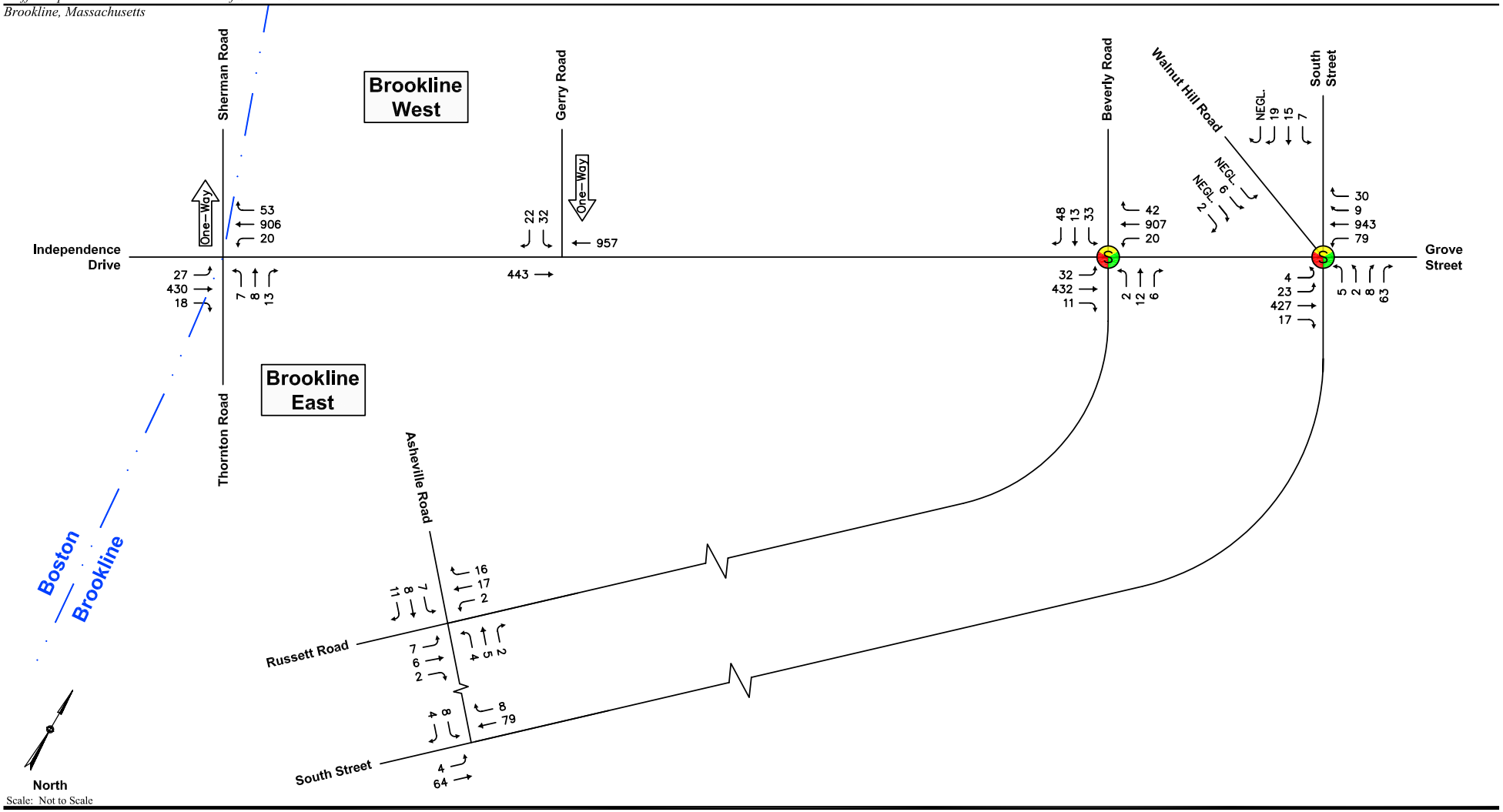


MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Figure 5

2018 No-Build Weekday Morning Peak Hour Traffic Volumes

Date: July 2014
Dwg No. 389 TIAS_40B_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.



MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Figure 6

2018 No-Build Weekday Evening Peak Hour Traffic Volumes

Date: July 2014
Dwg No. 389 TIAS_40B_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.

Trip Generation Comparison – Observed Site Trips

ITE estimates for LUC 220 (Apartment) presented in **Table 5** were compared to empirical trip estimates based on trip rates that were calculated based on the existing peak hour activity at the Hancock Village driveways. **Table 6** provides a trip generation comparison for the empirically estimated and ITE estimated site trips during the weekday morning and weekday evening peak hours. Trip generation calculations are provided in the **Attachments**.

TABLE 6
UPDATED TRIP-GENERATION COMPARISON (184 Units)

Period/Direction	Empirical Basis Apartment Trips[1]	ITE Basis Apartment Trips[2]	Difference (Δ)
Weekday Morning Peak Hour			
Entering	24	19	+5
Exiting	70	75	-5
Total	94	94	0
Weekday Evening Peak Hour			
Entering	39	77	-38
Exiting	28	42	-14
Total	67	119	-52

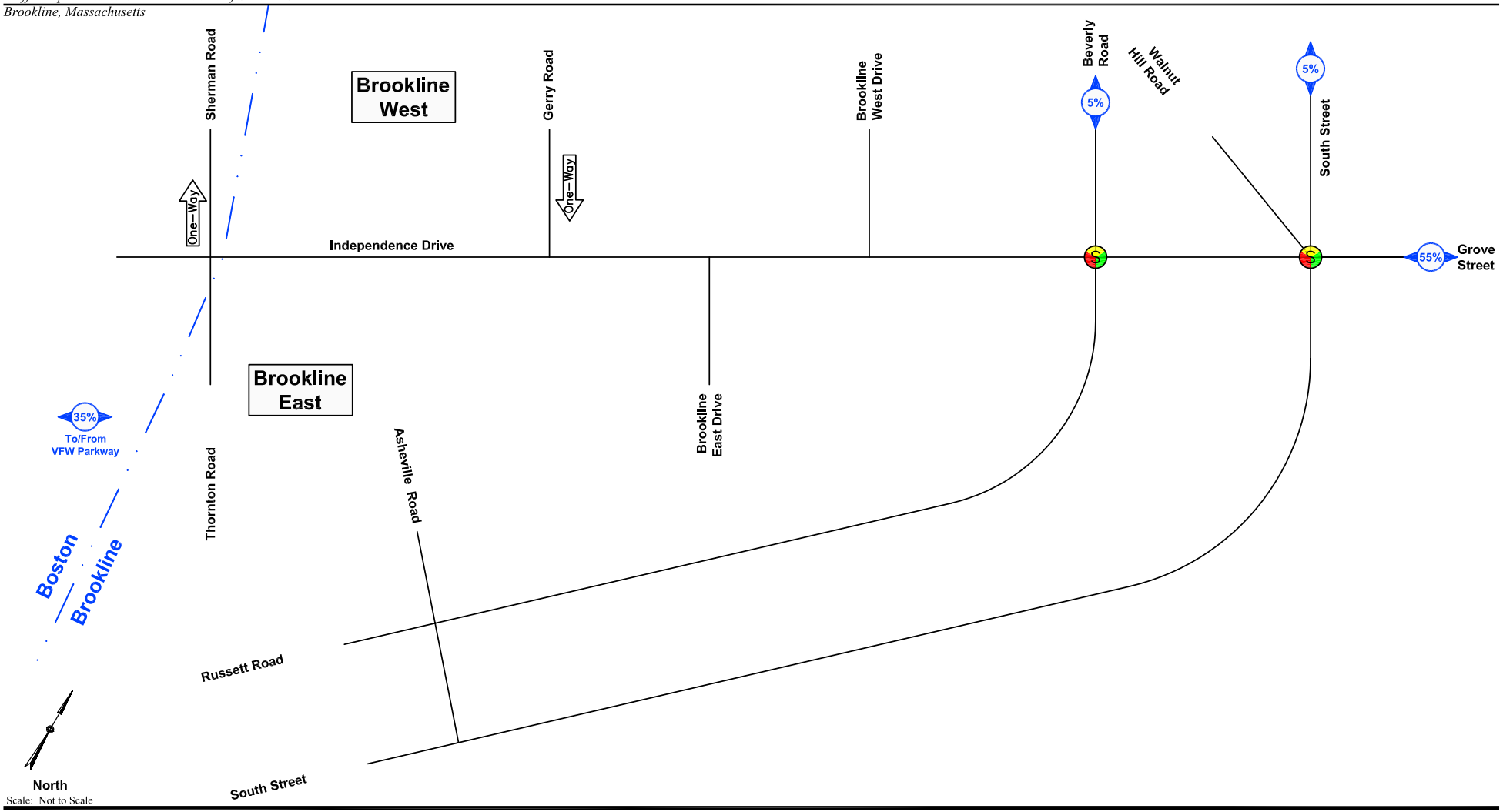
Source: ITE *Trip Generation,* Ninth Edition; 2012.
[1]Based on observed trip rates at the existing Hancock Village applied to 184 units.
[2]Based on ITE LUC 220 (Apartment) applied to 184 units.

As shown in **Table 6**, the number of observed trips at the site is similar to ITE projections for the weekday morning peak hour and approximately 44 percent less than ITE projections for the weekday evening peak hour based on the same number of apartment units. As a conservative measure and to be consistent with standard industry practice, the higher-volume ITE-based estimates were used in this analysis rather than trip rates calculated using empirical data for the existing site.

Trip Distribution

The distribution for projected traffic for the proposed expansion project is based on existing travel patterns at the Hancock Village site driveways and of the adjacent roadway system. The resulting trip distribution is presented in **Figure 7** with detailed calculations provided in the **Attachments.**

Figure 8 and **Figure 9** presents projected site-generated traffic volumes for the weekday morning and weekday evening peak hours for the proposed residential development based on the trip generation presented in **Table 5** and projected travel patterns presented in **Figure 7**.

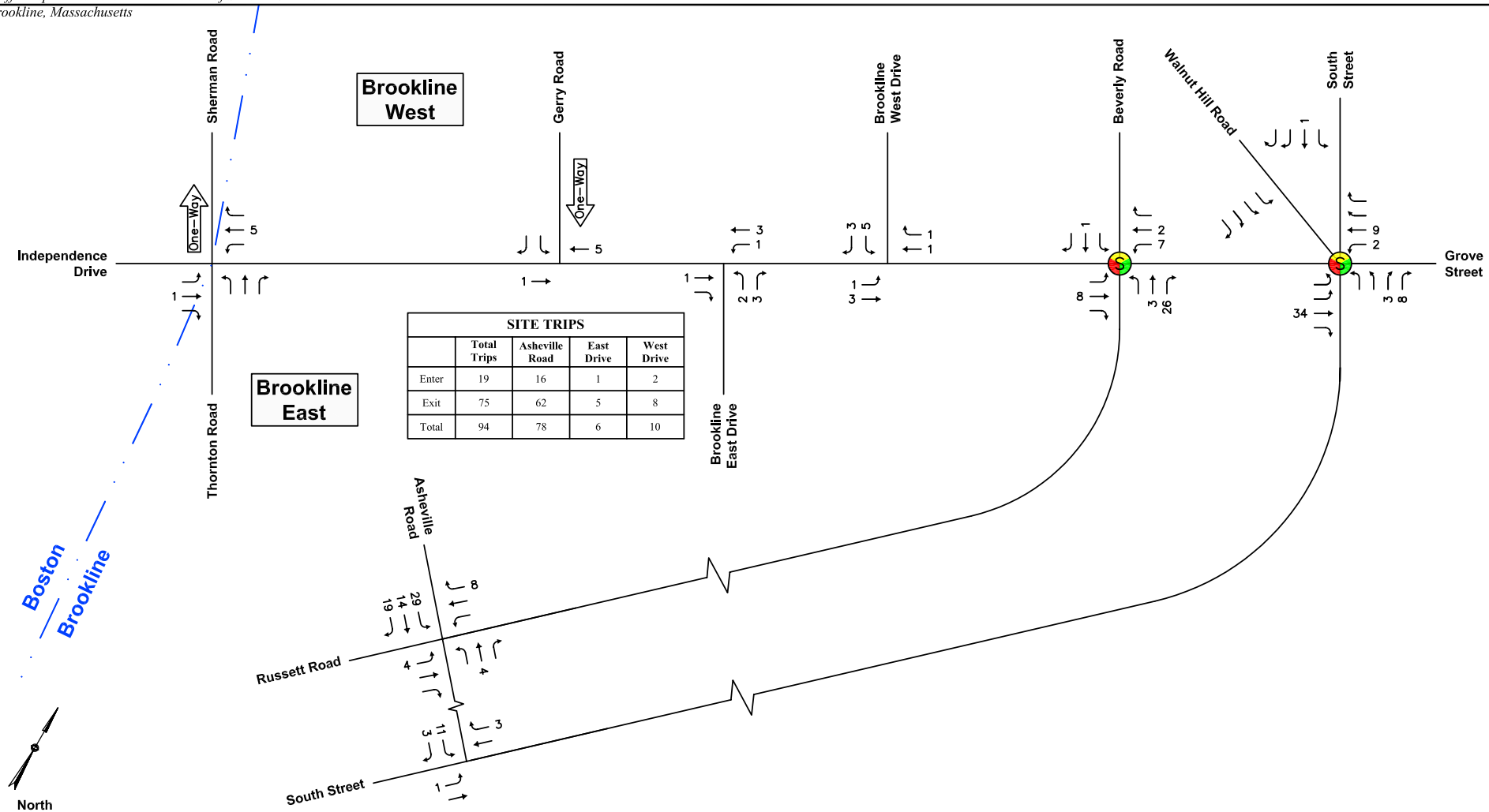


MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Figure 7

Trip Distribution

Date: July 2014
Dwg No. 389 TIAS_40B_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.



SITE TRIPS

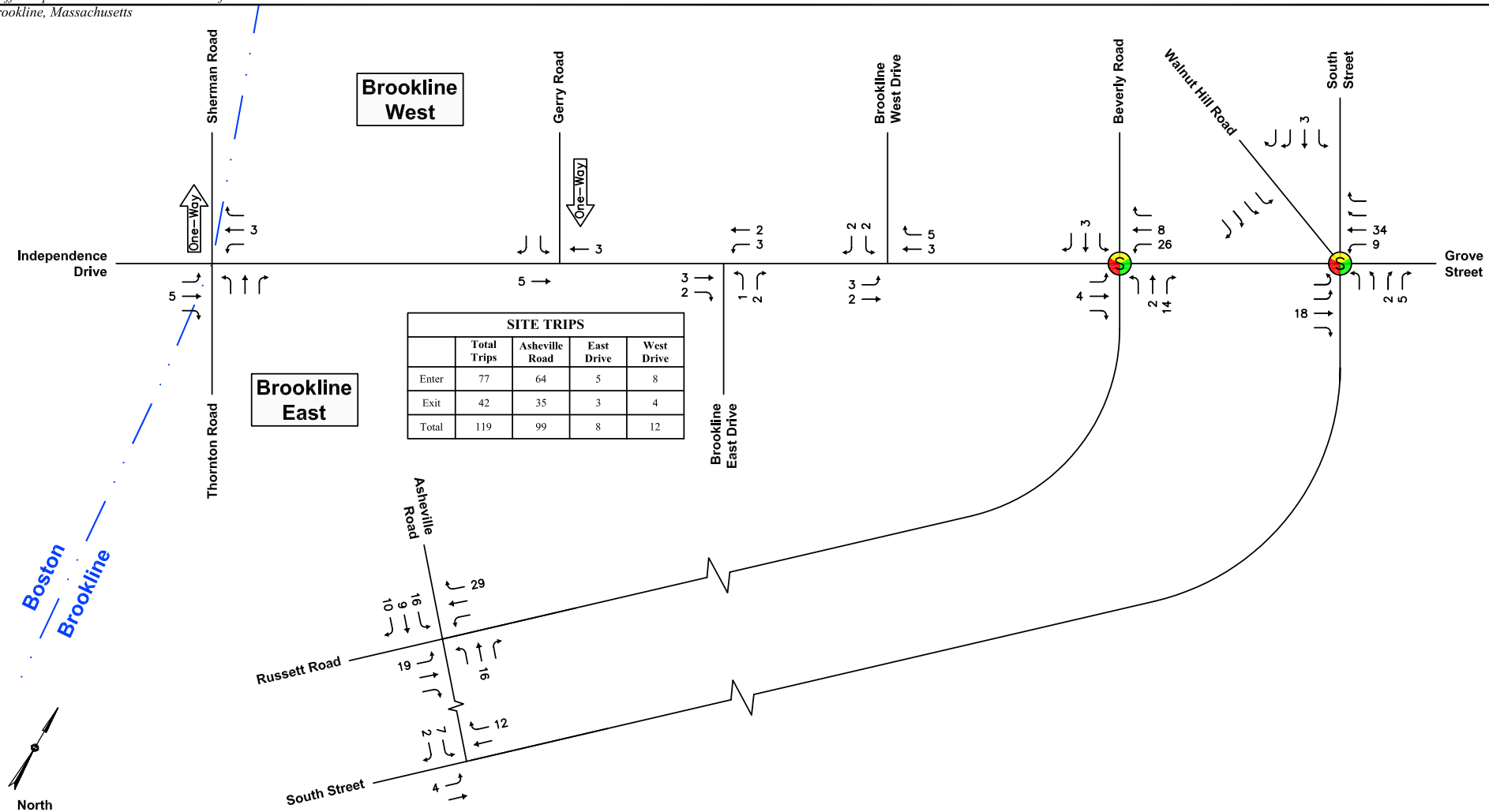
	Total Trips	Asheville Road	East Drive	West Drive
Enter	19	16	1	2
Exit	75	62	5	8
Total	94	78	6	10

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Figure 8

Site-Generated Trips
Weekday Morning Peak Hour Traffic Volumes

Date: July 2014
Dwg No. 389 TIAS_40B_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.



SITE TRIPS

	Total Trips	Asheville Road	East Drive	West Drive
Enter	77	64	5	8
Exit	42	35	3	4
Total	119	99	8	12

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Figure 9

Site-Generated Trips
Weekday Evening Peak Hour Traffic Volumes

Date: July 2014
Dwg No. 389 TIAS_40B_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.

2018 Build Traffic Conditions

2018 Build condition traffic volumes are derived by adding the incremental traffic increases for the proposed expansion at the site to the 2018 No-Build conditions. The resulting Build traffic volumes used for analysis are shown in **Figure 10** and **Figure 11**.

OPERATIONS ANALYSIS

This section provides an overview of operational analysis methodology, an assessment of driveway operations under Existing (Baseline) and projected future No-Build and Build conditions and a summary of the vehicular queues at the signalized intersections.

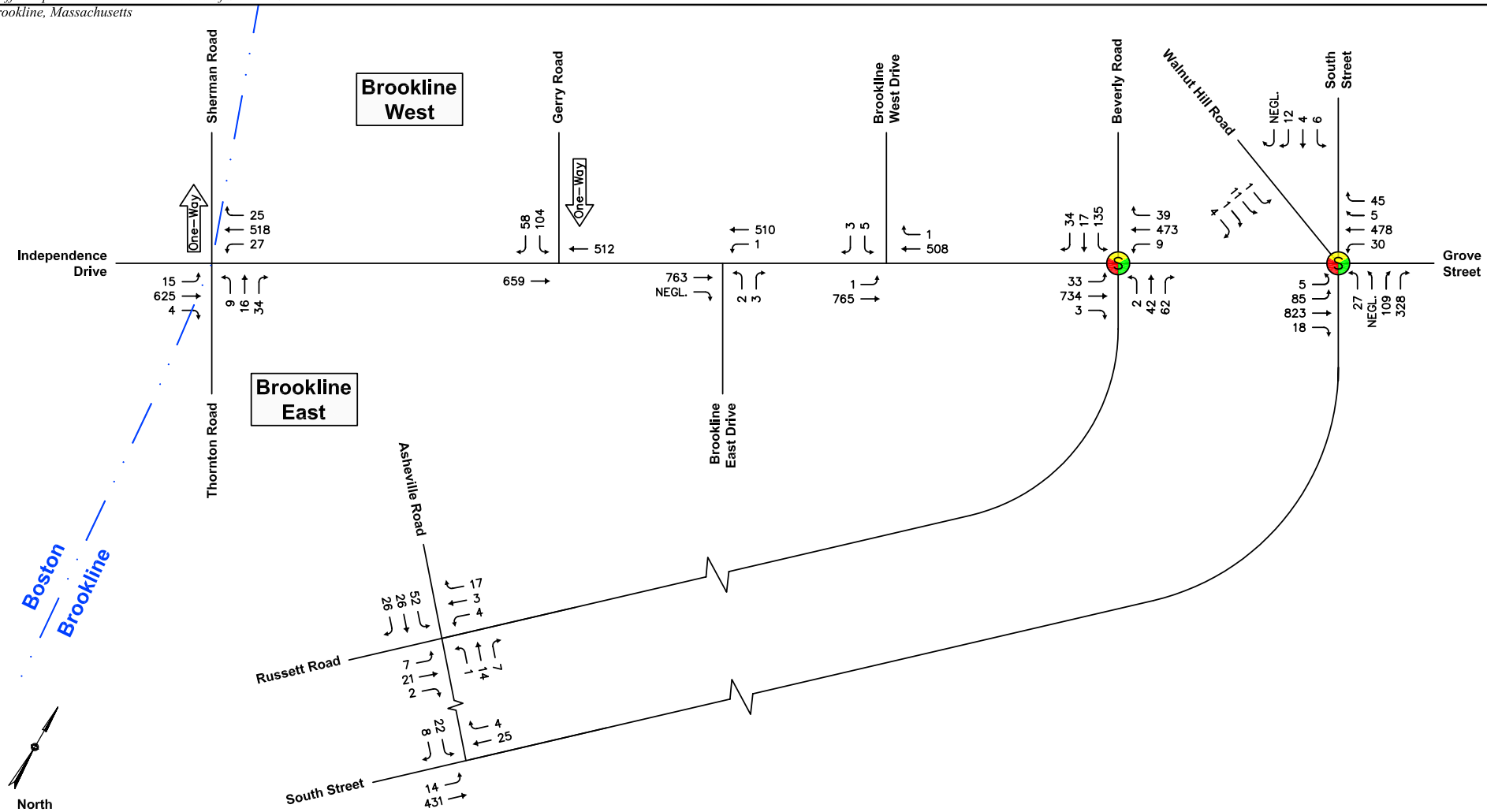
Analysis Methodology

Intersection capacity analyses are presented in this section for the Existing (Baseline), No-Build, and Build traffic-volume conditions. Capacity analyses, conducted in accordance with EEA/MassDOT guidelines, provide an index of how well the roadway facilities serve the traffic demands placed upon them. The operational results provide the basis for recommended access and roadway improvements in the following section.

Capacity analysis of intersections is developed using the Synchro® computer software, which implements the methods of the 2010 Highway Capacity Manual (HCM). The resulting analysis presents a level-of-service (LOS) designation for individual intersection movements. The LOS is a letter designation that provides a qualitative measure of operating conditions based on several factors including roadway geometry, speeds, ambient traffic volumes, traffic controls, and driver characteristics. Since the LOS of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of LOS, depending on the time of day, day of week, or period of year. A range of six levels of service is defined on the basis of average delay, ranging from LOS A (the least delay) to LOS F (delays greater than 50 seconds for unsignalized movements). The specific control delays and associated LOS designations are presented in the **Attachments**.

Analysis Results

Level-of-Service (LOS) analyses were conducted for the Existing (Baseline), No-Build, and Build conditions for the study intersections. The results of the intersection capacity are summarized below in **Table 7, Table 8, Table 9** and **Table 10**. Detailed analysis results are presented in the **Attachments**.

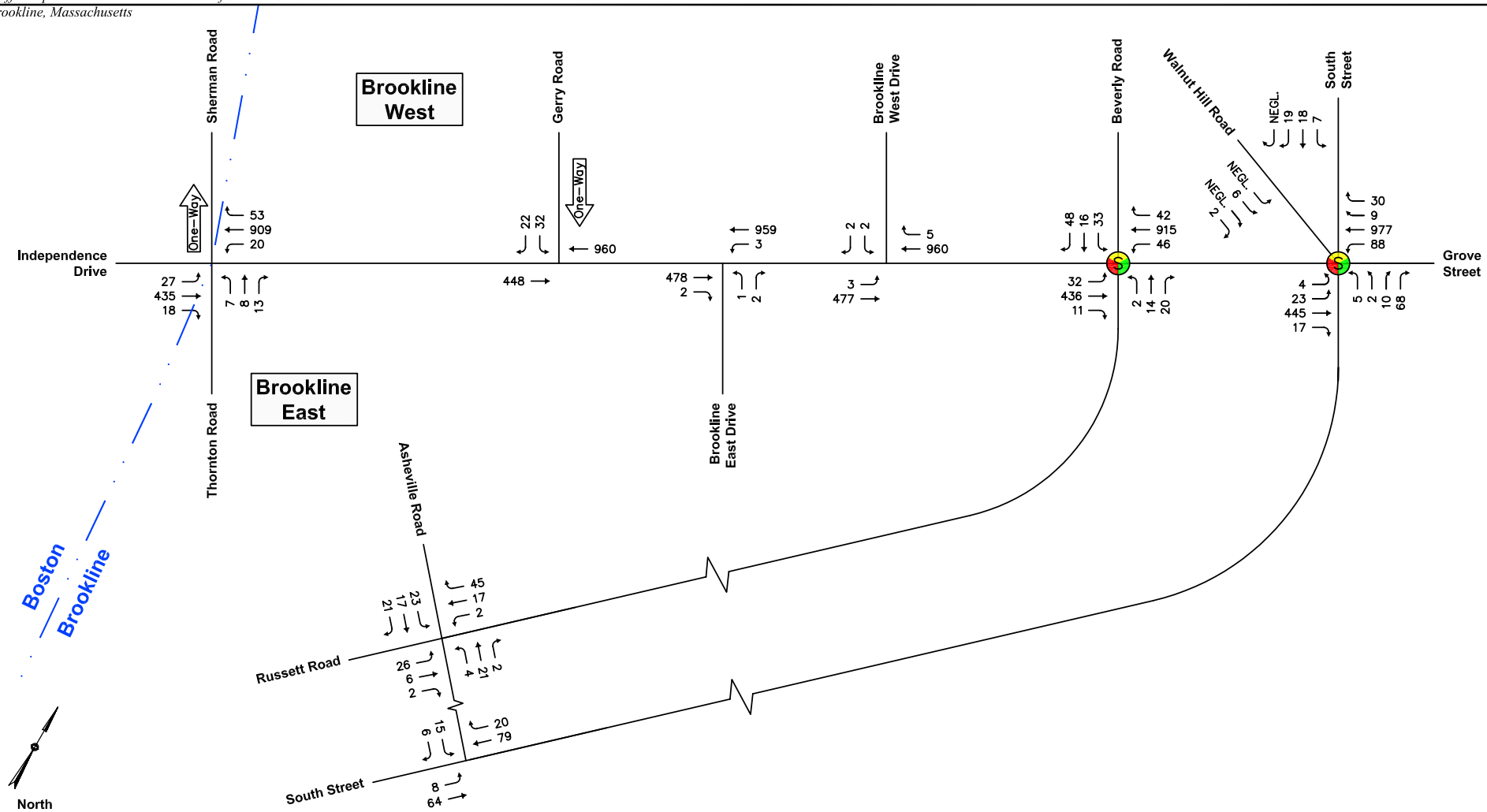


MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Figure 10

2018 Build Weekday Morning Peak Hour Traffic Volumes

Date: July 2014
Dwg No. 389 TIAS_40B_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.



MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Figure 11

2018 Build Weekday Evening Peak Hour Traffic Volumes

Date: July 2014
Dwg No. 389 TIAS_40B_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.

TABLE 7
UPDATED SIGNALIZED INTERSECTION CAPACITY ANALYSIS RESULTS (184 Units)
WEEKDAY MORNING PEAK HOUR

		2013 Existing (Baseline)			2018 No-Build			2018 Build		
Period	Approach	v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Grove Street at South Street	Eastbound	0.69	21	C	0.80	27	C	0.86	31	C
	Westbound	0.38	17	B	0.45	19	B	0.49	20	B
	Northbound	0.84	39	D	0.82	37	D	0.82	37	D
	Southbound	0.05	29	C	0.05	29	C	0.05	29	C
	Southeastbound	0.15	45	D	0.16	46	D	0.16	46	D
	Overall	**0.84**	**25**	**C**	**0.82**	**27**	**C**	**0.86**	**29**	**C**
Independence Drive at Beverly Road and Russett Road	Eastbound	0.45	14	B	0.48	15	B	0.50	16	B
	Westbound	0.37	34	C	0.40	34	C	0.42	35	C
	Northbound	0.26	33	C	0.26	32	C	0.34	32	C
	Southbound	0.73	50	D	0.75	51	D	0.80	55	D
	Overall	**0.73**	**26**	**C**	**0.75**	**27**	**C**	**0.80**	**28**	**C**

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service

TABLE 8
UPDATED SIGNALIZED INTERSECTION CAPACITY ANALYSIS RESULTS (184 Units)
WEEKDAY EVENING PEAK HOUR

		2013 Existing (Baseline)			2018 No-Build			2018 Build		
Period	Approach	v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Grove Street at South Street	Eastbound	0.22	<5	A	0.23	<5	A	0.24	<5	A
	Westbound	0.49	11	B	0.52	12	B	0.55	13	B
	Northbound	0.34	19	B	0.35	18	B	0.37	18	B
	Southbound	0.23	40	D	0.24	41	D	0.25	41	D
	Southeastbound	0.07	40	D	0.07	40	D	0.07	40	D
	Overall	**0.49**	**10**	**A**	**0.52**	**11**	**B**	**0.55**	**11**	**B**
Independence Drive at Beverly Road and Russett Road	Eastbound	0.22	8	A	0.23	8	A	0.24	8	A
	Westbound	0.47	20	B	0.49	20	B	0.53	21	C
	Northbound	0.09	35	C	0.09	35	C	0.18	36	D
	Southbound	0.47	44	D	0.49	44	D	0.49	44	D
	Overall	**0.47**	**18**	**B**	**0.49**	**18**	**B**	**0.53**	**19**	**B**

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service

TABLE 9
UPDATED UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS RESULTS (184 Units)
WEEKDAY MORNING PEAK HOUR

		2013 Existing (Baseline)			2018 No-Build			2018 Build		
Period	Approach	v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Independence Drive at										
Gerry Road	SB Left Exit	0.35	23	C	0.38	25	C	0.38	25	C
	SB Right Exit	0.08	10	A	0.08	10	A	0.08	10	A
Independence Drive at										
Sherman Road and	EB LT/TH	0.02	<5	A	0.02	<5	A	0.02	<5	A
Thornton Road	WB LT/TH	0.03	<5	A	0.03	<5	A	0.03	<5	A
	NB Exit	0.11	13	B	0.12	13	B	0.12	13	B
Russett Road at										
Asheville Road	Eastbound	0.00	<5	A	0.00	<5	A	0.01	<5	A
	Westbound	0.00	<5	A	0.00	<5	A	0.00	<5	A
	Northbound	0.03	9	A	0.03	9	A	0.04	9	A
	Southbound	0.07	9	A	0.07	9	A	0.17	10	A
South Street at										
Asheville Road	Eastbound	0.01	<5	A	0.01	<5	A	0.01	<5	A
	Westbound	0.00	<5	A	0.00	<5	A	0.00	<5	A
	Southbound	0.03	11	B	0.03	11	B	0.06	12	B
Independence Drive at										
Site Drive (East)	EB LT/TH	n/a[4]	n/a	n/a	n/a	n/a	n/a	0.00	<5	A
	SB Exit	n/a	n/a	n/a	n/a	n/a	n/a	0.03	16	C
Independence Drive at										
Site Drive (West)	WB LT/TH	n/a	n/a	n/a	n/a	n/a	n/a	0.00	<5	A
	NB Exit	n/a	n/a	n/a	n/a	n/a	n/a	0.02	16	C

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service
[4]n/a = not applicable

TABLE 10
UPDATED UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS RESULTS (184 Units)
WEEKDAY EVENING PEAK HOUR

		2013 Existing (Baseline)			2018 No-Build			2018 Build		
Period	Approach	v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Independence Drive at Gerry Road	SB Left Exit	0.20	30	D	0.22	34	D	0.22	34	D
	SB Right Exit	0.05	12	B	0.05	13	B	0.05	13	B
Independence Drive at Sherman Road and Thornton Road	EB LT/TH	0.04	<5	A	0.04	<5	A	0.04	<5	A
	WB LT/TH	0.02	<5	A	0.02	<5	A	0.02	<5	A
	NB Exit	0.07	14	B	0.07	14	B	0.07	14	B
Russett Road at Asheville Road	Eastbound	0.01	<5	A	0.01	<5	A	0.02	6	A
	Westbound	0.00	<5	A	0.00	<5	A	0.00	<5	A
	Northbound	0.01	9	A	0.01	9	A	0.04	10	A
	Southbound	0.03	9	A	0.03	9	A	0.08	10	A
South Street at Asheville Road	Eastbound	0.00	<5	A	0.00	<5	A	0.01	<5	A
	Westbound	0.00	<5	A	0.00	<5	A	0.00	<5	A
	Southbound	0.02	9	A	0.02	9	A	0.03	10	A
Independence Drive at Site Drive (East)	EB LT/TH	n/a[4]	n/a	n/a	n/a	n/a	n/a	0.01	<5	A
	SB Exit	n/a	n/a	n/a	n/a	n/a	n/a	0.02	21	C
Independence Drive at Site Drive (West)	WB LT/TH	n/a	n/a	n/a	n/a	n/a	n/a	0.00	<5	A
	NB Exit	n/a	n/a	n/a	n/a	n/a	n/a	0.01	14	B

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service
[4]n/a = not applicable

As summarized in **Table 7**, **Table 8**, **Table 9** and **Table 10**:

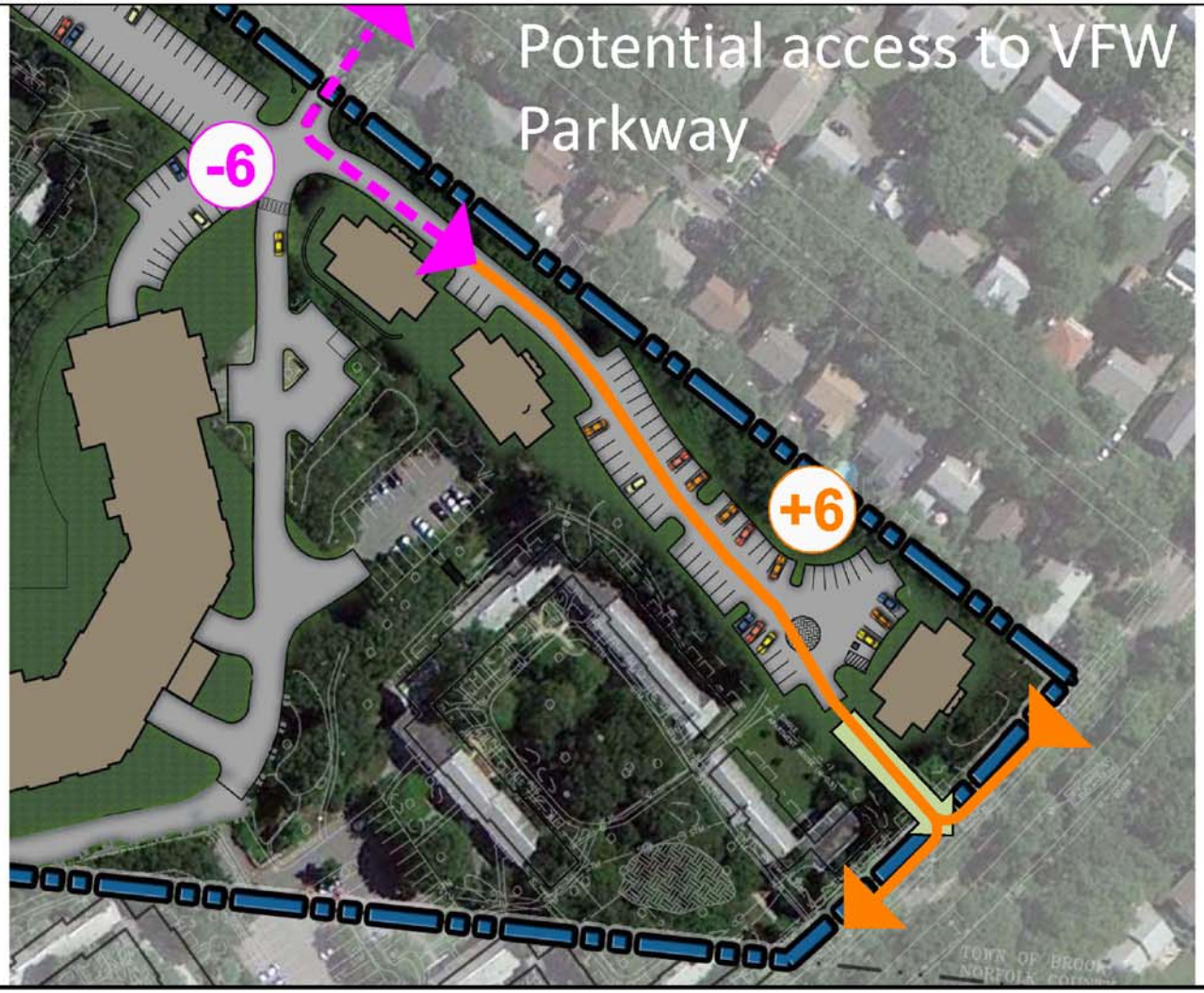
- Capacity analysis results show that the proposed 184-unit expansion will have little or no impact at signalized study intersections. Operational analysis of the signalized intersections indicates the intersections operate below capacity (LOS D or better) under existing and projected future conditions. Project impacts result in a 4 seconds or less increase in approach delays between No-Build and Build conditions with no change in overall LOS.

- Operational analysis of the unsignalized intersections indicates the main line movements at the unsignalized study intersections operate unimpeded at LOS A operations. Side street delays are expected to operate below capacity at LOS D or better. This operating condition is well within operating levels and delays typical of urban settings; adequate capacity is projected at unsignalized study intersections to accommodate the proposed residential expansion as provided by traffic gaps created by nearby traffic signals.

The above analysis results are based on a conservatively high trip generation methodology for the project; use of empirical trip rates for Hancock Village (which reflect transit and alternative travel modes) would result in trip generation reductions of approximately 50% relative to ITE during the weekday evening peak hour. Accordingly, actual site traffic impacts are likely to be lower than reported above.

Potential VFW Parkway Access – Qualitative Assessment

At the request of the Town, a qualitative assessment of traffic operations has been conducted relative to the construction of a potential site access driveway along VFW Parkway to serve the east side of the site. Based on the proximity of residential units to the potential access location along VFW Parkway, approximately 12 units would be anticipated to use the VFW Parkway access rather than Asheville Road access when traveling to/from VFW Parkway. As a result, the potential VFW Parkway access driveway would experience modest traffic levels of approximately 8 vehicle-trips or less (entering and exiting) during the critical weekday morning and weekday evening peak hours – approximately 1 vehicle-trip or less every 7 minutes – that are likely to be re-routed to the VFW Parkway access from the Asheville Road access. Therefore, the addition of a driveway along VFW Parkway is expected to have limited benefit to the adjacent Russett Road/Asheville Road/South Street neighborhood. A graphical representation of the anticipated reassignment of traffic is shown in **Figure 12** and **Figure 13** for the weekday morning and weekday evening peak hours, respectively.



North
Scale: Not to Scale

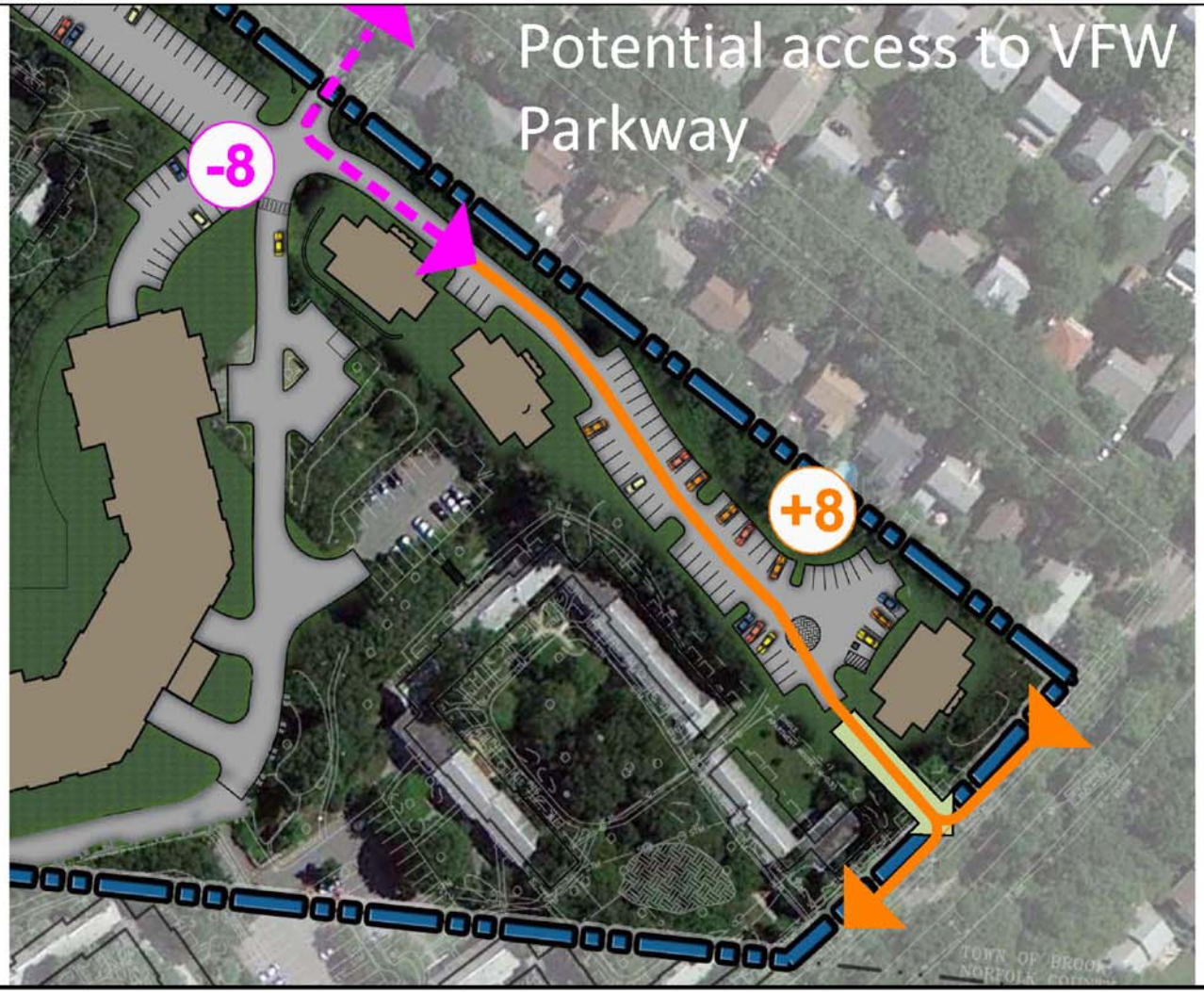
Site Plan Source: Stantec

Figure 12

Reassignment of Site Trips
Potential VFW Parkway Access Driveway
Weekday Morning Peak Hour Traffic Volumes

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Date: July 2014
Dwg No. 389 TIAS_40B_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.



North
Scale: Not to Scale

Site Plan Source: Stantec

Figure 13

Reassignment of Site Trips
Potential VFW Parkway Access Driveway
Weekday Morning Peak Hour Traffic Volumes

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Date: July 2014
Dwg No. 389 TIAS_40B_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.

CONCLUSIONS AND RECOMMENDATIONS

MDM finds that travel conditions in the site vicinity along Independence Drive and Russett Road are generally unconstrained. Trip generation estimates based on ITE methodology trip generation for the development is estimated at approximately 94 vehicle-trips during the weekday morning peak hour and 119 vehicle-trips during the weekday evening peak hour. Traffic impacts associated with the proposed Residences of South Brookline are not expected to notably affect travel or safety conditions in the site vicinity. However, MDM recommends access-related improvements aimed at enhancing traffic operations and/or travel safety. Elements of a Transportation Demand Management (TDM) program are also described below.

Independence Drive at Brookline West Drive. An existing un-utilized curb-cut along the westerly side of Independence Drive is proposed to be modified to serve as the access/egress to the site for approximately 20 apartment units. MDM recommends the following improvements:

- A "STOP" sign (R1-1) and STOP line pavement markings are recommended on the driveway approach to Independence Drive.

- A proposed sidewalk along the proposed Brookline West Drive will connect all of the units to the existing sidewalk system along Independence Drive. Marked crosswalks should be provided as needed.

- Any new plantings (shrubs, bushes) and structures (walls, fences, etc.) should be maintained at a height of 2 feet or less within the sight lines in vicinity of the site driveway to provide unobstructed sight lines.

Independence Drive at Brookline East Drive: A driveway is proposed along the easterly side of Independence Drive approximately 100 feet east of Gerry Road which will serve as the access/egress to the site for approximately 12 apartment units. MDM recommends the following improvements:

- A "STOP" sign (R1-1) and STOP line pavement markings are recommended on the driveway approach to Independence Drive.

- A proposed sidewalk along the proposed Brookline East Drive will connect all of the units to the existing sidewalk system along Independence Drive. Marked crosswalks should be provided as needed.

- Any new plantings (shrubs, bushes) and structures (walls, fences, etc.) should be maintained at a height of 2 feet or less within the sight lines in vicinity of the site driveway to provide unobstructed sight lines.

Russett Road at Asheville Road: The existing Asheville Road will serve as access/egress to the site for approximately 152 additional apartment units. MDM recommends the following improvements:

- Given the traffic patterns at the intersection of Russett Road and Asheville Road it may be desirable to convert said location to 4-way stop control. Under existing (baseline) conditions the traffic volumes during the peak periods on Asheville Road are generally equal to or higher than volumes along Russett Road.

- The site driveway connection to Asheville Road as proposed will be widened to 22 feet to accommodate two-way traffic flows. The final design of the roadway should accommodate passenger cars, delivery traffic, and emergency apparatus as needed. Currently, the driveway is limited to approximately 17 feet wide near where it becomes a public roadway (Asheville Road).

- A sidewalk connection is proposed to provide a connection between Asheville Road and the internal sidewalk/path system. Marked crosswalks should be provided as needed.

- Any new plantings (shrubs, bushes) and structures (walls, fences, etc.) should be maintained at a height of 2 feet or less within the sight lines in vicinity of the site driveway to provide unobstructed sight lines.

Transportation Demand Management

Transportation demand management programs are currently serving Hancock Village residents and are aimed at reducing dependence on single occupant vehicle travel. These TDM measures include (a) implementation of the Hancock Village shuttle service connecting residents to the MBTA Cleveland Circle station; (b) access to ZIPCAR service, with two (2) on-site ZIPCAR spaces to provide residents with direct access to private automobile, thereby accommodating occasional private auto use for residents who choose public transportation as a preferred travel mode and do not own a vehicle; (c) an integrated system of sidewalks that connect the residential buildings to the public sidewalk system and bus/shuttle stops along Independence Way to facilitate walking access to area land uses and public transportation. Expansion of these existing TDM initiatives is recommended to further promote non-auto travel by residents include continued promotion of the shuttle service and ZIPCAR access in informational products for existing and potential residents, provision of additional ZIPCAR spaces within the site to accommodate additional anticipated resident demand, inclusion of additional sidewalk connections for proposed buildings to the sidewalk system along Russett Road, and provision of on-site secure bicycle storage facilities within the proposed buildings. Specific elements of the TDM programming for the Site will be identified under local permitting of the project.

Attachments

- Traffic Volume Data
- Seasonal Data
- Crash Data
- Stopping Sight Distance Calculations
- Public Transportation Information
- Growth Calculations
- Trip Generation Calculations
- Trip Distribution Calculations
- Capacity Analysis Worksheets

□ Traffic Volume Data

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

Independence Drive
south of Gerry Road
City, State : Chestnut Hill, MA
Client : MDM/ C. Sudak

71311Avolu
Site Code: 389

Start	NB				SB				Combined				25-Sep-07
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Tue
12:00	6		59		17		91		23		150		
12:15	5		57		13		109		18		166		
12:30	2		66		8		109		10		175		
12:45	0	13	67	249	8	46	86	395	8	59	153	644	
01:00	1		68		0		90		1		158		
01:15	0		80		2		109		2		189		
01:30	1		80		7		109		8		189		
01:45	0	2	81	309	2	11	105	413	2	13	186	722	
02:00	1		80		0		116		1		196		
02:15	0		68		5		153		5		221		
02:30	0		74		5		132		5		206		
02:45	0	1	84	306	0	10	160	561	0	11	244	867	
03:00	1		80		3		159		4		239		
03:15	2		70		2		167		4		237		
03:30	0		88		2		182		2		270		
03:45	2	5	76	314	2	9	188	696	4	14	264	1010	
04:00	1		78		1		204		2		282		
04:15	5		86		1		197		6		283		
04:30	7		83		6		195		13		278		
04:45	5	18	74	321	5	13	219	815	10	31	293	1136	
05:00	10		113		7		191		17		304		
05:15	28		96		7		245		35		341		
05:30	32		88		7		200		39		288		
05:45	32	102	91	388	13	34	230	866	45	136	321	1254	
06:00	51		107		13		204		64		311		
06:15	102		92		26		186		128		278		
06:30	132		86		31		172		163		258		
06:45	150	435	94	379	46	116	127	689	196	551	221	1068	
07:00	146		89		70		128		216		217		
07:15	186		56		90		114		276		170		
07:30	182		45		120		97		302		142		
07:45	200	714	41	231	155	435	96	435	355	1149	137	666	
08:00	172		40		156		99		328		139		
08:15	139		37		136		74		275		111		
08:30	149		32		103		70		252		102		
08:45	128	588	28	137	111	506	75	318	239	1094	103	455	
09:00	108		37		93		61		201		98		
09:15	118		37		75		65		193		102		
09:30	80		28		99		73		179		101		
09:45	88	394	19	121	114	381	70	269	202	775	89	390	
10:00	76		19		73		57		149		76		
10:15	80		18		72		46		152		64		
10:30	72		23		88		37		160		60		
10:45	67	295	20	80	81	314	52	192	148	609	72	272	
11:00	60		16		88		44		148		60		
11:15	80		9		75		34		155		43		
11:30	90		2		85		34		175		36		
11:45	57	287	3	30	66	314	24	136	123	601	27	166	
Total	2854		2865		2189		5785		5043		8650		
Percent	56.6%		33.1%		43.4%		66.9%						
Day Total		5719				7974				13693			
Peak	07:15		05:00		07:30		05:15		07:15		05:15		
Vol.	740		388		567		879		1261		1261		
P.H.F.	0.925		0.858		0.909		0.897		0.888		0.924		

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

Independence Drive
south of Gerry Road
City, State : Chestnut Hill, MA
Client : MDM/ C. Sudak

71311Avolu
Site Code: 389

Start	NB				SB				Combined				26-Sep-07
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Wed
12:00	3		59		21		125		24		184		
12:15	15		63		22		98		37		161		
12:30	9		82		11		105		20		187		
12:45	3	30	68	272	12	66	94	422	15	96	162	694	
01:00	3		66		6		94		9		160		
01:15	3		66		7		93		10		159		
01:30	0		59		2		110		2		169		
01:45	0	6	86	277	1	16	114	411	1	22	200	688	
02:00	3		76		6		126		9		202		
02:15	2		76		6		151		8		227		
02:30	0		87		1		148		1		235		
02:45	0	5	72	311	2	15	171	596	2	20	243	907	
03:00	2		75		0		178		2		253		
03:15	0		89		2		180		2		269		
03:30	1		110		2		208		3		318		
03:45	0	3	92	366	3	7	206	772	3	10	298	1138	
04:00	5		86		1		202		6		288		
04:15	3		88		1		213		4		301		
04:30	8		106		4		178		12		284		
04:45	6	22	84	364	4	10	208	801	10	32	292	1165	
05:00	14		86		6		204		20		290		
05:15	25		107		7		208		32		315		
05:30	25		100		6		177		31		277		
05:45	38	102	84	377	15	34	208	797	53	136	292	1174	
06:00	58		98		22		178		80		276		
06:15	89		86		23		208		112		294		
06:30	121		92		33		188		154		280		
06:45	150	418	72	348	35	113	127	701	185	531	199	1049	
07:00	143		64		59		147		202		211		
07:15	166		68		72		134		238		202		
07:30	206		50		125		124		331		174		
07:45	180	695	57	239	162	418	112	517	342	1113	169	756	
08:00	178		43		123		101		301		144		
08:15	169		45		130		81		299		126		
08:30	141		40		109		98		250		138		
08:45	128	616	35	163	103	465	75	355	231	1081	110	518	
09:00	119		42		85		68		204		110		
09:15	102		16		101		83		203		99		
09:30	91		33		77		80		168		113		
09:45	104	416	32	123	76	339	59	290	180	755	91	413	
10:00	66		18		81		52		147		70		
10:15	72		26		86		53		158		79		
10:30	81		13		99		33		180		46		
10:45	55	274	8	65	64	330	31	169	119	604	39	234	
11:00	70		15		94		28		164		43		
11:15	62		14		97		26		159		40		
11:30	68		3		93		24		161		27		
11:45	70	270	5	37	85	369	31	109	155	639	36	146	
Total	2857		2942		2182		5940		5039		8882		
Percent	56.7%		33.1%		43.3%		66.9%						
Day Total		5799				8122				13921			
Peak	07:30		05:15		07:30		03:30		07:30		03:30		
Vol.	733		389		540		829		1273		1205		
P.H.F.	0.890		0.909		0.833		0.973		0.931		0.947		

Transportation Data Corporation

Mario Perone, mperone1@verizon.net

t (781) 587-0086 f (781) 587-0089

N/S: Beverly Road/Russett Road
E/W: Grove Street/Independence Drive
City, State: Brookline, MA
Client: MDM/D. Dumais

File Name : 04239B
Site Code : 389
Start Date : 4/11/2012
Page No : 1

Groups Printed- Cars & Peds - Trucks

	Beverly Road From North				Grove Street From East				Russett Road From South				Independence Drive From West						
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	3	4	12	1	5	74	1	1	2	8	0	1	1	171	5	0	3	286	289
07:15 AM	5	1	11	2	6	86	1	0	1	5	1	2	1	183	4	2	6	305	311
07:30 AM	2	3	21	2	9	106	0	0	12	6	2	9	0	146	9	6	17	316	333
07:45 AM	13	7	57	0	21	99	0	5	12	22	0	8	1	177	16	10	23	425	448
Total	23	15	101	5	41	365	2	6	27	41	3	20	3	677	34	18	49	1332	1381
08:00 AM	15	5	38	0	4	104	2	3	5	8	0	4	1	158	3	3	10	343	353
08:15 AM	2	0	6	1	1	118	0	1	4	1	0	3	1	178	3	1	6	314	320
08:30 AM	1	0	8	0	3	107	1	1	4	0	1	7	0	129	3	0	8	257	265
08:45 AM	5	1	5	0	2	98	1	0	2	2	0	3	0	125	4	0	3	245	248
Total	23	6	57	1	10	427	4	5	15	11	1	17	2	590	13	4	27	1159	1186
Grand Total	46	21	158	6	51	792	6	11	42	52	4	37	5	1267	47	22	76	2491	2567
Apprch %	20.4	9.3	70.2		6	93.3	0.7		42.9	53.1	4.1		0.4	96.1	3.6				
Total %	1.8	0.8	6.3		2	31.8	0.2		1.7	2.1	0.2		0.2	50.9	1.9		3	97	
Cars & Peds	46	21	158		51	789	6		42	52	4		5	1264	47		0	0	2561
% Cars & Peds	100	100	100	100	100	99.6	100	100	100	100	100	100	100	99.8	100	100	0	0	99.8
Trucks	0	0	0		0	3	0		0	0	0		0	3	0		0	0	6
% Trucks	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0.2	0	0	0	0	0.2

	Beverly Road From North				Grove Street From East				Russett Road From South				Independence Drive From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	2	3	21	26	9	106	0	115	12	6	2	20	0	146	9	155	316
07:45 AM	13	7	57	77	21	99	0	120	12	22	0	34	1	177	16	194	425
08:00 AM	15	5	38	58	4	104	2	110	5	8	0	13	1	158	3	162	343
08:15 AM	2	0	6	8	1	118	0	119	4	1	0	5	1	178	3	182	314
Total Volume	32	15	122	169	35	427	2	464	33	37	2	72	3	659	31	693	1398
% App. Total	18.9	8.9	72.2		7.5	92	0.4		45.8	51.4	2.8		0.4	95.1	4.5		
PHF	.533	.536	.535	.549	.417	.905	.250	.967	.688	.420	.250	.529	.750	.926	.484	.893	.822
Cars & Peds	32	15	122	169	35	426	2	463	33	37	2	72	3	657	31	691	1395
% Cars & Peds	100	100	100	100	100	99.8	100	99.8	100	100	100	100	100	99.7	100	99.7	99.8
Trucks	0	0	0	0	0	1	0	1	0	0	0	0	0	2	0	2	3
% Trucks	0	0	0	0	0	0.2	0	0.2	0	0	0	0	0	0.3	0	0.3	0.2

Transportation Data Corporation

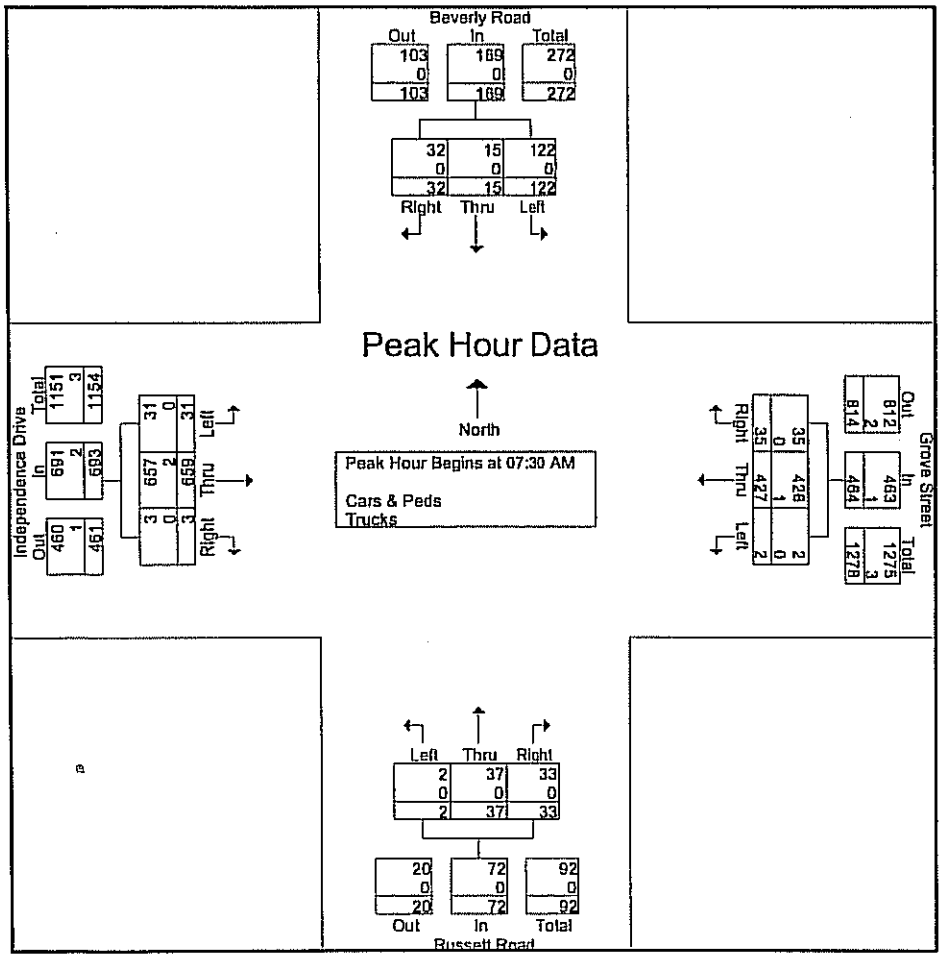
Mario Perone, mperone1@verizon.net

t (781) 587-0086 f (781) 587-0089

N/S: Beverly Road/Russett Road
E/W: Grove Street/Independence Drive
City, State: Brookline, MA
Client: MDM/D. Dumais

File Name : 04239B
Site Code : 389
Start Date : 4/11/2012
Page No : 1

	Beverly Road From North				Grove Street From East				Russett Road From South				Independence Drive From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	2	3	21	26	9	106	0	115	12	6	2	20	0	146	9	155	316
07:45 AM	13	7	57	77	21	99	0	120	12	22	0	34	1	177	16	194	425
08:00 AM	15	5	38	58	4	104	2	110	5	8	0	13	1	158	3	162	343
08:15 AM	2	0	6	8	1	118	0	119	4	1	0	5	1	178	3	182	314
Total Volume	32	15	122	169	35	427	2	464	33	37	2	72	3	659	31	693	1398
% App. Total	18.9	8.9	72.2		7.5	92	0.4		45.8	51.4	2.8		0.4	95.1	4.5		
PHF	.533	.536	.535	.549	.417	.905	.250	.967	.688	.420	.250	.529	.750	.926	.484	.893	.822
Cars & Peds	32	15	122	169	35	426	2	463	33	37	2	72	3	657	31	691	1395
% Cars & Peds	100	100	100	100	100	99.8	100	99.8	100	100	100	100	100	99.7	100	99.7	99.8
Trucks	0	0	0	0	0	1	0	1	0	0	0	0	0	2	0	2	3
% Trucks	0	0	0	0	0	0.2	0	0.2	0	0	0	0	0	0.3	0	0.3	0.2



Transportation Data Corporation

Mario Perone, mperone1@verizon.net
t (781) 587-0086 f (781) 587-0089

N/S: South Street
E,W/NW: Grove Street/Walnut Hill Road
City, State: Brookline, MA
Client: MDM/D. Dumais

File Name : 04239D
Site Code : 389
Start Date : 4/11/2012
Page No : 1

Groups Printed- Cars & Peds - Trucks

	South Street From North					Grove Street From East					South Street From South					Grove Street From West					Walnut Hill Road From Northwest							
Start Time	Hard Right	Right	Thru	Left	Peds	Right	Bear Right	Thru	Left	Peds	Right	Thru	Bear Left	Left	Peds	Right	Thru	Left	Hard Left	Peds	Hard Right	Bear Right	Bear Left	Hard Left	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	1	0	1	0	11	0	76	5	0	89	12	0	2	6	1	162	15	1	0	0	0	1	0	0	6	377	383
07:15 AM	0	0	0	2	3	11	0	89	6	2	107	25	0	3	4	1	187	18	1	0	1	0	2	0	3	12	453	465
07:30 AM	0	5	1	1	2	6	0	112	6	0	101	33	0	6	9	3	176	12	0	0	0	0	2	1	2	13	465	478
07:45 AM	0	2	1	1	2	10	1	111	8	2	80	38	0	16	2	9	205	25	3	0	2	0	4	0	2	8	516	524
Total	0	8	2	5	7	38	1	388	25	4	377	108	0	27	21	14	730	70	5	0	3	0	9	1	7	39	1811	1850
08:00 AM	0	2	1	2	1	15	0	102	5	1	63	16	0	3	3	5	193	29	1	0	2	1	2	0	1	6	442	448
08:15 AM	0	2	0	2	4	12	4	116	8	2	57	13	0	1	9	0	169	14	1	0	0	0	2	0	4	19	401	420
08:30 AM	0	4	3	0	7	12	2	116	8	3	48	4	0	5	8	3	150	13	0	0	0	0	4	0	5	23	372	395
08:45 AM	0	5	5	3	1	8	2	76	7	1	47	2	0	6	0	3	129	11	0	0	1	1	0	0	1	3	306	309
Total	0	13	9	7	13	47	8	410	28	7	215	35	0	15	20	11	641	67	2	0	3	2	8	0	11	51	1521	1572
Grand Total	0	21	11	12	20	85	9	798	53	11	592	143	0	42	41	25	1371	137	7	0	6	2	17	1	18	90	3332	3422
Apprch %	0	47.7	25	27.3		9	1	84.4	5.6		76.2	18.4	0	5.4		1.6	89	8.9	0.5		23.1	7.7	65.4	3.8				
Total %	0	0.6	0.3	0.4		2.6	0.3	23.9	1.6		17.8	4.3	0	1.3		0.8	41.1	4.1	0.2		0.2	0.1	0.5	0		2.6	97.4	
Cars & Peds	0	21	11	12		84	9	795	52		591	143	0	42		25	1368	137	7		6	2	17	1		0	0	3411
% Cars & Peds	0	100	100	100	90	98.8	100	99.6	98.1	100	99.8	100	0	100	100	100	99.8	100	100	0	100	100	100	100	100	0	0	99.7
Trucks	0	0	0	0		1	0	3	1		1	0	0	0		0	3	0	0		0	0	0	0		0	0	11
% Trucks	0	0	0	0	10	1.2	0	0.4	1.9	0	0.2	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0.3

	South Street From North					Grove Street From East					South Street From South					Grove Street From West					Walnut Hill Road From Northwest					
Start Time	Hard Right	Right	Thru	Left	App. Total	Right	Bear Right	Thru	Left	App. Total	Right	Thru	Bear Left	Left	App. Total	Right	Thru	Left	Hard Left	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 07:15 AM																										
07:15 AM	0	0	0	2	2	11	0	89	6	106	107	25	0	3	135	1	187	18	1	207	1	0	2	0	3	453
07:30 AM	0	5	1	1	7	6	0	112	6	124	101	33	0	6	140	3	176	12	0	191	0	0	2	1	3	465
07:45 AM	0	2	1	1	4	10	1	111	8	130	80	38	0	16	134	9	205	25	3	242	2	0	4	0	6	516
08:00 AM	0	2	1	2	5	15	0	102	5	122	63	16	0	3	82	5	193	29	1	228	2	1	2	0	5	442
Total Volume	0	9	3	6	18	42	1	414	25	482	351	112	0	28	491	18	761	84	5	868	5	1	10	1	17	1876
% App. Total			16.7	33.3				85.9			71.5	22.8					87.7				29.4		58.8			
PHF	.000	.450	.750	.750	.643	.700	.250	.924	.781	.927	.820	.737	.000	.438	.877	.500	.928	.724	.417	.897	.625	.250	.625	.250	.708	.909
Cars & Peds	0	9	3	6	18	42	1	412	24	479	351	112	0	28	491	18	759	84	5	866	5	1	10	1	17	1871
% Cars & Peds	0	100	100	100	100	100	100	99.5	96.0	99.4	100	100	0	100	100	100	99.7	100	100	99.8	100	100	100	100	100	99.7
Trucks	0	0	0	0	0	0	0	2	1	3	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	5
% Trucks	0	0	0	0	0	0	0	0.5	4.0	0.6	0	0	0	0	0	0	0.3	0	0	0.2	0	0	0	0	0	0.3

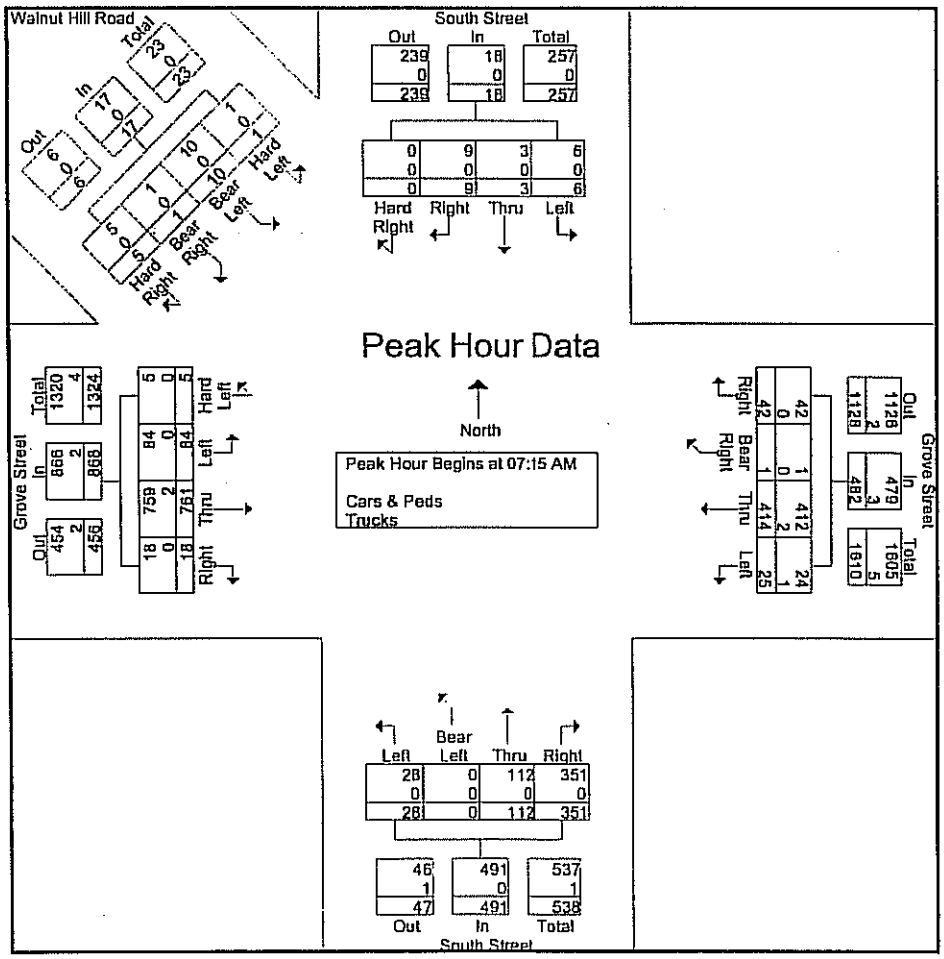
Transportation Data Corporation

Mario Perone, mperonel@verizon.net
t (781) 587-0086 f (781) 587-0089

N/S: South Street
E,W/NW: Grove Street/Walnut Hill Road
City, State: Brookline, MA
Client: MDM/D. Dumais

File Name : 04239D
Site Code : 389
Start Date : 4/11/2012
Page No : 1

	South Street From North					Grove Street From East					South Street From South					Grove Street From West					Walnut Hill Road From Northwest					
Start Time	Hard Right	Right	Thru	Left	App. Total	Right	Bear Right	Thru	Left	App. Total	Right	Thru	Bear Left	Left	App. Total	Right	Thru	Left	Hard Left	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 07:15 AM																										
07:15 AM	0	0	0	2	2	11	0	89	6	106	107	25	0	3	135	1	187	18	1	207	1	0	2	0	3	453
07:30 AM	0	5	1	1	7	6	0	112	6	124	101	33	0	6	140	3	176	12	0	191	0	0	2	1	3	465
07:45 AM	0	2	1	1	4	10	1	111	8	130	80	38	0	16	134	9	205	25	3	242	2	0	4	0	6	516
08:00 AM	0	2	1	2	5	15	0	102	5	122	63	16	0	3	82	5	193	29	1	228	2	1	2	0	5	442
Total Volume	0	9	3	6	18	42	1	414	25	482	351	112	0	28	491	18	761	84	5	868	5	1	10	1	17	1876
% App. Total			16.7	33.3				85.9			71.5	22.8					87.7				29.4		58.8			
PHF	.000	.450	.750	.750	.643	.700	.250	.924	.781	.927	.820	.737	.000	.438	.877	.500	.928	.724	.417	.897	.625	.250	.625	.250	.708	.909
Cars & Peds	0	9	3	6	18	42	1	412	24	479	351	112	0	28	491	18	759	84	5	866	5	1	10	1	17	1871
% Cars & Peds	0	100	100	100	100	100	100	99.5	96.0	99.4	100	100	0	100	100	100	99.7	100	100	99.8	100	100	100	100	100	99.7
Trucks	0	0	0	0	0	0	0	2	1	3	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	5
% Trucks	0	0	0	0	0	0	0	0.5	4.0	0.6	0	0	0	0	0	0	0.3	0	0	0.2	0	0	0	0	0	0.3



MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

/S: Russett Road
: Asheville Road
V: Asheville Road/Site Drive
rookline, MA

File Name : 389 Asheville & Russett AM
Site Code : 38900001
Start Date : 4/11/2012
Page No : 1

Groups Printed- Vehicles

	Russett Road From North					Asheville Road From East					Russett Road From South					Asheville Road/Site Drive From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	1	1	0	0	2	2	1	0	0	3	0	5	0	1	6	2	2	1	0	5	16
07:15 AM	3	0	0	0	3	0	0	0	0	0	1	6	0	0	7	2	5	0	0	7	17
07:30 AM	1	0	1	0	2	1	1	0	0	2	0	5	1	0	6	0	7	9	0	16	26
07:45 AM	3	1	0	0	4	6	4	0	1	11	0	10	0	0	10	2	4	6	0	12	37
Total	8	2	1	0	11	9	6	0	1	16	1	26	1	1	29	6	18	16	0	40	96
08:00 AM	4	2	2	0	8	0	3	1	0	4	1	4	0	0	5	1	1	5	0	7	24
08:15 AM	1	0	1	0	2	0	2	0	1	3	1	1	2	0	4	4	0	3	0	7	16
08:30 AM	1	1	1	0	3	0	0	0	1	1	0	0	1	0	1	6	3	3	1	13	18
08:45 AM	2	1	2	0	5	0	2	0	0	2	0	0	3	0	3	6	6	2	0	14	24
Total	8	4	6	0	18	0	7	1	2	10	2	5	6	0	13	17	10	13	1	41	82
Grand Total	16	6	7	0	29	9	13	1	3	26	3	31	7	1	42	23	28	29	1	81	178
Apprch %	55.2	20.7	24.1	0		34.6	50	3.8	11.5		7.1	73.8	16.7	2.4		28.4	34.6	35.8	1.2		
Total %	9	3.4	3.9	0	16.3	5.1	7.3	0.6	1.7	14.6	1.7	17.4	3.9	0.6	23.6	12.9	15.7	16.3	0.6	45.5	

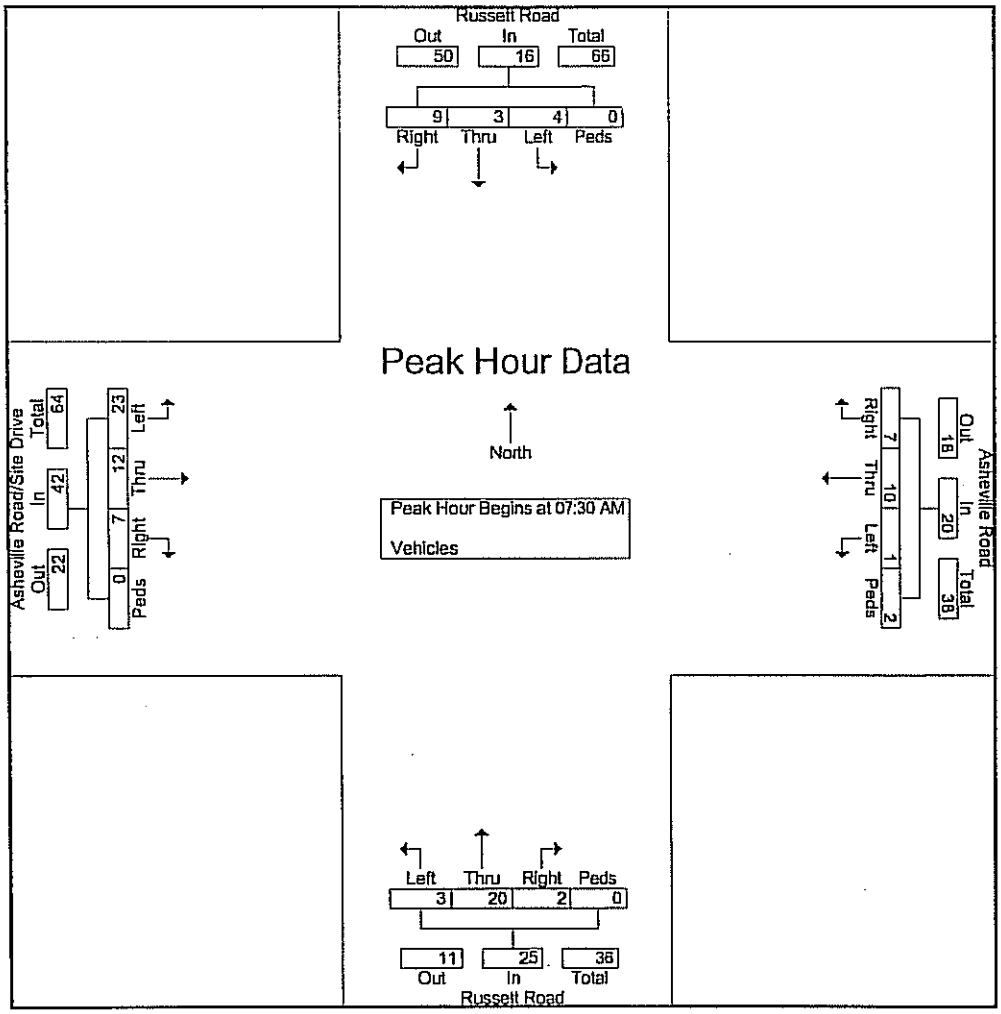
	Russett Road From North					Asheville Road From East					Russett Road From South					Asheville Road/Site Drive From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
eak Hour Analysis From 7:30:00 AM to 8:15:00 AM - Peak 1 of 1																					
eak Hour for Entire Intersection Begins at 7:30:00 AM																					
7:30:00 AM	1	0	1	0	2	1	1	0	0	2	0	5	1	0	6	0	7	9	0	16	26
7:45:00 AM	3	1	0	0	4	6	4	0	1	11	0	10	0	0	10	2	4	6	0	12	37
8:00:00 AM	4	2	2	0	8	0	3	1	0	4	1	4	0	0	5	1	1	5	0	7	24
8:15:00 AM	1	0	1	0	2	0	2	0	1	3	1	1	2	0	4	4	0	3	0	7	16
Total Volume	9	3	4	0	16	7	10	1	2	20	2	20	3	0	25	7	12	23	0	42	103
% App. Total	56.2	18.8	25	0		35	50	5	10		8	80	12	0		16.7	28.6	54.8	0		
PHF	.563	.375	.500	.000	.500	.292	.625	.250	.500	.455	.500	.500	.375	.000	.625	.438	.429	.639	.000	.656	.696

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

/S: Russett Road
: Asheville Road
V: Asheville Road/Site Drive
rookline, MA

File Name : 389 Asheville & Russett AM
Site Code : 38900001
Start Date : 4/11/2012
Page No : 2



MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

I/S: South Street
V: Asheville Road
Brookline, MA

File Name : 389 Asheville & South AM
Site Code : 38900001
Start Date : 4/11/2012
Page No : 1

Groups Printed- Passenger Cars - Heavy Vehicles

	South Street From North				South Street From South				Asheville Road From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
07:00 AM	0	5	0	5	92	2	1	95	2	1	0	3	103
07:15 AM	0	4	0	4	101	0	1	102	0	3	0	3	109
07:30 AM	1	4	0	5	107	1	0	108	1	4	1	6	119
07:45 AM	0	11	0	11	106	9	0	115	2	2	0	4	130
Total	1	24	0	25	406	12	2	420	5	10	1	16	461
08:00 AM	0	13	0	13	67	0	0	67	1	2	0	3	83
08:15 AM	1	10	0	11	66	1	0	67	1	0	0	1	79
08:30 AM	0	9	0	9	44	1	0	45	3	1	0	4	58
08:45 AM	1	14	0	15	36	0	0	36	3	6	0	9	60
Total	2	46	0	48	213	2	0	215	8	9	0	17	280
Grand Total	3	70	0	73	619	14	2	635	13	19	1	33	741
Apprch %	4.1	95.9	0		97.5	2.2	0.3		39.4	57.6	3		
Total %	0.4	9.4	0	9.9	83.5	1.9	0.3	85.7	1.8	2.6	0.1	4.5	
Passenger Cars	3	68	0	71	612	14	2	628	13	19	1	33	732
% Passenger Cars	100	97.1	0	97.3	98.9	100	100	98.9	100	100	100	100	98.8
Heavy Vehicles	0	2	0	2	7	0	0	7	0	0	0	0	9
% Heavy Vehicles	0	2.9	0	2.7	1.1	0	0	1.1	0	0	0	0	1.2

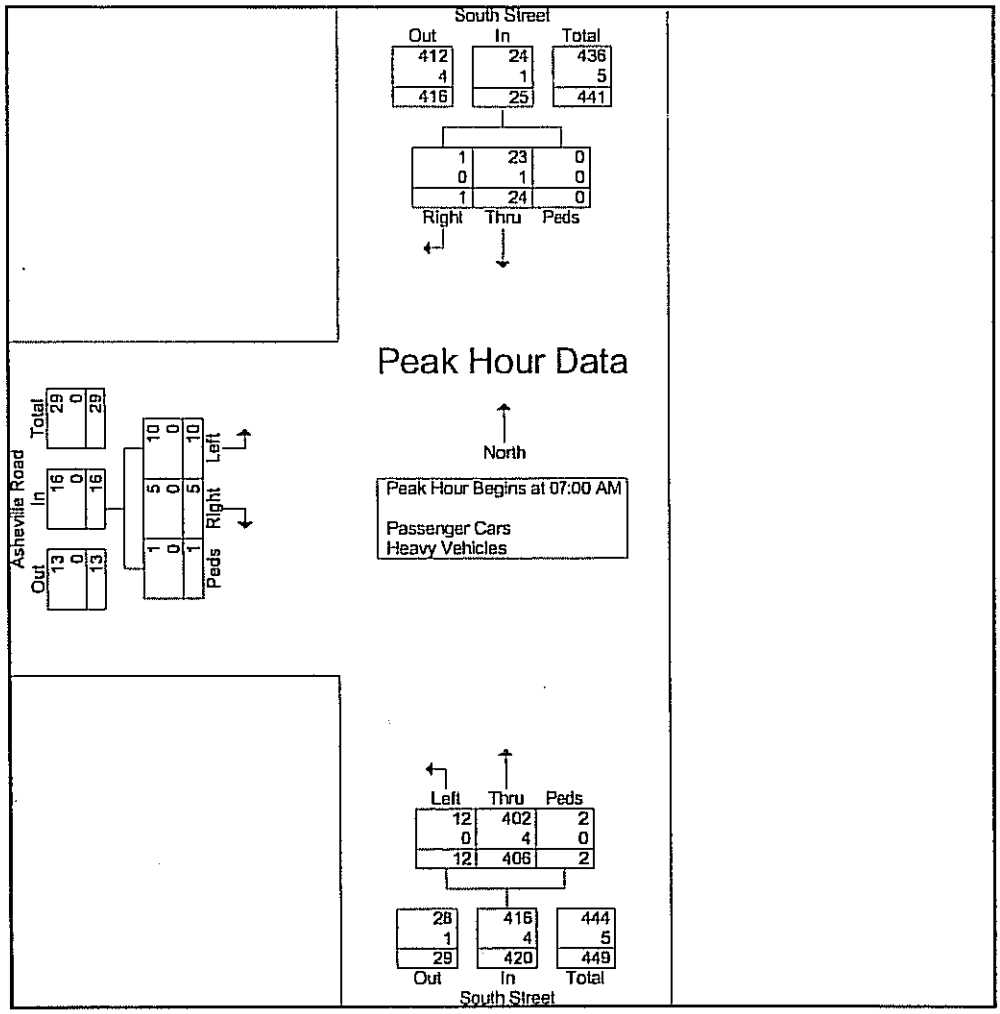
	South Street From North				South Street From South				Asheville Road From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 7:00:00 AM to 8:45:00 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 7:00:00 AM													
7:00:00 AM	0	5	0	5	92	2	1	95	2	1	0	3	103
7:15:00 AM	0	4	0	4	101	0	1	102	0	3	0	3	109
7:30:00 AM	1	4	0	5	107	1	0	108	1	4	1	6	119
7:45:00 AM	0	11	0	11	106	9	0	115	2	2	0	4	130
Total Volume	1	24	0	25	406	12	2	420	5	10	1	16	461
% App. Total	4	96	0		96.7	2.9	0.5		31.2	62.5	6.2		
PHF	.250	.545	.000	.568	.949	.333	.500	.913	.625	.625	.250	.667	.887
Passenger Cars	1	23	0	24	402	12	2	416	5	10	1	16	456
% Passenger Cars	100	95.8	0	96.0	99.0	100	100	99.0	100	100	100	100	98.9
Heavy Vehicles	0	1	0	1	4	0	0	4	0	0	0	0	5
% Heavy Vehicles	0	4.2	0	4.0	1.0	0	0	1.0	0	0	0	0	1.1

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

N/S: South Street
W: Asheville Road
Brookline, MA

File Name : 389 Asheville & South AM
Site Code : 38900001
Start Date : 4/11/2012
Page No : 2



MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

N/S: Independence Drive
W: Gerry Road
Brookline, MA

File Name : 389 Independence & Gerry AM
Site Code : 00389002
Start Date : 4/12/2012
Page No : 1

Groups Printed- Passenger Cars - Heavy Vehicles - Busses

	Independence Drive From North				Independence Drive From South				Gerry Road From West				
Start Time	Right	Thru	Bicycles	App. Total	Thru	Left	Bicycles	App. Total	Right	Left	Bicycles	App. Total	Int. Total
07:00 AM	0	62	5	67	153	0	1	154	10	16	2	28	249
07:15 AM	0	86	4	90	151	0	2	153	5	21	1	27	270
07:30 AM	0	110	11	121	153	0	2	155	14	25	0	39	315
07:45 AM	0	102	6	108	183	0	1	184	11	24	3	38	330
Total	0	360	26	386	640	0	6	646	40	86	6	132	1164
08:00 AM	0	119	2	121	137	0	5	142	16	29	1	46	309
08:15 AM	0	110	13	123	131	0	2	133	17	26	1	44	300
08:30 AM	0	113	4	117	134	1	1	136	9	19	2	30	283
08:45 AM	0	98	1	99	127	1	2	130	15	16	2	33	262
Total	0	440	20	460	529	2	10	541	57	90	6	153	1154
Grand Total	0	800	46	846	1169	2	16	1187	97	176	12	285	2318
Apprch %	0	94.6	5.4		98.5	0.2	1.3		34	61.8	4.2		
Total %	0	34.5	2	36.5	50.4	0.1	0.7	51.2	4.2	7.6	0.5	12.3	
Passenger Cars	0	774	44	818	1142	1	16	1159	96	175	9	280	2257
% Passenger Cars	0	96.8	95.7	96.7	97.7	50	100	97.6	99	99.4	75	98.2	97.4
Heavy Vehicles	0	11	0	11	20	1	0	21	1	1	0	2	34
% Heavy Vehicles	0	1.4	0	1.3	1.7	50	0	1.8	1	0.6	0	0.7	1.5
Busses	0	15	2	17	7	0	0	7	0	0	3	3	27
% Busses	0	1.9	4.3	2	0.6	0	0	0.6	0	0	25	1.1	1.2

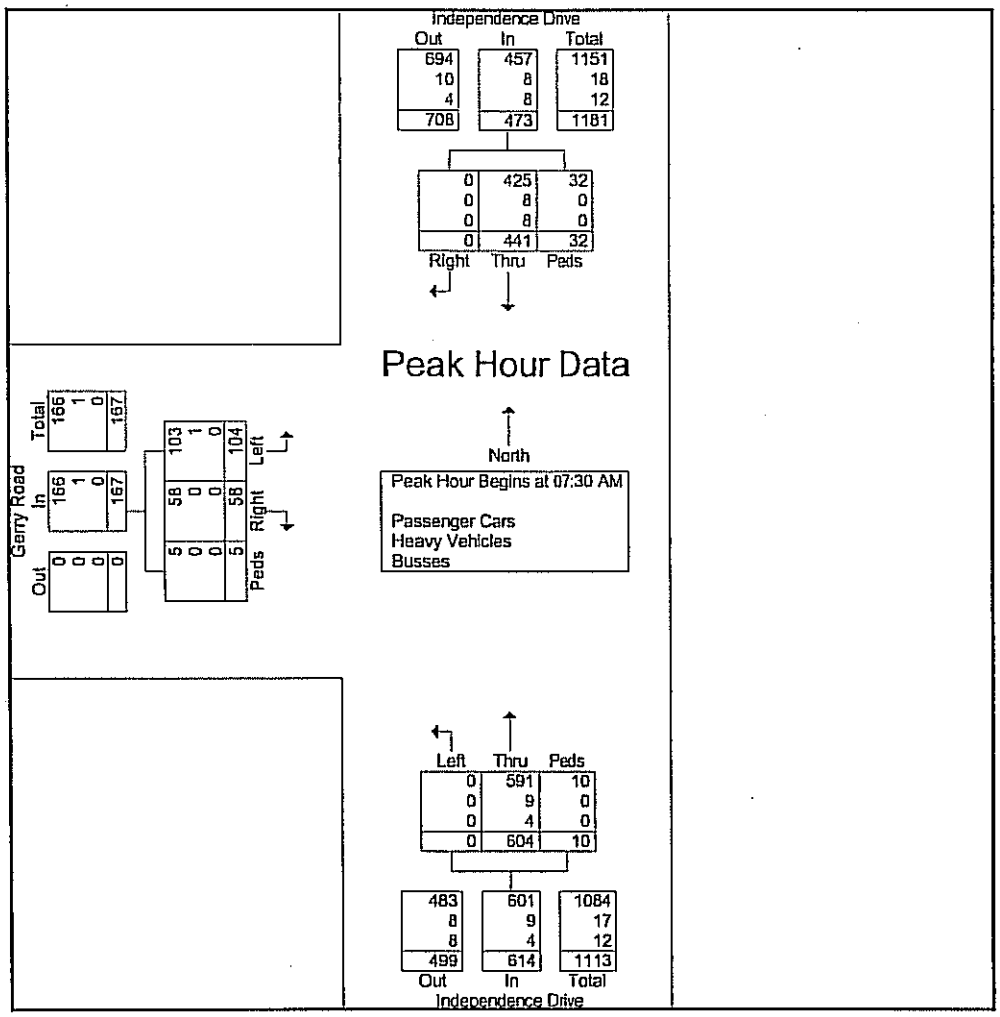
	Independence Drive From North				Independence Drive From South				Gerry Road From West				
Start Time	Right	Thru	Bicycles	App. Total	Thru	Left	Bicycles	App. Total	Right	Left	Bicycles	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	0	110	11	121	153	0	2	155	14	25	0	39	315
07:45 AM	0	102	6	108	183	0	1	184	11	24	3	38	330
08:00 AM	0	119	2	121	137	0	5	142	16	29	1	46	309
08:15 AM	0	110	13	123	131	0	2	133	17	26	1	44	300
Total Volume	0	441	32	473	604	0	10	614	58	104	5	167	1254
% App. Total	0	93.2	6.8		98.4	0	1.6		34.7	62.3	3		
PHF	.000	.926	.615	.961	.825	.000	.500	.834	.853	.897	.417	.908	.950
Passenger Cars	0	425	32	457	591	0	10	601	58	103	5	166	1224
% Passenger Cars	0	96.4	100	96.6	97.8	0	100	97.9	100	99.0	100	99.4	97.6
Heavy Vehicles	0	8	0	8	9	0	0	9	0	1	0	1	18
% Heavy Vehicles	0	1.8	0	1.7	1.5	0	0	1.5	0	1.0	0	0.6	1.4
Busses	0	8	0	8	4	0	0	4	0	0	0	0	12
% Busses	0	1.8	0	1.7	0.7	0	0	0.7	0	0	0	0	1.0

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

N/S: Independence Drive
V: Gerry Road
Brookline, MA

File Name : 389 Independence & Gerry AM
Site Code : 00389002
Start Date : 4/12/2012
Page No : 2



MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

/S: Independence Drive
: Thornton Road
/: Sherman Road
rookline, MA

File Name : 389 Independence & Sherman AM
Site Code : 00389991
Start Date : 4/11/2012
Page No : 1

Groups Printed- Passenger Cars - Heavy Vehicles - Busses

	Independence Drive From North					Thornton Road From East					Independence Drive From South					Sherman Road From West					
Start Time	Right	Thru	Left	Bicycles	App. Total	Right	Thru	Left	Bicycles	App. Total	Right	Thru	Left	Bicycles	App. Total	Right	Thru	Left	Bicycles	App. Total	Int. Total
07:00 AM	1	82	2	0	85	4	1	6	3	14	1	156	3	1	161	0	0	0	0	0	260
07:15 AM	5	80	0	4	89	9	0	2	6	17	1	156	4	6	167	0	0	0	1	1	274
07:30 AM	5	107	4	6	122	7	1	5	4	17	1	139	1	0	141	0	0	0	3	3	283
07:45 AM	7	112	6	3	128	14	14	0	2	30	1	136	6	3	146	1	0	1	0	2	306
Total	18	381	12	13	424	34	16	13	15	78	4	587	14	10	615	1	0	1	4	6	1123
08:00 AM	9	134	10	3	156	9	0	1	5	15	1	128	4	2	135	0	0	0	2	2	308
08:15 AM	4	126	7	3	140	4	1	3	1	9	1	153	4	0	158	0	0	0	1	1	308
08:30 AM	6	114	1	3	124	8	0	5	8	21	2	103	2	3	110	1	0	0	1	2	257
08:45 AM	5	91	1	1	98	4	0	3	4	11	1	102	4	0	107	0	0	1	0	1	217
Total	24	465	19	10	518	25	1	12	18	56	5	486	14	5	510	1	0	1	4	6	1090
Grand Total	42	846	31	23	942	59	17	25	33	134	9	1073	28	15	1125	2	0	2	8	12	2213
Apprch %	4.5	89.8	3.3	2.4		44	12.7	18.7	24.6		0.8	95.4	2.5	1.3		16.7	0	16.7	66.7		
Total %	1.9	38.2	1.4	1	42.6	2.7	0.8	1.1	1.5	6.1	0.4	48.5	1.3	0.7	50.8	0.1	0	0.1	0.4	0.5	
Passenger Cars	41	819	31	23	914	59	17	25	25	126	9	1052	25	15	1101	2	0	2	7	11	2152
% Passenger Cars	97.6	96.8	100	100	97	100	100	100	75.8	94	100	98	89.3	100	97.9	100	0	100	87.5	91.7	97.2
Heavy Vehicles	1	12	0	0	13	0	0	0	0	0	0	13	3	0	16	0	0	0	0	0	29
% Heavy Vehicles	2.4	1.4	0	0	1.4	0	0	0	0	0	0	1.2	10.7	0	1.4	0	0	0	0	0	1.3
Busses	0	15	0	0	15	0	0	0	8	8	0	8	0	0	8	0	0	0	1	1	32
% Busses	0	1.8	0	0	1.6	0	0	0	24.2	6	0	0.7	0	0	0.7	0	0	0	12.5	8.3	1.4

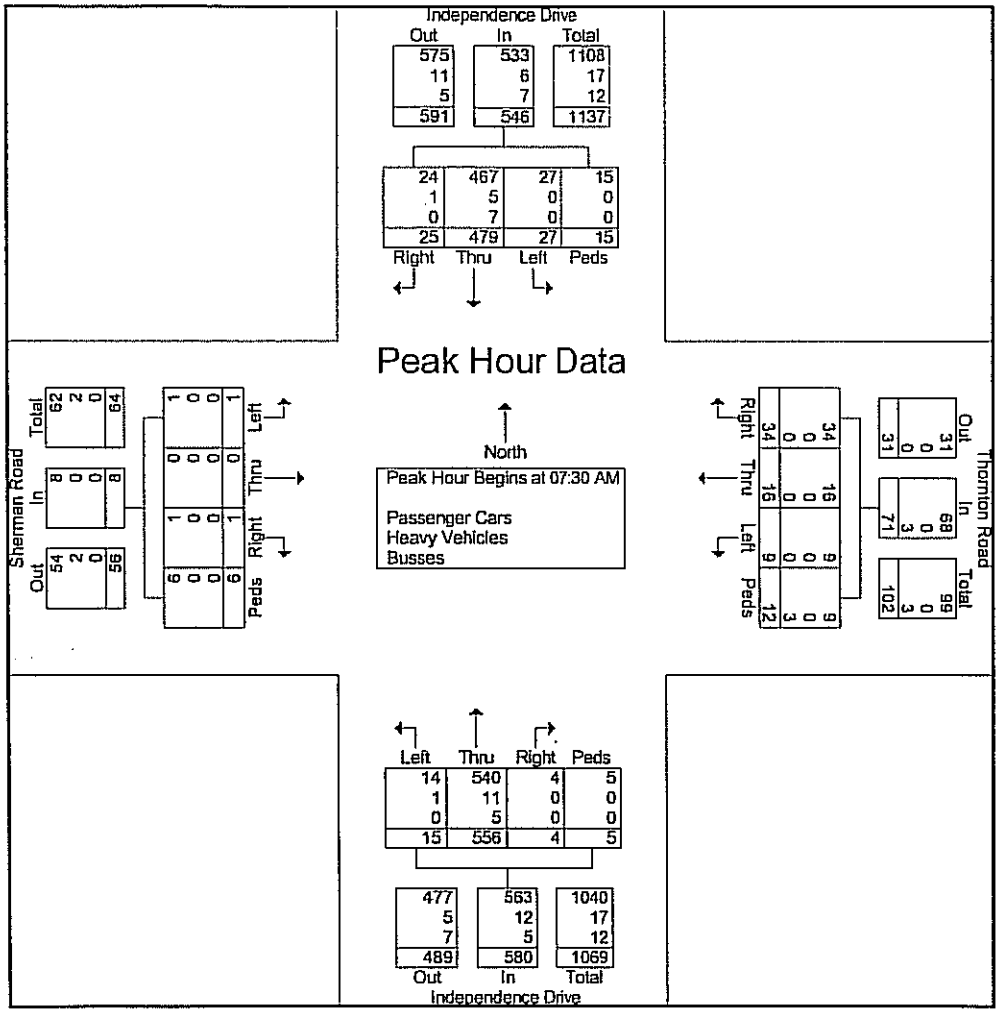
	Independence Drive From North					Thornton Road From East					Independence Drive From South					Sherman Road From West					
Start Time	Right	Thru	Left	Bicycles	App. Total	Right	Thru	Left	Bicycles	App. Total	Right	Thru	Left	Bicycles	App. Total	Right	Thru	Left	Bicycles	App. Total	Int. Total
eak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
eak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	5	107	4	6	122	7	1	5	4	17	1	139	1	0	141	0	0	0	3	3	283
07:45 AM	7	112	6	3	128	14	14	0	2	30	1	136	6	3	146	1	0	1	0	2	306
08:00 AM	9	134	10	3	156	9	0	1	5	15	1	128	4	2	135	0	0	0	2	2	308
08:15 AM	4	126	7	3	140	4	1	3	1	9	1	153	4	0	158	0	0	0	1	1	308
Total Volume	25	479	27	15	546	34	16	9	12	71	4	556	15	5	580	1	0	1	6	8	1205
% App. Total	4.6	87.7	4.9	2.7		47.9	22.5	12.7	16.9		0.7	95.9	2.6	0.9		12.5	0	12.5	75		
PHF	.694	.894	.675	.625	.875	.607	.286	.450	.600	.592	1.00	.908	.625	.417	.918	.250	.000	.250	.500	.667	.978
Passenger Cars	24	467	27	15	533	34	16	9	9	68	4	540	14	5	563	1	0	1	6	8	1172
% Passenger Cars																					
Heavy Vehicles	1	5	0	0	6	0	0	0	0	0	0	11	1	0	12	0	0	0	0	0	18
% Heavy Vehicles	4.0	1.0	0	0	1.1	0	0	0	0	0	0	2.0	6.7	0	2.1	0	0	0	0	0	1.5
Busses	0	7	0	0	7	0	0	0	3	3	0	5	0	0	5	0	0	0	0	0	15
% Busses	0	1.5	0	0	1.3	0	0	0	25.0	4.2	0	0.9	0	0	0.9	0	0	0	0	0	1.2

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

/S: Independence Drive
: Thornton Road
/: Sherman Road
rookline, MA

File Name : 389 Independence & Sherman AM
Site Code : 00389991
Start Date : 4/11/2012
Page No : 2



Transportation Data Corporation

Mario Perone, mperone1@verizon.net

t (781) 587-0086 f (781) 587-0089

N/S: Beverly Road/Russett Road
E/W: Grove Street/Independence Drive
City, State: Brookline, MA
Client: MDM/D. Dumais

File Name : 04239BB
Site Code : 389
Start Date : 4/11/2012
Page No : 1

Groups Printed- Cars & Peds - Trucks

	Beverly Road From North				Grove Street From East				Russett Road From South				Independence Drive From West						
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	9	1	6	2	11	191	1	1	3	2	0	0	2	90	5	2	5	321	326
04:15 PM	10	1	7	0	7	206	3	0	0	2	0	4	3	80	6	6	10	325	335
04:30 PM	14	3	5	0	2	211	5	1	1	2	1	0	3	93	2	3	4	342	346
04:45 PM	8	4	7	1	6	238	7	3	0	2	0	7	2	92	10	4	15	376	391
Total	41	9	25	3	26	846	16	5	4	8	1	11	10	355	23	15	34	1364	1398
05:00 PM	13	1	5	5	9	220	4	0	4	2	0	6	2	98	9	0	11	367	378
05:15 PM	12	1	9	1	13	179	6	0	2	2	0	3	3	105	5	5	9	337	346
05:30 PM	12	6	10	2	12	190	2	0	0	5	2	3	3	112	6	3	8	360	368
05:45 PM	19	9	10	0	11	200	1	1	3	1	2	1	0	96	8	0	2	360	362
Total	56	17	34	8	45	789	13	1	9	10	4	13	8	411	28	8	30	1424	1454
Grand Total	97	26	59	11	71	1635	29	6	13	18	5	24	18	766	51	23	64	2788	2852
Apprch %	53.3	14.3	32.4		4.1	94.2	1.7		36.1	50	13.9		2.2	91.7	6.1				
Total %	3.5	0.9	2.1		2.5	58.6	1		0.5	0.6	0.2		0.6	27.5	1.8		2.2	97.8	
Cars & Peds	97	26	59		71	1634	29		13	18	5		18	763	51		0	0	2848
% Cars & Peds	100	100	100	100	100	99.9	100	100	100	100	100	100	100	99.6	100	100	0	0	99.9
Trucks	0	0	0		0	1	0		0	0	0		0	3	0		0	0	4
% Trucks	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.4	0	0	0	0	0.1

	Beverly Road From North				Grove Street From East				Russett Road From South				Independence Drive From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	8	4	7	19	6	238	7	251	0	2	0	2	2	92	10	104	376
05:00 PM	13	1	5	19	9	220	4	233	4	2	0	6	2	98	9	109	367
05:15 PM	12	1	9	22	13	179	6	198	2	2	0	4	3	105	5	113	337
05:30 PM	12	6	10	28	12	190	2	204	0	5	2	7	3	112	6	121	360
Total Volume	45	12	31	88	40	827	19	886	6	11	2	19	10	407	30	447	1440
% App. Total	51.1	13.6	35.2		4.5	93.3	2.1		31.6	57.9	10.5		2.2	91.1	6.7		
PHF	.865	.500	.775	.786	.769	.869	.679	.882	.375	.550	.250	.679	.833	.908	.750	.924	.957
Cars & Peds	45	12	31	88	40	827	19	886	6	11	2	19	10	407	30	447	1440
% Cars & Peds	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Transportation Data Corporation

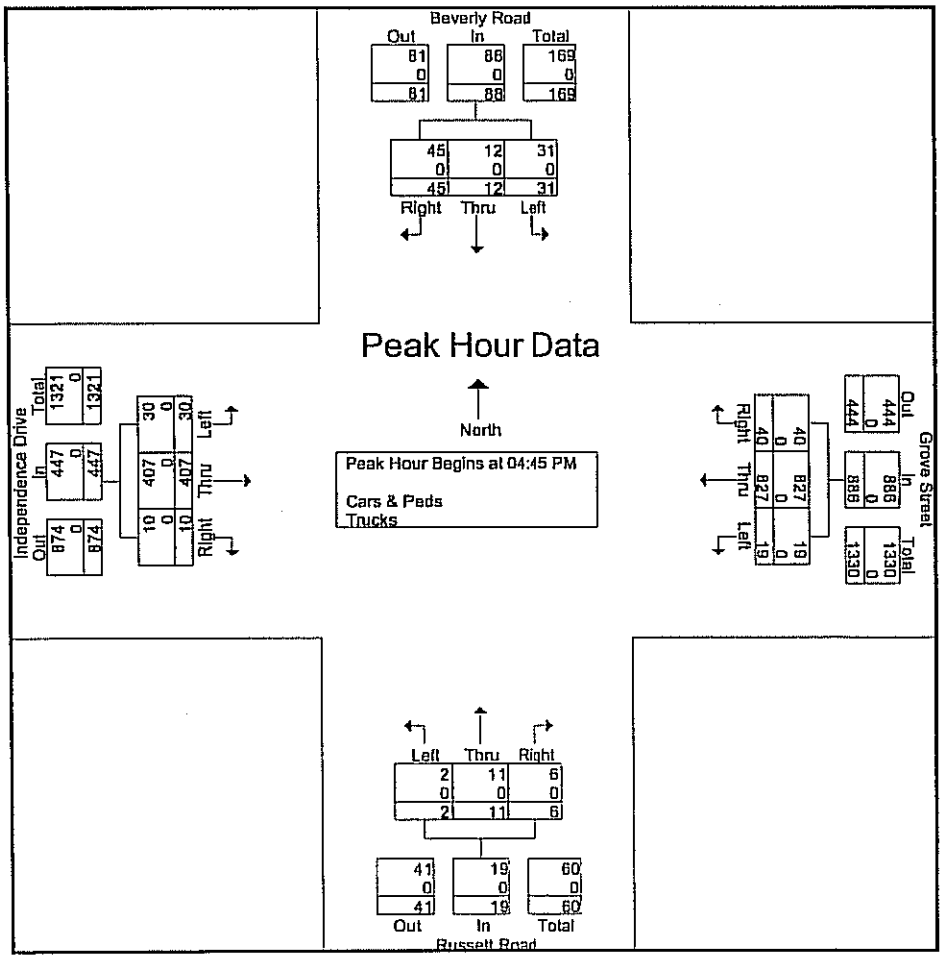
Mario Perone, mperone1@verizon.net

t (781) 587-0086 f (781) 587-0089

N/S: Beverly Road/Russett Road
E/W: Grove Street/Independence Drive
City, State: Brookline, MA
Client: MDM/D. Dumais

File Name : 04239BB
Site Code : 389
Start Date : 4/11/2012
Page No : 1

	Beverly Road From North				Grove Street From East				Russett Road From South				Independence Drive From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	8	4	7	19	6	238	7	251	0	2	0	2	2	92	10	104	376
05:00 PM	13	1	5	19	9	220	4	233	4	2	0	6	2	98	9	109	367
05:15 PM	12	1	9	22	13	179	6	198	2	2	0	4	3	105	5	113	337
05:30 PM	12	6	10	28	12	190	2	204	0	5	2	7	3	112	6	121	360
Total Volume	45	12	31	88	40	827	19	886	6	11	2	19	10	407	30	447	1440
% App. Total	51.1	13.6	35.2		4.5	93.3	2.1		31.6	57.9	10.5		2.2	91.1	6.7		
PHF	.865	.500	.775	.786	.769	.869	.679	.882	.375	.550	.250	.679	.833	.908	.750	.924	.957
Cars & Peds	45	12	31	88	40	827	19	886	6	11	2	19	10	407	30	447	1440
% Cars & Peds	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Transportation Data Corporation

Mario Perone, mperone1@verizon.net
t (781) 587-0086 f (781) 587-0089

N/S: South Street
E,W/NW: Grove Street/Walnut Hill Road
City, State: Brookline, MA
Client: MDM/D. Dumais

File Name : 04239DD
Site Code : 389
Start Date : 4/11/2012
Page No : 1

Groups Printed- Cars & Peds - Trucks

	South Street From North					Grove Street From East					South Street From South					Grove Street From West					Walnut Hill Road From Northwest							
Start Time	Hard Right	Right	Thru	Left	Peds	Right	Bear Right	Thru	Left	Peds	Right	Thru	Bear Left	Left	Peds	Right	Thru	Left	Hard Left	Peds	Hard Right	Bear Right	Bear Left	Hard Left	Peds	Excln. Total	Incln. Total	Int. Total
04:00 PM	0	7	4	2	0	5	3	196	20	0	16	4	0	2	2	5	87	5	1	0	0	0	1	0	0	2	358	360
04:15 PM	0	3	4	0	0	5	2	209	13	0	8	3	0	0	3	3	81	5	0	0	0	0	0	0	0	3	336	339
04:30 PM	0	5	3	3	2	11	1	212	16	3	13	4	0	2	2	3	92	4	1	0	0	0	2	0	2	9	372	381
04:45 PM	0	7	4	1	2	5	4	245	22	0	18	3	0	1	12	3	96	2	0	0	0	0	3	0	2	16	414	430
Total	0	22	15	6	4	26	10	862	71	3	55	14	0	5	19	14	356	16	2	0	0	0	6	0	4	30	1480	1510
05:00 PM	0	6	2	0	5	6	3	226	22	3	8	2	0	0	3	4	94	6	2	1	1	0	1	0	5	17	383	400
05:15 PM	0	2	2	3	8	8	2	190	17	3	18	2	1	2	5	3	102	6	2	0	0	0	1	0	8	24	361	385
05:30 PM	0	2	6	3	4	10	0	197	13	0	15	1	1	2	6	6	109	8	0	0	1	0	1	0	4	14	375	389
05:45 PM	0	7	6	1	1	15	4	207	18	3	13	3	0	0	2	2	98	4	1	0	1	0	1	0	1	7	381	388
Total	0	17	16	7	18	39	9	820	70	9	54	8	2	4	16	15	403	24	5	1	3	0	4	0	18	62	1500	1562
Grand Total	0	39	31	13	22	65	19	1682	141	12	109	22	2	9	35	29	759	40	7	1	3	0	10	0	22	92	2980	3072
Apprch %	0	47	37.3	15.7		3.4	1	88.2	7.4		76.8	15.5	1.4	6.3		3.5	90.9	4.8	0.8		23.1	0	76.9	0				
Total %	0	1.3	1	0.4		2.2	0.6	56.4	4.7		3.7	0.7	0.1	0.3		1	25.5	1.3	0.2		0.1	0	0.3	0		3	97	
Cars & Peds	0	39	31	13		65	19	1681	139		109	22	2	9		29	756	40	7		3	0	10	0		0	0	3066
% Cars & Peds	0	100	100	100	100	100	100	99.9	98.6	100	100	100	100	100	100	100	99.6	100	100	100	100	0	100	0	100	0	0	99.8
Trucks	0	0	0	0		0	0	1	2		0	0	0	0		0	3	0	0		0	0	0	0		0	0	6
% Trucks	0	0	0	0	0	0	0	0.1	1.4	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0.2

	South Street From North					Grove Street From East					South Street From South					Grove Street From West					Walnut Hill Road From Northwest					
Start Time	Hard Right	Right	Thru	Left	App. Total	Right	Bear Right	Thru	Left	App. Total	Right	Thru	Bear Left	Left	App. Total	Right	Thru	Left	Hard Left	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 04:45 PM																										
04:45 PM	0	7	4	1	12	5	4	245	22	276	18	3	0	1	22	3	96	2	0	101	0	0	3	0	3	414
05:00 PM	0	6	2	0	8	6	3	226	22	257	8	2	0	0	10	4	94	6	2	106	1	0	1	0	2	383
05:15 PM	0	2	2	3	7	8	2	190	17	217	18	2	1	2	23	3	102	6	2	113	0	0	1	0	1	361
05:30 PM	0	2	6	3	11	10	0	197	13	220	15	1	1	2	19	6	109	8	0	123	1	0	1	0	2	375
Total Volume	0	17	14	7	38	29	9	858	74	970	59	8	2	5	74	16	401	22	4	443	2	0	6	0	8	1533
% App. Total		44.7	36.8	18.4				88.5			79.7	10.8					90.5									
PHF	.000	.607	.583	.583	.792	.725	.563	.876	.841	.879	.819	.667	.500	.625	.804	.667	.920	.688	.500	.900	.500	.000	.500	.000	.667	.926
Cars & Peds	0	17	14	7	38	29	9	858	74	970	59	8	2	5	74	16	401	22	4	443	2	0	6	0	8	1533
% Cars & Peds	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0	100	0	100	100
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Transportation Data Corporation

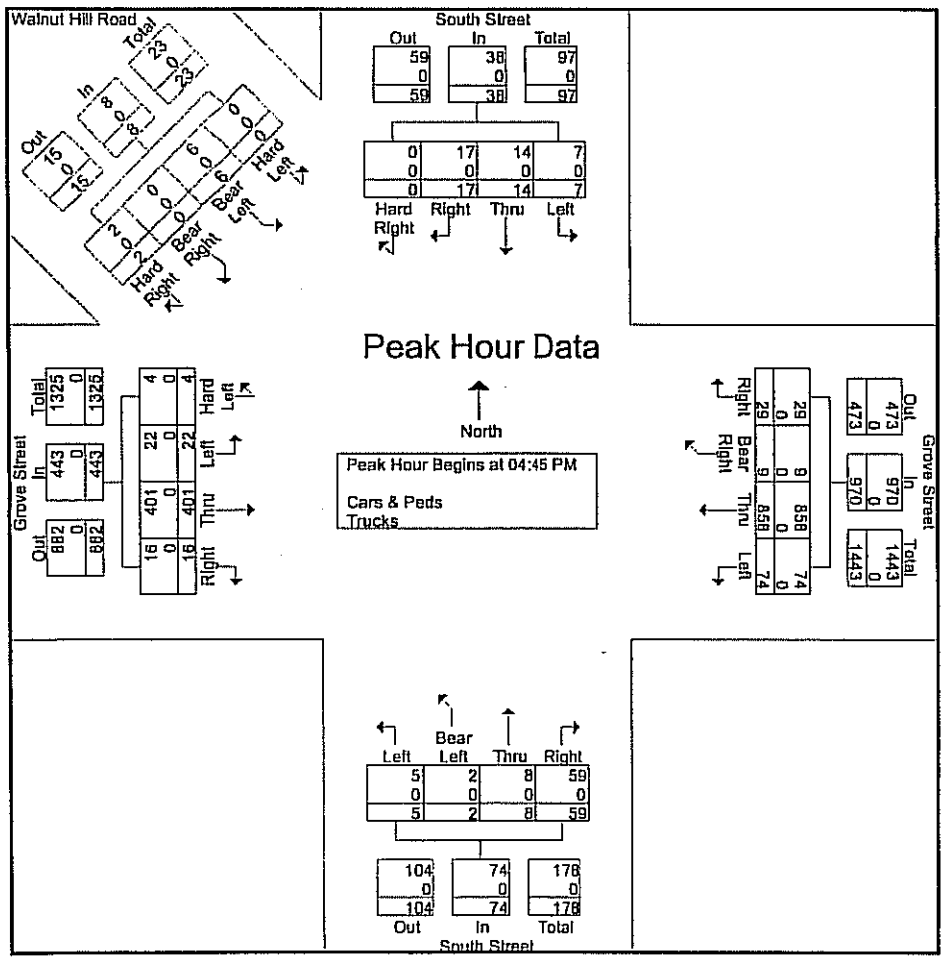
Mario Perone, mperone1@verizon.net

t (781) 587-0086 f (781) 587-0089

N/S: South Street
E,W/NW: Grove Street/Walnut Hill Road
City, State: Brookline, MA
Client: MDM/D. Dumais

File Name : 04239DD
Site Code : 389
Start Date : 4/11/2012
Page No : 1

	South Street From North					Grove Street From East					South Street From South					Grove Street From West					Walnut Hill Road From Northwest					
Start Time	Hard Right	Right	Thru	Left	App. Total	Right	Bear Right	Thru	Left	App. Total	Right	Thru	Bear Left	Left	App. Total	Right	Thru	Left	Hard Left	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																										
Peak Hour for Entire Intersection Begins at 04:45 PM																										
04:45 PM	0	7	4	1	12	5	4	245	22	276	18	3	0	1	22	3	96	2	0	101	0	0	3	0	3	414
05:00 PM	0	6	2	0	8	6	3	226	22	257	8	2	0	0	10	4	94	6	2	106	1	0	1	0	2	383
05:15 PM	0	2	2	3	7	8	2	190	17	217	18	2	1	2	23	3	102	6	2	113	0	0	1	0	1	361
05:30 PM	0	2	6	3	11	10	0	197	13	220	15	1	1	2	19	6	109	8	0	123	1	0	1	0	2	375
Total Volume	0	17	14	7	38	29	9	858	74	970	59	8	2	5	74	16	401	22	4	443	2	0	6	0	8	1533
% App. Total		44.7	36.8	18.4				88.5			79.7	10.8					90.5									
PHF	.000	.607	.583	.583	.792	.725	.563	.876	.841	.879	.819	.667	.500	.625	.804	.667	.920	.688	.500	.900	.500	.000	.500	.000	.667	.926
Cars & Peds	0	17	14	7	38	29	9	858	74	970	59	8	2	5	74	16	401	22	4	443	2	0	6	0	8	1533
% Cars & Peds	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0	100	0	100	100
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

/S: Russett Road
: Asheville Road
/: Asheville Road/Site Drive
rookline, MA

File Name : 389 Asheville & Russett PM
Site Code : 38900002
Start Date : 4/11/2012
Page No : 1

Groups Printed- Vehicles

	Russett Road From North					Asheville Road From East					Russett Road From South					Asheville Road/Site Drive From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:00 PM	1	0	0	0	1	1	2	0	0	3	3	1	0	0	4	1	4	1	0	6	14
04:15 PM	3	1	0	0	4	0	2	1	1	4	0	1	2	0	3	0	2	1	0	3	14
04:30 PM	2	2	1	0	5	0	2	0	0	2	0	1	0	0	1	1	2	1	3	7	15
04:45 PM	4	4	1	0	9	0	1	2	0	3	0	1	3	0	4	1	1	0	0	2	18
Total	10	7	2	0	19	1	7	3	1	12	3	4	5	0	12	3	9	3	3	18	61
05:00 PM	3	4	0	0	7	0	2	1	0	3	1	1	2	0	4	5	1	4	0	10	24
05:15 PM	5	2	0	0	7	0	1	1	2	4	0	2	1	0	3	3	5	1	0	9	23
05:30 PM	4	6	1	0	11	2	1	0	2	5	1	2	1	0	4	2	1	2	1	6	26
05:45 PM	5	0	1	0	6	0	1	1	0	2	0	1	3	2	6	2	1	2	0	5	19
Total	17	12	2	0	31	2	5	3	4	14	2	6	7	2	17	12	8	9	1	30	92
Grand Total	27	19	4	0	50	3	12	6	5	26	5	10	12	2	29	15	17	12	4	48	153
Apprch %	54	38	8	0		11.5	46.2	23.1	19.2		17.2	34.5	41.4	6.9		31.2	35.4	25	8.3		
Total %	17.6	12.4	2.6	0	32.7	2	7.8	3.9	3.3	17	3.3	6.5	7.8	1.3	19	9.8	11.1	7.8	2.6	31.4	

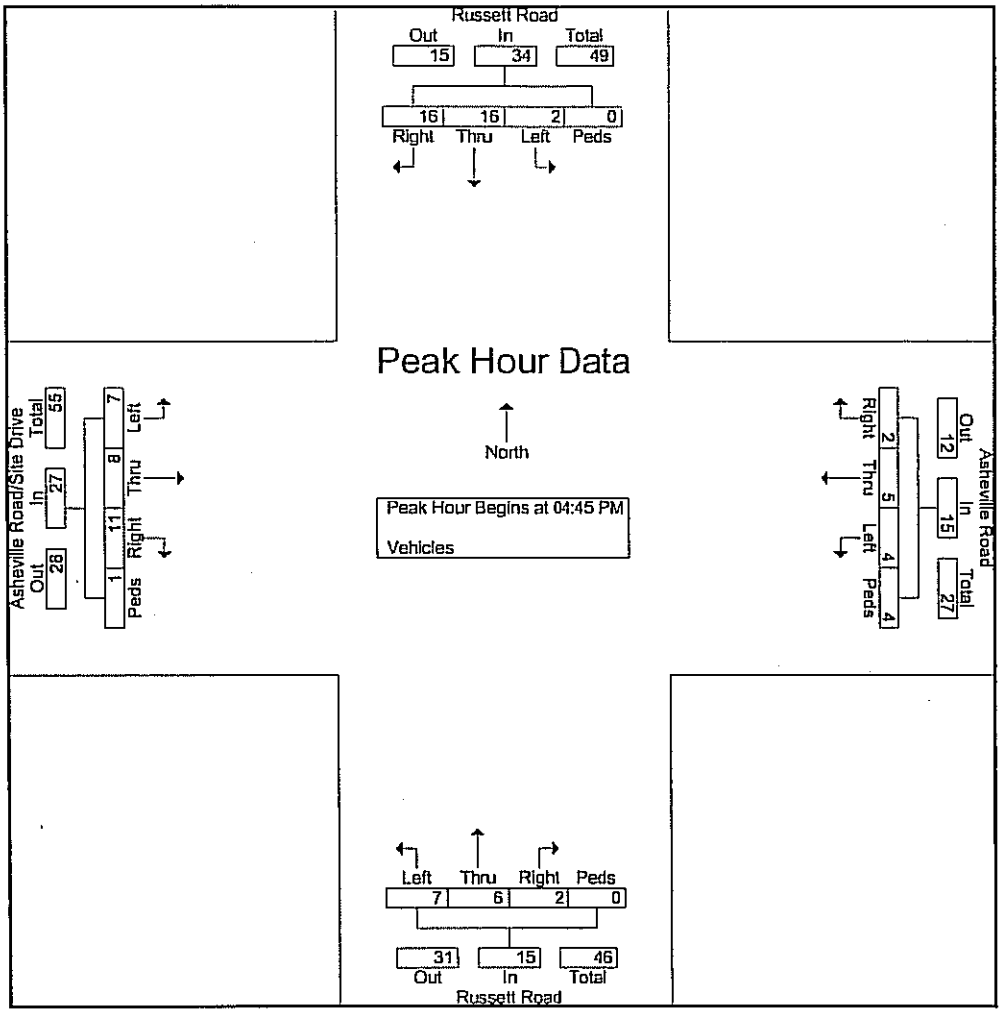
	Russett Road From North					Asheville Road From East					Russett Road From South					Asheville Road/Site Drive From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
eak Hour Analysis From 4:45:00 PM to 5:30:00 PM - Peak 1 of 1																					
eak Hour for Entire Intersection Begins at 4:45:00 PM																					
4:45:00 PM	4	4	1	0	9	0	1	2	0	3	0	1	3	0	4	1	1	0	0	2	18
5:00:00 PM	3	4	0	0	7	0	2	1	0	3	1	1	2	0	4	5	1	4	0	10	24
5:15:00 PM	5	2	0	0	7	0	1	1	2	4	0	2	1	0	3	3	5	1	0	9	23
5:30:00 PM	4	6	1	0	11	2	1	0	2	5	1	2	1	0	4	2	1	2	1	6	26
Total Volume	16	16	2	0	34	2	5	4	4	15	2	6	7	0	15	11	8	7	1	27	91
% App. Total	47.1	47.1	5.9	0		13.3	33.3	26.7	26.7		13.3	40	46.7	0		40.7	29.6	25.9	3.7		
PHF	.800	.667	.500	.000	.773	.250	.625	.500	.500	.750	.500	.750	.583	.000	.938	.550	.400	.438	.250	.675	.875

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

/S: Russett Road
: Asheville Road
V: Asheville Road/Site Drive
rookline, MA

File Name : 389 Asheville & Russett PM
Site Code : 38900002
Start Date : 4/11/2012
Page No : 2



MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

/S: South Street
/: Asheville Road
rookline, MA

File Name : 389 Asheville & South PM
Site Code : 38900002
Start Date : 4/11/2012
Page No : 1

Groups Printed- Passenger Cars - Heavy Vehicles

	South Street From North				South Street From South				Asheville Road From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
04:00 PM	2	17	0	19	14	2	0	16	2	4	0	6	41
04:15 PM	1	12	0	13	6	0	0	6	1	1	0	2	21
04:30 PM	2	20	0	22	11	1	0	12	1	3	0	4	38
04:45 PM	2	17	0	19	16	1	0	17	1	1	0	2	38
Total	7	66	0	73	47	4	0	51	5	9	0	14	138
05:00 PM	1	20	0	21	10	1	0	11	0	2	0	2	34
05:15 PM	3	17	0	20	23	1	0	24	2	2	2	6	50
05:30 PM	1	12	0	13	13	2	0	15	1	1	0	2	30
05:45 PM	4	21	0	25	15	1	0	16	1	1	2	4	45
Total	9	70	0	79	61	5	0	66	4	6	4	14	159
Grand Total	16	136	0	152	108	9	0	117	9	15	4	28	297
Apprch %	10.5	89.5	0		92.3	7.7	0		32.1	53.6	14.3		
Total %	5.4	45.8	0	51.2	36.4	3	0	39.4	3	5.1	1.3	9.4	
Passenger Cars	15	132	0	147	106	9	0	115	8	14	4	26	288
% Passenger Cars	93.8	97.1	0	96.7	98.1	100	0	98.3	88.9	93.3	100	92.9	97
Heavy Vehicles	1	4	0	5	2	0	0	2	1	1	0	2	9
% Heavy Vehicles	6.2	2.9	0	3.3	1.9	0	0	1.7	11.1	6.7	0	7.1	3

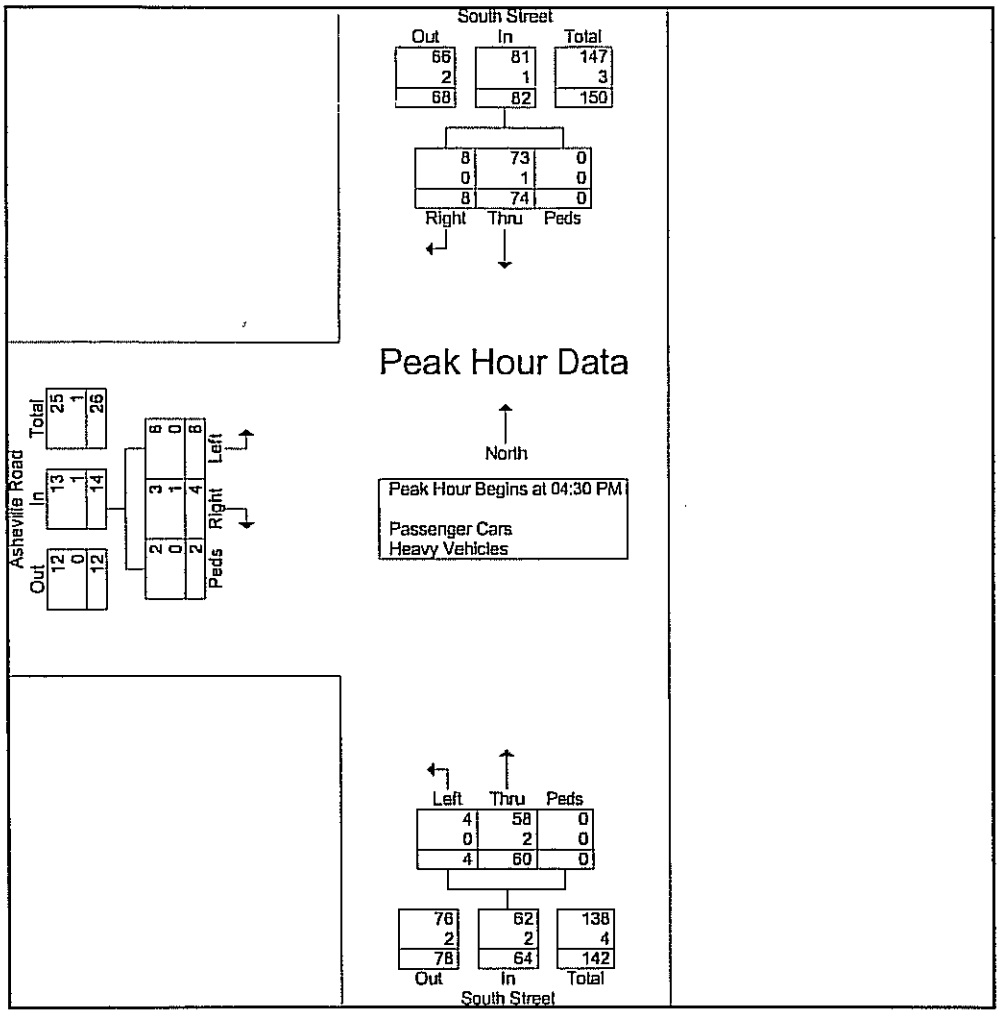
	South Street From North				South Street From South				Asheville Road From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
eak Hour Analysis From 4:00:00 PM to 5:45:00 PM - Peak 1 of 1													
eak Hour for Entire Intersection Begins at 4:30:00 PM													
4:30:00 PM	2	20	0	22	11	1	0	12	1	3	0	4	38
4:45:00 PM	2	17	0	19	16	1	0	17	1	1	0	2	38
5:00:00 PM	1	20	0	21	10	1	0	11	0	2	0	2	34
5:15:00 PM	3	17	0	20	23	1	0	24	2	2	2	6	50
Total Volume	8	74	0	82	60	4	0	64	4	8	2	14	160
% App. Total	9.8	90.2	0		93.8	6.2	0		28.6	57.1	14.3		
PHF	.667	.925	.000	.932	.652	1.00	.000	.667	.500	.667	.250	.583	.800
Passenger Cars	8	73	0	81	58	4	0	62	3	8	2	13	156
% Passenger Cars	100	98.6	0	98.8	96.7	100	0	96.9	75.0	100	100	92.9	97.5
Heavy Vehicles	0	1	0	1	2	0	0	2	1	0	0	1	4
% Heavy Vehicles	0	1.4	0	1.2	3.3	0	0	3.1	25.0	0	0	7.1	2.5

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

I/S: South Street
V: Asheville Road
rookline, MA

File Name : 389 Asheville & South PM
Site Code : 38900002
Start Date : 4/11/2012
Page No : 2



MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

/S: Independence Drive
/: Gerry Road
rookline, MA

File Name : 389 Independence & Gerry PM
Site Code : 00389002
Start Date : 4/12/2012
Page No : 1

Groups Printed- Passenger Cars - Heavy Vehicles - Busses

	Independence Drive From North				Independence Drive From South				Gerry Road From West				
Start Time	Right	Thru	Bicycles	App. Total	Thru	Left	Bicycles	App. Total	Right	Left	Bicycles	App. Total	Int. Total
04:00 PM	0	198	3	201	95	0	1	96	4	5	1	10	307
04:15 PM	0	175	0	175	80	0	1	81	10	5	0	15	271
04:30 PM	1	202	3	206	102	0	1	103	1	8	0	9	318
04:45 PM	0	190	1	191	101	0	0	101	6	3	2	11	303
Total	1	765	7	773	378	0	3	381	21	21	3	45	1199
05:00 PM	0	230	2	232	102	0	0	102	7	13	0	20	354
05:15 PM	0	249	5	254	103	0	0	103	7	6	0	13	370
05:30 PM	0	233	3	236	76	0	1	77	2	10	3	15	328
05:45 PM	0	211	2	213	94	0	0	94	3	9	0	12	319
Total	0	923	12	935	375	0	1	376	19	38	3	60	1371
Grand Total	1	1688	19	1708	753	0	4	757	40	59	6	105	2570
Apprch %	0.1	98.8	1.1		99.5	0	0.5		38.1	56.2	5.7		
Total %	0	65.7	0.7	66.5	29.3	0	0.2	29.5	1.6	2.3	0.2	4.1	
Passenger Cars	1	1668	19	1688	745	0	4	749	39	57	2	98	2535
% Passenger Cars	100	98.8	100	98.8	98.9	0	100	98.9	97.5	96.6	33.3	93.3	98.6
Heavy Vehicles	0	6	0	6	1	0	0	1	1	2	0	3	10
% Heavy Vehicles	0	0.4	0	0.4	0.1	0	0	0.1	2.5	3.4	0	2.9	0.4
Busses	0	14	0	14	7	0	0	7	0	0	4	4	25
% Busses	0	0.8	0	0.8	0.9	0	0	0.9	0	0	66.7	3.8	1

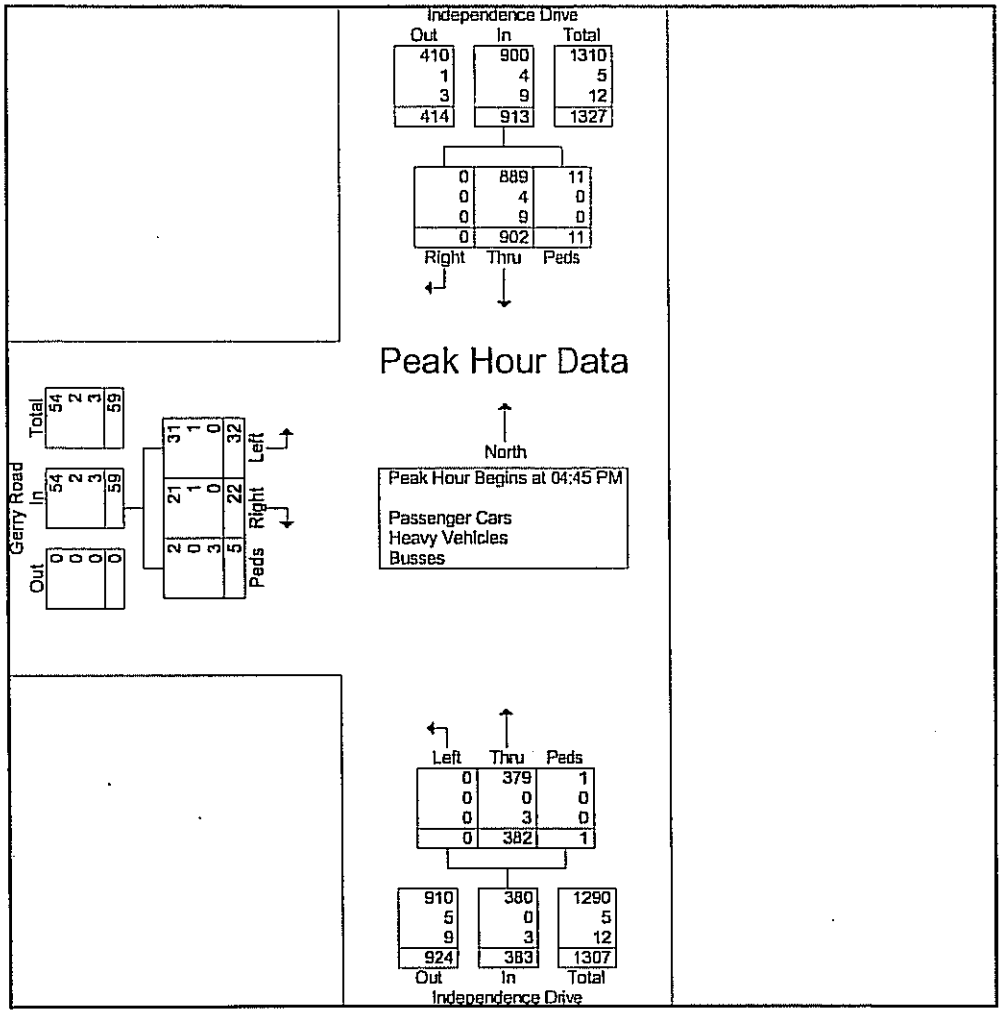
	Independence Drive From North				Independence Drive From South				Gerry Road From West				
Start Time	Right	Thru	Bicycles	App. Total	Thru	Left	Bicycles	App. Total	Right	Left	Bicycles	App. Total	Int. Total
eak Hour Analysis From 04:45 PM to 05:30 PM - Peak 1 of 1													
eak Hour for Entire Intersection Begins at 04:45 PM													
04:45 PM	0	190	1	191	101	0	0	101	6	3	2	11	303
05:00 PM	0	230	2	232	102	0	0	102	7	13	0	20	354
05:15 PM	0	249	5	254	103	0	0	103	7	6	0	13	370
05:30 PM	0	233	3	236	76	0	1	77	2	10	3	15	328
Total Volume	0	902	11	913	382	0	1	383	22	32	5	59	1355
% App. Total	0	98.8	1.2		99.7	0	0.3		37.3	54.2	8.5		
PHF	.000	.906	.550	.899	.927	.000	.250	.930	.786	.615	.417	.738	.916
Passenger Cars	0	889	11	900	379	0	1	380	21	31	2	54	1334
% Passenger Cars	0	98.6	100	98.6	99.2	0	100	99.2	95.5	96.9	40.0	91.5	98.5
Heavy Vehicles	0	4	0	4	0	0	0	0	1	1	0	2	6
% Heavy Vehicles	0	0.4	0	0.4	0	0	0	0	4.5	3.1	0	3.4	0.4
Busses	0	9	0	9	3	0	0	3	0	0	3	3	15
% Busses	0	1.0	0	1.0	0.8	0	0	0.8	0	0	60.0	5.1	1.1

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

/S: Independence Drive
/: Gerry Road
rookline, MA

File Name : 389 Independence & Gerry PM
Site Code : 00389002
Start Date : 4/12/2012
Page No : 2



MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

/S: Independence Drive
: Thornton Road
/: Sherman Road
rookline, MA

File Name : 389 Independence & Sherman PM
Site Code : 00389992
Start Date : 4/11/2012
Page No : 1

Groups Printed- Passenger Cars - Heavy Vehicles - Busses

	Independence Drive From North					Thornton Road From East					Independence Drive From South					Sherman Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:00 PM	7	182	5	6	200	1	0	2	2	5	2	86	7	0	95	1	0	0	0	1	301
04:15 PM	14	210	2	8	234	1	0	2	3	6	2	77	4	0	83	0	0	0	0	0	323
04:30 PM	14	205	5	2	226	5	0	3	2	10	4	85	7	1	97	0	0	0	3	3	336
04:45 PM	16	226	3	1	246	2	3	2	13	20	2	100	4	1	107	0	0	0	1	1	374
Total	51	823	15	17	906	9	3	9	20	41	10	348	22	2	382	1	0	0	4	5	1334
05:00 PM	10	223	6	3	242	4	4	3	5	16	10	91	6	2	109	0	0	0	1	1	368
05:15 PM	11	191	3	3	208	6	0	0	3	9	5	95	9	1	110	2	0	0	4	6	333
05:30 PM	16	188	8	4	216	1	1	2	5	9	1	110	8	0	119	2	0	0	0	2	346
05:45 PM	26	188	8	2	224	3	0	1	7	11	3	94	9	0	106	2	0	0	7	9	350
Total	63	790	25	12	890	14	5	6	20	45	19	390	32	3	444	6	0	0	12	18	1397
Grand Total	114	1613	40	29	1796	23	8	15	40	86	29	738	54	5	826	7	0	0	16	23	2731
Apprch %	6.3	89.8	2.2	1.6		26.7	9.3	17.4	46.5		3.5	89.3	6.5	0.6		30.4	0	0	69.6		
Total %	4.2	59.1	1.5	1.1	65.8	0.8	0.3	0.5	1.5	3.1	1.1	27	2	0.2	30.2	0.3	0	0	0.6	0.8	
Passenger Cars	110	1587	40	28	1765	23	8	14	38	83	29	724	51	5	809	7	0	0	13	20	2677
% Passenger Cars	96.5	98.4	100	96.6	98.3	100	100	93.3	95	96.5	100	98.1	94.4	100	97.9	100	0	0	81.2	87	98
Heavy Vehicles	4	15	0	0	19	0	0	1	0	1	0	7	3	0	10	0	0	0	0	0	30
% Heavy Vehicles	3.5	0.9	0	0	1.1	0	0	6.7	0	1.2	0	0.9	5.6	0	1.2	0	0	0	0	0	1.1
Busses	0	11	0	1	12	0	0	0	2	2	0	7	0	0	7	0	0	0	3	3	24
% Busses	0	0.7	0	3.4	0.7	0	0	0	5	2.3	0	0.9	0	0	0.8	0	0	0	18.8	13	0.9

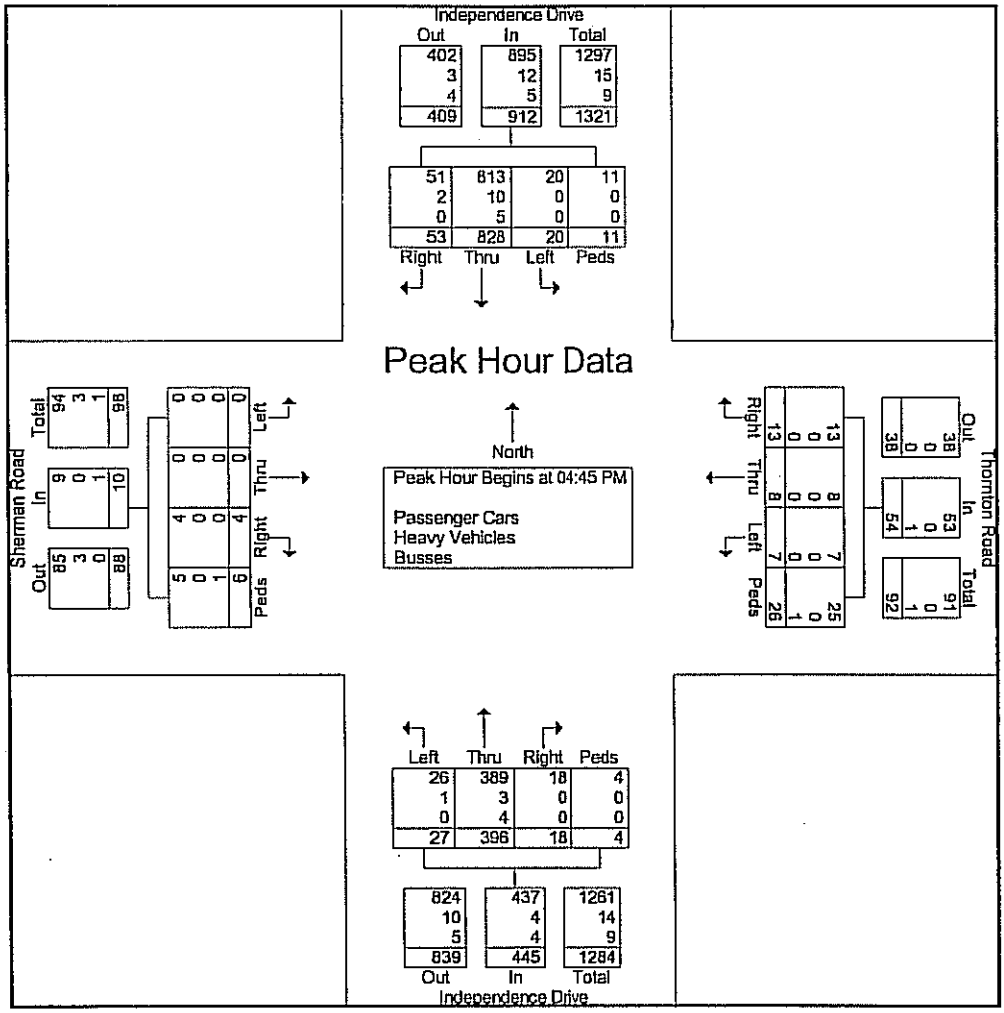
	Independence Drive From North					Thornton Road From East					Independence Drive From South					Sherman Road From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
eak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
eak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	16	226	3	1	246	2	3	2	13	20	2	100	4	1	107	0	0	0	1	1	374
05:00 PM	10	223	6	3	242	4	4	3	5	16	10	91	6	2	109	0	0	0	1	1	368
05:15 PM	11	191	3	3	208	6	0	0	3	9	5	95	9	1	110	2	0	0	4	6	333
05:30 PM	16	188	8	4	216	1	1	2	5	9	1	110	8	0	119	2	0	0	0	2	346
Total Volume	53	828	20	11	912	13	8	7	26	54	18	396	27	4	445	4	0	0	6	10	1421
% App. Total	5.8	90.8	2.2	1.2		24.1	14.8	13	48.1		4	89	6.1	0.9		40	0	0	60		
PHF	.828	.916	.625	.688	.927	.542	.500	.583	.500	.675	.450	.900	.750	.500	.935	.500	.000	.000	.375	.417	.950
Passenger Cars	51	813	20	11	895	13	8	7	25	53	18	369	26	4	437	4	0	0	5	9	1394
% Passenger Cars																					
Heavy Vehicles	2	10	0	0	12	0	0	0	0	0	0	3	1	0	4	0	0	0	0	0	16
% Heavy Vehicles	3.8	1.2	0	0	1.3	0	0	0	0	0	0	0.8	3.7	0	0.9	0	0	0	0	0	1.1
Busses	0	5	0	0	5	0	0	0	1	1	0	4	0	0	4	0	0	0	1	1	11
% Busses	0	0.6	0	0	0.5	0	0	0	3.8	1.9	0	1.0	0	0	0.9	0	0	0	16.7	10.0	0.8

MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA 01752

N/S: Independence Drive
E: Thornton Road
W: Sherman Road
Brookline, MA

File Name : 389 Independence & Sherman PM
Site Code : 00389992
Start Date : 4/11/2012
Page No : 2



□ Seasonal Data

SECTION I - CONTINUOUS COUNTING STATION MONTHLY AVERAGE DAILY TRAFFIC

STATION 407 - STONEHAM - RTE.28 - SOUTH OF THE READING T.L.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	April Adjustment to Year	
05	24,692	25,048	25,554	26,393	27,399	28,075	27,036	26,807	26,827	26,455	25,775	26,238	26,358	1.00	
	0%	0%	1%	-1%	-1%	-2%	-6%	1%	2%	1%	1%	5%	0%		
06	24,794	24,974	25,912	26,170	27,152	27,647	25,416	27,000	27,303	26,745	26,032	27,473	26,385	1.01	
	-2%	-4%	-3%	-3%	0%	-1%	0%	-2%	-6%	-3%	-3%	-7%	-3%		
07	24,339	24,072	25,117	25,508	27,159	27,355	25,461	26,342	25,778	*25,865*	25,342	25,426	25,647	1.01	
	-2%	-2%	-4%	-10%	-5%	-6%	-4%	-7%	-3%	-2%	0%	-4%	-4%		
08	23,897	23,709	24,028	22,893	25,770	25,669	24,456	24,404	25,003	25,300	25,300	24,296	24,560	1.07	
	-10%	-2%	-2%	8%	-3%	0%	2%	2%	-1%	0%	0%	3%	0%		
09	21,518	23,353	23,554	24,826	25,021	25,667	24,960	24,938	24,654	25,210	25,210	24,994	24,492	0.99	
												Growth	-2%	1.01	Sub Average

STATION 614 - RANDOLPH - RTE.24 - SOUTH OF RTE.I-93 (1)

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR		
05	119,000	121,184	123,223	128,608	127,310	135,164	130,146	133,821	129,886	123,751	128,046	*124,896*	127,086	0.99	
	3%	2%	6%	0%	1%	-2%	0%	1%	2%	5%	0%	1%	1%		
06	123,060	123,169	130,137	128,491	128,820	132,199	129,676	135,276	132,227	129,505	127,795	*126,164*	128,877	1.00	
	-1%	0%	-2%	-1%	2%	2%	2%	1%	0%	1%	-1%	-8%	-1%		
07	121,683	122,694	127,140	126,924	130,976	134,806	131,719	136,567	131,816	131,260	126,041	*115,585*	128,101	1.01	
	-4%	-3%	-3%	0%	-3%	-5%	-4%	-9%	-5%	-4%	-4%	1%	-4%		
08	116,613	119,616	123,196	126,571	126,472	128,066	126,758	123,866	125,489	125,476	120,744	*116,408*	123,273	0.97	
	0%	1%	0%	1%	1%	2%	3%	5%	3%	0%	0%	-5%	1%		
09	116,594	121,345	122,585	127,228	128,084	130,659	130,016	129,518	128,757	125,031	121,296	*110,661*	124,315	0.98	
												Growth	-1%	0.99	Sub Average

STATION 703 - ABINGTON - RTE.123 - AT THE BROCKTON C.L.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR		
05	11,765	13,137	13,345	13,910	13,694	14,536	13,543	13,701	13,854	13,505	13,683	*13,585*	13,522	0.97	
	7%	-1%	3%	-1%	1%	-2%	-5%	-3%	-1%	2%	0%	1%	0%		
06	12,635	13,053	13,787	13,800	13,829	14,197	12,875	13,252	13,744	13,804	13,637	*13,677*	13,524	0.98	
	1%	1%	-2%	-1%	0%	-3%	3%	2%	-1%	-1%	-3%	-7%	-1%		
07	12,725	13,219	13,457	13,826	13,808	13,831	13,234	*13,490*	13,544	13,620	13,289	12,763	13,364	0.98	
	-2%	-2%	-2%	0%	-3%	-3%	-2%	-5%	1%	1%	-2%	2%	-1%		
08	12,431	12,909	13,144	13,662	13,430	13,479	13,027	*12,806*	13,646	13,740	13,012	13,034	13,193	0.97	
	-1%	2%	1%	1%	-1%	3%	3%	3%	3%	0%	1%	2%	1%		
09	12,251	13,199	13,301	13,860	13,231	13,817	13,354	*13,212*	14,037	13,712	13,161	13,327	13,372	0.96	
												Growth	0%	0.97	Sub Average

STATION 6255 - WEYMOUTH - RTE.3 - NORTH OF RTE.18

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR		
05	118,000	121,374	124,011	136,739	136,980	149,033	144,695	147,221	137,210	133,034	134,233	131,016	134,629	0.98	
	8%	7%	9%	-1%	-1%	-5%	-2%	-1%	0%	2%	-2%	2%	1%		
06	127,860	130,036	134,769	134,790	137,305	142,198	141,532	145,144	137,785	135,232	131,943	133,004	135,967	1.01	
	-7%	-3%	-3%	-1%	-1%	-2%	-1%	-2%	-3%	-1%	-2%	-5%	-3%		
08	108,948	123,432	127,432	131,442	134,698	137,617	138,002	139,131	130,855	132,275	125,709	119,851	129,116	0.98	
	10%	0%	-2%	2%	0%	4%	4%	4%	7%	4%	10%	14%	5%		
09	120,200	123,983	124,607	134,354	135,239	143,114	143,685	144,937	140,079	137,288	138,708	136,428	135,235	1.01	
												Growth	1%	1.00	Sub Average

STATION 8087 - REVERE - RTE.1A - NORTH OF BOSTON C.L.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR		
05	49,125	53,613	55,733	57,663	57,512	60,228	58,555	58,898	56,798	56,786	55,613	54,493	56,251	0.98	
	8%	-1%	2%	-1%	-1%	-3%	-7%	-6%	-7%	-5%	-7%	-1%	-2%		
06	53,276	53,314	56,873	57,216	56,657	58,423	54,665	*55,500*	52,762	54,068	51,844	53,766	54,864	0.96	
	-4%	5%	1%	-2%	2%	-3%	7%	7%	6%	5%	7%	2%	3%		
07	51,257	56,029	57,187	55,957	57,823	56,862	58,429	59,406	57,008	56,550	55,363	54,614	56,374	1.01	
	-1%	-7%	-7%	-2%	-7%	-3%	-4%	-6%	-7%	-12%	-16%	-9%	-7%		
08	50,564	52,011	53,000	54,681	54,027	55,312	55,872	55,731	53,233	49,676	46,466	49,600	52,514	0.96	
	-5%	-1%	1%	-5%	-3%	4%	4%	4%	5%	13%	14%	5%	3%		
09	47,798	51,607	53,554	51,848	52,607	57,539	58,000	57,725	55,962	56,016	53,152	52,306	54,010	1.04	
												Growth	-1%	0.99	Sub Average

Average Adjusment Factors 0.99

Average Yearly Growth Calculated -0.49%

Yearly Growth Factor Used 1.0%

ITALICS = ESTIMATED DATA

MADT

- Crash Data

Moving Massachusetts Forward.
massDOT
Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Brookline, MA COUNT DATE : Apr-12

DISTRICT : 6 UNSIGNALIZED : [ ] SIGNALIZED : [X]

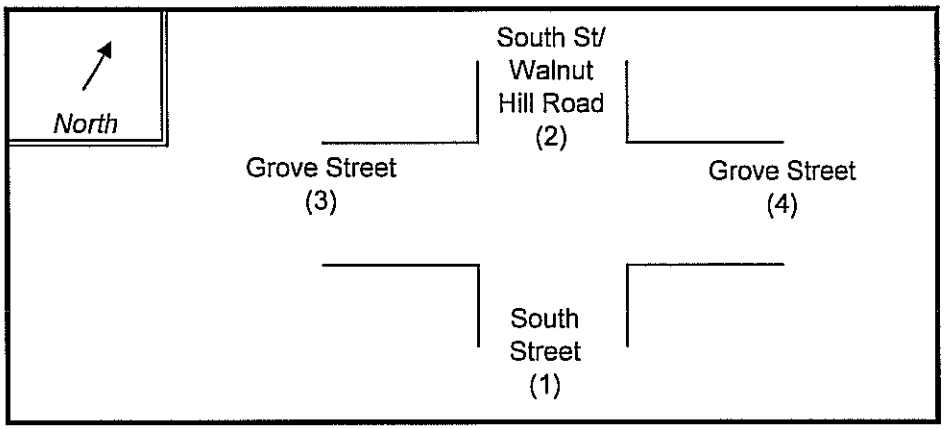
~ INTERSECTION DATA ~

MAJOR STREET : Grove Street

MINOR STREET(S) : South Street

Walnut Hill Road

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (PM) :	75	47	448	1,010		1,580

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **17,556**

TOTAL # OF CRASHES : 4 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **1.33**

CRASH RATE CALCULATION : **0.21**

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

Comments : 2013 Existing Traffic Volumes; MassDOT Rates: Signalized = 0.76, Unsignalized = 0.58

Project Title & Date: 389 - Brookline (Hancock Village)

Moving Massachusetts Forward. massDOT Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Brookline, MA COUNT DATE : Apr-12

DISTRICT : 6 UNSIGNALIZED : [ ] SIGNALIZED : [X]

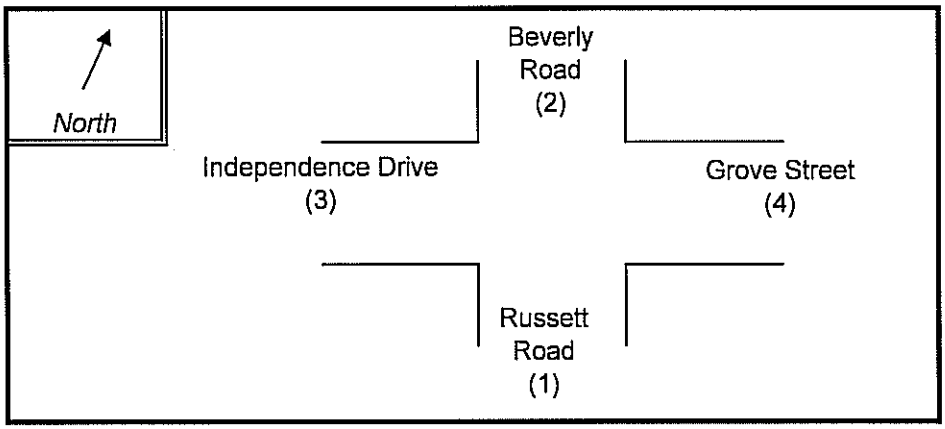
~ INTERSECTION DATA ~

MAJOR STREET : Grove Street/Independence Drive

MINOR STREET(S) : Beverly Road

Russett Road

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (PM) :	19	89	451	922		1,481

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **16,456**

TOTAL # OF CRASHES : 1 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.33**

CRASH RATE CALCULATION : 0.06 RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : 2013 Existing Traffic Volumes; MassDOT Rates: Signalized = 0.76, Unsignalized = 0.58

Project Title & Date: 389 - Brookline (Hancock Village)

Moving Massachusetts Forward.
massDOT
Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Brookline, MA COUNT DATE : Apr-12

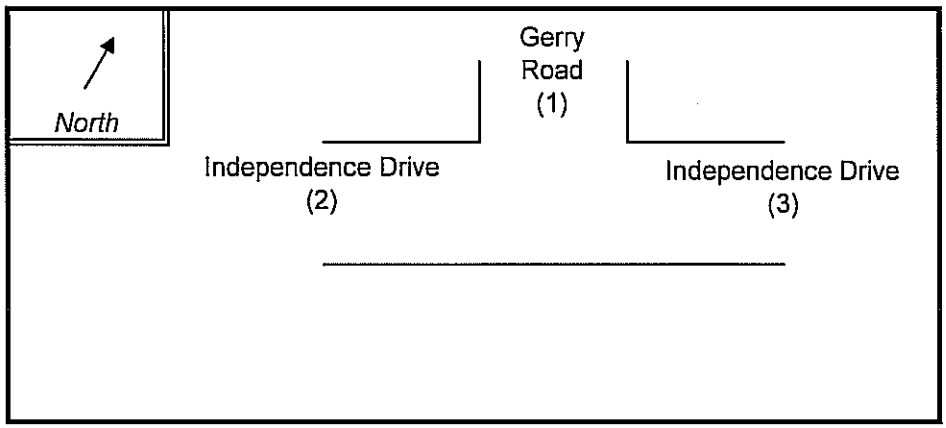
DISTRICT : 6 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Independence Drive

MINOR STREET(S) : Gerry Road

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	SB			
PEAK HOURLY VOLUMES (PM) :	419	911	54			1,384

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **15,378**

TOTAL # OF CRASHES : 3 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **1.00**

CRASH RATE CALCULATION : **0.18** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : 2013 Existing Traffic Volumes; MassDOT Rates: Signalized = 0.76, Unsignalized = 0.58

Project Title & Date: 389 - Brookline (Hancock Village)

Moving Massachusetts Forward.
massDOT
Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Brookline, MA COUNT DATE : Apr-12

DISTRICT : 6 UNSIGNALIZED : X SIGNALIZED :

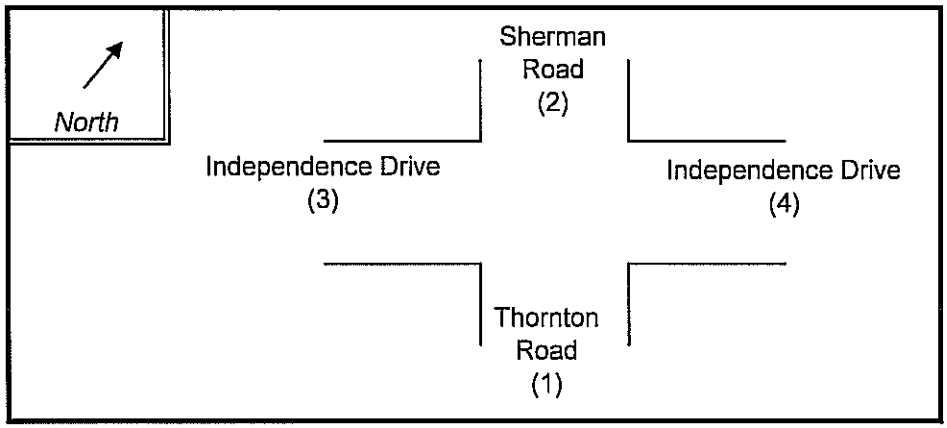
~ INTERSECTION DATA ~

MAJOR STREET : Independence Drive

MINOR STREET(S) : Sherman Road

Thornton Road

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (PM) :	451	933	28	0		1,412

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **15,689**

TOTAL # OF CRASHES : 3 # OF YEARS : 3 AVERAGE # OF CRASHES PER YEAR (**A**) : **1.00**

CRASH RATE CALCULATION : **0.17** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : 2013 Existing Traffic Volumes; MassDOT Rates: Signalized = 0.76, Unsignalized = 0.58

Project Title & Date: 389 - Brookline (Hancock Village)

massDOT

MassDOT Crash Report for BROOKLINE for the year 2009

Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Nonfatal Injuries	Total Fatal Injuries	Manner of Collision	Vehicle Action Prior to Crash	Vehicle Travel Directions	Most Harmful Events	Vehicle Configuration	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milemarker	Distance from Nearest Exit	Distance from Nearest Landmark	Non Motorist Type
Independence Drive at Sherman Road/Thornton Road																			
14-May-2009	8:00 AM	Non-fatal injury	2	3	0	Angle	V1: Travelling straight ahead / V2:Entering traffic lane	V1:Eastbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2:Passenger car	Dry	Daylight	Clear	INDEPENDENCE DRIVE / THORNTON ROAD					
Independence Drive at Gerry Road																			
06-Mar-2009	2:48 PM	Property damage only (none injured)	2	0	0	Not reported	V1: Entering traffic lane / V2:Travelling straight ahead	V1:Eastbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	Not reported	Not reported	Not Reported	GERRY ROAD / INDEPENDENCE DRIVE					
31-Mar-2009	7:35 AM	Non-fatal injury	1	1	0	Single vehicle crash	V1: Turning left	V1:Eastbound	V1: Collision with pedestrian	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	Dry	Daylight	Clear	INDEPENDENCE DRIVE / GERRY ROAD					P2:Pedestrian
Grove Street at South Street/Walnut Hill Road																			
05-Feb-2009	8:10 AM	Property damage only (none injured)	1	0	0	Single vehicle crash	V1: Travelling straight ahead	V1:Northbound	V1: Collision with motor vehicle in traffic	V1: Passenger car	Dry	Daylight	Cloudy	GROVE STREET / SOUTH STREET					
02-Dec-2009	5:40 PM	Property damage only (none injured)	2	0	0	Angle	V1: Turning left / V2:Travelling straight ahead	V1:Westbound / V2:Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2:Passenger car	Dry	Dark - lighted roadway	Clear	GROVE STREET / SOUTH STREET					

massDOT

MassDOT Crash Report for BROOKLINE for the year 2010

Crash Number	City/Town Name	Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Nonfatal Injuries	Total Fatal Injuries	Manner of Collision	Vehicle Action Prior to Crash	Vehicle Travel Directions	Most Harmful Events	Vehicle Configuration	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milemarker	Distance from Nearest Exit	Distance from Nearest Landmark	Hit and Run Type
Grove Street at South Street/Walnut Street																					
2730931	BROOKLINE	26-Oct-2010	8:26 PM	Not Reported	2	0	0	Rear-end	V1: Travelling straight ahead / V2: Travelling straight ahead	V1: Eastbound / V2: Southbound	V1: Not reported / V2: Not reported	V1: Not reported / V2: Not reported	Wet	Daylight	Clear	GROVE STREET / NEWTON STREET / SOUTH STREET					

massDOT

MassDOT Crash Report for BROOKLINE or the year 2011

Crash Number	City/Town Name	Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Nonfatal Injuries	Total Fatal Injuries	Manner of Collision	Vehicle Action Prior to Crash	Vehicle Travel Direction	Most Harmful Event	Vehicle Configuration	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Mile/Marker	Distance from Nearest Exit	Distance from Nearest Landmark	Non Motorist Type
Independence Drive at Sherman Road/Thornton Road																					
2700954	BROOKLINE	06-Feb-2011	5:25 PM	Non-fatal injury	2	1	0	Rear-end	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic	V1: Eastbound / V2: Eastbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Not reported / V2: Not reported	Wet	Dark - lighted roadway	Cloudy/Clear	INDEPENDENCE DRIVE / SHERMAN ROAD					
2835403	BROOKLINE	22-Nov-2011	2:30 PM	Non-fatal injury	4	1	0	Rear-end	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic / V3: Slowing or stopped in traffic / V4: Travelling straight ahead	V1: Southbound / V2: Southbound / V3: Southbound / V4: Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic / V4: Collision with motor vehicle in traffic	V1: Not reported / V2: Not reported / V3: Not reported / V4: Not reported	Dry	Daylight	Cloudy	INDEPENDENCE DRIVE / SHERMAN ROAD					
Independence Drive at Gerry Road																					
2700962	BROOKLINE	02-Mar-2011	8:40 AM	Property damage only (none injured)	2	0	0	Rear-end	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1: Northbound / V2: Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Not reported / V2: Not reported	Dry	Daylight	Clear		45 INDEPENDENCE DRIVE / GERRY ROAD				
Independence Drive/Grove Street at Russett Road/Beverly Road																					
2948219	BROOKLINE	03-Dec-2011	9:05 PM	Non-fatal injury	2	1	0	Angle	V1: Turning left / V2: Travelling straight ahead	V1: Southbound / V2: Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car	Dry	Dark - lighted roadway	Clear	INDEPENDENCE DRIVE / RUSSETT ROAD / GROVE STREET					
Grove Street at South Street/Walnut Hill Road																					
2786848	BROOKLINE	02-May-2011	3:40 PM	Property damage only (none injured)	1	0	0	Single vehicle crash	V1: Travelling straight ahead	V1: Southbound	V1: Collision with pedestrian	V1: Passenger car	Dry	Daylight	Clear		210 GROVE STREET				

massDOT

MassDOT Crash Report for BOSTON for the year 2009

Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Nonfatal Injuries	Total Fatal Injuries	Manner of Collision	Vehicle Action Prior to Crash	Vehicle Travel Directions	Most Harmful Events	Vehicle Configuration	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milepost/Exit	Distance from Nearest Exit	Distance from Nearest Landmark	Non Motorist Type

massDOT

MassDOT Crash Report for BOSTON for the year 2010

Crash Number	City/Town Name	Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Nonfatal Injuries	Total Fatal Injuries	Manner of Collision	Vehicle Action Prior to Crash	Vehicle Travel Directions	Most Harmful Events	Vehicle Configuration	Road Surface Condition	Ambient Light	Weather Condition	At Roadway/Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milepost	Distance from Nearest Exit	Distance from Nearest Landmark	Item Material Type

No reported crashes at the study intersections

MassDOT Crash Report for BOSTON for the year 2011

Crash Number	City/Town Name	Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Nonfatal Injuries	Total Fatal Injuries	Manner of Collision	Vehicle Action Prior to Crash	Vehicle Travel Direction	Most Harmful Events	Vehicle Configuration	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milemarker	Distance from Nearest Exit	Distance from Nearest Landmark	Non Motorist Type
No reported crashes at the study intersections																					

□ Stopping Sight Distance Calculations

Stopping Sight Distance

Independence Drive at Proposed Site Driveway (East)

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	EB	35	128.625	117.6	246.2
Direction 2	WB	35	128.625	117.6	246.2

INPUTS	Direction 1	Direction 2
Travel Direction	EB	WB
Speed	35	35
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = 1.075 x V^2 / a

Where:
t = reaction time (sec)
V = travel speed (mph)
a - deceleration rate (ft/sec^2)

Stopping Sight Distance

Independence Drive at Proposed Site Driveway (West)

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	EB	35	128.625	117.6	246.2
Direction 2	WB	35	128.625	117.6	246.2

INPUTS	Direction 1	Direction 2
Travel Direction	EB	WB
Speed	35	35
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = 1.075 x V^2 / a

Where:
t = reaction time (sec)
V = travel speed (mph)
a - deceleration rate (ft/sec^2)

Stopping Sight Distance

Russet Road at Site Drive (Asheville Road)

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	SB	30	110.25	86.4	196.6
Direction 2	NB	30	110.25	86.4	196.6

INPUTS	Direction 1	Direction 2
Travel Direction	SB	NB
Speed	30	30
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = 1.075 x V^2 / a

Where:
t = reaction time (sec)
V = travel speed (mph)
a - deceleration rate (ft/sec^2)

Stopping Sight Distance

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	WB	15	55.125	25.7	80.8
Direction 2	EB	15	55.125	18.2	73.3

INPUTS	Direction 1	Direction 2
Travel Direction	WB	EB
Speed	15	15
Grade	-0.056	0.064
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

□ Public Transportation Information

AMERICAN FactFinder

QT-P23

Journey to Work: 2000

Census 2000 Summary File 3 (SF 3) - Sample Data

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Census Tract 4012, Norfolk County, Massachusetts	
	Number	Percent
MEANS OF TRANSPORTATION AND CARPOOLING		
Workers 16 and over	2,306	100.0
Car, truck, or van	1,789	77.6
Drove alone	1,563	67.8
Carpooled	226	9.8
In 2-person carpool	182	7.9
In 3-person carpool	14	0.6
In 4-person carpool	30	1.3
In 5- or 6-person carpool	0	0.0
In 7-or-more-person carpool	0	0.0
Workers per car, truck, or van	1.07	(X)
Public transportation	302	13.1
Bus or trolley bus	81	3.5
Streetcar or trolley car (público in Puerto Rico)	46	2.0
Subway or elevated	138	6.0
Railroad	28	1.2
Ferryboat	0	0.0
Taxicab	9	0.4
Motorcycle	0	0.0
Bicycle	10	0.4
Walked	11	0.5
Other means	12	0.5
Worked at home	182	7.9
TRAVEL TIME TO WORK		
Workers who did not work at home	2,124	100.0
Less than 10 minutes	143	6.7
10 to 14 minutes	116	5.5
15 to 19 minutes	190	8.9
20 to 24 minutes	392	18.5
25 to 29 minutes	250	11.8
30 to 34 minutes	360	16.9
35 to 44 minutes	214	10.1
45 to 59 minutes	271	12.8
60 to 89 minutes	149	7.0
90 or more minutes	39	1.8
Mean travel time to work (minutes)	31.1	(X)
TIME LEAVING HOME TO GO TO WORK		
Workers who did not work at home	2,124	100.0
5:00 to 5:59 a.m.	24	1.1
6:00 to 6:29 a.m.	90	4.2
6:30 to 6:59 a.m.	96	4.5
7:00 to 7:29 a.m.	278	13.1
7:30 to 7:59 a.m.	486	22.9
8:00 to 8:29 a.m.	566	26.6

Subject	Census Tract 4012, Norfolk County, Massachusetts	
	Number	Percent
8:30 to 8:59 a.m.	228	10.7
9:00 to 11:59 a.m.	242	11.4
12:00 to 3:59 p.m.	62	2.9
All other times	52	2.4

(X) Not applicable.

Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P31, P33, P34, and P35.

AMERICAN FactFinder

QT-P23

Journey to Work: 2000

Census 2000 Summary File 3 (SF 3) - Sample Data

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

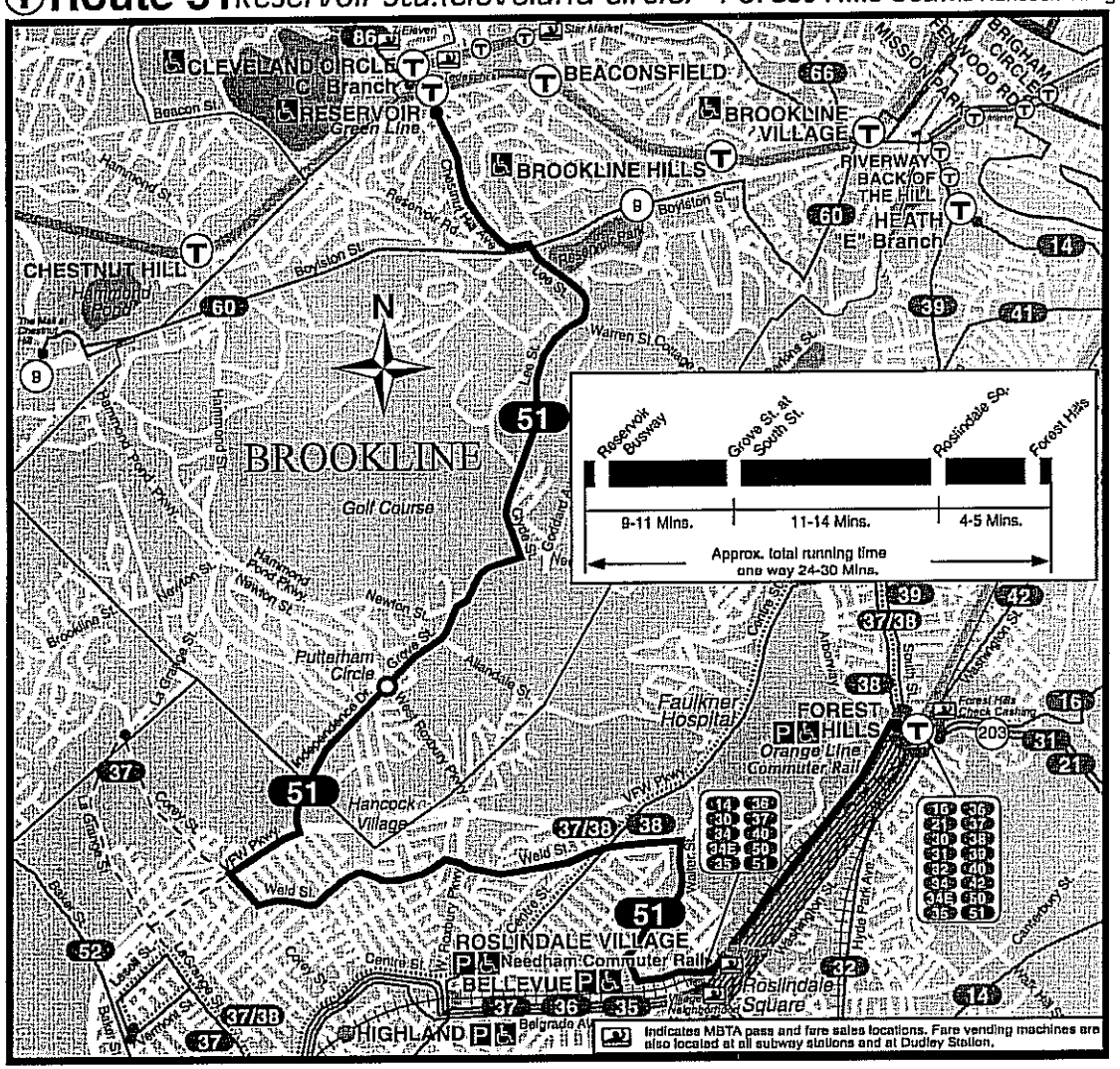
Subject	Census Tract 1301, Suffolk County, Massachusetts	
	Number	Percent
MEANS OF TRANSPORTATION AND CARPOOLING		
Workers 16 and over	2,546	100.0
Car, truck, or van	2,016	79.2
Drove alone	1,784	70.1
Carpooled	232	9.1
In 2-person carpool	172	6.8
In 3-person carpool	29	1.1
In 4-person carpool	7	0.3
In 5- or 6-person carpool	0	0.0
In 7-or-more-person carpool	24	0.9
Workers per car, truck, or van	1.07	(X)
Public transportation	379	14.9
Bus or trolley bus	96	3.8
Streetcar or trolley car (público in Puerto Rico)	17	0.7
Subway or elevated	103	4.0
Railroad	163	6.4
Ferryboat	0	0.0
Taxicab	0	0.0
Motorcycle	0	0.0
Bicycle	0	0.0
Walked	63	2.5
Other means	0	0.0
Worked at home	88	3.5
TRAVEL TIME TO WORK		
Workers who did not work at home	2,458	100.0
Less than 10 minutes	110	4.5
10 to 14 minutes	252	10.3
15 to 19 minutes	372	15.1
20 to 24 minutes	372	15.1
25 to 29 minutes	209	8.5
30 to 34 minutes	495	20.1
35 to 44 minutes	191	7.8
45 to 59 minutes	312	12.7
60 to 89 minutes	111	4.5
90 or more minutes	34	1.4
Mean travel time to work (minutes)	28.4	(X)
TIME LEAVING HOME TO GO TO WORK		
Workers who did not work at home	2,458	100.0
5:00 to 5:59 a.m.	48	2.0
6:00 to 6:29 a.m.	211	8.6
6:30 to 6:59 a.m.	221	9.0
7:00 to 7:29 a.m.	426	17.3
7:30 to 7:59 a.m.	346	14.1
8:00 to 8:29 a.m.	491	20.0

Subject	Census Tract 1301, Suffolk County, Massachusetts	
	Number	Percent
8:30 to 8:59 a.m.	257	10.5
9:00 to 11:59 a.m.	211	8.6
12:00 to 3:59 p.m.	114	4.6
All other times	133	5.4

(X) Not applicable.

Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P31, P33, P34, and P35.

Route 51 *Reservoir Sta.(Cleveland Circle) - Forest Hills Sta.* via Hancock Village



51

SUMMER June 22, 2013 - August 30, 2013

Reservoir Sta. (Cleveland Circle) - Forest Hills Sta.

Serving: Roslindale Square, Hancock Village and connections to the Orange & Green Lines and Needham Commuter Rail

Arrive times are approximate, subject to traffic.

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

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

Massachusetts Bay Transportation Authority

massDOT Massachusetts Department of Transportation

51 WEEKDAY

INBOUND			OUTBOUND		
Leave Reservoir Station	Arrive Roslindale Square	Arrive Forest Hills	Leave Forest Hills	Arrive Roslindale Square	Arrive Reservoir Station
6:35A	6:58A	7:05A	5:55A	5:58A	6:19A
7:00	7:23	7:30	6:20	6:23	6:48
7:25	7:49	7:57	6:45	6:50	7:15
7:50	8:15	8:23	7:10	7:15	7:44
8:11	8:36	8:44	7:30	7:34	8:07
8:40	9:04	9:10	8:00	8:04	8:32
9:03	9:24	9:30	8:25	8:29	8:54
9:28	9:49	9:55	8:50	8:55	9:20
9:52	10:13	10:19	9:15	9:22	9:46
10:50	11:11	11:17	10:15	10:19	10:44
11:50	12:14P	12:20P	11:15	11:19	11:44
12:50P	1:14P	1:20P	12:15P	12:19P	12:44P
1:50	2:14	2:18	1:15	1:19	1:44
2:24	2:49	2:53	1:45	1:49	2:12
2:54	3:21	3:27	2:15	2:20	2:44
3:18	3:45	3:51	2:39	2:44	3:07
3:42	4:09	4:15	3:03	3:10	3:36
4:06	4:33	4:39	3:27	3:34	4:00
4:30	4:57	5:03	3:51	3:58	4:24
4:54	5:21	5:27	4:15	4:22	4:48
5:18	5:45	5:51	4:39	4:46	5:12
5:42	6:09	6:15	5:03	5:10	5:36
6:06	6:32	6:37	5:27	5:34	6:00
6:30	6:53	6:58	5:51	5:58	6:23
6:54	7:17	7:22	6:15	6:20	6:45
7:20	7:40	7:44	6:39	6:44	7:09
8:01	8:22	8:26	7:30	7:34	7:56
9:01	9:22	9:26	8:30	8:34	8:56
10:01	10:22	10:26	9:30	9:34	9:56

51 SATURDAY

INBOUND			OUTBOUND		
Leave Reservoir Station	Arrive Roslindale Square	Arrive Forest Hills	Leave Forest Hills	Arrive Roslindale Square	Arrive Reservoir Station
6:47A	7:09A	7:14A	6:15A	6:20A	6:41A
7:47	8:09	8:14	7:15	7:20	7:44
8:47	9:09	9:14	8:15	8:20	8:44
9:47	10:09	10:14	9:15	9:20	9:44
10:47	11:09	11:14	10:15	10:20	10:44
11:47	12:11P	12:16P	11:15	11:20	11:44
12:47P	1:11P	1:16P	12:15P	12:20P	12:43P
1:47	2:11	2:16	1:15	1:20	1:43
2:47	3:11	3:16	2:15	2:20	2:43
3:47	4:11	4:16	3:15	3:20	3:43
4:47	5:11	5:16	4:15	4:20	4:43
5:47	6:10	6:13	5:15	5:20	5:43
6:47	7:09	7:14	6:15	6:20	6:42
7:47	8:09	8:14	7:15	7:20	7:42
8:45	9:05	9:10	8:15	8:20	8:41
9:45	10:05	10:10	9:15	9:20	9:41

ALL BUSES ARE ACCESSIBLE TO PERSONS WITH DISABILITIES

Route 51
Reservoir Station (Cleveland Circle) - Forest Hills Station via Hancock Village

NO SERVICE ON SUNDAY

FARES

PAYING WITH...	1-BUS TRIP	2-BUS TRIP	BUS + SUBWAY TRIP
CharlieCard	$1.50	$1.50	$2.00
CharlieTicket	$2.00	$2.00	$4.50
Cash onboard	$2.00	$4.00	$4.50
Student CharlieCard*	$0.75	$0.75	$1.00
Senior/TAP CharlieCard**	$0.75	$0.75	$1.00

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

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

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

Summer 2013 Holidays

July 4 : See Sunday September 2 : See Sunday

51 WEEKDAY

INBOUND			OUTBOUND		
Leave Reservoir Station	Arrive Roslindale Square	Arrive Forest Hills	Leave Forest Hills	Arrive Roslindale Square	Arrive Reservoir Station
6:35A	6:58A	7:05A	5:55A	5:58A	6:19A
7:00	7:23	7:30	6:20	6:23	6:48
7:25	7:49	7:57	us 6:35	6:39	7:00
s 7:40	8:06	8:14	us 6:45	6:49	7:10
7:50	8:15	8:23	6:45	6:50	7:15
8:11	8:36	8:44	7:10	7:15	7:44
8:40	9:04	9:10	7:30	7:34	8:07
9:03	9:24	9:30	8:00	8:04	8:32
9:28	9:49	9:55	8:25	8:29	8:54
9:52	10:13	10:19	8:50	8:55	9:20
10:50	11:11	11:17	9:15	9:22	9:46
11:50	12:14P	12:20P	10:15	10:19	10:44
			11:15	11:19	11:44
12:50P	1:14P	1:20P			
1:50	2:14	2:18	12:15P	12:19P	12:44P
2:24	2:49	2:53	1:15	1:19	1:44
2:54	3:21	3:27	1:45	1:49	2:12
us 3:20	3:41	3:47	2:15	2:20	2:44
3:18	3:45	3:51	2:39	2:44	3:07
gs 3:05	3:57	4:03	3:03	3:10	3:36
3:42	4:09	4:15	3:27	3:34	4:00
4:06	4:33	4:39	3:51	3:58	4:24
4:30	4:57	5:03	4:15	4:22	4:48
4:54	5:21	5:27	4:39	4:46	5:12
5:18	5:45	5:51	5:03	5:10	5:36
5:42	6:09	6:15	5:27	5:34	6:00
6:06	6:32	6:37	5:51	5:58	6:23
6:30	6:53	6:58	6:15	6:20	6:45
6:54	7:17	7:22	6:39	6:44	7:09
7:20	7:40	7:44	7:30	7:34	7:56
8:01	8:22	8:26	8:30	8:34	8:56
9:01	9:22	9:26	9:30	9:34	9:56
10:01	10:22	10:26			

g - Leaves from Greenough St. at Tappan St. via Putterham Circle and Newton St. at Arlington Rd.
s - Does NOT run during school vacation.
u - To/from Union Sq., Allston.

51 SATURDAY

INBOUND			OUTBOUND		
Leave Reservoir Station	Arrive Roslindale Square	Arrive Forest Hills	Leave Forest Hills	Arrive Roslindale Square	Arrive Reservoir Station
6:47A	7:06A	7:10A	6:15A	6:18A	6:38A
7:47	8:08	8:12	7:15	7:18	7:40
8:47	9:08	9:12	8:15	8:18	8:41
9:47	10:09	10:14	9:15	9:19	9:41
10:47	11:10	11:15	10:15	10:20	10:43
11:47	12:10P	12:15P	11:15	11:20	11:43
12:47P	1:10P	1:15P	12:15P	12:20P	12:44P
1:47	2:09	2:14	1:15	1:20	1:43
2:47	3:09	3:14	2:15	2:19	2:42
3:47	4:09	4:14	3:15	3:19	3:42
4:47	5:09	5:14	4:15	4:19	4:41
5:45	6:07	6:12	5:15	5:19	5:41
6:45	7:07	7:12	6:15	6:19	6:41
7:45	8:07	8:10	7:15	7:19	7:41
8:45	9:04	9:09	8:15	8:19	8:40
9:45	10:04	10:09	9:15	9:19	9:40

ALL BUSES ARE ACCESSIBLE TO PERSONS WITH DISABILITIES.

Route 51
Reservoir Station (Cleveland Circle) - Forest Hills Station via Hancock Village

NO SERVICE ON SUNDAY

FARES

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

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

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

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

Fall 2013 Holidays

Oct. 14: See Sat. Sept. 2, Nov. 28, Dec. 25: See Sun. Nov. 11: See Weekday

□ Growth Calculations

SECTION I - CONTINUOUS COUNTING STATION MONTHLY AVERAGE DAILY TRAFFIC

STATION 407 - STONEHAM - RTE.28 - SOUTH OF THE READING T.L.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	April Adjustment to Year	
05	24,692	25,048	25,554	26,393	27,399	28,075	27,038	26,807	26,827	26,455	25,775	26,238	26,358	1.00	
	0%	0%	1%	-1%	-1%	-2%	-6%	1%	2%	1%	1%	5%	0%		
06	24,794	24,974	25,912	26,170	27,152	27,647	25,416	27,000	27,303	26,745	26,032	27,473	26,385	1.01	
	-2%	-4%	-3%	-3%	0%	-1%	0%	-2%	-6%	-3%	-3%	-7%	-3%		
07	24,339	24,072	25,117	25,508	27,159	27,355	25,461	26,342	25,778	*25,865*	25,342	25,426	25,647	1.01	
	-2%	-2%	-4%	-10%	-5%	-6%	-4%	-7%	-3%	-2%	0%	-4%	-4%		
08	23,897	23,709	24,028	22,893	25,770	25,669	24,456	24,404	25,003	25,300	25,300	24,296	24,560	1.07	
	-10%	-2%	-2%	6%	-3%	0%	2%	2%	-1%	0%	0%	3%	0%		
09	21,516	23,353	23,554	24,826	25,021	25,667	24,960	24,938	24,654	25,210	25,210	24,994	24,492	0.99	
												Growth	-2%	1.01	Sub Average

STATION 614 - RANDOLPH - RTE.24 - SOUTH OF RTE.I-93 (1)

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR		
05	119,000	121,184	123,223	126,608	127,310	135,164	130,146	133,621	129,886	123,751	128,046	*124,896*	127,086	0.99	
	3%	2%	6%	0%	1%	-2%	0%	1%	2%	5%	0%	1%	1%		
06	123,060	123,169	130,137	128,491	128,820	132,199	129,676	135,276	132,227	129,505	127,795	*126,164*	128,877	1.00	
	-1%	0%	-2%	-1%	2%	2%	2%	1%	0%	1%	-1%	-8%	-1%		
07	121,683	122,694	127,140	126,924	130,976	134,806	131,719	136,567	131,816	131,260	126,041	*115,585*	128,101	1.01	
	-4%	-3%	-3%	0%	-3%	-5%	-4%	-9%	-5%	-4%	-4%	1%	-4%		
08	116,613	119,616	123,196	126,571	126,472	128,066	126,758	123,866	125,489	125,476	120,744	*116,408*	123,273	0.97	
	0%	1%	0%	1%	1%	2%	3%	5%	3%	0%	0%	-5%	1%		
09	116,594	121,345	122,585	127,228	128,084	130,659	130,018	129,518	128,757	125,031	121,296	*110,661*	124,315	0.98	
												Growth	-1%	0.99	Sub Average

STATION 703 - ABINGTON - RTE.123 - AT THE BROCKTON C.L.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR		
05	11,765	13,137	13,345	13,910	13,694	14,536	13,543	13,701	13,854	13,505	13,683	*13,585*	13,522	0.97	
	7%	-1%	3%	-1%	1%	-2%	-5%	-3%	-1%	2%	0%	1%	0%		
06	12,635	13,053	13,787	13,800	13,829	14,197	12,875	13,252	13,744	13,804	13,637	*13,677*	13,524	0.98	
	1%	1%	-2%	-1%	0%	-3%	3%	2%	-1%	-1%	-3%	-7%	-1%		
07	12,725	13,219	13,457	13,626	13,608	13,831	13,234	*13,490*	13,544	13,620	13,289	12,763	13,384	0.98	
	-2%	-2%	-2%	0%	-3%	-3%	-2%	-5%	1%	1%	-2%	2%	-1%		
08	12,431	12,909	13,144	13,662	13,430	13,479	13,027	*12,806*	13,646	13,740	13,012	13,034	13,193	0.97	
	-1%	2%	1%	1%	-1%	3%	3%	3%	3%	0%	1%	2%	1%		
09	12,251	13,199	13,301	13,860	13,231	13,817	13,354	*13,212*	14,037	13,712	13,161	13,327	13,372	0.96	
												Growth	0%	0.97	Sub Average

STATION 6255 - WEYMOUTH - RTE.3 - NORTH OF RTE.18

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR		
05	118,000	121,374	124,011	136,739	138,980	149,033	144,695	147,221	137,210	133,034	134,233	131,016	134,629	0.98	
	8%	7%	9%	-1%	-1%	-5%	-2%	-1%	0%	2%	-2%	2%	1%		
06	127,860	130,038	134,769	134,790	137,305	142,198	141,532	145,144	137,785	135,232	131,943	133,004	135,987	1.01	
	-7%	-3%	-3%	-1%	-1%	-2%	-1%	-2%	-3%	-1%	-2%	-5%	-3%		
08	108,948	123,432	127,432	131,442	134,698	137,617	138,002	139,131	130,855	132,275	125,709	119,851	129,116	0.98	
	10%	0%	-2%	2%	0%	4%	4%	4%	7%	4%	10%	14%	5%		
09	120,200	123,983	124,607	134,354	135,239	143,114	143,685	144,937	140,079	137,288	138,708	136,428	135,235	1.01	
												Growth	1%	1.00	Sub Average

STATION 8087 - REVERE - RTE.1A - NORTH OF BOSTON C.L.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR		
05	49,125	53,613	55,733	57,663	57,512	60,228	58,555	58,898	56,798	56,786	55,613	54,493	56,251	0.98	
	8%	-1%	2%	-1%	-1%	-3%	-7%	-6%	-7%	-5%	-7%	-1%	-2%		
06	53,276	53,314	56,873	57,216	56,657	58,423	54,665	*55,500*	52,762	54,068	51,844	53,766	54,864	0.96	
	-4%	5%	1%	-2%	2%	-3%	7%	7%	8%	5%	7%	2%	3%		
07	51,257	56,029	57,187	55,957	57,823	56,862	58,429	59,406	57,008	56,550	55,363	54,614	56,374	1.01	
	-1%	-7%	-7%	-2%	-7%	-3%	-4%	-6%	-7%	-12%	-16%	-9%	-7%		
08	50,564	52,011	53,000	54,681	54,027	55,312	55,872	55,731	53,233	49,676	46,466	49,600	52,514	0.96	
	-5%	-1%	1%	-5%	-3%	4%	4%	4%	5%	13%	14%	5%	3%		
09	47,798	51,607	53,554	51,848	52,607	57,539	58,000	57,725	55,962	56,016	53,152	52,306	54,010	1.04	
												Growth	-1%	0.99	Sub Average

Average Adjusment Factors 0.99

Average Yearly Growth Calculated -0.49%

Yearly Growth Factor Used 1.0%

ITALICS = ESTIMATED DATA

MADT

□ Trip Generation Calculations

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

28 Lord Road, Suite 280
Marlborough, MA 01752

Phone (508) 303-0370
Fax (508) 303-0371
www.mdmtrans.com

Project 389 - BROOKLINE
Sheet No. _____ of _____
Prepared By CJONES Date 9/4/13
Checked By _____ Date _____
Description EXISTING TRIP RATES

BASED ON THE TRIP GENERATION PRESENTED IN TABLE 1:

WEEKDAY AM PEAK HOUR

IN	93 trips/700 units	=	0.13 trips/unit
OUT	263 trips/700 units	=	0.38 trips/unit
TOTAL	356 trips/700 units	=	0.51 trips/unit

WEEKDAY PM PEAK HOUR:

IN	146 trips/700 units	=	0.21 trips/unit
OUT	108 trips/700 units	=	0.15 trips/unit
TOTAL	254 trips/700 units	=	0.36 trips/unit

Institute of Transportation Engineers (ITE) 9th Edition
Land Use Code (LUC) 220 - Apartment

Average Vehicle Trips Ends vs: Dwelling Units
Independent Variable (X): 184

AVERAGE WEEKDAY DAILY

T = 6.06 * (X) + 123.56
T = 6.06 * 184 + (123.56)
T = 1238.60
T = 1,238 vehicle trips
with 50% (**619** vpd) entering and 50% (**619** vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.49 * (X) + 3.73
T = 0.49 * 184 + (3.73)
T = 93.89
T = 94 vehicle trips
with 20% (**19** vph) entering and 80% (**75** vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.55 * (X) + 17.65
T = 0.55 * 184 + (17.65)
T = 118.85
T = 119 vehicle trips
with 65% (**77** vph) entering and 35% (**42** vph) exiting.

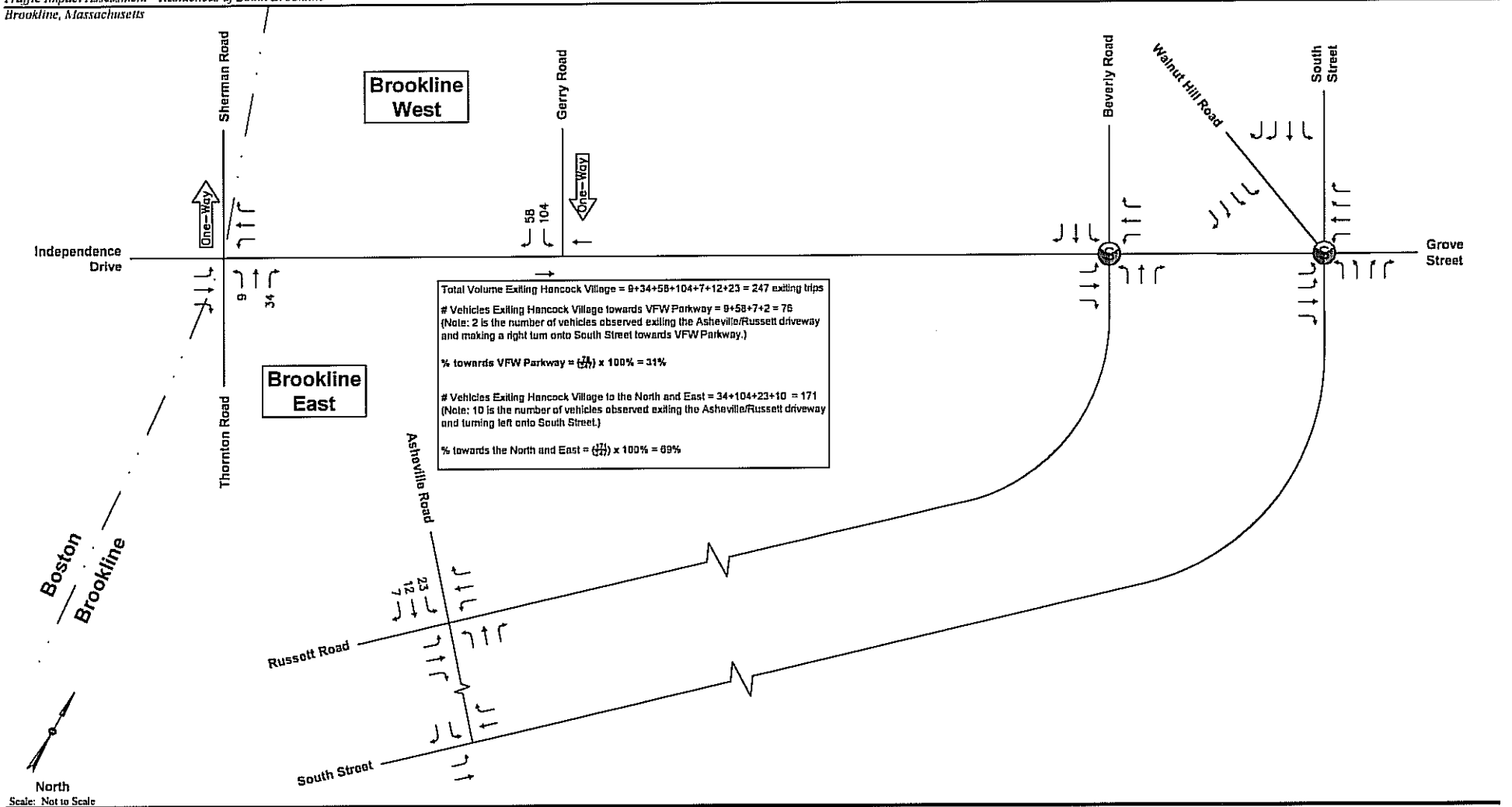
SATURDAY DAILY

T = 7.85 * (X) - 256.19
T = 7.85 * 184 - (256.19)
T = 1188.21
T = 1,188 vehicle trips
with 50% (**594** vpd) entering and 50% (**594** vpd) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

T = 0.41 * (X) + 19.23
T = 0.41 * 184 + (19.23)
T = 94.67
T = 94 vehicle trips
with 50% (**47** vph) entering and 50% (**47** vph) exiting.

□ Trip Distribution Calculations

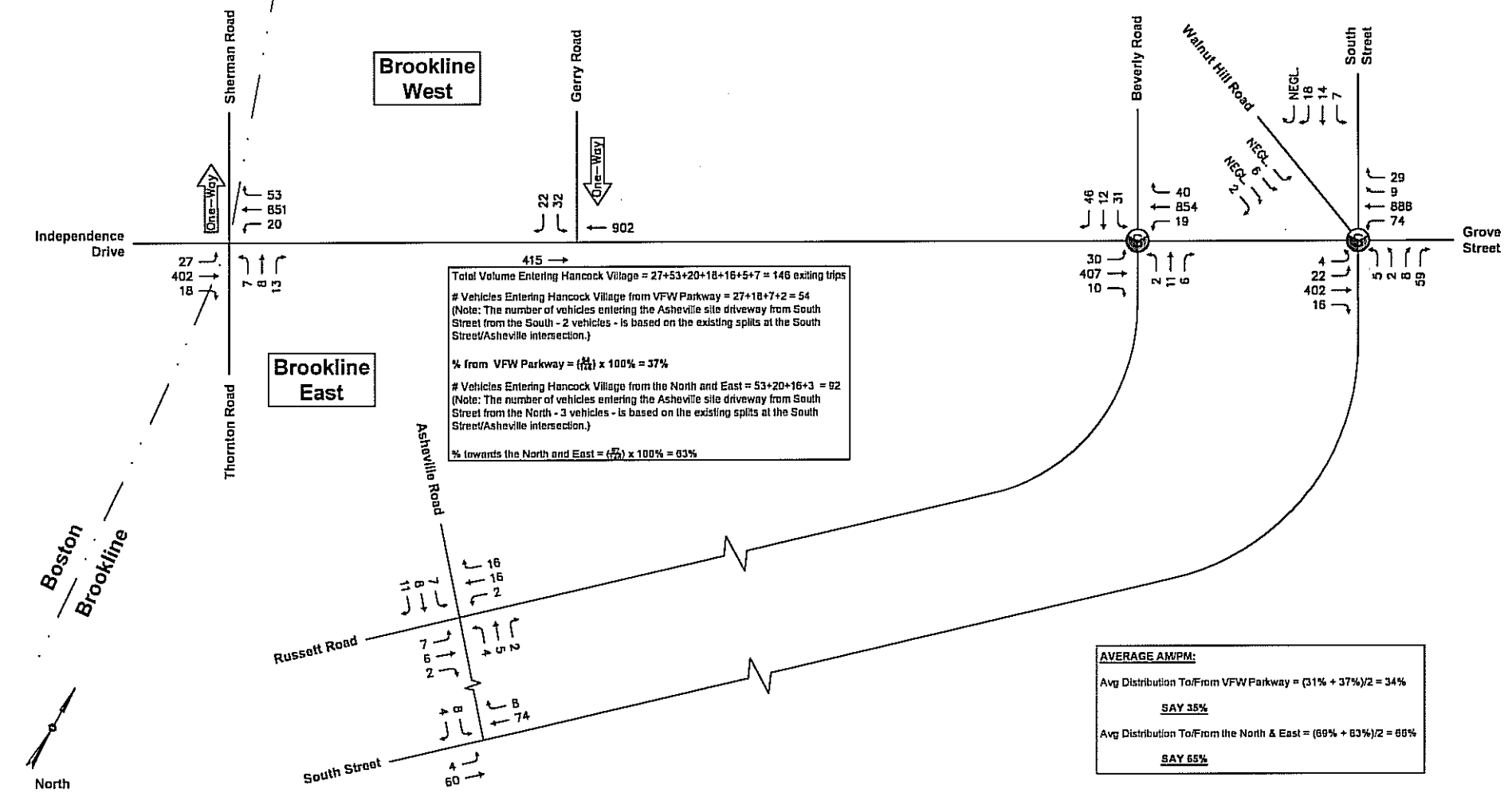


MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Attachments

Trip Distribution Calculations
Step 1
AM Peak Hour Distribution to/from VFW Parkway

Date: July 2014
Dwg No. 319 TIAS_40B_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.

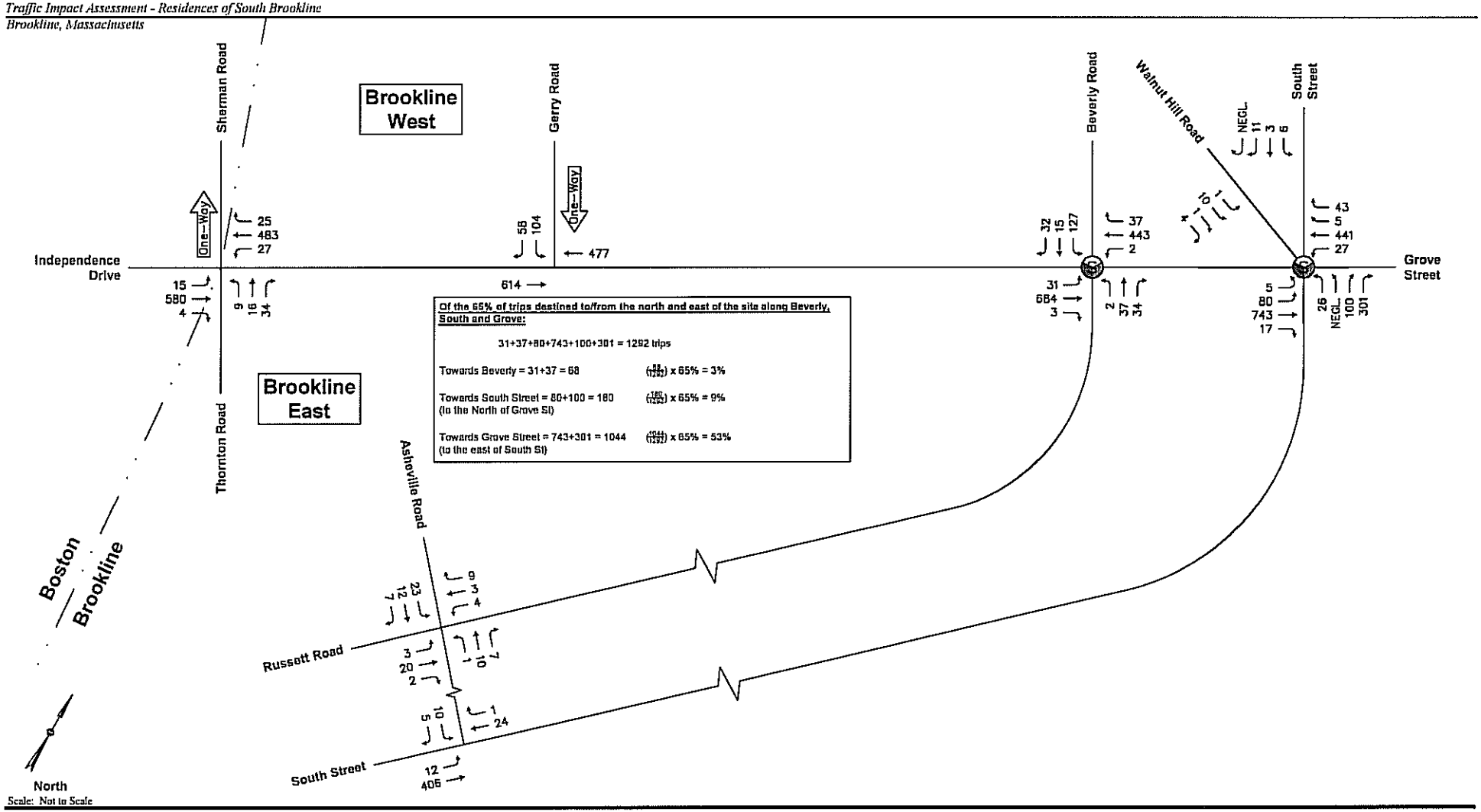


MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Attachments

Trip Distribution Calculations
Step 2
PM Peak Hour Distribution to/from VFW Parkway

Date: July 2014
Dwg No. 389 TIAS_40B_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.

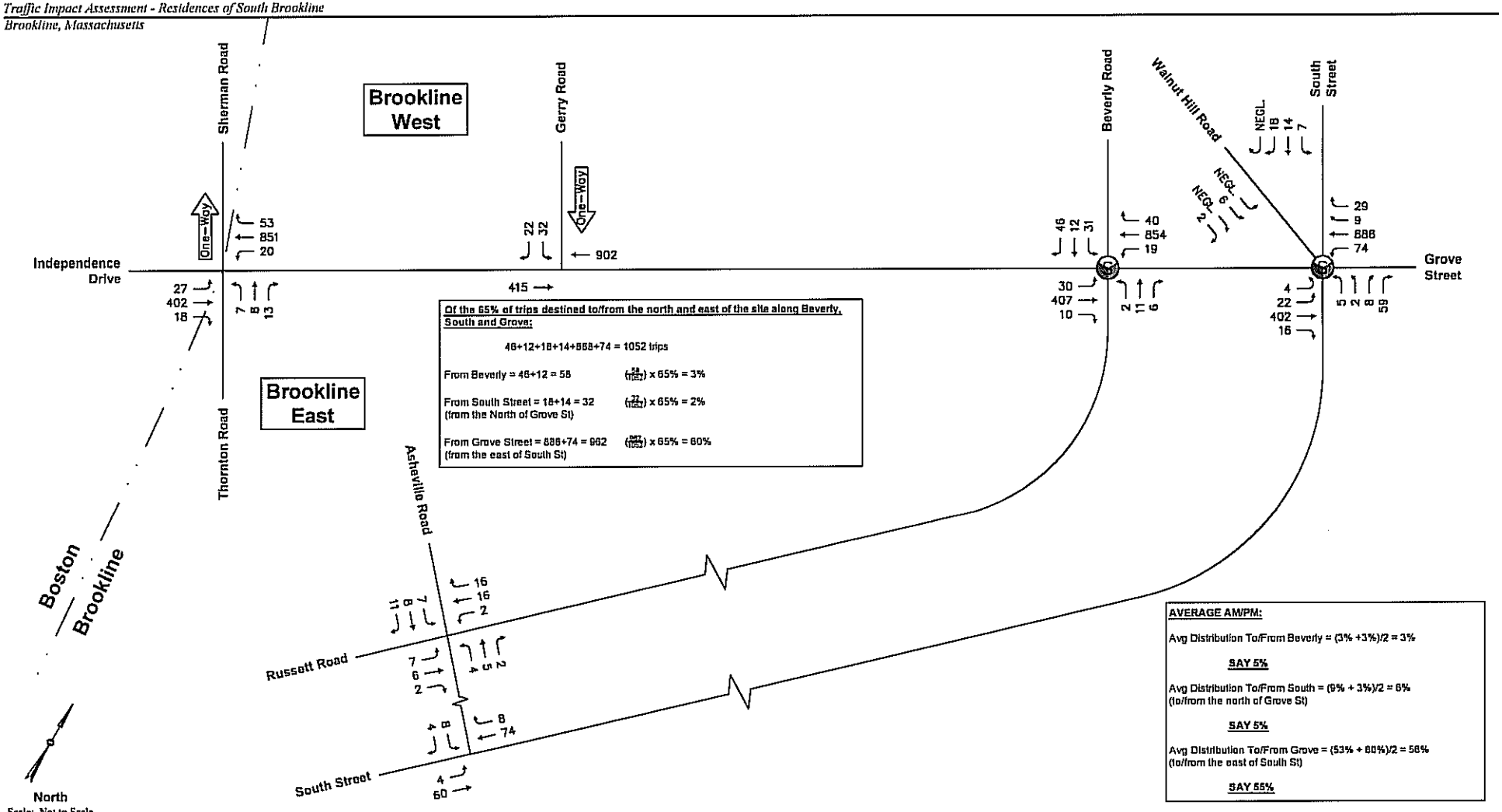


MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Attachments

Trip Distribution Calculations
Step 3
AM Peak Hour Distribution to/from Beverly Rd, South St, and Grove St

Date: July 2014
Dwg No. 389 TIAS_40B_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.



Of the 65% of trips destined to/from the north and east of the site along Beverly, South and Grove:

46+12+18+14+886+74 = 1052 trips

From Beverly = 46+12 = 58 $(\frac{58}{1052}) \times 65\% = 3\%$

From South Street = 18+14 = 32 (from the North of Grove St) $(\frac{32}{1052}) \times 65\% = 2\%$

From Grove Street = 886+74 = 960 (from the east of South St) $(\frac{960}{1052}) \times 65\% = 60\%$

AVERAGE AM/PM:

Avg Distribution To/From Beverly = (3% +3%)/2 = 3%

SAY 5%

Avg Distribution To/From South = (9% + 3%)/2 = 6% (to/from the north of Grove St)

SAY 5%

Avg Distribution To/From Grove = (53% + 60%)/2 = 56% (to/from the east of South St)

SAY 55%

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Attachments

Trip Distribution Calculations
Step 4
PM Peak Hour Distribution to/from Beverly Rd, South St, and Grove St

Date: July 2014
Dwg No. 389 TIAS_400_Updated_Jul 2014.dwg
Copyright © by MDM Transportation Consultants, Inc. All rights reserved.

- Capacity Analysis Worksheets

LEVEL OF SERVICE METHODOLOGY

Capacity analysis of intersections is developed using the Synchro® computer software, which implements the methods of the 2010 Highway Capacity Manual (HCM). The resulting analysis presents a level-of-service (LOS) designation for individual intersection movements and (for signalized intersections) for the entire intersection. The LOS is a letter designation that provides a qualitative measure of operating conditions based on several factors including roadway geometry, speeds, ambient traffic volumes, traffic controls, and driver characteristics. Since the LOS of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of LOS, depending on the time of day, day of week, or period of year. A range of six levels of service are defined on the basis of average delay, ranging from LOS A (the least delay) to LOS F (delays greater than 50 seconds for unsignalized movements, and greater than 80 seconds for signalized movements).

Signalized Intersection Performance Measures

The six LOS designations for signalized intersections may be described as follows:

- *LOS A* describes operations with low control delay; most vehicles do not stop at all.
- *LOS B* describes operations with relatively low control delay. However, more vehicles stop than LOS A.
- *LOS C* describes operations with higher control delays. Individual cycle failures may begin to appear. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
- *LOS D* describes operations with control delay in the range where the influence of congestion becomes more noticeable. Many vehicles stop and individual cycle failures are noticeable.
- *LOS E* describes operations with high control delay values. Individual cycle failures are frequent occurrences.
- *LOS F* describes operations with high control delay values that often occur with over-saturation. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

The LOS for signalized intersections are calculated using the operational analysis methodology of the 2010 *Highway Capacity Manual*.[1] This method assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on delay. LOS designations are based on the criterion of control or signal delay per vehicle. Control or signal delay is a measure of driver discomfort, frustration, and fuel consumption, and includes initial deceleration delay approaching the traffic signal, queue move-up time, stopped delay and final acceleration delay. **Table A1** summarizes the relationship between LOS and control delay. The tabulated control delay criterion may be applied in assigning LOS designations to individual lane groups, to individual intersection approaches, or to entire intersections.

Table A1
LEVEL-OF-SERVICE CRITERIA
FOR SIGNALIZED INTERSECTIONS[1]

Level of Service	Control (Signal) Delay per Vehicle (Seconds)
A	≤10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	>80.0

[1]Source: *Highway Capacity Manual 2010;* Transportation Research Board; Washington, DC; 2010.

[1]*Highway Capacity Manual* 2010; Transportation Research Board; Washington, DC; 2010.

Unsignalized Intersection Performance Measures

The six LOS designations for unsignalized intersections may be described as follows:

- *LOS A* represents a condition with little or no control delay to minor street traffic.
- *LOS B* represents a condition with short control delays to minor street traffic.
- *LOS C* represents a condition with average control delays to minor street traffic.
- *LOS D* represents a condition with long control delays to minor street traffic.
- *LOS E* represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
- *LOS F* represents a condition where minor street demand volume exceeds capacity of an approach lane, with extreme control delays resulting.

The LOS designations of unsignalized intersections are determined by application of a procedure described in the 2010 *Highway Capacity Manual.*[2] LOS is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. Control delay includes the effects of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for LOS at unsignalized intersections are also given in the *Highway Capacity Manual 2010*. **Table A2** summarizes the relationship between LOS and average control delay.

Table A2
LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS[1]

Average Control Delay (seconds per vehicle)	Level of Service	
	$v/c \leq 1$	$v/c > 1$
≤ 10.0	A	F
10.1 to 15.0	B	F
15.1 to 25.0	C	F
25.1 to 35.0	D	F
35.1 to 50.0	E	F
>50.0	F	F

[1]Source: *Highway Capacity Manual 2010*, Transportation Research Board; Washington, DC; 2010.

[2] ibid

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR
Lane Configurations												
Volume (vph)	5	81	750	17	27	446	5	43	26	0	101	304
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	10	10	10	10
Grade (%)			2%			2%					0%	
Storage Length (ft)		0		0	0		0			50		0
Storage Lanes		0		0	0		0			1		0
Taper Length (ft)		25			25					25		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.997			0.986					0.887	
Flt Protected			0.995			0.997				0.950		
Satd. Flow (prot)	0	0	3545	0	0	3513	0	0	0	1685	1573	0
Flt Permitted			0.780			0.866				0.743		
Satd. Flow (perm)	0	0	2779	0	0	3052	0	0	0	1318	1573	0
Right Turn on Red				Yes				Yes				Yes
Satd. Flow (RTOR)			2			11					143	
Link Speed (mph)			25			30					30	
Link Distance (ft)			590			1790					1000	
Travel Time (s)			16.1			40.7					22.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)			0%			0%					0%	
Adj. Flow (vph)	6	91	843	19	30	501	6	48	29	0	113	342
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	959	0	0	585	0	0	0	29	455	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Left	Right	Right	Left	Left	Left	Right
Median Width(ft)			0			0					10	
Link Offset(ft)			0			0					0	
Crosswalk Width(ft)			16			16					16	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.09	1.09	1.09	1.09
Turning Speed (mph)	15	15		9	15		9	9	15	15		9
Number of Detectors	1	1	1		1	1			1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50		50	50			50	50	50	
Trailing Detector (ft)	0	0	0		0	0			0	0	0	
Turn Type	Perm	Perm	NA		Perm	NA			Perm	Perm	NA	
Protected Phases			1			1					2	
Permitted Phases	1	1			1				2	2		
Detector Phase	1	1	1		1	1			2	2	2	
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0		12.0	12.0			8.0	8.0	8.0	

Lane Group	SBL	SBT	SBR	SEL2	SEL	SER	SER2	ø9
Lane Configurations								
Volume (vph)	6	3	11	1	10	1	4	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	16	16	16	12	12	12	12	
Grade (%)		-1%			-5%			
Storage Length (ft)	0		0		0	0		
Storage Lanes	0		0		1	0		
Taper Length (ft)	25				25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor								
Frt		0.926			0.960			
Flt Protected		0.984			0.966			
Satd. Flow (prot)	0	1972	0	0	1806	0	0	
Flt Permitted		0.768			0.966			
Satd. Flow (perm)	0	1539	0	0	1806	0	0	
Right Turn on Red							No	
Satd. Flow (RTOR)								
Link Speed (mph)		30			30			
Link Distance (ft)		1000			503			
Travel Time (s)		22.7			11.4			
Confl. Peds. (#/hr)								
Confl. Bikes (#/hr)								
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	
Parking (#/hr)								
Mid-Block Traffic (%)		0%			0%			
Adj. Flow (vph)	7	3	12	1	11	1	4	
Shared Lane Traffic (%)								
Lane Group Flow (vph)	0	22	0	0	17	0	0	
Enter Blocked Intersection	No	No	No	No	No	No	No	
Lane Alignment	Left	Left	Right	Left	Left	Right	Right	
Median Width(ft)		10			12			
Link Offset(ft)		0			0			
Crosswalk Width(ft)		16			16			
Two way Left Turn Lane								
Headway Factor	0.84	0.84	0.84	0.97	0.97	0.97	0.97	
Turning Speed (mph)	15		9	15	15	9	9	
Number of Detectors	1	1		1	1			
Detector Template								
Leading Detector (ft)	50	50		50	50			
Trailing Detector (ft)	0	0		0	0			
Turn Type	Perm	NA		Prot	Prot			
Protected Phases		2		4	4			9
Permitted Phases	2							
Detector Phase	2	2		4	4			
Switch Phase								
Minimum Initial (s)	8.0	8.0		4.0	4.0			4.0

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR
Minimum Split (s)	17.0	17.0	17.0		17.0	17.0			13.0	13.0	13.0	
Total Split (s)	40.0	40.0	40.0		40.0	40.0			23.0	23.0	23.0	
Total Split (%)	42.1%	42.1%	42.1%		42.1%	42.1%			24.2%	24.2%	24.2%	
Maximum Green (s)	35.0	35.0	35.0		35.0	35.0			18.0	18.0	18.0	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0			3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0			2.0	2.0	2.0	
Lost Time Adjust (s)			-1.0			-1.0				-1.0	-1.0	
Total Lost Time (s)			4.0			4.0				4.0	4.0	
Lead/Lag	Lead	Lead	Lead		Lead	Lead			Lead	Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0		2.0	2.0			2.0	2.0	2.0	
Minimum Gap (s)	2.0	2.0	2.0		2.0	2.0			2.0	2.0	2.0	
Time Before Reduce (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Recall Mode	C-Max	C-Max	C-Max		C-Max	C-Max			None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)			47.6			47.6				26.6	26.6	
Actuated g/C Ratio			0.50			0.50				0.28	0.28	
v/c Ratio			0.69			0.38				0.08	0.84	
Control Delay			21.3			17.2				29.7	39.4	
Queue Delay			0.0			0.0				0.0	0.0	
Total Delay			21.3			17.2				29.7	39.4	
LOS			C			B				C	D	
Approach Delay			21.3			17.2					38.8	
Approach LOS			C			B					D	
90th %ile Green (s)	35.0	35.0	35.0		35.0	35.0			18.0	18.0	18.0	
90th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Max	Max	Max	
70th %ile Green (s)	35.0	35.0	35.0		35.0	35.0			18.0	18.0	18.0	
70th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Max	Max	Max	
50th %ile Green (s)	54.9	54.9	54.9		54.9	54.9			30.1	30.1	30.1	
50th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Gap	Gap	Gap	
30th %ile Green (s)	54.8	54.8	54.8		54.8	54.8			30.2	30.2	30.2	
30th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Gap	Gap	Gap	
10th %ile Green (s)	53.3	53.3	53.3		53.3	53.3			31.7	31.7	31.7	
10th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Gap	Gap	Gap	
Queue Length 50th (ft)			223			85				12	168	
Queue Length 95th (ft)			#206			185				39	#413	
Internal Link Dist (ft)			510			1710					920	
Turn Bay Length (ft)										50		
Base Capacity (vph)			1393			1534				368	543	
Starvation Cap Reductn			0			0				0	0	
Spillback Cap Reductn			0			0				0	0	
Storage Cap Reductn			0			0				0	0	
Reduced v/c Ratio			0.69			0.38				0.08	0.84	

Intersection Summary

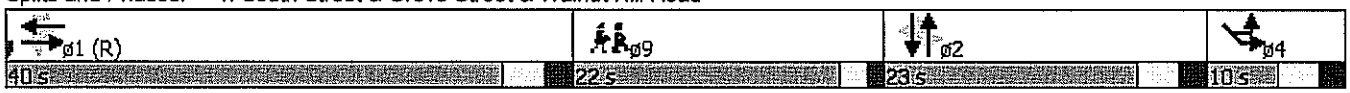
Area Type: Other

Lane Group	SBL	SBT	SBR	SEL2	SEL	SER	SER2	ø9
Minimum Split (s)	13.0	13.0		9.0	9.0			22.0
Total Split (s)	23.0	23.0		10.0	10.0			22.0
Total Split (%)	24.2%	24.2%		10.5%	10.5%			23%
Maximum Green (s)	18.0	18.0		5.0	5.0			19.0
Yellow Time (s)	3.0	3.0		3.0	3.0			2.0
All-Red Time (s)	2.0	2.0		2.0	2.0			1.0
Lost Time Adjust (s)		-1.0			-1.0			
Total Lost Time (s)		4.0			4.0			
Lead/Lag	Lead	Lead		Lag	Lag			Lag
Lead-Lag Optimize?								Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0
Minimum Gap (s)	2.0	2.0		2.0	2.0			2.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0			0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0			0.0
Recall Mode	None	None		None	None			None
Walk Time (s)								4.0
Flash Dont Walk (s)								15.0
Pedestrian Calls (#/hr)								15
Act Effct Green (s)		26.6			5.9			
Actuated g/C Ratio		0.28			0.06			
v/c Ratio		0.05			0.15			
Control Delay		29.4			45.4			
Queue Delay		0.0			0.0			
Total Delay		29.4			45.4			
LOS		C			D			
Approach Delay		29.4			45.4			
Approach LOS		C			D			
90th %ile Green (s)	18.0	18.0		5.0	5.0			19.0
90th %ile Term Code	Max	Max		Max	Max			Ped
70th %ile Green (s)	18.0	18.0		5.0	5.0			19.0
70th %ile Term Code	Max	Max		Max	Max			Ped
50th %ile Green (s)	30.1	30.1		0.0	0.0			0.0
50th %ile Term Code	Gap	Gap		Skip	Skip			Skip
30th %ile Green (s)	30.2	30.2		0.0	0.0			0.0
30th %ile Term Code	Gap	Gap		Skip	Skip			Skip
10th %ile Green (s)	31.7	31.7		0.0	0.0			0.0
10th %ile Term Code	Gap	Gap		Skip	Skip			Skip
Queue Length 50th (ft)		9			10			
Queue Length 95th (ft)		31			31			
Internal Link Dist (ft)		920			423			
Turn Bay Length (ft)								
Base Capacity (vph)		430			115			
Starvation Cap Reductn		0			0			
Spillback Cap Reductn		0			0			
Storage Cap Reductn		0			0			
Reduced v/c Ratio		0.05			0.15			

Intersection Summary

Cycle Length: 95
Actuated Cycle Length: 95
Offset: 10 (11%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 24.6 Intersection LOS: C
Intersection Capacity Utilization 79.1% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: South Street & Grove Street & Walnut Hill Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	691	3	2	448	37	2	37	34	128	15	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	16	16	16
Grade (%)		0%			-3%			-1%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.999			0.989			0.937			0.975	
Flt Protected		0.998						0.999			0.965	
Satd. Flow (prot)	0	3599	0	0	3624	0	0	1787	0	0	2026	0
Flt Permitted		0.916			0.953			0.994			0.714	
Satd. Flow (perm)	0	3303	0	0	3454	0	0	1778	0	0	1499	0
Right Turn on Red			Yes			Yes			No			No
Satd. Flow (RTOR)		1			9							
Link Speed (mph)		35			25			30			30	
Link Distance (ft)		650			590			1000			1000	
Travel Time (s)		12.7			16.1			22.7			22.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	38	843	4	2	546	45	2	45	41	156	18	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	885	0	0	593	0	0	88	0	0	213	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.98	0.98	0.98	0.99	0.99	0.99	0.85	0.85	0.85
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	1 2			2			4			4	
Permitted Phases	1 2			2			4			4		
Detector Phase	1	1 2		2	2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0			12.0	12.0		8.0	8.0		8.0	8.0	

Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	7.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	8.0			17.0	17.0		13.0	13.0		13.0	13.0	
Total Split (s)	11.0			30.0	30.0		32.0	32.0		32.0	32.0	
Total Split (%)	11.6%			31.6%	31.6%		33.7%	33.7%		33.7%	33.7%	
Maximum Green (s)	7.0			25.0	25.0		27.0	27.0		27.0	27.0	
Yellow Time (s)	3.0			3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0			2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)					-1.0			-1.0			-1.0	
Total Lost Time (s)					4.0			4.0			4.0	
Lead/Lag	Lead			Lag	Lag		Lag	Lag		Lag	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0			2.0	2.0		2.0	2.0		2.0	2.0	
Minimum Gap (s)	2.0			2.0	2.0		2.0	2.0		2.0	2.0	
Time Before Reduce (s)	0.0			0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0			0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None			C-Max	C-Max		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		55.8			44.3			18.4			18.4	
Actuated g/C Ratio		0.59			0.47			0.19			0.19	
v/c Ratio		0.45			0.37			0.26			0.73	
Control Delay		13.8			34.0			32.5			50.3	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		13.8			34.0			32.5			50.3	
LOS		B			C			C			D	
Approach Delay		13.8			34.0			32.5			50.3	
Approach LOS		B			C			C			D	
90th %ile Green (s)	9.7			25.0	25.0		24.3	24.3		24.3	24.3	
90th %ile Term Code	Max			Coord	Coord		Gap	Gap		Gap	Gap	
70th %ile Green (s)	13.7			25.0	25.0		20.3	20.3		20.3	20.3	
70th %ile Term Code	Max			Coord	Coord		Gap	Gap		Gap	Gap	
50th %ile Green (s)	14.1			49.4	49.4		17.5	17.5		17.5	17.5	
50th %ile Term Code	Gap			Coord	Coord		Gap	Gap		Gap	Gap	
30th %ile Green (s)	11.1			55.3	55.3		14.6	14.6		14.6	14.6	
30th %ile Term Code	Gap			Coord	Coord		Gap	Gap		Gap	Gap	
10th %ile Green (s)	8.7			61.9	61.9		10.4	10.4		10.4	10.4	
10th %ile Term Code	Gap			Coord	Coord		Gap	Gap		Gap	Gap	
Queue Length 50th (ft)		87			84			45			122	
Queue Length 95th (ft)		240			233			73			163	
Internal Link Dist (ft)		570			510			920			920	
Turn Bay Length (ft)												
Base Capacity (vph)		1975			1615			524			441	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.45			0.37			0.17			0.48	

Intersection Summary

Area Type: Other

Lane Group	ø9
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	23%
Maximum Green (s)	19.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	2.0
Minimum Gap (s)	2.0
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	12.0
Pedestrian Calls (#/hr)	19
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	19.0
90th %ile Term Code	Ped
70th %ile Green (s)	19.0
70th %ile Term Code	Ped
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Cycle Length: 95
Actuated Cycle Length: 95
Offset: 0 (0%), Referenced to phase 2:EBWB, Start of Green, Master Intersection
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 25.8 — Intersection LOS: C
Intersection Capacity Utilization 60.2% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 2: Russett Road/Beverly Road & Independence Drive/Grove Street

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	621	482	0	104	58
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	2	4	0	1	0
Mvmt Flow	0	654	507	0	109	61

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	507	0	-	0	834	254
Stage 1	-	-	-	-	507	-
Stage 2	-	-	-	-	327	-
Critical Hdwy	4.1	-	-	-	6.82	6.9
Critical Hdwy Stg 1	-	-	-	-	5.82	-
Critical Hdwy Stg 2	-	-	-	-	5.82	-
Follow-up Hdwy	2.2	-	-	-	3.51	3.3
Pot Cap-1 Maneuver	1068	-	-	-	309	752
Stage 1	-	-	-	-	573	-
Stage 2	-	-	-	-	706	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1068	-	-	-	309	752
Mov Cap-2 Maneuver	-	-	-	-	309	-
Stage 1	-	-	-	-	573	-
Stage 2	-	-	-	-	706	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	18.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1068	-	-	-	309	752
HCM Lane V/C Ratio	-	-	-	-	0.354	0.081
HCM Control Delay (s)	0	-	-	-	22.9	10.2
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0	-	-	-	1.6	0.3

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	15	587	4	27	488	25	9	16	34
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	-2	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	0	3	0	0	3	0	0	0	0
Mvmt Flow	15	599	4	28	498	26	9	16	35

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	523	0	0	603	0	0	936	1211	302
Stage 1	-	-	-	-	-	-	632	632	-
Stage 2	-	-	-	-	-	-	304	579	-
Critical Hdwy	4.1	-	-	4.1	-	-	6.4	6.1	6.7
Critical Hdwy Stg 1	-	-	-	-	-	-	5.4	5.1	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.4	5.1	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3
Pot Cap-1 Maneuver	1054	-	-	984	-	-	297	210	712
Stage 1	-	-	-	-	-	-	534	512	-
Stage 2	-	-	-	-	-	-	753	537	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1054	-	-	984	-	-	279	0	712
Mov Cap-2 Maneuver	-	-	-	-	-	-	279	0	-
Stage 1	-	-	-	-	-	-	523	0	-
Stage 2	-	-	-	-	-	-	723	0	-

Approach	EB	WB	NB
HCM Control Delay, s	0.3	0.6	12.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	537	1054	-	-	984	-	-
HCM Lane V/C Ratio	0.112	0.015	-	-	0.028	-	-
HCM Control Delay (s)	12.5	8.5	0.1	-	8.8	0.2	-
HCM Lane LOS	B	A	A	-	A	A	-
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-

Intersection

Int Delay, s/veh

Movement	SBL	SBT	SBR
Vol, veh/h	0	0	0
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	98	98	98
Heavy Vehicles, %	0	0	0
Mvmt Flow	0	0	0

Major/Minor

Conflicting Flow All
    Stage 1
    Stage 2
Critical Hdwy
Critical Hdwy Stg 1
Critical Hdwy Stg 2
Follow-up Hdwy
Pot Cap-1 Maneuver
    Stage 1
    Stage 2
Platoon blocked, %
Mov Cap-1 Maneuver
Mov Cap-2 Maneuver
    Stage 1
    Stage 2

Approach

HCM Control Delay, s
HCM LOS

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	3	20	2	4	3	9	1	10	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	70	70	70	70	70	70	70	70	70
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	4	29	3	6	4	13	1	14	10

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	17	0	0	31	0	0	75	68	30
Stage 1	-	-	-	-	-	-	39	39	-
Stage 2	-	-	-	-	-	-	36	29	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3
Pot Cap-1 Maneuver	1613	-	-	1595	-	-	920	826	1050
Stage 1	-	-	-	-	-	-	981	866	-
Stage 2	-	-	-	-	-	-	985	875	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1613	-	-	1595	-	-	892	820	1050
Mov Cap-2 Maneuver	-	-	-	-	-	-	892	820	-
Stage 1	-	-	-	-	-	-	978	863	-
Stage 2	-	-	-	-	-	-	953	872	-

Approach	EB	WB	NB
HCM Control Delay, s	0.9	1.8	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	901	1613	-	-	1595	-	-	900
HCM Lane V/C Ratio	0.029	0.003	-	-	0.004	-	-	0.067
HCM Control Delay (s)	9.1	7.2	0	-	7.3	0	-	9.3
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.2

Intersection

Int Delay, s/veh

Movement	SBL	SBT	SBR
Vol, veh/h	23	12	7
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	70	70	70
Heavy Vehicles, %	0	0	0
Mvmt Flow	33	17	10

Major/Minor	Minor2		
Conflicting Flow All	73	62	11
Stage 1	22	22	-
Stage 2	51	40	-
Critical Hdwy	7.1	6.5	6.2
Critical Hdwy Stg 1	6.1	5.5	-
Critical Hdwy Stg 2	6.1	5.5	-
Follow-up Hdwy	3.5	4	3.3
Pot Cap-1 Maneuver	923	833	1076
Stage 1	1002	881	-
Stage 2	967	866	-
Platoon blocked, %			
Mov Cap-1 Maneuver	897	827	1076
Mov Cap-2 Maneuver	897	827	-
Stage 1	999	877	-
Stage 2	939	863	-

Approach	SB
HCM Control Delay, s	9.3
HCM LOS	A

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	12	410	24	1	10	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	8	-7	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	1	4	0	0	0
Mvmt Flow	13	461	27	1	11	6

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	28	0	-	0	516	28
Stage 1	-	-	-	-	28	-
Stage 2	-	-	-	-	488	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1599	-	-	-	523	1053
Stage 1	-	-	-	-	1000	-
Stage 2	-	-	-	-	621	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1599	-	-	-	517	1053
Mov Cap-2 Maneuver	-	-	-	-	517	-
Stage 1	-	-	-	-	1000	-
Stage 2	-	-	-	-	614	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	10.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1599	-	-	-	623
HCM Lane V/C Ratio	0.008	-	-	-	0.027
HCM Control Delay (s)	7.3	0	-	-	10.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR
Lane Configurations												
Volume (vph)	4	22	406	16	75	897	9	29	5	2	8	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	10	10	10	10
Grade (%)			2%			2%					0%	
Storage Length (ft)		0		0	0		0			50		0
Storage Lanes		0		0	0		0			1		0
Taper Length (ft)		25			25					25		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor			1.00			1.00				0.91		
Frt			0.995			0.994					0.868	
Flt Protected			0.997			0.996				0.950		
Satd. Flow (prot)	0	0	3535	0	0	3538	0	0	0	1685	1539	0
Flt Permitted			0.861			0.867				0.911		
Satd. Flow (perm)	0	0	3051	0	0	3073	0	0	0	1470	1539	0
Right Turn on Red				Yes				Yes				Yes
Satd. Flow (RTOR)			5			4					65	
Link Speed (mph)			25			30					30	
Link Distance (ft)			590			1790					1000	
Travel Time (s)			16.1			40.7					22.7	
Confl. Peds. (#/hr)		50		50	50				50			
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	4	24	437	17	81	965	10	31	5	2	9	65
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	482	0	0	1087	0	0	0	7	74	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Left	Right	Right	Left	Left	Left	Right
Median Width(ft)			0			0					10	
Link Offset(ft)			0			0					0	
Crosswalk Width(ft)			16			16					16	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.09	1.09	1.09	1.09
Turning Speed (mph)	15	15		9	15		9	9	15	15		9
Number of Detectors	1	1	1		1	1			1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50		50	50			50	50	50	
Trailing Detector (ft)	0	0	0		0	0			0	0	0	
Detector 1 Position(ft)	0	0	0		0	0			0	0	0	
Detector 1 Size(ft)	50	50	50		50	50			50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Turn Type	Perm	Perm	NA		Perm	NA			Perm	Perm	NA	
Protected Phases			1			1					2	
Permitted Phases	1	1			1				2	2		
Detector Phase	1	1	1		1	1			2	2	2	

Lane Group	SBL	SBT	SBR	SEL	SER2	ø9
Lane Configurations						
Volume (vph)	7	14	18	6	2	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	
Lane Width (ft)	16	16	16	12	12	
Grade (%)		-1%		-5%		
Storage Length (ft)	0		0	0		
Storage Lanes	0		0	1		
Taper Length (ft)	25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor		0.95				
Frt		0.939		0.966		
Flt Protected		0.991		0.964		
Satd. Flow (prot)	0	1917	0	1814	0	
Flt Permitted		0.924		0.964		
Satd. Flow (perm)	0	1787	0	1814	0	
Right Turn on Red					No	
Satd. Flow (RTOR)						
Link Speed (mph)		30		30		
Link Distance (ft)		1000		503		
Travel Time (s)		22.7		11.4		
Confl. Peds. (#/hr)			50			
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	
Heavy Vehicles (%)	0%	0%	0%	0%	0%	
Adj. Flow (vph)	8	15	19	6	2	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	42	0	8	0	
Enter Blocked Intersection	No	No	No	No	No	
Lane Alignment	Left	Left	Right	Left	Right	
Median Width(ft)		10		12		
Link Offset(ft)		0		0		
Crosswalk Width(ft)		16		16		
Two way Left Turn Lane						
Headway Factor	0.84	0.84	0.84	0.97	0.97	
Turning Speed (mph)	15		9	15	9	
Number of Detectors	1	1		1		
Detector Template						
Leading Detector (ft)	50	50		50		
Trailing Detector (ft)	0	0		0		
Detector 1 Position(ft)	0	0		0		
Detector 1 Size(ft)	50	50		50		
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex		
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0		0.0		
Detector 1 Queue (s)	0.0	0.0		0.0		
Detector 1 Delay (s)	0.0	0.0		0.0		
Turn Type	Perm	NA		Prot		
Protected Phases		2		4		9
Permitted Phases	2					
Detector Phase	2	2		4		

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0		12.0	12.0			8.0	8.0	8.0	
Minimum Split (s)	17.0	17.0	17.0		17.0	17.0			13.0	13.0	13.0	
Total Split (s)	40.0	40.0	40.0		40.0	40.0			18.0	18.0	18.0	
Total Split (%)	44.4%	44.4%	44.4%		44.4%	44.4%			20.0%	20.0%	20.0%	
Maximum Green (s)	35.0	35.0	35.0		35.0	35.0			13.0	13.0	13.0	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0			3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0			2.0	2.0	2.0	
Lost Time Adjust (s)			-1.0			-1.0				-1.0	-1.0	
Total Lost Time (s)			4.0			4.0				4.0	4.0	
Lead/Lag	Lead	Lead	Lead		Lead	Lead			Lag	Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0		2.0	2.0			2.0	2.0	2.0	
Recall Mode	C-Max	C-Max	C-Max		C-Max	C-Max			None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)			65.2			65.2				9.2	9.2	
Actuated g/C Ratio			0.72			0.72				0.10	0.10	
v/c Ratio			0.22			0.49				0.05	0.34	
Control Delay			3.3			11.2				37.0	17.0	
Queue Delay			0.0			0.0				0.0	0.0	
Total Delay			3.3			11.2				37.0	17.0	
LOS			A			B				D	B	
Approach Delay			3.3			11.2					18.7	
Approach LOS			A			B					B	
90th %ile Green (s)	37.8	37.8	37.8		37.8	37.8			9.2	9.2	9.2	
90th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Gap	Gap	Gap	
70th %ile Green (s)	50.0	50.0	50.0		50.0	50.0			8.0	8.0	8.0	
70th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Min	Min	Min	
50th %ile Green (s)	72.0	72.0	72.0		72.0	72.0			8.0	8.0	8.0	
50th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Min	Min	Min	
30th %ile Green (s)	72.0	72.0	72.0		72.0	72.0			8.0	8.0	8.0	
30th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Min	Min	Min	
10th %ile Green (s)	85.0	85.0	85.0		85.0	85.0			0.0	0.0	0.0	
10th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Skip	Skip	Skip	
Queue Length 50th (ft)			13			67				4	5	
Queue Length 95th (ft)			144			364				17	44	
Internal Link Dist (ft)			510			1710					920	
Turn Bay Length (ft)										50		
Base Capacity (vph)			2210			2226				228	294	
Starvation Cap Reductn			0			0				0	0	
Spillback Cap Reductn			0			0				0	0	
Storage Cap Reductn			0			0				0	0	
Reduced v/c Ratio			0.22			0.49				0.03	0.25	

Intersection Summary

Area Type: Other
Cycle Length: 90

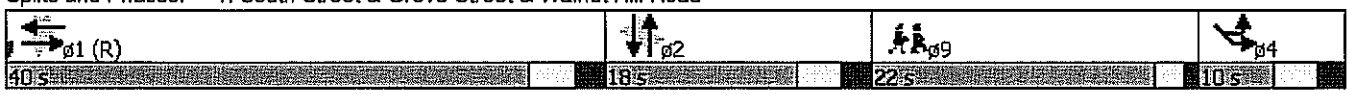
Lane Group	SBL	SBT	SBR	SEL	SER2	ø9
Switch Phase						
Minimum Initial (s)	8.0	8.0		4.0		4.0
Minimum Split (s)	13.0	13.0		9.0		22.0
Total Split (s)	18.0	18.0		10.0		22.0
Total Split (%)	20.0%	20.0%		11.1%		24%
Maximum Green (s)	13.0	13.0		5.0		19.0
Yellow Time (s)	3.0	3.0		3.0		2.0
All-Red Time (s)	2.0	2.0		2.0		1.0
Lost Time Adjust (s)		-1.0		-1.0		
Total Lost Time (s)		4.0		4.0		
Lead/Lag	Lag	Lag		Lag		Lead
Lead-Lag Optimize?						Yes
Vehicle Extension (s)	2.0	2.0		2.0		2.0
Recall Mode	None	None		None		None
Walk Time (s)						4.0
Flash Dont Walk (s)						15.0
Pedestrian Calls (#/hr)						23
Act Effct Green (s)		9.2		6.0		
Actuated g/C Ratio		0.10		0.07		
v/c Ratio		0.23		0.07		
Control Delay		40.3		40.1		
Queue Delay		0.0		0.0		
Total Delay		40.3		40.1		
LOS		D		D		
Approach Delay		40.3		40.1		
Approach LOS		D		D		
90th %ile Green (s)	9.2	9.2		6.0		19.0
90th %ile Term Code	Gap	Gap		Gap		Ped
70th %ile Green (s)	8.0	8.0		0.0		19.0
70th %ile Term Code	Min	Min		Skip		Ped
50th %ile Green (s)	8.0	8.0		0.0		0.0
50th %ile Term Code	Min	Min		Skip		Skip
30th %ile Green (s)	8.0	8.0		0.0		0.0
30th %ile Term Code	Min	Min		Skip		Skip
10th %ile Green (s)	0.0	0.0		0.0		0.0
10th %ile Term Code	Skip	Skip		Skip		Skip
Queue Length 50th (ft)		22		4		
Queue Length 95th (ft)		53		18		
Internal Link Dist (ft)		920		423		
Turn Bay Length (ft)						
Base Capacity (vph)		277		125		
Starvation Cap Reductn		0		0		
Spillback Cap Reductn		0		0		
Storage Cap Reductn		0		0		
Reduced v/c Ratio		0.15		0.06		

Intersection Summary

Actuated Cycle Length: 90
Offset: 18 (20%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.49
Intersection Signal Delay: 10.2
Intersection Capacity Utilization 67.6%
Analysis Period (min) 15

Intersection LOS: B
ICU Level of Service C

Splits and Phases: 1: South Street & Grove Street & Walnut Hill Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	411	10	19	863	40	2	11	6	31	12	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	16	16	16
Grade (%)		0%			-3%			-1%			0%	
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00			0.96			0.92	
Frt		0.997			0.993			0.957			0.930	
Flt Protected		0.997			0.999			0.995			0.983	
Satd. Flow (prot)	0	3583	0	0	3622	0	0	1764	0	0	1871	0
Flt Permitted		0.871			0.941			0.977			0.877	
Satd. Flow (perm)	0	3127	0	0	3409	0	0	1720	0	0	1622	0
Right Turn on Red			Yes			Yes			No			No
Satd. Flow (RTOR)		3			6							
Link Speed (mph)		35			25			30			30	
Link Distance (ft)		650			590			1000			1000	
Travel Time (s)		12.7			16.1			22.7			22.7	
Confl. Peds. (#/hr)	50		50	50		50	50		50	50		50
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	31	428	10	20	899	42	2	11	6	32	12	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	469	0	0	961	0	0	19	0	0	92	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.98	0.98	0.98	0.99	0.99	0.99	0.85	0.85	0.85
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	50	50		50	50		50	50		50	50	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	1 2			2			4			4	
Permitted Phases	1 2			2			4			4		
Detector Phase	1	1 2		2	2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0			12.0	12.0		8.0	8.0		8.0	8.0	
Minimum Split (s)	8.0			17.0	17.0		13.0	13.0		13.0	13.0	

Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	7.0
Minimum Split (s)	22.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	8.0			40.0	40.0		20.0	20.0		20.0	20.0	
Total Split (%)	8.9%			44.4%	44.4%		22.2%	22.2%		22.2%	22.2%	
Maximum Green (s)	4.0			35.0	35.0		15.0	15.0		15.0	15.0	
Yellow Time (s)	3.0			3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0			2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)					-1.0			-1.0			-1.0	
Total Lost Time (s)					4.0			4.0			4.0	
Lead/Lag	Lead			Lag	Lag		Lag	Lag		Lag	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0			2.0	2.0		2.0	2.0		2.0	2.0	
Recall Mode	None			C-Max	C-Max		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		60.8			54.4			11.0			11.0	
Actuated g/C Ratio		0.68			0.60			0.12			0.12	
v/c Ratio		0.22			0.47			0.09			0.47	
Control Delay		7.7			19.6			34.7			44.2	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		7.7			19.6			34.7			44.2	
LOS		A			B			C			D	
Approach Delay		7.7			19.6			34.7			44.2	
Approach LOS		A			B			C			D	
90th %ile Green (s)	5.5			35.0	35.0		13.5	13.5		13.5	13.5	
90th %ile Term Code	Max			Coord	Coord		Gap	Gap		Gap	Gap	
70th %ile Green (s)	8.0			35.0	35.0		11.0	11.0		11.0	11.0	
70th %ile Term Code	Max			Coord	Coord		Gap	Gap		Gap	Gap	
50th %ile Green (s)	7.2			59.5	59.5		9.3	9.3		9.3	9.3	
50th %ile Term Code	Gap			Coord	Coord		Gap	Gap		Gap	Gap	
30th %ile Green (s)	6.6			61.4	61.4		8.0	8.0		8.0	8.0	
30th %ile Term Code	Gap			Coord	Coord		Min	Min		Min	Min	
10th %ile Green (s)	4.8			76.2	76.2		0.0	0.0		0.0	0.0	
10th %ile Term Code	Gap			Coord	Coord		Skip	Skip		Skip	Skip	
Queue Length 50th (ft)		24			111			10			50	
Queue Length 95th (ft)		106			333			29			94	
Internal Link Dist (ft)		570			510			920			920	
Turn Bay Length (ft)												
Base Capacity (vph)		2147			2063			305			288	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.22			0.47			0.06			0.32	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:EBWB, Start of Green, Master Intersection
Natural Cycle: 65

Lane Group	ø9
Total Split (s)	22.0
Total Split (%)	24%
Maximum Green (s)	19.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	12.0
Pedestrian Calls (#/hr)	15
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	19.0
90th %ile Term Code	Ped
70th %ile Green (s)	19.0
70th %ile Term Code	Ped
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.47
Intersection Signal Delay: 17.7
Intersection Capacity Utilization 59.5%
Analysis Period (min) 15

Intersection LOS: B
ICU Level of Service B

Splits and Phases: 2: Russett Road/Beverly Road & Independence Drive/Grove Street

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	419	911	0	32	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	0	455	990	0	35	24

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	990	0	-	0	1218	495
Stage 1	-	-	-	-	990	-
Stage 2	-	-	-	-	228	-
Critical Hdwy	4.1	-	-	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	706	-	-	-	176	525
Stage 1	-	-	-	-	325	-
Stage 2	-	-	-	-	794	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	706	-	-	-	176	525
Mov Cap-2 Maneuver	-	-	-	-	176	-
Stage 1	-	-	-	-	325	-
Stage 2	-	-	-	-	794	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	23
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	706	-	-	-	176	525
HCM Lane V/C Ratio	-	-	-	-	0.198	0.046
HCM Control Delay (s)	0	-	-	-	30.4	12.2
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0	-	-	-	0.7	0.1

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	27	406	18	20	860	53	7	8	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	-2	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	2	0	0	2	0	0	0	0
Mvmt Flow	28	427	19	21	905	56	7	8	14

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	961	0	0	446	0	0	989	1497	223
Stage 1	-	-	-	-	-	-	494	494	-
Stage 2	-	-	-	-	-	-	495	1003	-
Critical Hdwy	4.1	-	-	4.1	-	-	6.4	6.1	6.7
Critical Hdwy Stg 1	-	-	-	-	-	-	5.4	5.1	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.4	5.1	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3
Pot Cap-1 Maneuver	724	-	-	1125	-	-	276	146	796
Stage 1	-	-	-	-	-	-	617	581	-
Stage 2	-	-	-	-	-	-	617	360	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	724	-	-	1125	-	-	251	0	796
Mov Cap-2 Maneuver	-	-	-	-	-	-	251	0	-
Stage 1	-	-	-	-	-	-	585	0	-
Stage 2	-	-	-	-	-	-	592	0	-

Approach	EB	WB	NB
HCM Control Delay, s	0.8	0.4	13.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	452	724	-	-	1125	-	-
HCM Lane V/C Ratio	0.065	0.039	-	-	0.019	-	-
HCM Control Delay (s)	13.5	10.2	0.2	-	8.3	0.2	-
HCM Lane LOS	B	B	A	-	A	A	-
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0.1	-	-

Intersection

Int Delay, s/veh

Movement	SBL	SBT	SBR
Vol, veh/h	0	0	0
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	95	95	95
Heavy Vehicles, %	0	0	0
Mvmt Flow	0	0	0

Major/Minor

Conflicting Flow All
    Stage 1
    Stage 2
Critical Hdwy
Critical Hdwy Stg 1
Critical Hdwy Stg 2
Follow-up Hdwy
Pot Cap-1 Maneuver
    Stage 1
    Stage 2
Platoon blocked, %
Mov Cap-1 Maneuver
Mov Cap-2 Maneuver
    Stage 1
    Stage 2

Approach

HCM Control Delay, s
HCM LOS

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	7	6	2	2	16	16	4	5	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	7	2	2	18	18	5	6	2

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	36	0	0	9	0	0	67	65	8
Stage 1	-	-	-	-	-	-	24	24	-
Stage 2	-	-	-	-	-	-	43	41	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3
Pot Cap-1 Maneuver	1588	-	-	1624	-	-	931	830	1080
Stage 1	-	-	-	-	-	-	999	879	-
Stage 2	-	-	-	-	-	-	976	865	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1588	-	-	1624	-	-	908	825	1080
Mov Cap-2 Maneuver	-	-	-	-	-	-	908	825	-
Stage 1	-	-	-	-	-	-	994	875	-
Stage 2	-	-	-	-	-	-	953	864	-

Approach	EB	WB	NB
HCM Control Delay, s	3.4	0.4	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	893	1588	-	-	1624	-	-	943
HCM Lane V/C Ratio	0.014	0.005	-	-	0.001	-	-	0.031
HCM Control Delay (s)	9.1	7.3	0	-	7.2	0	-	8.9
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection

Int Delay, s/veh

Movement	SBL	SBT	SBR
Vol, veh/h	7	8	11
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	88	88	88
Heavy Vehicles, %	0	0	0
Mvmt Flow	8	9	12

Major/Minor	Minor2		
Conflicting Flow All	60	57	27
Stage 1	32	32	-
Stage 2	28	25	-
Critical Hdwy	7.1	6.5	6.2
Critical Hdwy Stg 1	6.1	5.5	-
Critical Hdwy Stg 2	6.1	5.5	-
Follow-up Hdwy	3.5	4	3.3
Pot Cap-1 Maneuver	941	838	1054
Stage 1	990	872	-
Stage 2	994	878	-
Platoon blocked, %			
Mov Cap-1 Maneuver	930	833	1054
Mov Cap-2 Maneuver	930	833	-
Stage 1	985	871	-
Stage 2	981	874	-

Approach	SB
HCM Control Delay, s	8.9
HCM LOS	A

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	4	61	75	8	8	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	8	-7	-	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	0	3	1	0	0	25
Mvmt Flow	5	76	94	10	10	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	104	0	-	0	185	99
Stage 1	-	-	-	-	99	-
Stage 2	-	-	-	-	86	-
Critical Hdwy	4.1	-	-	-	6.4	6.45
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.525
Pot Cap-1 Maneuver	1500	-	-	-	809	897
Stage 1	-	-	-	-	930	-
Stage 2	-	-	-	-	942	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1500	-	-	-	807	897
Mov Cap-2 Maneuver	-	-	-	-	807	-
Stage 1	-	-	-	-	930	-
Stage 2	-	-	-	-	939	-

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1500	-	-	-	835
HCM Lane V/C Ratio	0.003	-	-	-	0.018
HCM Control Delay (s)	7.4	0	-	-	9.4
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR
Lane Configurations												
Volume (vph)	5	85	789	18	28	469	5	45	27	0	106	320
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	10	10	10	10
Grade (%)			2%			2%					0%	
Storage Length (ft)		0		0	0		0			50		0
Storage Lanes		0		0	0		0			1		0
Taper Length (ft)		25			25					25		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Frt			0.997			0.986					0.887	
Flt Protected			0.995			0.997				0.950		
Satd. Flow (prot)	0	0	3545	0	0	3513	0	0	0	1685	1573	0
Flt Permitted			0.748			0.819				0.742		
Satd. Flow (perm)	0	0	2665	0	0	2886	0	0	0	1316	1573	0
Right Turn on Red				Yes				Yes				Yes
Satd. Flow (RTOR)			2			11					143	
Link Speed (mph)			25			30					30	
Link Distance (ft)			590			1790					1000	
Travel Time (s)			16.1			40.7					22.7	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	6	96	887	20	31	527	6	51	30	0	119	360
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	1009	0	0	615	0	0	0	30	479	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Left	Right	Right	Left	Left	Left	Right
Median Width(ft)			0			0					10	
Link Offset(ft)			0			0					0	
Crosswalk Width(ft)			16			16					16	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.09	1.09	1.09	1.09
Turning Speed (mph)	15	15		9	15		9	9	15	15		9
Number of Detectors	1	1	1		1	1			1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50		50	50			50	50	50	
Trailing Detector (ft)	0	0	0		0	0			0	0	0	
Detector 1 Position(ft)	0	0	0		0	0			0	0	0	
Detector 1 Size(ft)	50	50	50		50	50			50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Turn Type	Perm	Perm	NA		Perm	NA			Perm	Perm	NA	
Protected Phases			1			1					2	
Permitted Phases	1	1			1				2	2		
Detector Phase	1	1	1		1	1			2	2	2	
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0		12.0	12.0			8.0	8.0	8.0	

Lane Group	SBL	SBT	SBR	SEL2	SEL	SER	SER2	ø9
Lane Configurations								
Volume (vph)	6	3	12	1	11	1	4	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	16	16	16	12	12	12	12	
Grade (%)		-1%			-5%			
Storage Length (ft)	0		0		0	0		
Storage Lanes	0		0		1	0		
Taper Length (ft)	25				25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		0.924			0.962			
Flt Protected		0.985			0.965			
Satd. Flow (prot)	0	1970	0	0	1808	0	0	
Flt Permitted		0.818			0.965			
Satd. Flow (perm)	0	1636	0	0	1808	0	0	
Right Turn on Red							No	
Satd. Flow (RTOR)								
Link Speed (mph)		30			30			
Link Distance (ft)		1000			503			
Travel Time (s)		22.7			11.4			
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	
Adj. Flow (vph)	7	3	13	1	12	1	4	
Shared Lane Traffic (%)								
Lane Group Flow (vph)	0	23	0	0	18	0	0	
Enter Blocked Intersection	No	No	No	No	No	No	No	
Lane Alignment	Left	Left	Right	Left	Left	Right	Right	
Median Width(ft)		10			12			
Link Offset(ft)		0			0			
Crosswalk Width(ft)		16			16			
Two way Left Turn Lane								
Headway Factor	0.84	0.84	0.84	0.97	0.97	0.97	0.97	
Turning Speed (mph)	15		9	15	15	9	9	
Number of Detectors	1	1		1	1			
Detector Template								
Leading Detector (ft)	50	50		50	50			
Trailing Detector (ft)	0	0		0	0			
Detector 1 Position(ft)	0	0		0	0			
Detector 1 Size(ft)	50	50		50	50			
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			
Detector 1 Channel								
Detector 1 Extend (s)	0.0	0.0		0.0	0.0			
Detector 1 Queue (s)	0.0	0.0		0.0	0.0			
Detector 1 Delay (s)	0.0	0.0		0.0	0.0			
Turn Type	Perm	NA		Prot	Prot			
Protected Phases		2		4	4			9
Permitted Phases	2							
Detector Phase	2	2		4	4			
Switch Phase								
Minimum Initial (s)	8.0	8.0		4.0	4.0			4.0

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR
Minimum Split (s)	17.0	17.0	17.0		17.0	17.0			13.0	13.0	13.0	
Total Split (s)	40.0	40.0	40.0		40.0	40.0			23.0	23.0	23.0	
Total Split (%)	42.1%	42.1%	42.1%		42.1%	42.1%			24.2%	24.2%	24.2%	
Maximum Green (s)	35.0	35.0	35.0		35.0	35.0			18.0	18.0	18.0	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0			3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0			2.0	2.0	2.0	
Lost Time Adjust (s)			-1.0			-1.0				-1.0	-1.0	
Total Lost Time (s)			4.0			4.0				4.0	4.0	
Lead/Lag	Lead	Lead	Lead		Lead	Lead			Lead	Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0		2.0	2.0			2.0	2.0	2.0	
Recall Mode	C-Max	C-Max	C-Max		C-Max	C-Max			None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)			44.8			44.8				29.4	29.4	
Actuated g/C Ratio			0.47			0.47				0.31	0.31	
v/c Ratio			0.80			0.45				0.07	0.82	
Control Delay			26.9			19.2				29.2	37.2	
Queue Delay			0.0			0.0				0.0	0.0	
Total Delay			26.9			19.2				29.2	37.2	
LOS			C			B				C	D	
Approach Delay			26.9			19.2					36.7	
Approach LOS			C			B					D	
90th %ile Green (s)	35.0	35.0	35.0		35.0	35.0			18.0	18.0	18.0	
90th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Max	Max	Max	
70th %ile Green (s)	35.0	35.0	35.0		35.0	35.0			18.0	18.0	18.0	
70th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Max	Max	Max	
50th %ile Green (s)	52.6	52.6	52.6		52.6	52.6			32.4	32.4	32.4	
50th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Gap	Gap	Gap	
30th %ile Green (s)	51.1	51.1	51.1		51.1	51.1			33.9	33.9	33.9	
30th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Gap	Gap	Gap	
10th %ile Green (s)	45.2	45.2	45.2		45.2	45.2			39.8	39.8	39.8	
10th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Gap	Gap	Gap	
Queue Length 50th (ft)			234			98				12	178	
Queue Length 95th (ft)			#472			200				39	#448	
Internal Link Dist (ft)			510			1710					920	
Turn Bay Length (ft)										50		
Base Capacity (vph)			1257			1366				407	586	
Starvation Cap Reductn			0			0				0	0	
Spillback Cap Reductn			0			0				0	0	
Storage Cap Reductn			0			0				0	0	
Reduced v/c Ratio			0.80			0.45				0.07	0.82	

Intersection Summary

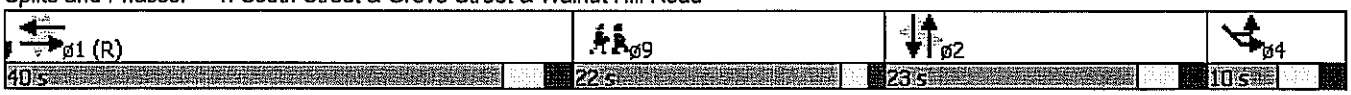
Area Type: Other
Cycle Length: 95
Actuated Cycle Length: 95
Offset: 10 (11%), Referenced to phase 1:EBWB, Start of Green

Lane Group	SBL	SBT	SBR	SEL2	SEL	SER	SER2	ø9
Minimum Split (s)	13.0	13.0		9.0	9.0			22.0
Total Split (s)	23.0	23.0		10.0	10.0			22.0
Total Split (%)	24.2%	24.2%		10.5%	10.5%			23%
Maximum Green (s)	18.0	18.0		5.0	5.0			19.0
Yellow Time (s)	3.0	3.0		3.0	3.0			2.0
All-Red Time (s)	2.0	2.0		2.0	2.0			1.0
Lost Time Adjust (s)		-1.0			-1.0			
Total Lost Time (s)		4.0			4.0			
Lead/Lag	Lead	Lead		Lag	Lag			Lag
Lead-Lag Optimize?								Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0
Recall Mode	None	None		None	None			None
Walk Time (s)								4.0
Flash Dont Walk (s)								15.0
Pedestrian Calls (#/hr)								15
Act Effct Green (s)		29.4			5.9			
Actuated g/C Ratio		0.31			0.06			
v/c Ratio		0.05			0.16			
Control Delay		28.8			45.6			
Queue Delay		0.0			0.0			
Total Delay		28.8			45.6			
LOS		C			D			
Approach Delay		28.9			45.6			
Approach LOS		C			D			
90th %ile Green (s)	18.0	18.0		5.0	5.0			19.0
90th %ile Term Code	Max	Max		Max	Max			Ped
70th %ile Green (s)	18.0	18.0		5.0	5.0			19.0
70th %ile Term Code	Max	Max		Max	Max			Ped
50th %ile Green (s)	32.4	32.4		0.0	0.0			0.0
50th %ile Term Code	Gap	Gap		Skip	Skip			Skip
30th %ile Green (s)	33.9	33.9		0.0	0.0			0.0
30th %ile Term Code	Gap	Gap		Skip	Skip			Skip
10th %ile Green (s)	39.8	39.8		0.0	0.0			0.0
10th %ile Term Code	Gap	Gap		Skip	Skip			Skip
Queue Length 50th (ft)		9			10			
Queue Length 95th (ft)		32			32			
Internal Link Dist (ft)		920			423			
Turn Bay Length (ft)								
Base Capacity (vph)		506			115			
Starvation Cap Reductn		0			0			
Spillback Cap Reductn		0			0			
Storage Cap Reductn		0			0			
Reduced v/c Ratio		0.05			0.16			

Intersection Summary

Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 27.2 Intersection LOS: C
Intersection Capacity Utilization 82.3% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: South Street & Grove Street & Walnut Hill Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	726	3	2	471	39	2	39	36	135	16	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	16	16	16
Grade (%)		0%			-3%			-1%			0%	
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.988			0.937			0.976	
Flt Protected		0.998						0.999			0.965	
Satd. Flow (prot)	0	3599	0	0	3620	0	0	1787	0	0	2028	0
Flt Permitted		0.913			0.953			0.994			0.703	
Satd. Flow (perm)	0	3293	0	0	3450	0	0	1778	0	0	1477	0
Right Turn on Red			Yes			Yes			No			No
Satd. Flow (RTOR)					9							
Link Speed (mph)		35			25			30			30	
Link Distance (ft)		650			590			1000			1000	
Travel Time (s)		12.7			16.1			22.7			22.7	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	40	885	4	2	574	48	2	48	44	165	20	41
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	929	0	0	624	0	0	94	0	0	226	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.98	0.98	0.98	0.99	0.99	0.99	0.85	0.85	0.85
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	50	50		50	50		50	50		50	50	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	1 2			2			4			4	
Permitted Phases	1 2			2			4			4		
Detector Phase	1	1 2		2	2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0			12.0	12.0		8.0	8.0		8.0	8.0	
Minimum Split (s)	8.0			17.0	17.0		13.0	13.0		13.0	13.0	
Total Split (s)	11.0			30.0	30.0		32.0	32.0		32.0	32.0	
Total Split (%)	11.6%			31.6%	31.6%		33.7%	33.7%		33.7%	33.7%	

Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	7.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	23%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	7.0			25.0	25.0		27.0	27.0		27.0	27.0	
Yellow Time (s)	3.0			3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0			2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)					-1.0			-1.0			-1.0	
Total Lost Time (s)					4.0			4.0			4.0	
Lead/Lag	Lead			Lag	Lag		Lag	Lag		Lag	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0			2.0	2.0		2.0	2.0		2.0	2.0	
Recall Mode	None			C-Max	C-Max		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		54.9			43.0			19.3			19.3	
Actuated g/C Ratio		0.58			0.45			0.20			0.20	
v/c Ratio		0.48			0.40			0.26			0.75	
Control Delay		15.0			34.4			31.8			50.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		15.0			34.4			31.8			50.7	
LOS		B			C			C			D	
Approach Delay		15.0			34.4			31.8			50.7	
Approach LOS		B			C			C			D	
90th %ile Green (s)	8.5			25.0	25.0		25.5	25.5		25.5	25.5	
90th %ile Term Code	Max			Coord	Coord		Gap	Gap		Gap	Gap	
70th %ile Green (s)	12.6			25.0	25.0		21.4	21.4		21.4	21.4	
70th %ile Term Code	Max			Coord	Coord		Gap	Gap		Gap	Gap	
50th %ile Green (s)	15.5			47.1	47.1		18.4	18.4		18.4	18.4	
50th %ile Term Code	Gap			Coord	Coord		Gap	Gap		Gap	Gap	
30th %ile Green (s)	13.2			52.4	52.4		15.4	15.4		15.4	15.4	
30th %ile Term Code	Gap			Coord	Coord		Gap	Gap		Gap	Gap	
10th %ile Green (s)	9.6			60.4	60.4		11.0	11.0		11.0	11.0	
10th %ile Term Code	Gap			Coord	Coord		Gap	Gap		Gap	Gap	
Queue Length 50th (ft)		97			88			48			129	
Queue Length 95th (ft)		261			244			75			170	
Internal Link Dist (ft)		570			510			920			920	
Turn Bay Length (ft)												
Base Capacity (vph)		1940			1565			524			435	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.48			0.40			0.18			0.52	

Intersection Summary

Area Type: Other
Cycle Length: 95
Actuated Cycle Length: 95
Offset: 0 (0%), Referenced to phase 2:EBWB, Start of Green, Master Intersection
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.75

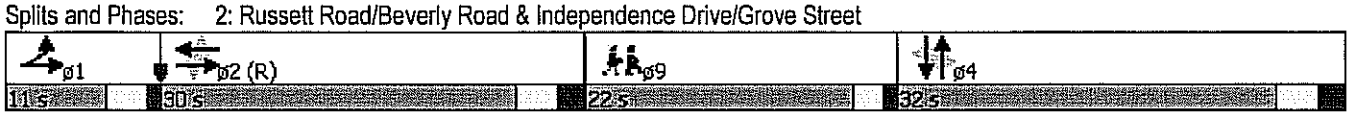
Lane Group	ø9
Maximum Green (s)	19.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	12.0
Pedestrian Calls (#/hr)	19
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	19.0
90th %ile Term Code	Ped
70th %ile Green (s)	19.0
70th %ile Term Code	Ped
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Intersection Signal Delay: 26.6
Intersection Capacity Utilization 62.5%
Analysis Period (min) 15

Intersection LOS: C
ICU Level of Service B

Splits and Phases: 2: Russett Road/Beverly Road & Independence Drive/Grove Street



Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	658	507	0	104	58
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	2	4	0	1	0
Mvmt Flow	0	693	534	0	109	61

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	534	0	-	0	880	267
Stage 1	-	-	-	-	534	-
Stage 2	-	-	-	-	346	-
Critical Hdwy	4.1	-	-	-	6.82	6.9
Critical Hdwy Stg 1	-	-	-	-	5.82	-
Critical Hdwy Stg 2	-	-	-	-	5.82	-
Follow-up Hdwy	2.2	-	-	-	3.51	3.3
Pot Cap-1 Maneuver	1044	-	-	-	288	737
Stage 1	-	-	-	-	555	-
Stage 2	-	-	-	-	691	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1044	-	-	-	288	737
Mov Cap-2 Maneuver	-	-	-	-	288	-
Stage 1	-	-	-	-	555	-
Stage 2	-	-	-	-	691	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	19.7
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1044	-	-	-	288	737
HCM Lane V/C Ratio	-	-	-	-	0.38	0.083
HCM Control Delay (s)	0	-	-	-	25	10.3
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0	-	-	-	1.7	0.3

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	15	624	4	27	513	25	9	16	34
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	-2	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	0	3	0	0	3	0	0	0	0
Mvmt Flow	15	637	4	28	523	26	9	16	35

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	549	0	0	641	0	0	986	1273	320
Stage 1	-	-	-	-	-	-	669	669	-
Stage 2	-	-	-	-	-	-	317	604	-
Critical Hdwy	4.1	-	-	4.1	-	-	6.4	6.1	6.7
Critical Hdwy Stg 1	-	-	-	-	-	-	5.4	5.1	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.4	5.1	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3
Pot Cap-1 Maneuver	1031	-	-	953	-	-	277	195	694
Stage 1	-	-	-	-	-	-	513	494	-
Stage 2	-	-	-	-	-	-	743	525	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1031	-	-	953	-	-	259	0	694
Mov Cap-2 Maneuver	-	-	-	-	-	-	259	0	-
Stage 1	-	-	-	-	-	-	501	0	-
Stage 2	-	-	-	-	-	-	712	0	-

Approach	EB	WB	NB
HCM Control Delay, s	0.3	0.6	12.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	513	1031	-	-	953	-	-
HCM Lane V/C Ratio	0.117	0.015	-	-	0.029	-	-
HCM Control Delay (s)	12.9	8.5	0.1	-	8.9	0.2	-
HCM Lane LOS	B	A	A	-	A	A	-
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-

Intersection

Int Delay, s/veh

Movement	SBL	SBT	SBR
Vol, veh/h	0	0	0
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	98	98	98
Heavy Vehicles, %	0	0	0
Mvmt Flow	0	0	0

Major/Minor

Conflicting Flow All
    Stage 1
    Stage 2
Critical Hdwy
Critical Hdwy Stg 1
Critical Hdwy Stg 2
Follow-up Hdwy
Pot Cap-1 Maneuver
    Stage 1
    Stage 2
Platoon blocked, %
Mov Cap-1 Maneuver
Mov Cap-2 Maneuver
    Stage 1
    Stage 2

Approach

HCM Control Delay, s
HCM LOS

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	3	21	2	4	3	9	1	10	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	70	70	70	70	70	70	70	70	70
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	4	30	3	6	4	13	1	14	10

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	17	0	0	33	0	0	76	69	31
Stage 1	-	-	-	-	-	-	40	40	-
Stage 2	-	-	-	-	-	-	36	29	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3
Pot Cap-1 Maneuver	1613	-	-	1592	-	-	919	825	1049
Stage 1	-	-	-	-	-	-	980	866	-
Stage 2	-	-	-	-	-	-	985	875	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1613	-	-	1592	-	-	891	819	1049
Mov Cap-2 Maneuver	-	-	-	-	-	-	891	819	-
Stage 1	-	-	-	-	-	-	977	863	-
Stage 2	-	-	-	-	-	-	953	872	-

Approach	EB	WB	NB
HCM Control Delay, s	0.8	1.8	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	900	1613	-	-	1592	-	-	899
HCM Lane V/C Ratio	0.029	0.003	-	-	0.004	-	-	0.067
HCM Control Delay (s)	9.1	7.2	0	-	7.3	0	-	9.3
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.2

Intersection

Int Delay, s/veh

Movement	SBL	SBT	SBR
Vol, veh/h	23	12	7
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	70	70	70
Heavy Vehicles, %	0	0	0
Mvmt Flow	33	17	10

Major/Minor	Minor2		
Conflicting Flow All	74	63	11
Stage 1	22	22	-
Stage 2	52	41	-
Critical Hdwy	7.1	6.5	6.2
Critical Hdwy Stg 1	6.1	5.5	-
Critical Hdwy Stg 2	6.1	5.5	-
Follow-up Hdwy	3.5	4	3.3
Pot Cap-1 Maneuver	921	832	1076
Stage 1	1002	881	-
Stage 2	966	865	-
Platoon blocked, %			
Mov Cap-1 Maneuver	895	826	1076
Mov Cap-2 Maneuver	895	826	-
Stage 1	999	877	-
Stage 2	938	862	-

Approach	SB
HCM Control Delay, s	9.3
HCM LOS	A

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	13	431	25	1	11	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	8	-7	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	1	4	0	0	0
Mvmt Flow	15	484	28	1	12	6

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	29	0	-	0	542	29
Stage 1	-	-	-	-	29	-
Stage 2	-	-	-	-	513	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1597	-	-	-	505	1052
Stage 1	-	-	-	-	999	-
Stage 2	-	-	-	-	605	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1597	-	-	-	498	1052
Mov Cap-2 Maneuver	-	-	-	-	498	-
Stage 1	-	-	-	-	999	-
Stage 2	-	-	-	-	597	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	11.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1597	-	-	-	596
HCM Lane V/C Ratio	0.009	-	-	-	0.03
HCM Control Delay (s)	7.3	0	-	-	11.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR
Lane Configurations												
Volume (vph)	4	23	427	17	79	943	9	30	5	2	8	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	10	10	10	10
Grade (%)			2%			2%					0%	
Storage Length (ft)		0		0	0		0			50		0
Storage Lanes		0		0	0		0			1		0
Taper Length (ft)		25			25					25		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor			1.00			1.00				0.91		
Frt			0.995			0.994					0.868	
Flt Protected			0.997			0.996				0.950		
Satd. Flow (prot)	0	0	3535	0	0	3538	0	0	0	1685	1539	0
Flt Permitted			0.855			0.862				0.895		
Satd. Flow (perm)	0	0	3030	0	0	3056	0	0	0	1445	1539	0
Right Turn on Red				Yes				Yes				Yes
Satd. Flow (RTOR)			5			4					68	
Link Speed (mph)			25			30					30	
Link Distance (ft)			590			1790					1000	
Travel Time (s)			16.1			40.7					22.7	
Confl. Peds. (#/hr)		50		50	50				50			
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	4	25	459	18	85	1014	10	32	5	2	9	68
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	506	0	0	1141	0	0	0	7	77	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Left	Right	Right	Left	Left	Left	Right
Median Width(ft)			0			0					10	
Link Offset(ft)			0			0					0	
Crosswalk Width(ft)			16			16					16	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.09	1.09	1.09	1.09
Turning Speed (mph)	15	15		9	15		9	9	15	15		9
Number of Detectors	1	1	1		1	1			1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50		50	50			50	50	50	
Trailing Detector (ft)	0	0	0		0	0			0	0	0	
Detector 1 Position(ft)	0	0	0		0	0			0	0	0	
Detector 1 Size(ft)	50	50	50		50	50			50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Turn Type	Perm	Perm	NA		Perm	NA			Perm	Perm	NA	
Protected Phases			1			1					2	
Permitted Phases	1	1			1				2	2		
Detector Phase	1	1	1		1	1			2	2	2	

Lane Group	SBL	SBT	SBR	SEL	SER2	ø9
Lane Configurations						
Volume (vph)	7	15	19	6	2	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	
Lane Width (ft)	16	16	16	12	12	
Grade (%)		-1%		-5%		
Storage Length (ft)	0		0	0		
Storage Lanes	0		0	1		
Taper Length (ft)	25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor		0.95				
Frt		0.939		0.966		
Flt Protected		0.991		0.964		
Satd. Flow (prot)	0	1916	0	1814	0	
Flt Permitted		0.927		0.964		
Satd. Flow (perm)	0	1793	0	1814	0	
Right Turn on Red					No	
Satd. Flow (RTOR)						
Link Speed (mph)		30		30		
Link Distance (ft)		1000		503		
Travel Time (s)		22.7		11.4		
Confl. Peds. (#/hr)			50			
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	
Heavy Vehicles (%)	0%	0%	0%	0%	0%	
Adj. Flow (vph)	8	16	20	6	2	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	44	0	8	0	
Enter Blocked Intersection	No	No	No	No	No	
Lane Alignment	Left	Left	Right	Left	Right	
Median Width(ft)		10		12		
Link Offset(ft)		0		0		
Crosswalk Width(ft)		16		16		
Two way Left Turn Lane						
Headway Factor	0.84	0.84	0.84	0.97	0.97	
Turning Speed (mph)	15		9	15	9	
Number of Detectors	1	1		1		
Detector Template						
Leading Detector (ft)	50	50		50		
Trailing Detector (ft)	0	0		0		
Detector 1 Position(ft)	0	0		0		
Detector 1 Size(ft)	50	50		50		
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex		
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0		0.0		
Detector 1 Queue (s)	0.0	0.0		0.0		
Detector 1 Delay (s)	0.0	0.0		0.0		
Turn Type	Perm	NA		Prot		
Protected Phases		2		4		9
Permitted Phases	2					
Detector Phase	2	2		4		

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0		12.0	12.0			8.0	8.0	8.0	
Minimum Split (s)	17.0	17.0	17.0		17.0	17.0			13.0	13.0	13.0	
Total Split (s)	40.0	40.0	40.0		40.0	40.0			18.0	18.0	18.0	
Total Split (%)	44.4%	44.4%	44.4%		44.4%	44.4%			20.0%	20.0%	20.0%	
Maximum Green (s)	35.0	35.0	35.0		35.0	35.0			13.0	13.0	13.0	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0			3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0			2.0	2.0	2.0	
Lost Time Adjust (s)			-1.0			-1.0				-1.0	-1.0	
Total Lost Time (s)			4.0			4.0				4.0	4.0	
Lead/Lag	Lead	Lead	Lead		Lead	Lead			Lag	Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0		2.0	2.0			2.0	2.0	2.0	
Recall Mode	C-Max	C-Max	C-Max		C-Max	C-Max			None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)			65.1			65.1				9.3	9.3	
Actuated g/C Ratio			0.72			0.72				0.10	0.10	
v/c Ratio			0.23			0.52				0.05	0.35	
Control Delay			3.2			11.9				37.0	16.7	
Queue Delay			0.0			0.0				0.0	0.0	
Total Delay			3.2			11.9				37.0	16.7	
LOS			A			B				D	B	
Approach Delay			3.2			11.9					18.4	
Approach LOS			A			B					B	
90th %ile Green (s)	37.7	37.7	37.7		37.7	37.7			9.3	9.3	9.3	
90th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Gap	Gap	Gap	
70th %ile Green (s)	50.0	50.0	50.0		50.0	50.0			8.0	8.0	8.0	
70th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Min	Min	Min	
50th %ile Green (s)	72.0	72.0	72.0		72.0	72.0			8.0	8.0	8.0	
50th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Min	Min	Min	
30th %ile Green (s)	72.0	72.0	72.0		72.0	72.0			8.0	8.0	8.0	
30th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Min	Min	Min	
10th %ile Green (s)	85.0	85.0	85.0		85.0	85.0			0.0	0.0	0.0	
10th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Skip	Skip	Skip	
Queue Length 50th (ft)			13			73				4	5	
Queue Length 95th (ft)			126			#411				17	45	
Internal Link Dist (ft)			510			1710					920	
Turn Bay Length (ft)										50		
Base Capacity (vph)			2194			2213				224	296	
Starvation Cap Reductn			0			0				0	0	
Spillback Cap Reductn			0			0				0	0	
Storage Cap Reductn			0			0				0	0	
Reduced v/c Ratio			0.23			0.52				0.03	0.26	

Intersection Summary

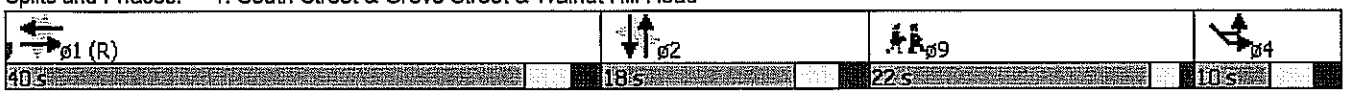
Area Type: Other
Cycle Length: 90

Lane Group	SBL	SBT	SBR	SEL	SER2	ø9
Switch Phase						
Minimum Initial (s)	8.0	8.0		4.0		4.0
Minimum Split (s)	13.0	13.0		9.0		22.0
Total Split (s)	18.0	18.0		10.0		22.0
Total Split (%)	20.0%	20.0%		11.1%		24%
Maximum Green (s)	13.0	13.0		5.0		19.0
Yellow Time (s)	3.0	3.0		3.0		2.0
All-Red Time (s)	2.0	2.0		2.0		1.0
Lost Time Adjust (s)		-1.0		-1.0		
Total Lost Time (s)		4.0		4.0		
Lead/Lag	Lag	Lag		Lag		Lead
Lead-Lag Optimize?						Yes
Vehicle Extension (s)	2.0	2.0		2.0		2.0
Recall Mode	None	None		None		None
Walk Time (s)						4.0
Flash Dont Walk (s)						15.0
Pedestrian Calls (#/hr)						23
Act Effct Green (s)		9.3		6.0		
Actuated g/C Ratio		0.10		0.07		
v/c Ratio		0.24		0.07		
Control Delay		40.5		40.1		
Queue Delay		0.0		0.0		
Total Delay		40.5		40.1		
LOS		D		D		
Approach Delay		40.5		40.1		
Approach LOS		D		D		
90th %ile Green (s)	9.3	9.3		6.0		19.0
90th %ile Term Code	Gap	Gap		Gap		Ped
70th %ile Green (s)	8.0	8.0		0.0		19.0
70th %ile Term Code	Min	Min		Skip		Ped
50th %ile Green (s)	8.0	8.0		0.0		0.0
50th %ile Term Code	Min	Min		Skip		Skip
30th %ile Green (s)	8.0	8.0		0.0		0.0
30th %ile Term Code	Min	Min		Skip		Skip
10th %ile Green (s)	0.0	0.0		0.0		0.0
10th %ile Term Code	Skip	Skip		Skip		Skip
Queue Length 50th (ft)		24		4		
Queue Length 95th (ft)		55		18		
Internal Link Dist (ft)		920		423		
Turn Bay Length (ft)						
Base Capacity (vph)		278		125		
Starvation Cap Reductn		0		0		
Spillback Cap Reductn		0		0		
Storage Cap Reductn		0		0		
Reduced v/c Ratio		0.16		0.06		

Intersection Summary

Actuated Cycle Length: 90
Offset: 18 (20%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.52
Intersection Signal Delay: 10.5 | Intersection LOS: B
Intersection Capacity Utilization 69.7% | ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: South Street & Grove Street & Walnut Hill Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	432	11	20	907	42	2	12	6	33	13	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	16	16	16
Grade (%)		0%			-3%			-1%			0%	
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00			0.97			0.92	
Frt		0.997			0.993			0.959			0.931	
Flt Protected		0.997			0.999			0.995			0.983	
Satd. Flow (prot)	0	3582	0	0	3622	0	0	1770	0	0	1875	0
Flt Permitted		0.863			0.940			0.979			0.877	
Satd. Flow (perm)	0	3099	0	0	3406	0	0	1731	0	0	1626	0
Right Turn on Red			Yes			Yes			No			No
Satd. Flow (RTOR)		3			6							
Link Speed (mph)		35			25			30			30	
Link Distance (ft)		650			590			1000			1000	
Travel Time (s)		12.7			16.1			22.7			22.7	
Confl. Peds. (#/hr)	50		50	50		50	50		50	50		50
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	33	450	11	21	945	44	2	12	6	34	14	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	494	0	0	1010	0	0	20	0	0	98	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.98	0.98	0.98	0.99	0.99	0.99	0.85	0.85	0.85
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	50	50		50	50		50	50		50	50	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	1 2			2			4			4	
Permitted Phases	1 2			2			4			4		
Detector Phase	1	1 2		2	2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0			12.0	12.0		8.0	8.0		8.0	8.0	
Minimum Split (s)	8.0			17.0	17.0		13.0	13.0		13.0	13.0	

Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	7.0
Minimum Split (s)	22.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	8.0			40.0	40.0		20.0	20.0		20.0	20.0	
Total Split (%)	8.9%			44.4%	44.4%		22.2%	22.2%		22.2%	22.2%	
Maximum Green (s)	4.0			35.0	35.0		15.0	15.0		15.0	15.0	
Yellow Time (s)	3.0			3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0			2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)					-1.0			-1.0			-1.0	
Total Lost Time (s)					4.0			4.0			4.0	
Lead/Lag	Lead			Lag	Lag		Lag	Lag		Lag	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0			2.0	2.0		2.0	2.0		2.0	2.0	
Recall Mode	None			C-Max	C-Max		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		60.6			54.3			11.2			11.2	
Actuated g/C Ratio		0.67			0.60			0.12			0.12	
v/c Ratio		0.23			0.49			0.09			0.49	
Control Delay		8.0			20.3			34.5			44.4	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		8.0			20.3			34.5			44.4	
LOS		A			C			C			D	
Approach Delay		8.0			20.3			34.5			44.4	
Approach LOS		A			C			C			D	
90th %ile Green (s)	5.1			35.0	35.0		13.9	13.9		13.9	13.9	
90th %ile Term Code	Max			Coord	Coord		Gap	Gap		Gap	Gap	
70th %ile Green (s)	7.6			35.0	35.0		11.4	11.4		11.4	11.4	
70th %ile Term Code	Max			Coord	Coord		Gap	Gap		Gap	Gap	
50th %ile Green (s)	7.4			58.9	58.9		9.7	9.7		9.7	9.7	
50th %ile Term Code	Gap			Coord	Coord		Gap	Gap		Gap	Gap	
30th %ile Green (s)	6.7			61.3	61.3		8.0	8.0		8.0	8.0	
30th %ile Term Code	Gap			Coord	Coord		Min	Min		Min	Min	
10th %ile Green (s)	4.8			76.2	76.2		0.0	0.0		0.0	0.0	
10th %ile Term Code	Gap			Coord	Coord		Skip	Skip		Skip	Skip	
Queue Length 50th (ft)		26			122			10			53	
Queue Length 95th (ft)		113			349			30			98	
Internal Link Dist (ft)		570			510			920			920	
Turn Bay Length (ft)												
Base Capacity (vph)		2121			2056			307			289	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.23			0.49			0.07			0.34	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:EBWB, Start of Green, Master Intersection
Natural Cycle: 65

Lane Group	ø9
Total Split (s)	22.0
Total Split (%)	24%
Maximum Green (s)	19.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	12.0
Pedestrian Calls (#/hr)	15
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	19.0
90th %ile Term Code	Ped
70th %ile Green (s)	19.0
70th %ile Term Code	Ped
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.49
Intersection Signal Delay: 18.2
Intersection Capacity Utilization 61.8%
Analysis Period (min) 15

Intersection LOS: B
ICU Level of Service B

Splits and Phases: 2: Russett Road/Beverly Road & Independence Drive/Grove Street

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	443	957	0	32	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	0	482	1040	0	35	24

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1040	0	-	0	1281	520
Stage 1	-	-	-	-	1040	-
Stage 2	-	-	-	-	241	-
Critical Hdwy	4.1	-	-	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	676	-	-	-	160	506
Stage 1	-	-	-	-	306	-
Stage 2	-	-	-	-	783	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	676	-	-	-	160	506
Mov Cap-2 Maneuver	-	-	-	-	160	-
Stage 1	-	-	-	-	306	-
Stage 2	-	-	-	-	783	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	25
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	676	-	-	-	160	506
HCM Lane V/C Ratio	-	-	-	-	0.217	0.047
HCM Control Delay (s)	0	-	-	-	33.6	12.5
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0	-	-	-	0.8	0.1

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	27	430	18	20	906	53	7	8	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	-2	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	2	0	0	2	0	0	0	0
Mvmt Flow	28	453	19	21	954	56	7	8	14

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	1009	0	0	472	0	0	1038	1571	236
Stage 1	-	-	-	-	-	-	519	519	-
Stage 2	-	-	-	-	-	-	519	1052	-
Critical Hdwy	4.1	-	-	4.1	-	-	6.4	6.1	6.7
Critical Hdwy Stg 1	-	-	-	-	-	-	5.4	5.1	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.4	5.1	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3
Pot Cap-1 Maneuver	695	-	-	1100	-	-	258	133	782
Stage 1	-	-	-	-	-	-	601	568	-
Stage 2	-	-	-	-	-	-	601	344	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	695	-	-	1100	-	-	233	0	782
Mov Cap-2 Maneuver	-	-	-	-	-	-	233	0	-
Stage 1	-	-	-	-	-	-	568	0	-
Stage 2	-	-	-	-	-	-	575	0	-

Approach	EB	WB	NB
HCM Control Delay, s	0.9	0.4	14
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	429	695	-	-	1100	-	-
HCM Lane V/C Ratio	0.069	0.041	-	-	0.019	-	-
HCM Control Delay (s)	14	10.4	0.3	-	8.3	0.2	-
HCM Lane LOS	B	B	A	-	A	A	-
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0.1	-	-

Intersection

Int Delay, s/veh

Movement	SBL	SBT	SBR
Vol, veh/h	0	0	0
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	95	95	95
Heavy Vehicles, %	0	0	0
Mvmt Flow	0	0	0

Major/Minor

Conflicting Flow All
    Stage 1
    Stage 2
Critical Hdwy
Critical Hdwy Stg 1
Critical Hdwy Stg 2
Follow-up Hdwy
Pot Cap-1 Maneuver
    Stage 1
    Stage 2
Platoon blocked, %
Mov Cap-1 Maneuver
Mov Cap-2 Maneuver
    Stage 1
    Stage 2

Approach

HCM Control Delay, s
HCM LOS

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	7	6	2	2	17	16	4	5	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	7	2	2	19	18	5	6	2

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	38	0	0	9	0	0	68	66	8
Stage 1	-	-	-	-	-	-	24	24	-
Stage 2	-	-	-	-	-	-	44	42	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3
Pot Cap-1 Maneuver	1585	-	-	1624	-	-	930	829	1080
Stage 1	-	-	-	-	-	-	999	879	-
Stage 2	-	-	-	-	-	-	975	864	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1585	-	-	1624	-	-	907	824	1080
Mov Cap-2 Maneuver	-	-	-	-	-	-	907	824	-
Stage 1	-	-	-	-	-	-	994	875	-
Stage 2	-	-	-	-	-	-	952	863	-

Approach	EB	WB	NB
HCM Control Delay, s	3.4	0.4	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	892	1585	-	-	1624	-	-	942
HCM Lane V/C Ratio	0.014	0.005	-	-	0.001	-	-	0.031
HCM Control Delay (s)	9.1	7.3	0	-	7.2	0	-	8.9
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection

Int Delay, s/veh

Movement	SBL	SBT	SBR
Vol, veh/h	7	8	11
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	88	88	88
Heavy Vehicles, %	0	0	0
Mvmt Flow	8	9	12

Major/Minor	Minor2		
Conflicting Flow All	61	58	28
Stage 1	33	33	-
Stage 2	28	25	-
Critical Hdwy	7.1	6.5	6.2
Critical Hdwy Stg 1	6.1	5.5	-
Critical Hdwy Stg 2	6.1	5.5	-
Follow-up Hdwy	3.5	4	3.3
Pot Cap-1 Maneuver	939	837	1053
Stage 1	988	872	-
Stage 2	994	878	-
Platoon blocked, %			
Mov Cap-1 Maneuver	928	832	1053
Mov Cap-2 Maneuver	928	832	-
Stage 1	983	871	-
Stage 2	981	874	-

Approach	SB
HCM Control Delay, s	8.9
HCM LOS	A

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	4	64	79	8	8	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	8	-7	-	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	0	3	1	0	0	25
Mvmt Flow	5	80	99	10	10	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	109	0	-	0	194	104
Stage 1	-	-	-	-	104	-
Stage 2	-	-	-	-	90	-
Critical Hdwy	4.1	-	-	-	6.4	6.45
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.525
Pot Cap-1 Maneuver	1494	-	-	-	799	892
Stage 1	-	-	-	-	925	-
Stage 2	-	-	-	-	939	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1494	-	-	-	796	892
Mov Cap-2 Maneuver	-	-	-	-	796	-
Stage 1	-	-	-	-	925	-
Stage 2	-	-	-	-	935	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1494	-	-	-	826
HCM Lane V/C Ratio	0.003	-	-	-	0.018
HCM Control Delay (s)	7.4	0	-	-	9.4
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR
Lane Configurations												
Volume (vph)	5	85	823	18	30	478	5	45	27	0	109	328
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	10	10	10	10
Grade (%)			2%			2%					0%	
Storage Length (ft)		0		0	0		0			50		0
Storage Lanes		0		0	0		0			1		0
Taper Length (ft)		25			25					25		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Frt			0.997			0.986					0.887	
Flt Protected			0.995			0.997				0.950		
Satd. Flow (prot)	0	0	3545	0	0	3513	0	0	0	1685	1573	0
Flt Permitted			0.741			0.780				0.742		
Satd. Flow (perm)	0	0	2640	0	0	2749	0	0	0	1316	1573	0
Right Turn on Red				Yes				Yes				Yes
Satd. Flow (RTOR)			2			11					143	
Link Speed (mph)			25			30					30	
Link Distance (ft)			590			1790					1000	
Travel Time (s)			16.1			40.7					22.7	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	6	96	925	20	34	537	6	51	30	0	122	369
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	1047	0	0	628	0	0	0	30	491	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Left	Right	Right	Left	Left	Left	Right
Median Width(ft)			0			0					10	
Link Offset(ft)			0			0					0	
Crosswalk Width(ft)			16			16					16	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.09	1.09	1.09	1.09
Turning Speed (mph)	15	15		9	15		9	9	15	15		9
Number of Detectors	1	1	1		1	1			1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50		50	50			50	50	50	
Trailing Detector (ft)	0	0	0		0	0			0	0	0	
Detector 1 Position(ft)	0	0	0		0	0			0	0	0	
Detector 1 Size(ft)	50	50	50		50	50			50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Turn Type	Perm	Perm	NA		Perm	NA			Perm	Perm	NA	
Protected Phases			1			1					2	
Permitted Phases	1	1			1				2	2		
Detector Phase	1	1	1		1	1			2	2	2	
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0		12.0	12.0			8.0	8.0	8.0	

Lane Group	SBL	SBT	SBR	SEL2	SEL	SER	SER2	ø9
Lane Configurations								
Volume (vph)	6	4	12	1	11	1	4	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	16	16	16	12	12	12	12	
Grade (%)		-1%			-5%			
Storage Length (ft)	0		0		0	0		
Storage Lanes	0		0		1	0		
Taper Length (ft)	25				25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		0.927			0.962			
Flt Protected		0.986			0.965			
Satd. Flow (prot)	0	1978	0	0	1808	0	0	
Flt Permitted		0.824			0.965			
Satd. Flow (perm)	0	1653	0	0	1808	0	0	
Right Turn on Red							No	
Satd. Flow (RTOR)								
Link Speed (mph)		30			30			
Link Distance (ft)		1000			503			
Travel Time (s)		22.7			11.4			
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	
Adj. Flow (vph)	7	4	13	1	12	1	4	
Shared Lane Traffic (%)								
Lane Group Flow (vph)	0	24	0	0	18	0	0	
Enter Blocked Intersection	No	No	No	No	No	No	No	
Lane Alignment	Left	Left	Right	Left	Left	Right	Right	
Median Width(ft)		10			12			
Link Offset(ft)		0			0			
Crosswalk Width(ft)		16			16			
Two way Left Turn Lane								
Headway Factor	0.84	0.84	0.84	0.97	0.97	0.97	0.97	
Turning Speed (mph)	15		9	15	15	9	9	
Number of Detectors	1	1		1	1			
Detector Template								
Leading Detector (ft)	50	50		50	50			
Trailing Detector (ft)	0	0		0	0			
Detector 1 Position(ft)	0	0		0	0			
Detector 1 Size(ft)	50	50		50	50			
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			
Detector 1 Channel								
Detector 1 Extend (s)	0.0	0.0		0.0	0.0			
Detector 1 Queue (s)	0.0	0.0		0.0	0.0			
Detector 1 Delay (s)	0.0	0.0		0.0	0.0			
Turn Type	Perm	NA		Prot	Prot			
Protected Phases		2		4	4			9
Permitted Phases	2							
Detector Phase	2	2		4	4			
Switch Phase								
Minimum Initial (s)	8.0	8.0		4.0	4.0			4.0

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR
Minimum Split (s)	17.0	17.0	17.0		17.0	17.0			13.0	13.0	13.0	
Total Split (s)	40.0	40.0	40.0		40.0	40.0			23.0	23.0	23.0	
Total Split (%)	42.1%	42.1%	42.1%		42.1%	42.1%			24.2%	24.2%	24.2%	
Maximum Green (s)	35.0	35.0	35.0		35.0	35.0			18.0	18.0	18.0	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0			3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0			2.0	2.0	2.0	
Lost Time Adjust (s)			-1.0			-1.0				-1.0	-1.0	
Total Lost Time (s)			4.0			4.0				4.0	4.0	
Lead/Lag	Lead	Lead	Lead		Lead	Lead			Lead	Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0		2.0	2.0			2.0	2.0	2.0	
Recall Mode	C-Max	C-Max	C-Max		C-Max	C-Max			None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)			44.0			44.0				30.2	30.2	
Actuated g/C Ratio			0.46			0.46				0.32	0.32	
v/c Ratio			0.86			0.49				0.07	0.82	
Control Delay			30.5			20.3				28.9	37.4	
Queue Delay			0.0			0.0				0.0	0.0	
Total Delay			30.5			20.3				28.9	37.4	
LOS			C			C				C	D	
Approach Delay			30.5			20.3					36.9	
Approach LOS			C			C					D	
90th %ile Green (s)	35.0	35.0	35.0		35.0	35.0			18.0	18.0	18.0	
90th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Max	Max	Max	
70th %ile Green (s)	35.0	35.0	35.0		35.0	35.0			18.0	18.0	18.0	
70th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Max	Max	Max	
50th %ile Green (s)	51.2	51.2	51.2		51.2	51.2			33.8	33.8	33.8	
50th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Gap	Gap	Gap	
30th %ile Green (s)	49.0	49.0	49.0		49.0	49.0			36.0	36.0	36.0	
30th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Gap	Gap	Gap	
10th %ile Green (s)	45.0	45.0	45.0		45.0	45.0			40.0	40.0	40.0	
10th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Max	Max	Max	
Queue Length 50th (ft)			254			107				12	182	
Queue Length 95th (ft)			#502			209				39	#463	
Internal Link Dist (ft)			510			1710					920	
Turn Bay Length (ft)										50		
Base Capacity (vph)			1224			1280				417	597	
Starvation Cap Reductn			0			0				0	0	
Spillback Cap Reductn			0			0				0	0	
Storage Cap Reductn			0			0				0	0	
Reduced v/c Ratio			0.86			0.49				0.07	0.82	

Intersection Summary

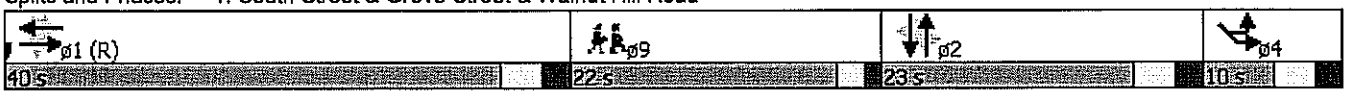
Area Type: Other
Cycle Length: 95
Actuated Cycle Length: 95
Offset: 10 (11%), Referenced to phase 1:EBWB, Start of Green

Lane Group	SBL	SBT	SBR	SEL2	SEL	SER	SER2	ø9
Minimum Split (s)	13.0	13.0		9.0	9.0			22.0
Total Split (s)	23.0	23.0		10.0	10.0			22.0
Total Split (%)	24.2%	24.2%		10.5%	10.5%			23%
Maximum Green (s)	18.0	18.0		5.0	5.0			19.0
Yellow Time (s)	3.0	3.0		3.0	3.0			2.0
All-Red Time (s)	2.0	2.0		2.0	2.0			1.0
Lost Time Adjust (s)		-1.0			-1.0			
Total Lost Time (s)		4.0			4.0			
Lead/Lag	Lead	Lead		Lag	Lag			Lag
Lead-Lag Optimize?								Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0
Recall Mode	None	None		None	None			None
Walk Time (s)								4.0
Flash Dont Walk (s)								15.0
Pedestrian Calls (#/hr)								15
Act Effct Green (s)		30.2			5.9			
Actuated g/C Ratio		0.32			0.06			
v/c Ratio		0.05			0.16			
Control Delay		28.6			45.6			
Queue Delay		0.0			0.0			
Total Delay		28.6			45.6			
LOS		C			D			
Approach Delay		28.6			45.6			
Approach LOS		C			D			
90th %ile Green (s)	18.0	18.0		5.0	5.0			19.0
90th %ile Term Code	Max	Max		Max	Max			Ped
70th %ile Green (s)	18.0	18.0		5.0	5.0			19.0
70th %ile Term Code	Max	Max		Max	Max			Ped
50th %ile Green (s)	33.8	33.8		0.0	0.0			0.0
50th %ile Term Code	Gap	Gap		Skip	Skip			Skip
30th %ile Green (s)	36.0	36.0		0.0	0.0			0.0
30th %ile Term Code	Gap	Gap		Skip	Skip			Skip
10th %ile Green (s)	40.0	40.0		0.0	0.0			0.0
10th %ile Term Code	Max	Max		Skip	Skip			Skip
Queue Length 50th (ft)		9			10			
Queue Length 95th (ft)		33			32			
Internal Link Dist (ft)		920			423			
Turn Bay Length (ft)								
Base Capacity (vph)		524			115			
Starvation Cap Reductn		0			0			
Spillback Cap Reductn		0			0			
Storage Cap Reductn		0			0			
Reduced v/c Ratio		0.05			0.16			

Intersection Summary

Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 29.2 — Intersection LOS: C
Intersection Capacity Utilization 84.2% — ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: South Street & Grove Street & Walnut Hill Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	734	3	9	473	39	2	42	62	135	17	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	16	16	16
Grade (%)		0%			-3%			-1%			0%	
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.989			0.920			0.976	
Flt Protected		0.998			0.999			0.999			0.965	
Satd. Flow (prot)	0	3599	0	0	3620	0	0	1755	0	0	2028	0
Flt Permitted		0.912			0.935			0.996			0.628	
Satd. Flow (perm)	0	3289	0	0	3388	0	0	1750	0	0	1320	0
Right Turn on Red			Yes			Yes			No			No
Satd. Flow (RTOR)					9							
Link Speed (mph)		35			25			30			30	
Link Distance (ft)		240			590			1000			1000	
Travel Time (s)		4.7			16.1			22.7			22.7	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	40	895	4	11	577	48	2	51	76	165	21	41
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	939	0	0	636	0	0	129	0	0	227	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.98	0.98	0.98	0.99	0.99	0.99	0.85	0.85	0.85
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	50	50		50	50		50	50		50	50	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	1 2			2			4			4	
Permitted Phases	1 2			2			4			4		
Detector Phase	1	1 2		2	2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0			12.0	12.0		8.0	8.0		8.0	8.0	
Minimum Split (s)	8.0			17.0	17.0		13.0	13.0		13.0	13.0	
Total Split (s)	11.0			30.0	30.0		32.0	32.0		32.0	32.0	
Total Split (%)	11.6%			31.6%	31.6%		33.7%	33.7%		33.7%	33.7%	

Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	7.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	23%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	7.0			25.0	25.0		27.0	27.0		27.0	27.0	
Yellow Time (s)	3.0			3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0			2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)					-1.0			-1.0			-1.0	
Total Lost Time (s)					4.0			4.0			4.0	
Lead/Lag	Lead			Lag	Lag		Lag	Lag		Lag	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0			2.0	2.0		2.0	2.0		2.0	2.0	
Recall Mode	None			C-Max	C-Max		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		53.7			42.0			20.5			20.5	
Actuated g/C Ratio		0.57			0.44			0.22			0.22	
v/c Ratio		0.50			0.42			0.34			0.80	
Control Delay		16.1			34.7			32.4			54.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		16.1			34.7			32.4			54.6	
LOS		B			C			C			D	
Approach Delay		16.1			34.7			32.4			54.6	
Approach LOS		B			C			C			D	
90th %ile Green (s)	7.0			25.0	25.0		27.0	27.0		27.0	27.0	
90th %ile Term Code	Max			Coord	Coord		Max	Max		Max	Max	
70th %ile Green (s)	11.1			25.0	25.0		22.9	22.9		22.9	22.9	
70th %ile Term Code	Max			Coord	Coord		Gap	Gap		Gap	Gap	
50th %ile Green (s)	16.2			45.1	45.1		19.7	19.7		19.7	19.7	
50th %ile Term Code	Gap			Coord	Coord		Gap	Gap		Gap	Gap	
30th %ile Green (s)	13.8			50.8	50.8		16.4	16.4		16.4	16.4	
30th %ile Term Code	Gap			Coord	Coord		Gap	Gap		Gap	Gap	
10th %ile Green (s)	10.0			59.3	59.3		11.7	11.7		11.7	11.7	
10th %ile Term Code	Gap			Coord	Coord		Gap	Gap		Gap	Gap	
Queue Length 50th (ft)		105			91			66			130	
Queue Length 95th (ft)		272			248			96			173	
Internal Link Dist (ft)		160			510			920			920	
Turn Bay Length (ft)												
Base Capacity (vph)		1895			1504			515			389	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.50			0.42			0.25			0.58	

Intersection Summary

Area Type: Other
Cycle Length: 95
Actuated Cycle Length: 95
Offset: 0 (0%), Referenced to phase 2:EBWB, Start of Green, Master Intersection
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80

Lane Group	ø9
Maximum Green (s)	19.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	12.0
Pedestrian Calls (#/hr)	19
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	19.0
90th %ile Term Code	Ped
70th %ile Green (s)	19.0
70th %ile Term Code	Ped
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Intersection Signal Delay: 27.9
Intersection Capacity Utilization 63.0%
Analysis Period (min) 15

Intersection LOS: C
ICU Level of Service B

Splits and Phases: 2: Russett Road/Beverly Road & Independence Drive/Grove Street

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	659	512	0	104	58
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	2	4	0	1	0
Mvmt Flow	0	694	539	0	109	61

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	539	0	-	0	886	269
Stage 1	-	-	-	-	539	-
Stage 2	-	-	-	-	347	-
Critical Hdwy	4.1	-	-	-	6.82	6.9
Critical Hdwy Stg 1	-	-	-	-	5.82	-
Critical Hdwy Stg 2	-	-	-	-	5.82	-
Follow-up Hdwy	2.2	-	-	-	3.51	3.3
Pot Cap-1 Maneuver	1040	-	-	-	286	735
Stage 1	-	-	-	-	552	-
Stage 2	-	-	-	-	690	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1040	-	-	-	286	735
Mov Cap-2 Maneuver	-	-	-	-	286	-
Stage 1	-	-	-	-	552	-
Stage 2	-	-	-	-	690	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	19.9
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1040	-	-	-	286	735
HCM Lane V/C Ratio	-	-	-	-	0.383	0.083
HCM Control Delay (s)	0	-	-	-	25.2	10.3
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0	-	-	-	1.7	0.3

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	15	625	4	27	518	25	9	16	34
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	-2	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	0	3	0	0	3	0	0	0	0
Mvmt Flow	15	638	4	28	529	26	9	16	35

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	554	0	0	642	0	0	989	1279	321
Stage 1	-	-	-	-	-	-	670	670	-
Stage 2	-	-	-	-	-	-	319	609	-
Critical Hdwy	4.1	-	-	4.1	-	-	6.4	6.1	6.7
Critical Hdwy Stg 1	-	-	-	-	-	-	5.4	5.1	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.4	5.1	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3
Pot Cap-1 Maneuver	1026	-	-	952	-	-	276	193	693
Stage 1	-	-	-	-	-	-	512	494	-
Stage 2	-	-	-	-	-	-	741	523	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1026	-	-	952	-	-	258	0	693
Mov Cap-2 Maneuver	-	-	-	-	-	-	258	0	-
Stage 1	-	-	-	-	-	-	500	0	-
Stage 2	-	-	-	-	-	-	709	0	-

Approach	EB	WB	NB
HCM Control Delay, s	0.3	0.6	13
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	512	1026	-	-	952	-	-
HCM Lane V/C Ratio	0.118	0.015	-	-	0.029	-	-
HCM Control Delay (s)	13	8.6	0.1	-	8.9	0.2	-
HCM Lane LOS	B	A	A	-	A	A	-
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-

Intersection

Int Delay, s/veh

Movement	SBL	SBT	SBR
Vol, veh/h	0	0	0
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	98	98	98
Heavy Vehicles, %	0	0	0
Mvmt Flow	0	0	0

Major/Minor

Conflicting Flow All
    Stage 1
    Stage 2
Critical Hdwy
Critical Hdwy Stg 1
Critical Hdwy Stg 2
Follow-up Hdwy
Pot Cap-1 Maneuver
    Stage 1
    Stage 2
Platoon blocked, %
Mov Cap-1 Maneuver
Mov Cap-2 Maneuver
    Stage 1
    Stage 2

Approach

HCM Control Delay, s
HCM LOS

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	7.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	7	21	2	4	3	17	1	14	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	70	70	70	70	70	70	70	70	70
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	10	30	3	6	4	24	1	20	10

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	29	0	0	33	0	0	116	91	31
Stage 1	-	-	-	-	-	-	51	51	-
Stage 2	-	-	-	-	-	-	65	40	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3
Pot Cap-1 Maneuver	1597	-	-	1592	-	-	865	803	1049
Stage 1	-	-	-	-	-	-	967	856	-
Stage 2	-	-	-	-	-	-	951	866	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1597	-	-	1592	-	-	799	795	1049
Mov Cap-2 Maneuver	-	-	-	-	-	-	799	795	-
Stage 1	-	-	-	-	-	-	961	851	-
Stage 2	-	-	-	-	-	-	875	863	-

Approach	EB	WB	NB
HCM Control Delay, s	1.7	1.2	9.3
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	862	1597	-	-	1592	-	-	889
HCM Lane V/C Ratio	0.036	0.006	-	-	0.004	-	-	0.167
HCM Control Delay (s)	9.3	7.3	0	-	7.3	0	-	9.9
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.6

Intersection

Int Delay, s/veh

Movement	SBL	SBT	SBR
Vol, veh/h	52	26	26
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	70	70	70
Heavy Vehicles, %	0	0	0
Mvmt Flow	74	37	37

Major/Minor	Minor2		
Conflicting Flow All	94	81	16
Stage 1	28	28	-
Stage 2	66	53	-
Critical Hdwy	7.1	6.5	6.2
Critical Hdwy Stg 1	6.1	5.5	-
Critical Hdwy Stg 2	6.1	5.5	-
Follow-up Hdwy	3.5	4	3.3
Pot Cap-1 Maneuver	894	813	1069
Stage 1	994	876	-
Stage 2	950	855	-
Platoon blocked, %			
Mov Cap-1 Maneuver	862	805	1069
Mov Cap-2 Maneuver	862	805	-
Stage 1	988	872	-
Stage 2	913	850	-

Approach	SB
HCM Control Delay, s	9.9
HCM LOS	A

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	14	431	25	4	22	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	8	-7	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	1	4	0	0	0
Mvmt Flow	16	484	28	4	25	9

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	33	0	-	0	546	30
Stage 1	-	-	-	-	30	-
Stage 2	-	-	-	-	516	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1592	-	-	-	502	1050
Stage 1	-	-	-	-	998	-
Stage 2	-	-	-	-	603	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1592	-	-	-	495	1050
Mov Cap-2 Maneuver	-	-	-	-	495	-
Stage 1	-	-	-	-	998	-
Stage 2	-	-	-	-	595	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	11.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1592	-	-	-	576
HCM Lane V/C Ratio	0.01	-	-	-	0.059
HCM Control Delay (s)	7.3	0	-	-	11.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	1	765	508	1	5	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	832	552	1	5	3

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	553	0	-	0	971	277
Stage 1	-	-	-	-	553	-
Stage 2	-	-	-	-	418	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	1013	-	-	-	250	720
Stage 1	-	-	-	-	540	-
Stage 2	-	-	-	-	632	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1013	-	-	-	250	720
Mov Cap-2 Maneuver	-	-	-	-	250	-
Stage 1	-	-	-	-	540	-
Stage 2	-	-	-	-	631	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	16.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1013	-	-	-	331
HCM Lane V/C Ratio	0.001	-	-	-	0.026
HCM Control Delay (s)	8.6	0	-	-	16.2
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	763	0	1	510	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	829	0	1	554	2	3

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	829	0	1108	415
Stage 1	-	-	-	-	829	-
Stage 2	-	-	-	-	279	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	798	-	204	586
Stage 1	-	-	-	-	389	-
Stage 2	-	-	-	-	743	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	798	-	204	586
Mov Cap-2 Maneuver	-	-	-	-	204	-
Stage 1	-	-	-	-	389	-
Stage 2	-	-	-	-	742	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	15.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	335	-	-	798	-
HCM Lane V/C Ratio	0.016	-	-	0.001	-
HCM Control Delay (s)	15.9	-	-	9.5	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR
Lane Configurations												
Volume (vph)	4	23	445	17	88	977	9	30	5	2	10	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	10	10	10	10
Grade (%)			2%			2%					0%	
Storage Length (ft)		0		0	0		0			50		0
Storage Lanes		0		0	0		0			1		0
Taper Length (ft)		25			25					25		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor			1.00			1.00				0.91		
Frt			0.995			0.995					0.870	
Flt Protected			0.997			0.996				0.950		
Satd. Flow (prot)	0	0	3535	0	0	3542	0	0	0	1685	1543	0
Flt Permitted			0.853			0.849				0.873		
Satd. Flow (perm)	0	0	3024	0	0	3012	0	0	0	1412	1543	0
Right Turn on Red				Yes				Yes				Yes
Satd. Flow (RTOR)			5			4					73	
Link Speed (mph)			25			30					30	
Link Distance (ft)			590			1790					1000	
Travel Time (s)			16.1			40.7					22.7	
Confl. Peds. (#/hr)		50		50	50				50			
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	4	25	478	18	95	1051	10	32	5	2	11	73
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	525	0	0	1188	0	0	0	7	84	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Left	Right	Right	Left	Left	Left	Right
Median Width(ft)			0			0					10	
Link Offset(ft)			0			0					0	
Crosswalk Width(ft)			16			16					16	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.09	1.09	1.09	1.09
Turning Speed (mph)	15	15		9	15		9	9	15	15		9
Number of Detectors	1	1	1		1	1			1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50		50	50			50	50	50	
Trailing Detector (ft)	0	0	0		0	0			0	0	0	
Detector 1 Position(ft)	0	0	0		0	0			0	0	0	
Detector 1 Size(ft)	50	50	50		50	50			50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0	0.0	
Turn Type	Perm	Perm	NA		Perm	NA			Perm	Perm	NA	
Protected Phases			1			1					2	
Permitted Phases	1	1			1				2	2		
Detector Phase	1	1	1		1	1			2	2	2	

Lane Group	SBL	SBT	SBR	SEL	SER2	ø9
Lane Configurations						
Volume (vph)	7	18	19	6	2	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	
Lane Width (ft)	16	16	16	12	12	
Grade (%)		-1%		-5%		
Storage Length (ft)	0		0	0		
Storage Lanes	0		0	1		
Taper Length (ft)	25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor		0.95				
Frt		0.943		0.966		
Flt Protected		0.992		0.964		
Satd. Flow (prot)	0	1933	0	1814	0	
Flt Permitted		0.930		0.964		
Satd. Flow (perm)	0	1812	0	1814	0	
Right Turn on Red					No	
Satd. Flow (RTOR)						
Link Speed (mph)		30		30		
Link Distance (ft)		1000		503		
Travel Time (s)		22.7		11.4		
Confl. Peds. (#/hr)			50			
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	
Heavy Vehicles (%)	0%	0%	0%	0%	0%	
Adj. Flow (vph)	8	19	20	6	2	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	47	0	8	0	
Enter Blocked Intersection	No	No	No	No	No	
Lane Alignment	Left	Left	Right	Left	Right	
Median Width(ft)		10		12		
Link Offset(ft)		0		0		
Crosswalk Width(ft)		16		16		
Two way Left Turn Lane						
Headway Factor	0.84	0.84	0.84	0.97	0.97	
Turning Speed (mph)	15		9	15	9	
Number of Detectors	1	1		1		
Detector Template						
Leading Detector (ft)	50	50		50		
Trailing Detector (ft)	0	0		0		
Detector 1 Position(ft)	0	0		0		
Detector 1 Size(ft)	50	50		50		
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex		
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0		0.0		
Detector 1 Queue (s)	0.0	0.0		0.0		
Detector 1 Delay (s)	0.0	0.0		0.0		
Turn Type	Perm	NA		Prot		
Protected Phases		2		4		9
Permitted Phases	2					
Detector Phase	2	2		4		

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR
Switch Phase												
Minimum Initial (s)	12.0	12.0	12.0		12.0	12.0			8.0	8.0	8.0	
Minimum Split (s)	17.0	17.0	17.0		17.0	17.0			13.0	13.0	13.0	
Total Split (s)	40.0	40.0	40.0		40.0	40.0			18.0	18.0	18.0	
Total Split (%)	44.4%	44.4%	44.4%		44.4%	44.4%			20.0%	20.0%	20.0%	
Maximum Green (s)	35.0	35.0	35.0		35.0	35.0			13.0	13.0	13.0	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0			3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0			2.0	2.0	2.0	
Lost Time Adjust (s)			-1.0			-1.0				-1.0	-1.0	
Total Lost Time (s)			4.0			4.0				4.0	4.0	
Lead/Lag	Lead	Lead	Lead		Lead	Lead			Lag	Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0		2.0	2.0			2.0	2.0	2.0	
Recall Mode	C-Max	C-Max	C-Max		C-Max	C-Max			None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)			65.1			65.1				9.3	9.3	
Actuated g/C Ratio			0.72			0.72				0.10	0.10	
v/c Ratio			0.24			0.55				0.05	0.37	
Control Delay			3.8			12.6				36.9	16.8	
Queue Delay			0.0			0.0				0.0	0.0	
Total Delay			3.8			12.6				36.9	16.8	
LOS			A			B				D	B	
Approach Delay			3.8			12.6					18.4	
Approach LOS			A			B					B	
90th %ile Green (s)	37.4	37.4	37.4		37.4	37.4			9.6	9.6	9.6	
90th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Gap	Gap	Gap	
70th %ile Green (s)	50.0	50.0	50.0		50.0	50.0			8.0	8.0	8.0	
70th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Min	Min	Min	
50th %ile Green (s)	72.0	72.0	72.0		72.0	72.0			8.0	8.0	8.0	
50th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Min	Min	Min	
30th %ile Green (s)	72.0	72.0	72.0		72.0	72.0			8.0	8.0	8.0	
30th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Min	Min	Min	
10th %ile Green (s)	85.0	85.0	85.0		85.0	85.0			0.0	0.0	0.0	
10th %ile Term Code	Coord	Coord	Coord		Coord	Coord			Skip	Skip	Skip	
Queue Length 50th (ft)			18			78				4	6	
Queue Length 95th (ft)			162			#471				17	48	
Internal Link Dist (ft)			510			1710					920	
Turn Bay Length (ft)										50		
Base Capacity (vph)			2188			2179				219	301	
Starvation Cap Reductn			0			0				0	0	
Spillback Cap Reductn			0			0				0	0	
Storage Cap Reductn			0			0				0	0	
Reduced v/c Ratio			0.24			0.55				0.03	0.28	

Intersection Summary

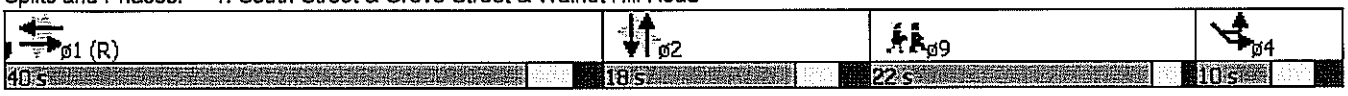
Area Type: Other
Cycle Length: 90

Lane Group	SBL	SBT	SBR	SEL	SER2	ø9
Switch Phase						
Minimum Initial (s)	8.0	8.0		4.0		4.0
Minimum Split (s)	13.0	13.0		9.0		22.0
Total Split (s)	18.0	18.0		10.0		22.0
Total Split (%)	20.0%	20.0%		11.1%		24%
Maximum Green (s)	13.0	13.0		5.0		19.0
Yellow Time (s)	3.0	3.0		3.0		2.0
All-Red Time (s)	2.0	2.0		2.0		1.0
Lost Time Adjust (s)		-1.0		-1.0		
Total Lost Time (s)		4.0		4.0		
Lead/Lag	Lag	Lag		Lag		Lead
Lead-Lag Optimize?						Yes
Vehicle Extension (s)	2.0	2.0		2.0		2.0
Recall Mode	None	None		None		None
Walk Time (s)						4.0
Flash Dont Walk (s)						15.0
Pedestrian Calls (#/hr)						23
Act Effct Green (s)		9.3		6.0		
Actuated g/C Ratio		0.10		0.07		
v/c Ratio		0.25		0.07		
Control Delay		40.5		40.1		
Queue Delay		0.0		0.0		
Total Delay		40.5		40.1		
LOS		D		D		
Approach Delay		40.5		40.1		
Approach LOS		D		D		
90th %ile Green (s)	9.6	9.6		6.0		19.0
90th %ile Term Code	Gap	Gap		Gap		Ped
70th %ile Green (s)	8.0	8.0		0.0		19.0
70th %ile Term Code	Min	Min		Skip		Ped
50th %ile Green (s)	8.0	8.0		0.0		0.0
50th %ile Term Code	Min	Min		Skip		Skip
30th %ile Green (s)	8.0	8.0		0.0		0.0
30th %ile Term Code	Min	Min		Skip		Skip
10th %ile Green (s)	0.0	0.0		0.0		0.0
10th %ile Term Code	Skip	Skip		Skip		Skip
Queue Length 50th (ft)		25		4		
Queue Length 95th (ft)		57		18		
Internal Link Dist (ft)		920		423		
Turn Bay Length (ft)						
Base Capacity (vph)		281		125		
Starvation Cap Reductn		0		0		
Spillback Cap Reductn		0		0		
Storage Cap Reductn		0		0		
Reduced v/c Ratio		0.17		0.06		

Intersection Summary

Actuated Cycle Length: 90
Offset: 18 (20%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 11.2 Intersection LOS: B
Intersection Capacity Utilization 71.4% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: South Street & Grove Street & Walnut Hill Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	436	11	46	915	42	2	14	20	33	16	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	16	16	16
Grade (%)		0%			-3%			-1%			0%	
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00			0.94			0.93	
Frt		0.997			0.994			0.925			0.933	
Flt Protected		0.997			0.998			0.997			0.983	
Satd. Flow (prot)	0	3582	0	0	3622	0	0	1669	0	0	1882	0
Flt Permitted		0.860			0.907			0.989			0.885	
Satd. Flow (perm)	0	3088	0	0	3287	0	0	1650	0	0	1649	0
Right Turn on Red			Yes			Yes			No			No
Satd. Flow (RTOR)		3			6							
Link Speed (mph)		35			25			30			30	
Link Distance (ft)		240			590			1000			1000	
Travel Time (s)		4.7			16.1			22.7			22.7	
Confl. Peds. (#/hr)	50		50	50		50	50		50	50		50
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	33	454	11	48	953	44	2	15	21	34	17	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	498	0	0	1045	0	0	38	0	0	101	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	0.98	0.98	0.98	0.99	0.99	0.99	0.85	0.85	0.85
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	50	50		50	50		50	50		50	50	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	1 2			2			4			4	
Permitted Phases	1 2			2			4			4		
Detector Phase	1	1 2		2	2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0			12.0	12.0		8.0	8.0		8.0	8.0	
Minimum Split (s)	8.0			17.0	17.0		13.0	13.0		13.0	13.0	

Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	7.0
Minimum Split (s)	22.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	8.0			40.0	40.0		20.0	20.0		20.0	20.0	
Total Split (%)	8.9%			44.4%	44.4%		22.2%	22.2%		22.2%	22.2%	
Maximum Green (s)	4.0			35.0	35.0		15.0	15.0		15.0	15.0	
Yellow Time (s)	3.0			3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0			2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)					-1.0			-1.0			-1.0	
Total Lost Time (s)					4.0			4.0			4.0	
Lead/Lag	Lead			Lag	Lag		Lag	Lag		Lag	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	2.0			2.0	2.0		2.0	2.0		2.0	2.0	
Recall Mode	None			C-Max	C-Max		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		60.5			54.2			11.3			11.3	
Actuated g/C Ratio		0.67			0.60			0.13			0.13	
v/c Ratio		0.24			0.53			0.18			0.49	
Control Delay		8.1			21.1			36.2			44.4	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		8.1			21.1			36.2			44.4	
LOS		A			C			D			D	
Approach Delay		8.1			21.1			36.2			44.4	
Approach LOS		A			C			D			D	
90th %ile Green (s)	4.9			35.0	35.0		14.1	14.1		14.1	14.1	
90th %ile Term Code	Max			Coord	Coord		Gap	Gap		Gap	Gap	
70th %ile Green (s)	7.5			35.0	35.0		11.5	11.5		11.5	11.5	
70th %ile Term Code	Max			Coord	Coord		Gap	Gap		Gap	Gap	
50th %ile Green (s)	7.5			58.7	58.7		9.8	9.8		9.8	9.8	
50th %ile Term Code	Gap			Coord	Coord		Gap	Gap		Gap	Gap	
30th %ile Green (s)	6.7			61.3	61.3		8.0	8.0		8.0	8.0	
30th %ile Term Code	Gap			Coord	Coord		Min	Min		Min	Min	
10th %ile Green (s)	4.8			76.2	76.2		0.0	0.0		0.0	0.0	
10th %ile Term Code	Gap			Coord	Coord		Skip	Skip		Skip	Skip	
Queue Length 50th (ft)		26			127			20			55	
Queue Length 95th (ft)		114			362			47			100	
Internal Link Dist (ft)		160			510			920			920	
Turn Bay Length (ft)												
Base Capacity (vph)		2111			1983			293			293	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.24			0.53			0.13			0.34	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:EBWB, Start of Green, Master Intersection
Natural Cycle: 70

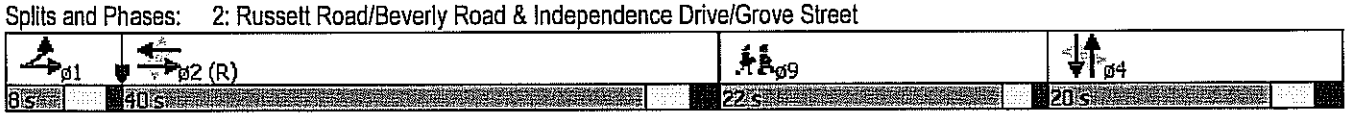
Lane Group	ø9
Total Split (s)	22.0
Total Split (%)	24%
Maximum Green (s)	19.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	12.0
Pedestrian Calls (#/hr)	15
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	19.0
90th %ile Term Code	Ped
70th %ile Green (s)	19.0
70th %ile Term Code	Ped
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.53
Intersection Signal Delay: 19.0
Intersection Capacity Utilization 65.8%
Analysis Period (min) 15

Intersection LOS: B
ICU Level of Service C

Splits and Phases: 2: Russett Road/Beverly Road & Independence Drive/Grove Street



Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	448	960	0	32	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	0	487	1043	0	35	24

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1043	0	-	0	1286	522
Stage 1	-	-	-	-	1043	-
Stage 2	-	-	-	-	243	-
Critical Hdwy	4.1	-	-	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	675	-	-	-	159	505
Stage 1	-	-	-	-	305	-
Stage 2	-	-	-	-	781	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	675	-	-	-	159	505
Mov Cap-2 Maneuver	-	-	-	-	159	-
Stage 1	-	-	-	-	305	-
Stage 2	-	-	-	-	781	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	25.2
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	675	-	-	-	159	505
HCM Lane V/C Ratio	-	-	-	-	0.219	0.047
HCM Control Delay (s)	0	-	-	-	33.9	12.5
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0	-	-	-	0.8	0.1

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	27	435	18	20	909	53	7	8	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	-2	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	2	0	0	2	0	0	0	0
Mvmt Flow	28	458	19	21	957	56	7	8	14

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	1013	0	0	477	0	0	1045	1579	238
Stage 1	-	-	-	-	-	-	524	524	-
Stage 2	-	-	-	-	-	-	521	1055	-
Critical Hdwy	4.1	-	-	4.1	-	-	6.4	6.1	6.7
Critical Hdwy Stg 1	-	-	-	-	-	-	5.4	5.1	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.4	5.1	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3
Pot Cap-1 Maneuver	692	-	-	1096	-	-	256	131	780
Stage 1	-	-	-	-	-	-	598	565	-
Stage 2	-	-	-	-	-	-	600	343	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	692	-	-	1096	-	-	231	0	780
Mov Cap-2 Maneuver	-	-	-	-	-	-	231	0	-
Stage 1	-	-	-	-	-	-	565	0	-
Stage 2	-	-	-	-	-	-	574	0	-

Approach	EB	WB	NB
HCM Control Delay, s	0.9	0.4	14.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	426	692	-	-	1096	-	-
HCM Lane V/C Ratio	0.069	0.041	-	-	0.019	-	-
HCM Control Delay (s)	14.1	10.4	0.3	-	8.3	0.2	-
HCM Lane LOS	B	B	A	-	A	A	-
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0.1	-	-

Intersection

Int Delay, s/veh

Movement	SBL	SBT	SBR
Vol, veh/h	0	0	0
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	95	95	95
Heavy Vehicles, %	0	0	0
Mvmt Flow	0	0	0

Major/Minor

Conflicting Flow All
    Stage 1
    Stage 2
Critical Hdwy
Critical Hdwy Stg 1
Critical Hdwy Stg 2
Follow-up Hdwy
Pot Cap-1 Maneuver
    Stage 1
    Stage 2
Platoon blocked, %
Mov Cap-1 Maneuver
Mov Cap-2 Maneuver
    Stage 1
    Stage 2

Approach

HCM Control Delay, s
HCM LOS

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	26	6	2	2	17	45	4	21	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	30	7	2	2	19	51	5	24	2

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	70	0	0	9	0	0	138	142	8
Stage 1	-	-	-	-	-	-	67	67	-
Stage 2	-	-	-	-	-	-	71	75	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3
Pot Cap-1 Maneuver	1544	-	-	1624	-	-	837	753	1080
Stage 1	-	-	-	-	-	-	948	843	-
Stage 2	-	-	-	-	-	-	944	836	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1544	-	-	1624	-	-	789	737	1080
Mov Cap-2 Maneuver	-	-	-	-	-	-	789	737	-
Stage 1	-	-	-	-	-	-	929	826	-
Stage 2	-	-	-	-	-	-	900	835	-

Approach	EB	WB	NB
HCM Control Delay, s	5.6	0.2	9.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	762	1544	-	-	1624	-	-	859
HCM Lane V/C Ratio	0.04	0.019	-	-	0.001	-	-	0.081
HCM Control Delay (s)	9.9	7.4	0	-	7.2	0	-	9.6
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.3

Intersection

Int Delay, s/veh

Movement	SBL	SBT	SBR
Vol, veh/h	23	17	21
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	88	88	88
Heavy Vehicles, %	0	0	0
Mvmt Flow	26	19	24

Major/Minor	Minor2		
Conflicting Flow All	129	117	45
Stage 1	49	49	-
Stage 2	80	68	-
Critical Hdwy	7.1	6.5	6.2
Critical Hdwy Stg 1	6.1	5.5	-
Critical Hdwy Stg 2	6.1	5.5	-
Follow-up Hdwy	3.5	4	3.3
Pot Cap-1 Maneuver	849	777	1031
Stage 1	969	858	-
Stage 2	934	842	-
Platoon blocked, %			
Mov Cap-1 Maneuver	813	761	1031
Mov Cap-2 Maneuver	813	761	-
Stage 1	950	857	-
Stage 2	887	825	-

Approach	SB
HCM Control Delay, s	9.6
HCM LOS	A

Minor Lane/Major Mvmt

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	8	64	79	20	15	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	8	-7	-	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	0	3	1	0	0	25
Mvmt Flow	10	80	99	25	19	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	124	0	-	0	211	111
Stage 1	-	-	-	-	111	-
Stage 2	-	-	-	-	100	-
Critical Hdwy	4.1	-	-	-	6.4	6.45
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.525
Pot Cap-1 Maneuver	1475	-	-	-	782	883
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	929	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1475	-	-	-	777	883
Mov Cap-2 Maneuver	-	-	-	-	777	-
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	922	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	9.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1475	-	-	-	805
HCM Lane V/C Ratio	0.007	-	-	-	0.033
HCM Control Delay (s)	7.5	0	-	-	9.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	3	477	960	5	2	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	518	1043	5	2	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1049	0	-	0	1312	524
Stage 1	-	-	-	-	1046	-
Stage 2	-	-	-	-	266	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	659	-	-	-	150	498
Stage 1	-	-	-	-	299	-
Stage 2	-	-	-	-	754	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	659	-	-	-	149	498
Mov Cap-2 Maneuver	-	-	-	-	149	-
Stage 1	-	-	-	-	299	-
Stage 2	-	-	-	-	749	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	21
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	659	-	-	-	229
HCM Lane V/C Ratio	0.005	-	-	-	0.019
HCM Control Delay (s)	10.5	0	-	-	21
HCM Lane LOS	B	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	478	2	3	959	1	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	520	2	3	1042	1	2

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	522	0	1049	261
Stage 1	-	-	-	-	521	-
Stage 2	-	-	-	-	528	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1041	-	223	738
Stage 1	-	-	-	-	561	-
Stage 2	-	-	-	-	556	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1041	-	221	738
Mov Cap-2 Maneuver	-	-	-	-	221	-
Stage 1	-	-	-	-	561	-
Stage 2	-	-	-	-	552	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	13.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	415	-	-	1041	-
HCM Lane V/C Ratio	0.008	-	-	0.003	-
HCM Control Delay (s)	13.7	-	-	8.5	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-