


MEMORANDUM

DATE: October 30, 2023

TO: Josh Katzen
Hanover Washington Limited Partnership
625 Mt. Auburn Street, Suite 210
Cambridge, MA 02138

FROM: Robert J. Michaud, P.E. – Managing Principal 
Daniel A. Dumais, P.E. – Senior Project Manager

RE: **Proposed Fast-Food Restaurant with Drive-Thru (Taco Bell)**
1207 Washington Street, Hanover, Massachusetts

MDM Transportation Consultants, Inc. (MDM) has prepared this traffic impact assessment (TIA) for a proposed Fast-Food Restaurant with Drive-Thru (Taco Bell) development to be located with the existing mixed-use Plaza located at 1207 Washington Street (Route 53) in Hanover, Massachusetts. The location of the site relative to the adjacent roadway network is shown in **Figure 1**. This assessment summarizes baseline traffic conditions at the Site and adjacent roadways, evaluates project trip generation, assesses site access and circulation, estimates peak parking demand characteristics, quantifies driveway operations, and provides a queue assessment of the drive through window.

Key findings of the TIA are as follows:

- *Modest Traffic Generation.* The majority of the trips will be associated with pass-by activity resulting in a nominal increase in new trips to the area. The proposed restaurant with drive-thru is estimated to generate approximately 46 new vehicle trips during the weekday morning peak hour, 32 new vehicle trips during the weekday evening peak hour and 53 new vehicle trips during the Saturday midday peak hour. This level of impact will be imperceptible to the average motorist and well with the day-to-day fluctuations of the adjacent street and Plaza.
- *Adequate Roadway Capacity & Operations.* The proposed development is expected to have minimal impact on the study area intersection and will not result in any notable changes in traffic operations in the study area relative to No-Build conditions. No further mitigation is required at the Plaza driveways to accommodate the restaurant with drive-thru.

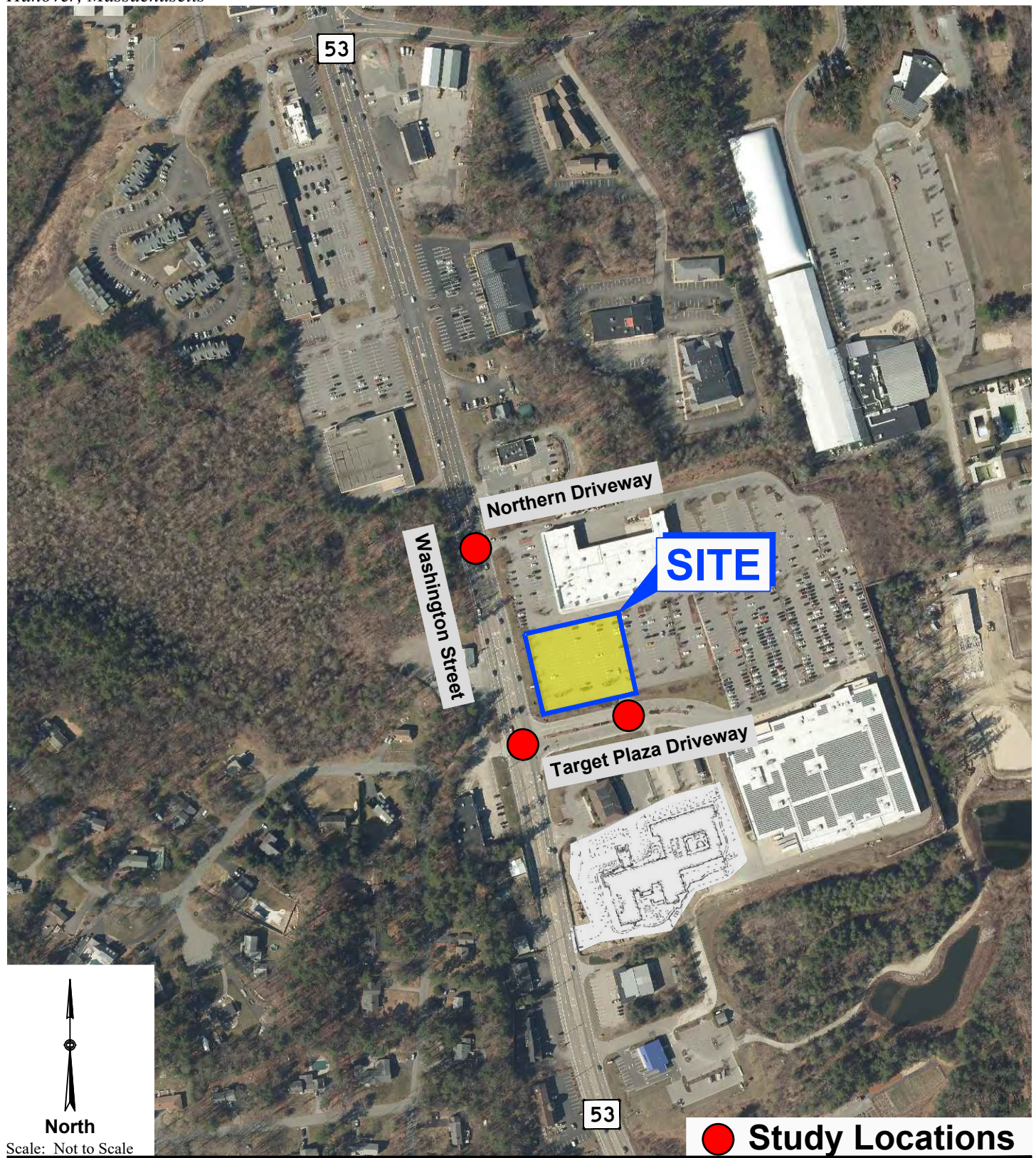


Figure 1

Site Location

- *Drive-Thru Operations.* To ensure proper accounting for potential peak queuing at the window, an analysis is presented that assumes a likely/projected operating condition with average window capacity (90 transactions per hour limit based on the average speed of 40 seconds per transaction) which assumes a 65% window transaction distribution. The restaurant with drive thru is estimated to result in up to 39 trips through the drive-thru during the critical study periods, resulting in a maximum (95th percentile) 3-vehicle queue that will occur during the midday lunch period and is expected to occur from the order board position based on empirical observations. The maximum queue will be contained within the Taco Bell portion of the Plaza with no material impact to on-site circulation or parking.

- *Adequate Parking Supply.* Parking observations indicate a large parking surplus at the Site in the immediate area of the proposed restaurant with drive-thru during both a weekday and Saturday. With the project in place, the critical peak parking demand is estimated at 62 parked vehicles which will be accommodated by the proposed 86 parking space supply within the immediate area surrounding the proposed restaurant with drive-thru. The resulting 24 vacant parking spaces will result in a 28% surplus. To the extent feasible the restaurant employees should be directed to park away from more critical parking areas to allow customers to park more efficiently on-site. The total marked spaces within the Plaza will be reduced by 33± spaces and the land banked spaces will be increased to 248 to make up the difference resulting in an overall parking supply (1,150 spaces).

In summary, the majority of the trips will be associated with pass-by activity resulting in a nominal increase in new trips to the area. MDM finds that incremental traffic associated with the proposed development is not expected to materially impact operating conditions at the study intersections. The study intersections exhibit below-average crash rates based on historic crash data; safety countermeasures are therefore not warranted. Projected queue results for the drive-thru window will be c within the Taco Bell portion of the Plaza with no material impact to on-site circulation or parking. Parking observations and projections indicate ample parking under Build conditions in the immediate area of the proposed restaurant with drive-thru to accommodate the project during both a weekday and Saturday. Implementation of site-circulation improvements, pedestrian and bicycle improvements, and a drive-thru management plan as outlined under *Recommendations and Conclusions* will establish a framework of minimizing Site traffic impacts by encouraging non-motorized travel modes and pedestrian accommodation that is compatible with other projects in the area.

PROJECT DESCRIPTION

The project site is located at 1207 Washington Street (Route 53) in Hanover, Massachusetts. The Site consists of a mixed-use Plaza anchored by Target. The Plaza includes Target, two banks, general office, retail store, restaurants, and a Benchmark Senior Living community. The primary Plaza Driveway provides signalized access/egress to Washington Street and four (4) secondary unsignalized access/egress points along Washington Street are also provided including access/egress to the recently completed Benchmark community. The Plaza also provides internal connections to the between the various buildings. The Plaza includes a total of 1,043 marked spaces with an additional 208 spaces land banked resulting in an overall parking supply of 1,251 spaces.

Under the proposed development plan the parking area near the 1207 building will be modified to include a 2,114± sf restaurant with a dual order board drive-thru lane. The building will provide dual pick-up windows with one window dedicated to mobile pre-orders. To manage traffic flow patterns on-site and to reduce vehicular conflicts with the proposed drive-thru lanes, a one-way counterclockwise traffic flow will be established around two sides of the proposed building with bypass areas provided prior to entering the drive-thru area and adjacent to the pick-up windows. Access/egress for the Plaza will remain unchanged. The total marked spaces within the Plaza will be reduced by 33± spaces and the land banked spaces will be increased to 248 to make up the difference resulting in an overall parking supply (1,150 spaces). The preliminary site layout prepared by Kelly Engineering Group is presented in **Figure 2**.

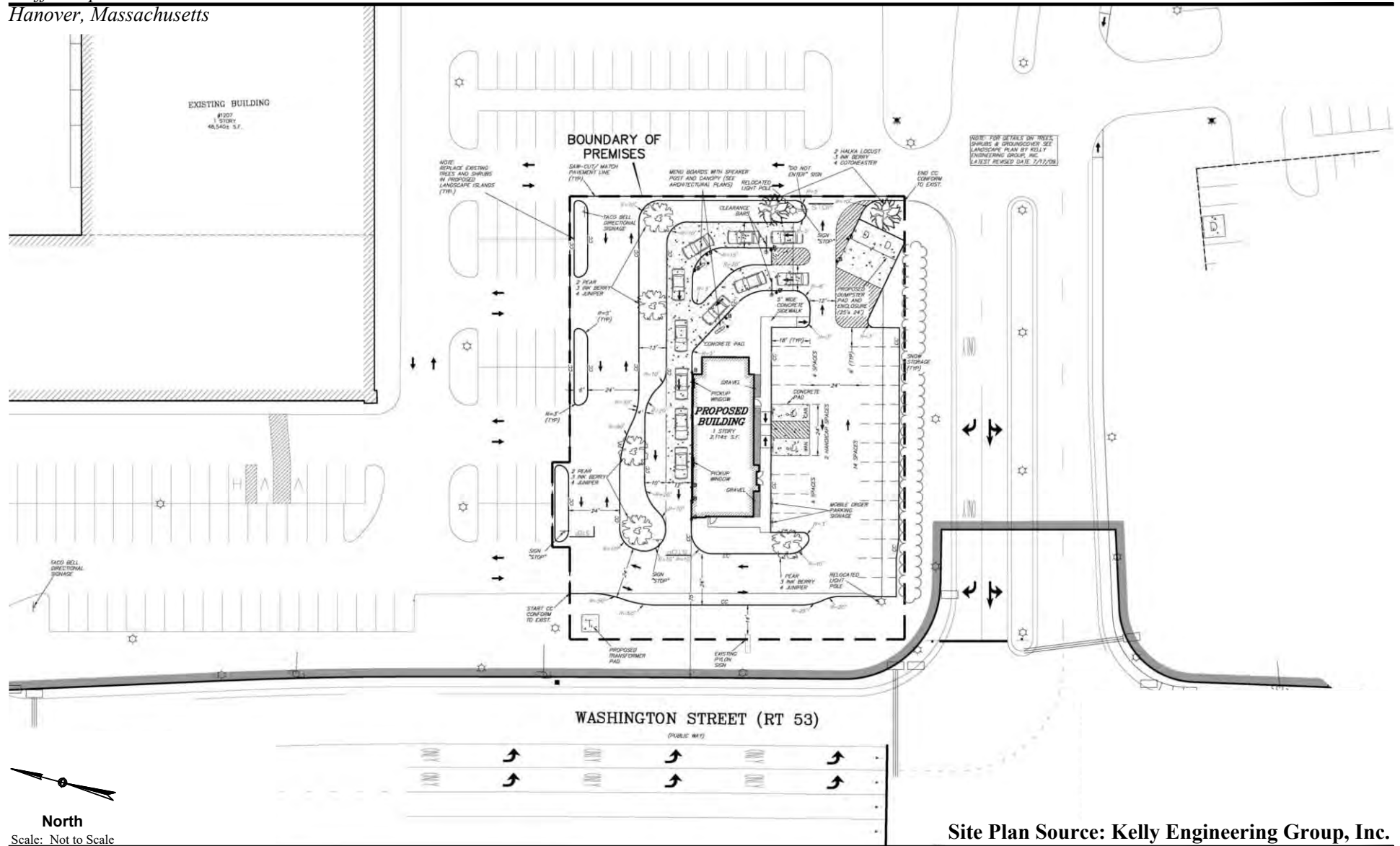
BASELINE TRAFFIC & SAFETY CHARACTERISTICS

This memorandum 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:

- Washington Street (Route 53) at Target Plaza Driveway – Signalized
- Washington Street (Route 53) at Plaza Northern Driveway – Unsignalized
- Primary Plaza Driveway at Internal Intersection w/ Retail B/Office – Unsignalized

Baseline Traffic Data

Traffic volume data were collected at the study intersections in November 2022 during the weekday morning (7:00 AM - 9:00 AM), weekday evening (4:00 PM – 6:00 PM), and Saturday midday (11:00 AM – 1:00 PM) periods to coincide with peak traffic activity of the proposed use and the adjacent streets. Review of MassDOT permanent count station data indicates that November is an average traffic month, therefore, no seasonal adjustment is required. Likewise, nearby permanent count station data published by MassDOT indicates a flat of declining



growth rate; therefore, no adjustments are required to represent 2023 Baseline conditions. The 2023 Baseline traffic volumes for the weekday morning, weekday evening and Saturday midday peak hour traffic volumes for the study intersections are shown in **Figure 3** and **Figure 4**. Traffic count data and MassDOT permanent count station data are provided in the **Attachments**.

Daily Traffic Volumes

Daily traffic volumes along Route 53 just north of the primary signalized plaza driveway were obtained using a video-based automatic traffic recorder (ATR) in November 2022. The results of the counts are summarized in **Table 1** and are discussed below.

TABLE 1
BASELINE TRAFFIC VOLUME SUMMARY
ROUTE 53 NORTH OF PRIMARY SIGNALIZED PLAZA DRIVEWAY (#1207)

Time Period	Daily Volume (vpd) ¹	Percent Daily Traffic ²	Peak Hour Volume (vph) ³	Peak Flow Direction ⁴	Peak Hour Directional Volume (vph) ⁴
Weekday Morning Peak Hour	27,600	6%	1,580	60% NB	942
Weekday Evening Peak Hour	27,600	8%	2,300	61% SB	1,396
Saturday Midday Peak Hour	27,300	9%	2,540	51% SB	1,286

¹Two-way daily traffic expressed in vehicles per day without seasonal adjustment as counted by MDM in November 2022.

²The percent of daily traffic that occurs during the peak hour.

³Two-way peak-hour volume expressed in vehicles per hour as counted by MDM in April 2019.

⁴NB = Northbound, SB = Southbound

As summarized in **Table 1**, the weekday daily traffic volume on Route 53 adjacent to the Site is approximately 27,600 vehicles per day (vpd) on a weekday and approximately 27,300 vehicles per day (vpd) on a Saturday. Peak hour traffic flow on Route 53 ranges from approximately 1,6580 to 2,540 vehicles per hour (vph) representing approximately 6 to 9 percent of daily traffic flow.

Trip Generation Characteristics – 1207 Washington Street Plaza (Site)

Trip generation for the Plaza (1207 Washington Street) has been determined based on turning movement counts conducted at the Plaza driveways in November 2022 and infill of 6,800 sf of vacant retail space. **Table 2** presents the Observed trip generation characteristics of the Plaza during the study periods. The Permitted trip generation of the Plaza based on the Single Environmental Impact Report (SEIR) prepared for the Plaza in November 2007 has also been provided for reference purposes.

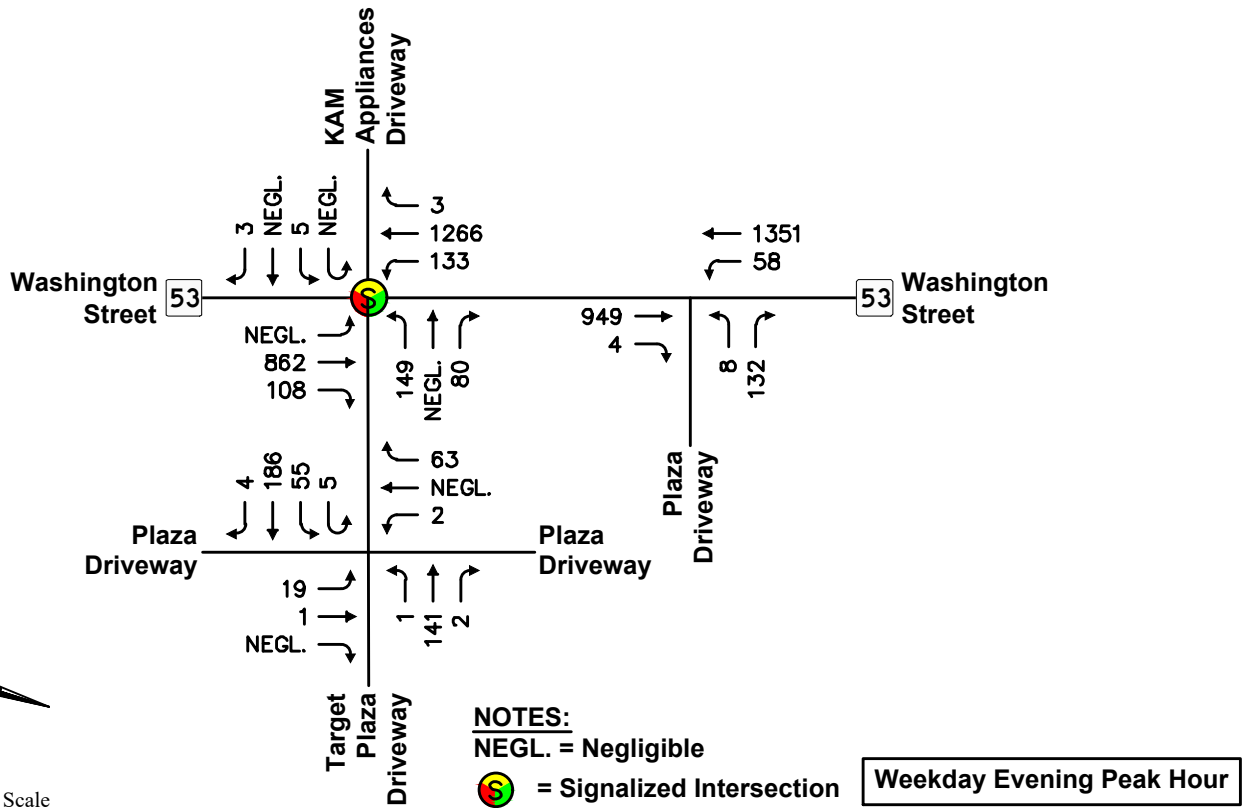
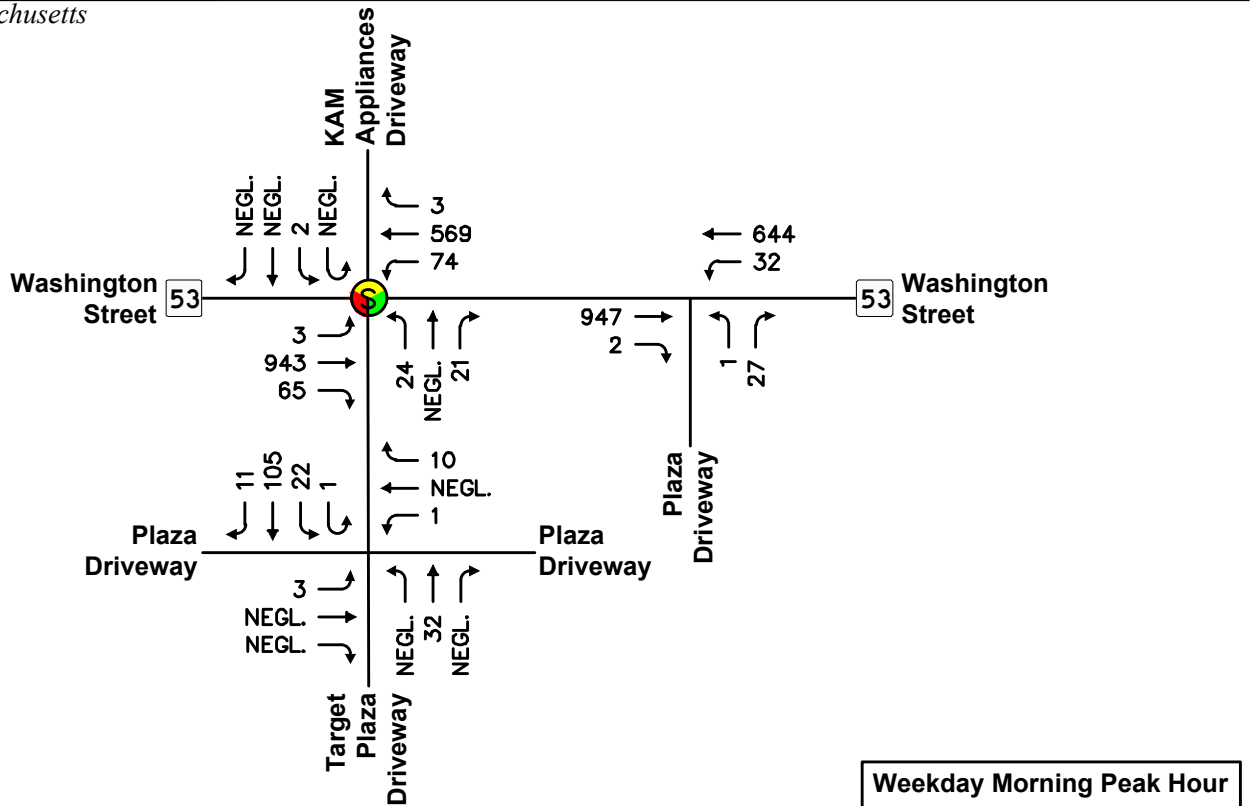
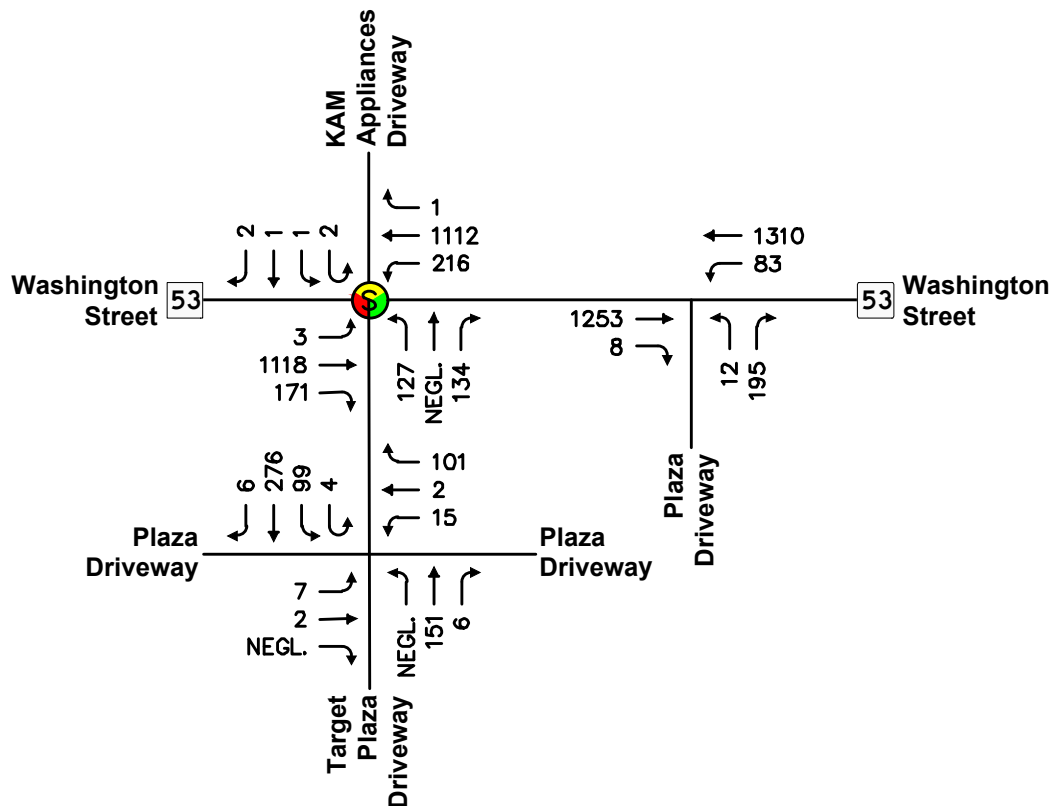


Figure 3



North

Scale: Not to Scale

NOTES:

NEGL. = Negligible



= Signalized Intersection

Saturday Midday Peak Hour

Figure 4

**2023 Existing Conditions
Saturday Midday Peak Hour Volumes**

TABLE 2
TRIP-GENERATION COMPARISON

Period/Direction	Permitted Trips ¹	Observed Plaza (Total Trips) ²	Δ
<i>Weekday Morning Peak Hour:</i>			
Entering	155	192	+37
<u>Exiting</u>	<u>99</u>	<u>81</u>	<u>-18</u>
Total	254	273	+19
<i>Weekday Evening Peak Hour:</i>			
Entering	512	327	-185
<u>Exiting</u>	<u>554</u>	<u>395</u>	<u>-159</u>
Total	1,066	722	-344
<i>Saturday Midday Peak Hour:</i>			
Entering	760	520	-240
<u>Exiting</u>	<u>702</u>	<u>493</u>	<u>-209</u>
Total	1,462	1,013	-449

¹Based on the SEIR prepared for the Plaza in November 2007.

²Based on turning movement counts conducted in November 2022 and infill of vacant Retail Trips based on LUC 820 (Shopping Center) applied to 6.8ksf prorated out of 200.7ksf.

As summarized in **Table 2**,

- *Observed Trip Generation.* With infill of 6,800 sf of vacant space at the Plaza, the current uses generate approximately 273 vehicle trips during the weekday morning peak hour, 722 vehicle trips during the weekday evening peak hour, and 1,013 vehicle trips during the Saturday midday peak hour.
- *Permitted Trip Generation.* Based on Permitting for the Plaza, when fully occupied the Plaza was estimated to generate approximately 254 vehicle trips during the weekday morning peak hour, 1,066 vehicle trips during the weekday evening peak hour, and 1,462 trips during the Saturday midday peak hour. The observed Plaza trips are highly consistent with those Permitted during the less critical weekday morning peak hour and significantly (approximately 30% fewer) during the weekday evening and Saturday midday peak hours.

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 Hanover for the five-year period 2017 through 2021. Crash data for the study intersections is summarized in **Table 3** with detailed data provided in the **Attachments**.

Crash rates were calculated for the study intersections as reported in **Table 3**. These rates quantify the number of crashes per million entering vehicles. MassDOT has determined the official District 5 (which includes the Town of Hanover) crash rate to be 0.57 for unsignalized intersections and 0.75 for signalized intersections. This rate represents MassDOT's "average" crash experience for District 5 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. A review of Highway Safety Improvement Project (HSIP) locations was also conducted.

TABLE 3
INTERSECTION CRASH SUMMARY
2017 THROUGH 2021¹

Data Category	STUDY LOCATION
	Route 53 at Target Driveway/ KAM Appliances Driveway
Traffic Control	Signalized
Crash Rate ²	0.04
MassDOT Avg. Rate ³	0.75
<i>Year:</i>	
2017	1
2018	0
2019	0
2020	1
<u>2021</u>	<u>0</u>
Total	2
<i>Type:</i>	
Angle	0
Rear-End	2
Head-On	0
Sideswipe	0
Single Vehicle	0
Other/Unknown	0
<i>Severity:</i>	
P. Damage Only	2
Personal Injury	0
Fatality	0
<i>Conditions:</i>	
Dry	1
Wet	1
Snow	0
<i>Time:</i>	
7:00 to 9:00 AM	0
4:00 to 6:00 PM	0
Rest of Day	2

¹Source: MassDOT Crash Database.

²Crashes per million entering vehicles.

³District 5 Average Crash Rate.

As summarized in **Table 3**,

- *Route 53 at Primary Plaza Driveway.* A total of two (2) crashes were reported for the Route 53 signalized intersection with the Target Driveway and KAM Appliance Driveway. The resulting crash rate of 0.04 is lower than the District 5 average. The reported crashes included two (2) rear-end type collisions resulting in property-damage only, generally indicative of low-speed crashes. No fatalities or pedestrian-related incidents were reported during the study period.
- *Route 53 at Plaza Northern Driveway.* There were no reported crashed reported for this location during the study period.
- *Internal Plaza Driveway.* There were no reported crashed reported for this location during the study period.

In summary, based on extensive review of MassDOT crash data, the study intersection experienced a crash rate that is below the MassDOT District 5 average and is not listed as an HSIP location. Therefore, no additional safety countermeasures are warranted based on the review of the crash records and associated crash rates.

PROJECTED FUTURE TRAFFIC CONDITIONS

Evaluation of the proposed development impacts requires the establishment of a future baseline analysis condition. This section estimates future roadway and traffic conditions with and without the proposed development. For planning purposes, a seven-year planning horizon (year 2030) was selected consistent with standard industry practice along State Highway.

To determine the impact of site-generated traffic volumes on the roadway network under future conditions, 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 No-Build and Build 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 negative (-0.7 percent per year) growth rate. For purposes of this evaluation, a 0.5-percent compounded annual growth rate was used (3.6 percent increase over a 7-year horizon). This growth rate is higher than historic rates and is also expected to account for any small fluctuation in hourly traffic as may occur from time to time in the study area and traffic associated with other potential small developments or vacancies in the area. This rate is also consistent with recent planning reports in the area. MassDOT permanent count station data and background growth calculations are provided in the **Attachments**.

Development of future No-Build traffic volumes also considers traffic generated through the study area from other specific area developments. Review of Massachusetts Environmental Policy Act (MEPA) files indicates that there are several Site-specific development projects in the area that may increase baseline traffic at the study intersections as follows:

- *1207 Washington Vacancies (Site)*. There is currently 6,800 sf of vacant space in the Plaza located adjacent to Aspen Dental and Dollar Tree. Trips associated with the infill of the vacant space were estimated based on ITE Trip Generation rates for a shopping center (LUC 565) applied to 6,800 sf of retail space within the larger plaza. The trips were distributed onto the roadway network based on travel patterns for the Plaza. Site-specific trip tracings for the project are provided in the **Attachments**.
- *Hanover Crossing Vacancies/Remaining Buildout*. There is currently 200,000± sf of vacant or unbuilt space at Hanover Crossing and the residential component which was proposed to include 297± units is under construction. Trips associated with the infill of the vacant/unbuilt space were estimated based on the traffic study prepared for the project by Vanasse and Associates, Inc. dated May 2019. For the purposes of this report no trips have been removed for the construction-related activity at this location. Site-specific trip tracings for the project are provided in the **Attachments**.

2030 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 Baseline (2023) volumes by approximately 3.6 percent (0.5 percent compounded annually over 7 years) as well as traffic associated with the vacancies or unbuilt portions of the Hannover Crossing which is under construction and minor vacancy at 1207 Washington Street (Site). The resulting 2030 No-Build traffic volumes are displayed in **Figure 5** and **Figure 6**.

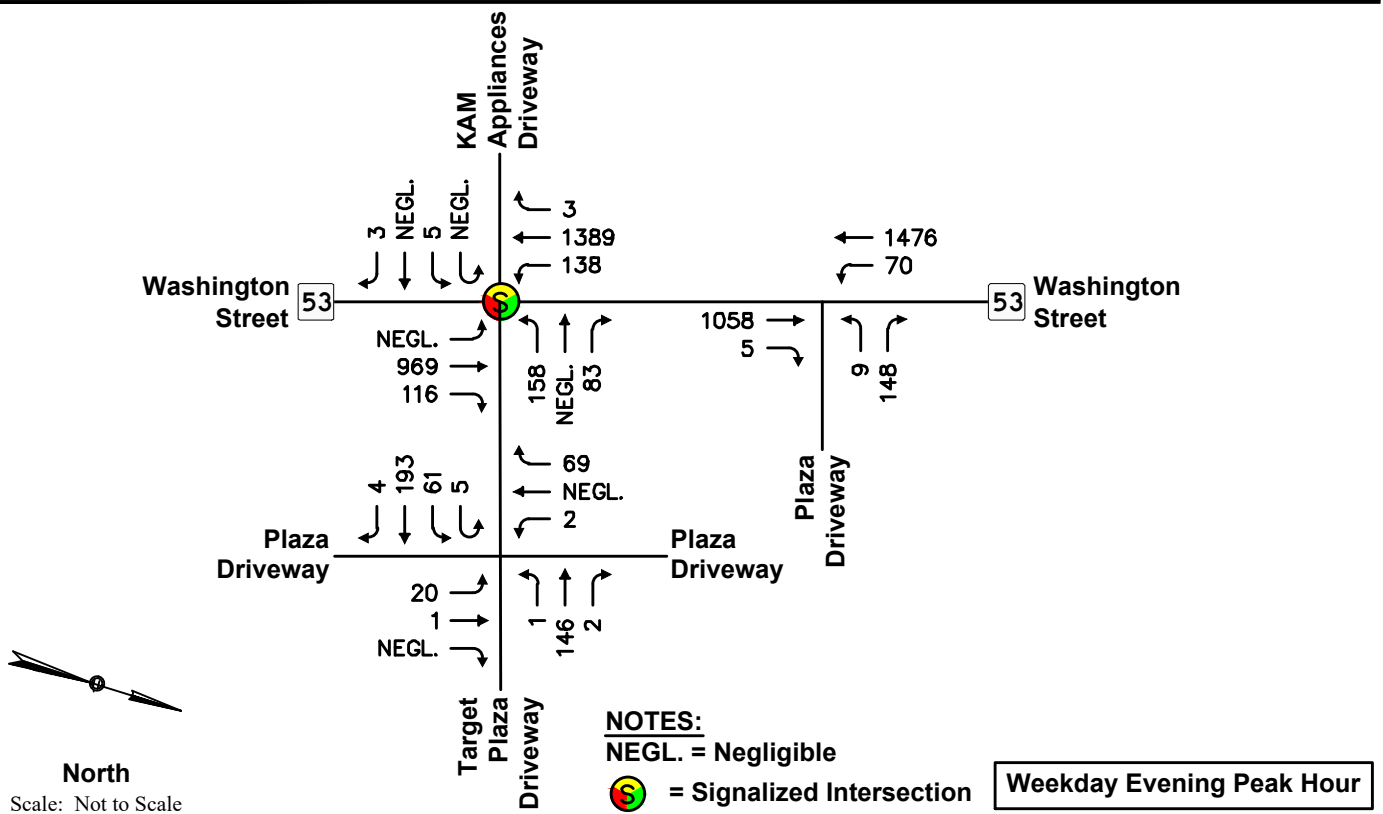
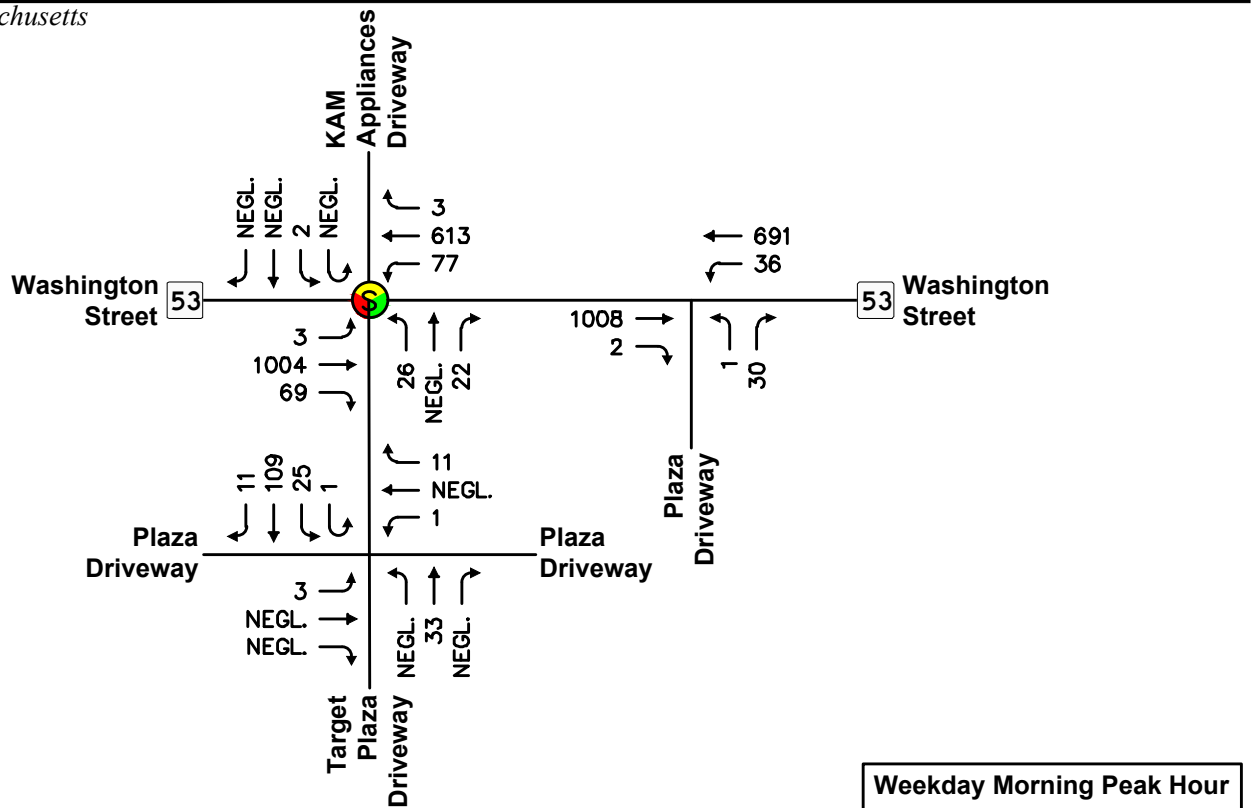
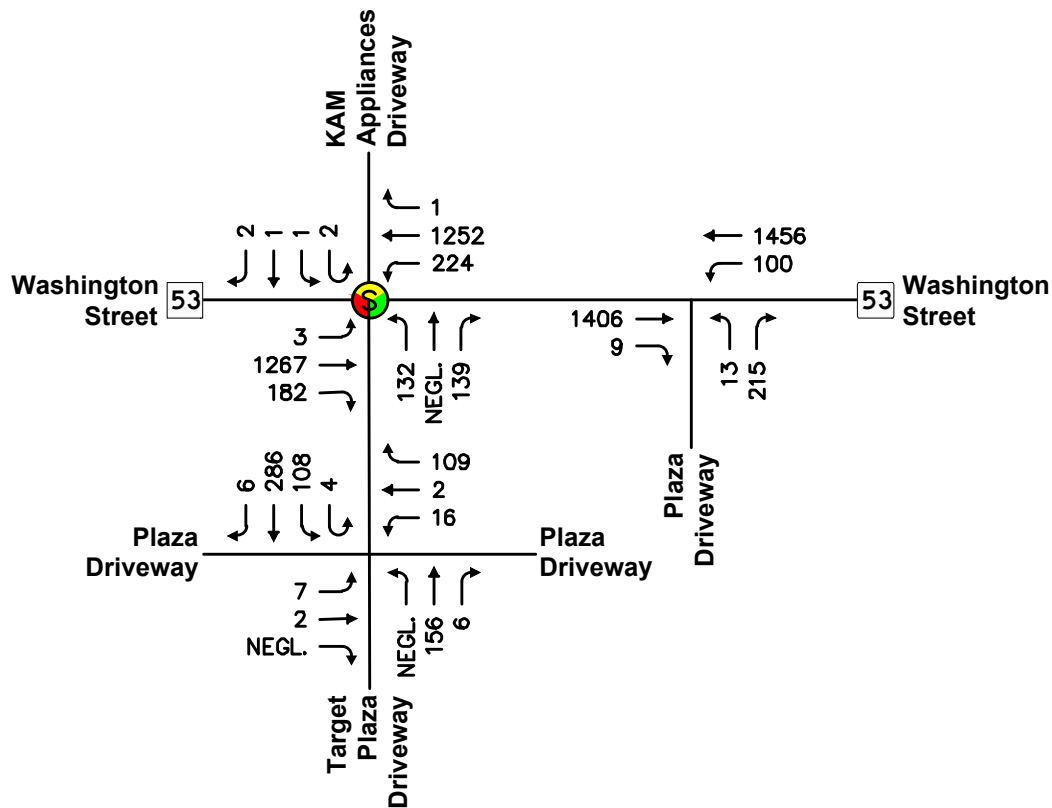


Figure 5

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

2030 No-Build Conditions Weekday Peak Hour Volumes



North

Scale: Not to Scale

NOTES:

NEGL. = Negligible



= Signalized Intersection

Saturday Midday Peak Hour

Figure 6

**2030 No-Build Conditions
Saturday Midday Peak Hour Volumes**

Trip Generation

The trip generation estimates for the proposed Fast-Food Restaurant with a Drive-thru (Taco Bell) use of the Site are provided for the weekday morning, weekday evening and Saturday midday periods, which correspond to the critical analysis periods for the proposed uses and adjacent street traffic flow. While most Taco Bell restaurants do not open until after 9:00 am, to remain conservative, the analysis is provided for the weekday morning period assuming that this location offers breakfast service at a competitive level to other fast-food restaurants with a drive-thru on an industry standard basis.

New traffic generated by the project was estimated using trip rates published in ITE's *Trip Generation* for the highest land use in this category (LUC); LUC 934 – Fast-Food Restaurant with Drive-Through Window are provided in the **Attachments**.

The trip estimates were then adjusted to reflect pass-by traffic, which represents the portion of Site-generated trips that is drawn from the existing traffic stream and that is not “new” traffic to area roadways. Pass-by data as published by ITE in the *Trip Generation Manual Appendices*¹ indicates average pass-by rates of approximately 50-55 percent for a fast-food restaurant with drive-through use. While no reduction was taken to reflect internal capture rates, which represent the portion of site-generated trips that are shared between the two land uses at the Site. In this case there will be shared trips between the existing Plaza uses and the proposed restaurant with drive-thru use. Internal capture rates published in *Trip Generation Handbook*² ITE for retail to/from restaurant uses ranged from 29% to 50%. **Table 4** presents the trip-generation estimates for the proposed development based on the ITE trip generation methodology. Trip generation calculations are provided in the **Attachments**.

¹ ITE *Trip Generation Appendices, Pass-By Tables*, Institute of Transportation Engineers; 2022.

² *Trip Generation Handbook, 3rd Edition*, Institute of Transportation Engineers; 2017.

TABLE 4
TRIP-GENERATION SUMMARY

Period	Total Trips ¹	Pass-by Trips ²	Net New Trips
<i>Weekday Morning Peak-Hour:</i>			
Enter	48	24	24
<u>Exit</u>	<u>46</u>	<u>24</u>	<u>22</u>
Total	94	48	46
<i>Weekday Evening Peak-Hour:</i>			
Enter	36	19	17
<u>Exit</u>	<u>34</u>	<u>19</u>	<u>15</u>
Total	70	38	32
<i>Saturday Midday Peak-Hour:</i>			
Enter	60	32	28
<u>Exit</u>	<u>57</u>	<u>32</u>	<u>25</u>
Total	117	64	53

¹Based on ITE LUC 934 applied to 2,114 sf.

³Estimated at 50 percent during morning periods, 55 percent during evening and Saturday periods (ITE Trip Generation Handbook).

As summarized in **Table 4**, the proposed project is estimated to generate approximately 94 vehicle trips (48 entering and 46 exiting) during the weekday morning peak hour, 70 vehicle trips (36 entering and 34 exiting) during the weekday evening peak hour and 117 vehicle trips (60 entering and 57 exiting) during the Saturday midday peak hour. The majority of the trips will be associated with pass-by activity resulting in a nominal increase in new trips to the area. Specifically, the proposed project is estimated to generate approximately 46 new vehicle trips during the weekday morning peak hour, 32 new vehicle trips during the weekday evening peak hour and 53 new vehicle trips during the Saturday midday peak hour. This level of impact will be imperceptible to the average motorist and well with the day-to-day fluctuations of the adjacent street and Plaza.

Trip Generation – Comparison

The Permitted trip generation of the Plaza based on the Single Environmental Impact Report (SEIR) prepared for the Plaza in November 2007 was then compared to the Plaza under conditions with the infill of vacant retail space (6,800 sf) and the proposed restaurant with drive-thru in place. **Table 5** presents the Proposed trip generation characteristics of the Plaza with comparison to what was originally Permitted.

TABLE 5
TRIP-GENERATION COMPARISON

Period/Direction	Permitted Trips ¹	Proposed Total Trips ²	Increase (Δ)
<i>Weekday Morning Peak Hour:</i>			
Entering	155	240	+85
<u>Exiting</u>	<u>99</u>	<u>127</u>	<u>+28</u>
Total	254	367	+113
<i>Weekday Evening Peak Hour:</i>			
Entering	512	363	-149
<u>Exiting</u>	<u>554</u>	<u>429</u>	<u>-125</u>
Total	1,066	792	-274
<i>Saturday Midday Peak Hour:</i>			
Entering	760	580	-180
<u>Exiting</u>	<u>702</u>	<u>550</u>	<u>-152</u>
Total	1,462	1,130	-332

¹Based on the SEIR prepared for the Plaza in November 2007.

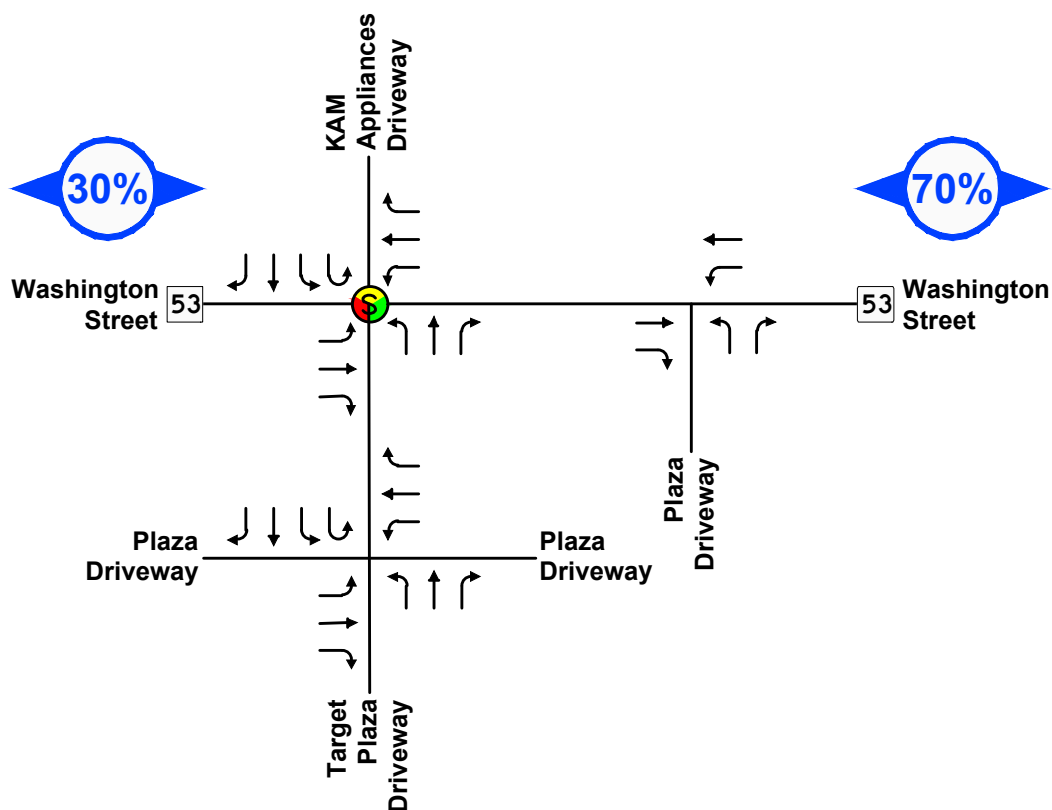
²Based on turning movement counts conducted in November 2022 and infill of vacant Retail Trips based on LUC 820 (Shopping Center) applied to 6.8ksf prorated out of 200.7ksf, and ITE LUC 934 (Fast Food with drive-thru applied to 2,114 sf).

As summarized in **Table 5**, the Proposed Plaza with the fast-food restaurant with drive-thru in place will result in trip levels that result in a moderate increase of 113 trips compared to the Permitted Plaza during the less critical weekday morning peak hour and fewer trips (approximately 20 to 25% less) than Permitted during the weekday evening and Saturday midday peak hours. In summary the Plaza and its access/egress points have been designed to accommodate the proposed activity level.

Trip Distribution

The directional distribution of development-generated trips on the roadway network is a function of a number of variables, including existing travel patterns, the efficiency of the roadways leading to the site, and population densities. Based on these patterns, the development is expected to draw 70 percent of new site trips to/from north of the site and 30 percent to/from south of the site. The specific trip distribution pattern is presented in **Figure 7**. Trip distribution calculations are provided in the **Attachments**.

New development-related trips for the proposed restaurant with drive-thru are assigned to the roadway network using the ITE trip-generation estimates shown in **Table 4** and the distribution patterns presented in **Figure 7**. Development-related trips at each intersection approach for the weekday morning, weekday evening, and Saturday midday peak hours are quantified in **Figure 8** and **Figure 9**.



North

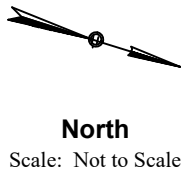
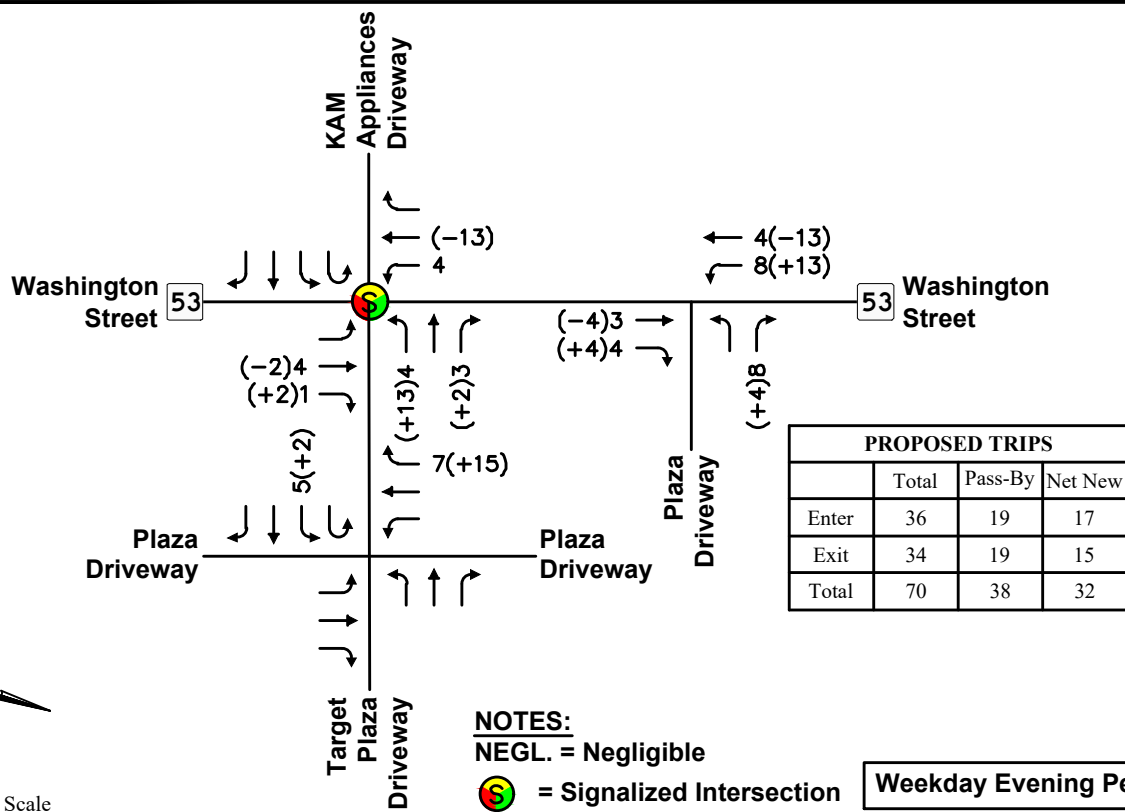
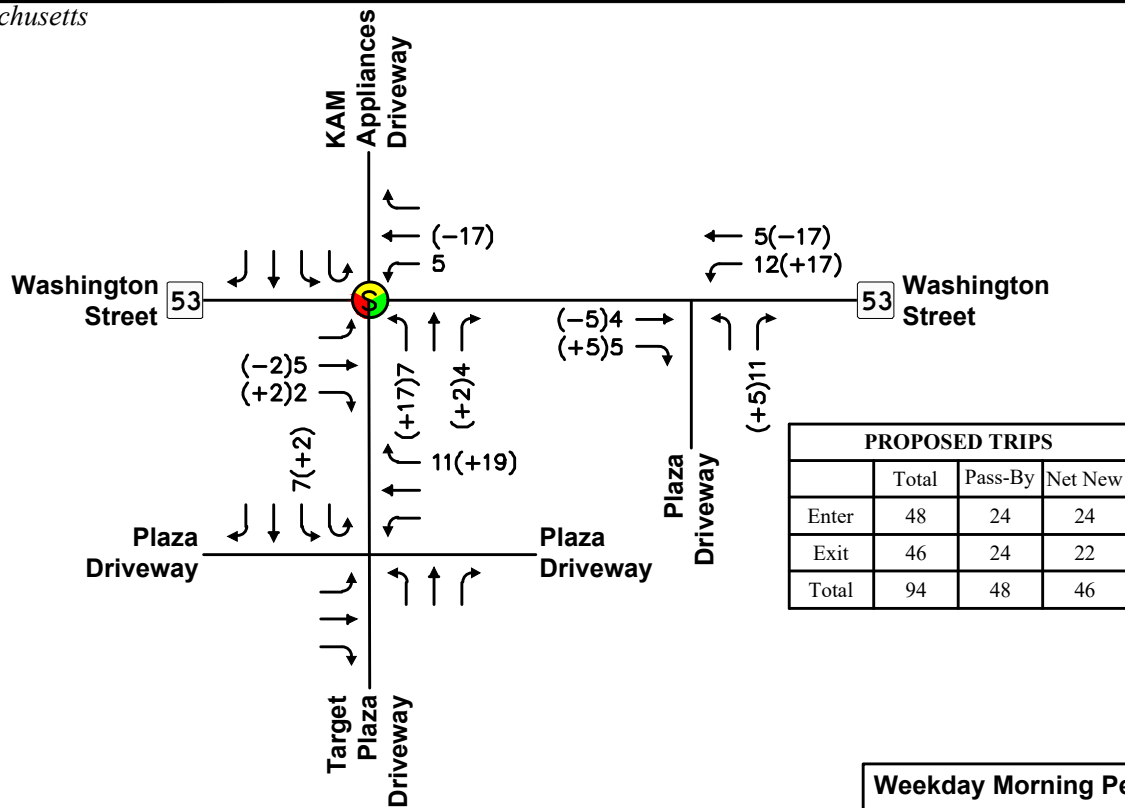
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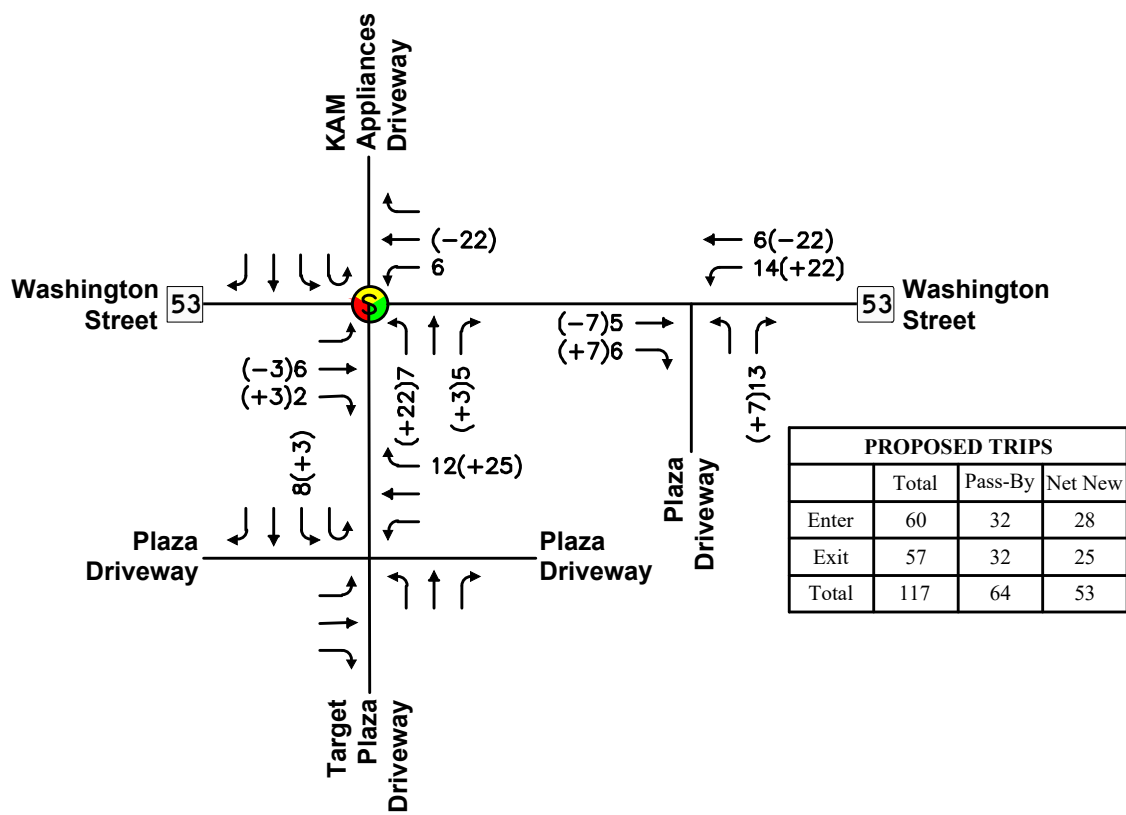
NOTES:

NEGL. = Negligible



= Signalized Intersection





North

Scale: Not to Scale

NOTES:

NEGL. = Negligible



= Signalized Intersection

Saturday Midday Peak Hour

Figure 9

**Site Generated Trips
Saturday Midday Peak Hour Volumes**

2030 Build Traffic Conditions

2030 Build condition traffic volumes are derived by adding the incremental traffic increases for the proposed restaurant with drive-thru use expansion at the Site to the 2030 No-Build conditions. **Figure 10** and **Figure 11** present the 2030 Build condition traffic-volume networks for the weekday morning, weekday evening, and Saturday midday peak hours.

OPERATIONS ANALYSIS

This section provides an overview of operational analysis methodology, and an assessment of intersection operations under Baseline and projected future No-Build and Build conditions.

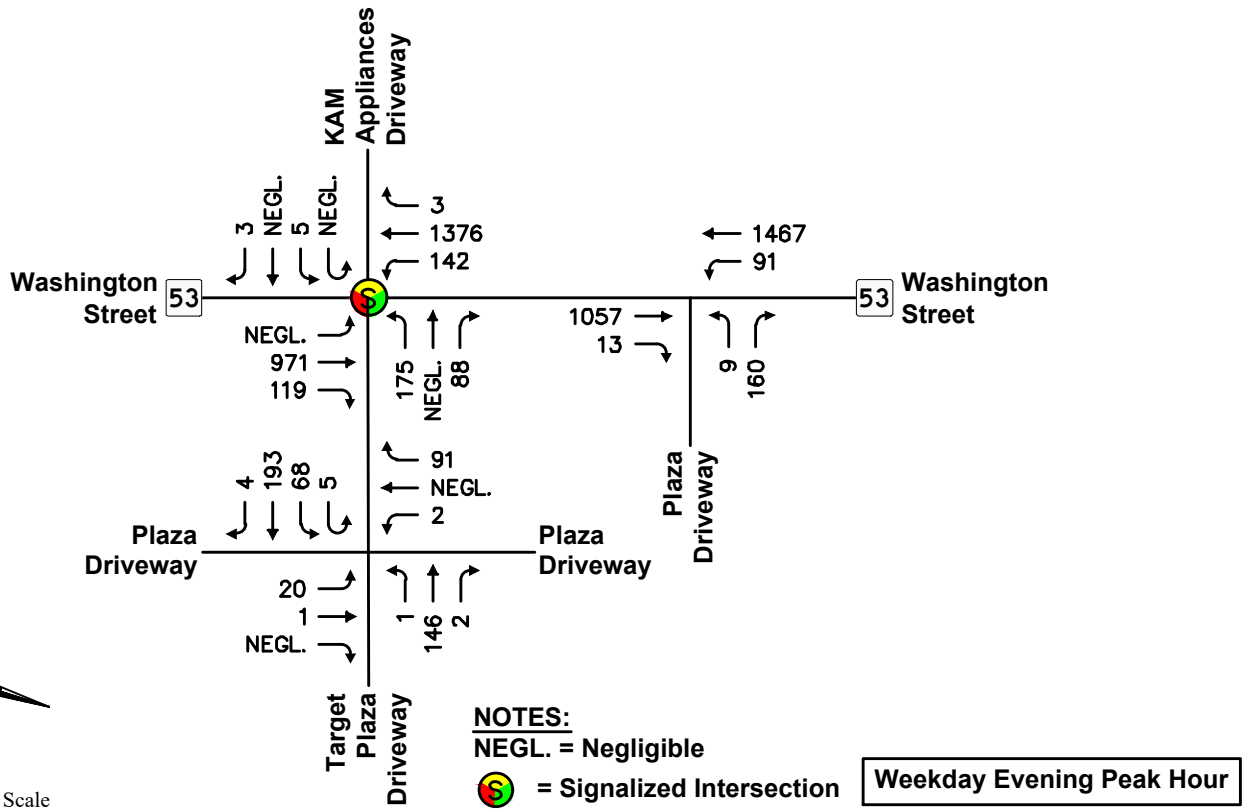
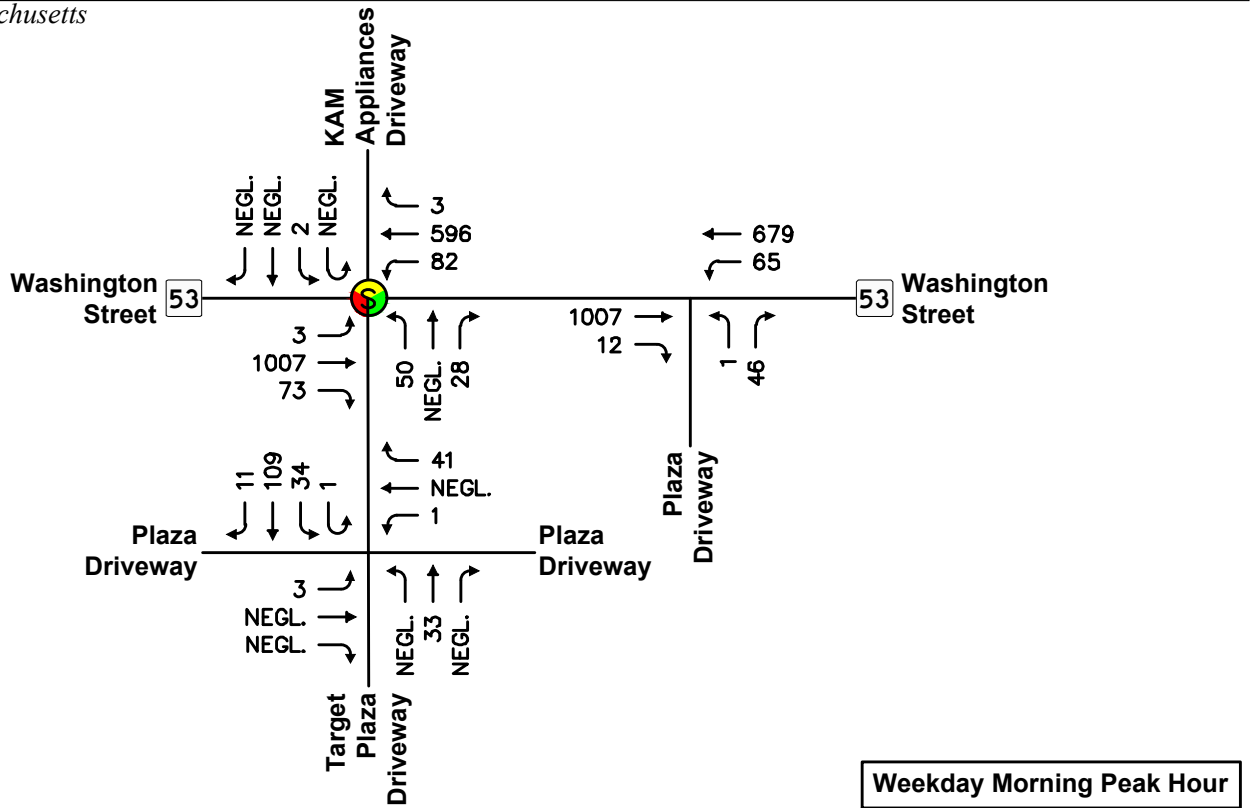
Analysis Methodology

Intersection capacity analyses are presented in this section for the 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 Highway Capacity Manual 6th Edition (HCM6). 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 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 delays greater than 80 seconds for signalized movements). The specific control delays and associated LOS designations are presented in the **Attachments**.

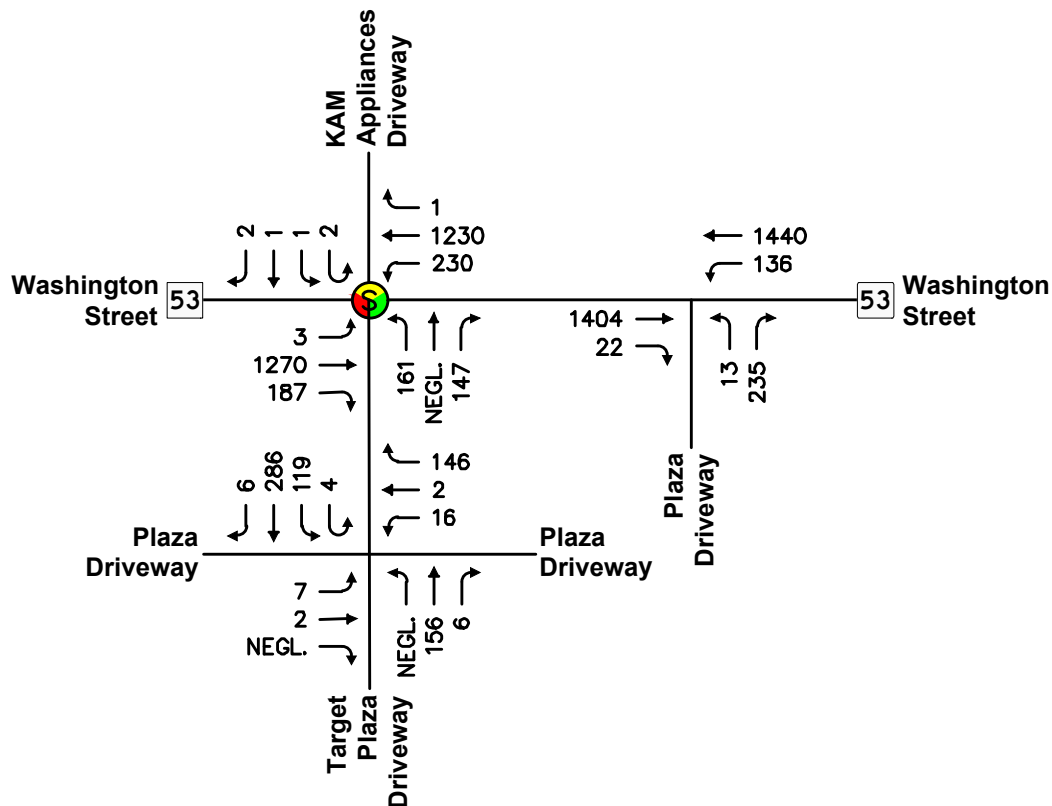
Intersection Capacity Analysis Results

Level-of-Service (LOS) analyses were conducted for the No-Build and Build conditions with a comparison to the Permitted Plaza for the study intersections. The results of the intersection capacity are summarized below in **Table 6**, **Table 7**, and **Table 8**. Detailed analysis results are presented in the **Attachments**.



North
Scale: Not to Scale

Figure 10
2030 Build Conditions
Weekday Peak Hour Volumes



North

Scale: Not to Scale

NOTES:

NEGL. = Negligible



= Signalized Intersection

Saturday Midday Peak Hour

TABLE 6
INTERSECTION CAPACITY ANALYSIS RESULTS
WEEKDAY MORNING PEAK HOUR

Intersection	Approach	2030 No-Build			2030 Build			Permitted Plaza		
		v/c ¹	Delay ²	LOS ³	v/c	Delay	LOS	v/c	Delay	LOS
Route 53 at Primary Plaza Dwy/ KAM Appliances Dwy	Eastbound	0.01	34	C	0.01	32	C	0.00	28	C
	Westbound	0.15	20	B	0.31	25	C	0.21	18	B
	Northbound	0.47	8	A	0.50	10	B	0.50	7	A
	Southbound	<u>0.22</u>	<u>6</u>	<u>A</u>	<u>0.23</u>	<u>7</u>	<u>A</u>	<u>0.20</u>	<u>5</u>	<u>A</u>
	OVERALL	0.47	8	A	0.50	10	B	0.50	7	A
Route 53 at Northern Driveway	Westbound	0.08	14	B	0.12	15	B	n/a	n/a	n/a
	Northbound	0.00	<5	A	0.00	<5	A	n/a	n/a	n/a
	Southbound	0.07	<5	A	0.12	<5	A	n/a	n/a	n/a
Primary Plaza Dwy at Internal Intersection	Eastbound	0.02	<5	A	0.03	<5	A	n/a	n/a	n/a
	Westbound	0.00	<5	A	0.00	<5	A	n/a	n/a	n/a
	Northbound	0.01	11	B	0.01	11	B	n/a	n/a	n/a
	Southbound	0.02	9	A	0.06	9	A	n/a	n/a	n/a

¹ Volume-to-capacity ratio

² Average control delay per vehicle (in seconds)

³ Level of service

⁴ n/a = not applicable

TABLE 7
INTERSECTION CAPACITY ANALYSIS RESULTS
WEEKDAY EVENING PEAK HOUR

Intersection	Approach	2030 No-Build			2030 Build			Permitted Plaza		
		v/c ¹	Delay ²	LOS ³	v/c	Delay	LOS	v/c	Delay	LOS
Route 53 at Primary Plaza Dwy/ KAM Appliances Dwy	Eastbound	0.02	24	C	0.02	<5	A	0.06	24	C
	Westbound	0.64	34	C	0.68	36	D	0.75	32	C
	Northbound	0.58	18	B	0.59	18	B	0.69	19	B
	Southbound	<u>0.53</u>	<u>10</u>	<u>A</u>	<u>0.53</u>	<u>10</u>	<u>B</u>	<u>0.68</u>	<u>13</u>	<u>B</u>
	OVERALL	0.64	15	B	0.68	15	B	0.75	18	C
Route 53 at Northern Driveway	Westbound	0.47	24	C	0.37	17	C	0.58	12	B
	Northbound	0.00	<5	A	0.00	<5	A	0.02	<5	A
	Southbound	0.12	<5	A	0.15	6	A	0.57	<5	A
Primary Plaza Dwy at Internal Intersection	Eastbound	0.05	<5	A	0.06	<5	A	n/a	n/a	n/a
	Westbound	0.00	<5	A	0.00	<5	A	n/a	n/a	n/a
	Northbound	0.06	14	B	0.06	15	B	n/a	n/a	n/a
	Southbound	0.09	9	A	0.12	9	A	n/a	n/a	n/a

¹ Volume-to-capacity ratio

² Average control delay per vehicle (in seconds)

³ Level of service

⁴ n/a = not applicable

TABLE 8
INTERSECTION CAPACITY ANALYSIS RESULTS
SATURDAY MIDDAY PEAK HOUR

Intersection	Approach	2030 No-Build			2030 Build			Permitted Plaza		
		v/c ¹	Delay ²	LOS ³	v/c	Delay	LOS	v/c	Delay	LOS
Route 53 at Primary Plaza Dwy/ KAM Appliances Dwy	Eastbound	0.01	26	C	0.02	28	C	0.06	26	C
	Westbound	0.60	29	C	0.68	32	C	0.92	45	D
	Northbound	0.74	18	B	0.76	19	B	0.94	33	C
	Southbound	<u>0.50</u>	<u>13</u>	<u>B</u>	<u>0.50</u>	<u>13</u>	<u>B</u>	<u>0.96</u>	<u>24</u>	<u>C</u>
	OVERALL	0.74	17	B	0.68	18	B	0.96	31	C
Route 53 at Northern Driveway	Westbound	0.69	35	D	0.75	41	E	0.74	12	B
	Northbound	0.00	<5	A	0.00	<5	A	0.02	<5	A
	Southbound	0.24	8	A	0.33	8	A	0.54	<5	A
Primary Plaza Dwy at Internal Intersection	Eastbound	0.09	<5	A	0.10	<5	A	n/a	n/a	n/a
	Westbound	0.00	<5	A	0.00	<5	A	n/a	n/a	n/a
	Northbound	0.04	18	C	0.04	20	C	n/a	n/a	n/a
	Southbound	0.19	11	B	0.23	11	B	n/a	n/a	n/a

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 6**, **Table 7**, and **Table 8**:

- *Route 53 at Primary Plaza Driveway/KAM Appliance Driveway.* Under -Build conditions the signalized Route 53 at the Primary Plaza Driveway/ KAM Appliance driveway will continue to operate below capacity at LOS B or better during the peak hours. Furthermore, all of the approaches will continue to operate at LOS D or better during peak hours.
- *Route 53 at Northern Plaza Driveway.* Under Build conditions the unsignalized northern plaza driveway approach to Route 53 will operate below capacity at LOS E or better during the peak hours. The Route 53 northbound and southbound approaches to the intersection will operate unimpeded at LOS A during the peak hours.
- *Primary Plaza Driveway at Internal Intersection.* Build conditions the Internal Intersection along the Primary Plaza Drive will continue to operate well below capacity with LOS C or better operations for the internal roadways and unimpeded at LOS A along the Primary Plaza Driveway during the peak hours.

In summary, the proposed development is expected to have minimal impact on the study area intersection and will not result in any notable changes in traffic operations in the study area relative to No-Build conditions. No further mitigation is required at the Plaza driveways to accommodate the restaurant with drive-thru.

DRIVE-THRU OPERATIONS

The 2,114± sf restaurant will include a dual order board drive-thru lane. The building will provide dual pick-up windows with one window dedicated to mobile pre-orders. Circulation around the building will be one-way counter-clockwise around the building to facilitate operation of the drive-through window. Vehicle queue analysis was conducted for the drive-through window to identify likely average and maximum queuing during the peak study periods. The analysis utilizes a standard queue algorithm and standard drive-through window processing times for a coffee shop.

Drive-through trips represent between 54% and 71% with an average of 65% total peak hourly transactions for a fast-food restaurant with a drive-thru window based on industry standards for various uses. Typical transaction times vary for fast food restaurants with drive-thru windows with the typical range of 30 to 50 seconds per transaction. Based on operational data for a Taco Bell with drive-thru use, window transaction times generally average approximately 40 seconds per transaction during peak periods, representing a peak throughput capacity of up to 90 vehicles per hour. To ensure proper accounting for potential peak queuing at the window, an analysis is presented that assumes a likely/projected operating condition with average window capacity (90 transactions per hour limit based on the average speed of 40 seconds per transaction) which assumes a 65% window transaction distribution.

The queuing results are summarized for the drive-through in **Table 9**; tabulated results and supporting queue calculations are provided in the **Attachments**.

TABLE 9
PROJECTED DRIVE-THROUGH CHARACTERISTICS

Period	Restaurant w/ Drive-Thru		
	Volume	Average Queue	Max Queue
<i>Weekday Morning Peak Hour</i>	32	1	2
<i>Weekday Evening Peak Hour</i>	24	1	2
<i>Saturday Midday Peak Hour</i>	39	1	3

¹Based on ITE LUC 934 applied to 2,114 sf and 65% of entering volume and 40 seconds per transaction.

As presented in **Table 9**, projected queue results indicate a maximum (95th percentile) queue of 3 vehicles or less during peak hours for the drive-thru window. For the purposes of a Taco Bell, the maximum 3-vehicle queue will occur during the midday lunch period and is expected to occur from the order board position based on empirical observations. The maximum queue will be contained within the Taco Bell portion of the Plaza with no material impact to on-site circulation or parking. Recommendations are summarized under *Recommendations and Conclusions* to enhance on-site queue storage and circulation.

PARKING ASSESSMENT

The proposed restaurant with drive-thru will be supported by a 24-space parking field immediately surrounding the building and more than 100 additional shared parking spaces in that section of the Plaza. MDM conducted parking observations at the existing Plaza, which includes a parking supply of 119 spaces in the portion of the lot proposed to include a fast-food restaurant with drive-thru window. This section provides a summary of observed peak parking demand and projected peak parking demand with the restaurant with drive-thru window in place.

Observed Peak Parking Demand

MDM conducted parking observations within the existing Plaza in the area of the proposed restaurant with drive-thru window, which includes a parking supply of 119 spaces. The existing parking layout is presented in **Figure 12** and is divided into parking zones for inventory purposes. Observations of peak parking activity was conducted over a 72-hour period on Thursday, November 17, 2022, Friday November 18, 2022, and Saturday, November 19, 2017. These time periods correspond to the peak demand period for various restaurants with drive-thru window uses. Parking accumulation survey results for the study periods are provided in the **Attachments** and have been adjusted to infill the vacant retail space (6,800) based on ITE's 85th percentile peak parking rates. The resulting No-Build parking characteristics for the study area are shown in **Figure 13**:

- *Weekday Peak Parking Demand.* A peak parking demand of 47± spaces was observed on both a Thursday and Friday during the midday period (1:00 pm) resulting in a parking surplus of 72 spaces (61%) within the parking field near the proposed restaurant with drive-thru.
- *Saturday Peak Parking Demand.* A peak parking demand of 42± spaces was observed on a Saturday during the midday period (12:00 – 1:00 pm) resulting in a parking surplus of 77 spaces (65%) within the parking field near the proposed restaurant with drive-thru.

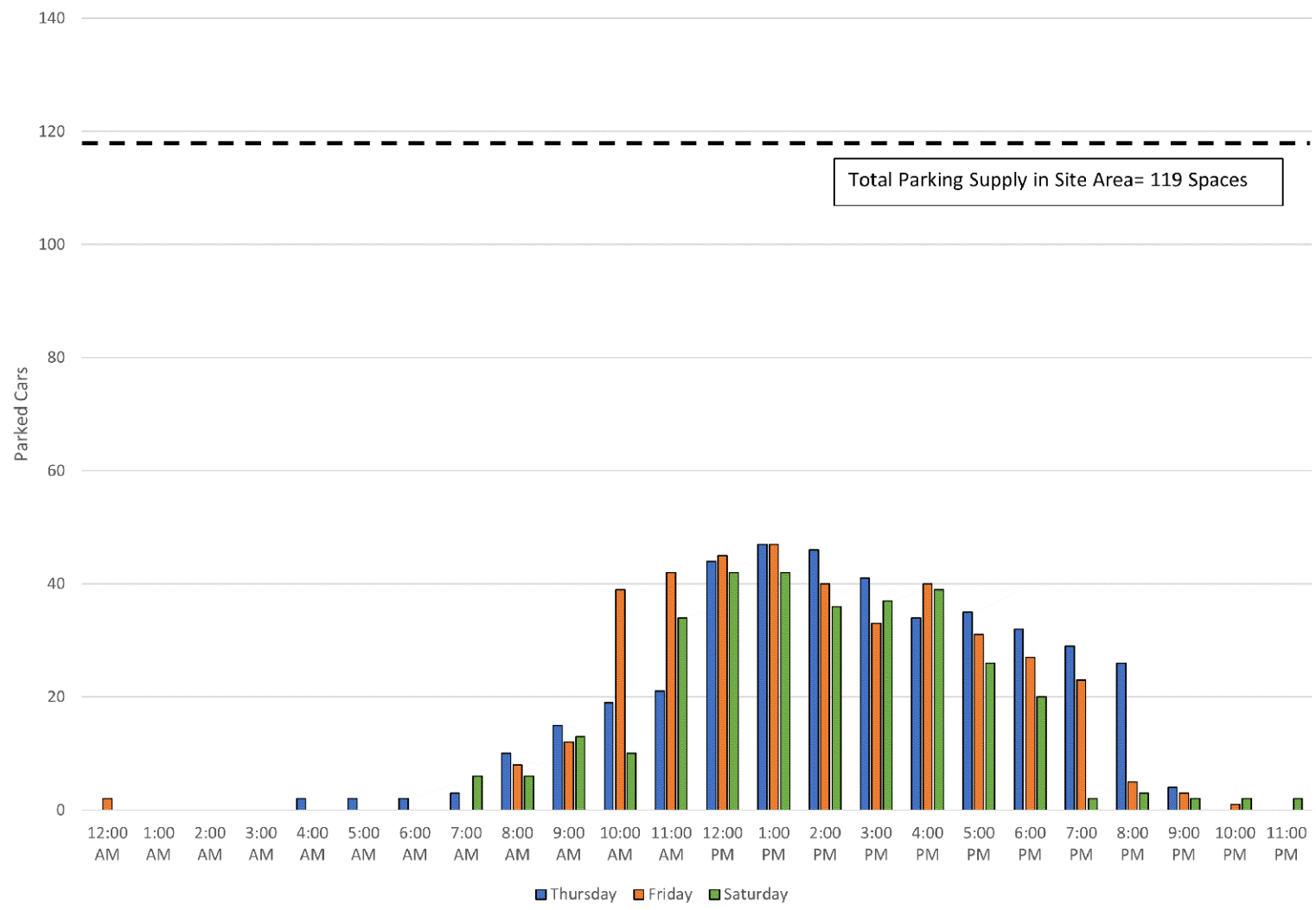
In summary, observations indicate a large parking surplus at the Site in the immediate area of the proposed restaurant with drive-thru during both a weekday and Saturday. The detailed parking observations are included in the **Attachments**.

Projected Fast-Food Restaurant w/ Drive-Thru Peak Parking Demand

Projected peak parking demands at the site are evaluated based on the observed parking demand at the Site with the addition of trips associated with the proposed 2,114 sf restaurant with drive-thru use.



Figure 12



Peak parking generation rates for restaurant with drive-thru uses are published by the Institute of Transportation Engineers (ITE) in *Parking Generation*³, which provides a basis for identifying parking demand characteristics for developments. These parking rates represent peak characteristics for each land use type as “stand-alone” uses that have differing peak parking periods. **Table 10** provides a summary of unadjusted peak parking demands for the proposed 28 seat restaurant with drive-thru use. For the purposes of this report the fast-food with drive-thru rates and hourly distribution were used as the align with the critical peak parking period for the plaza (midday). The ratios provided also account for average visitor and employee parking activity. ITE Parking data for the is provided in the **Attachments**.

TABLE 10
PEAK PARKING DEMAND – ITE BASIS

Source	Fast Food w/ Drive-Thru ²
Weekday	13
Friday	17
Saturday	19

¹Peak Parking Demand in vehicles.

²85th Percentile peak parking rate per ITE LUC 934 (Fast-Food Restaurant with Drive-Through Window) applied to 28 seats.

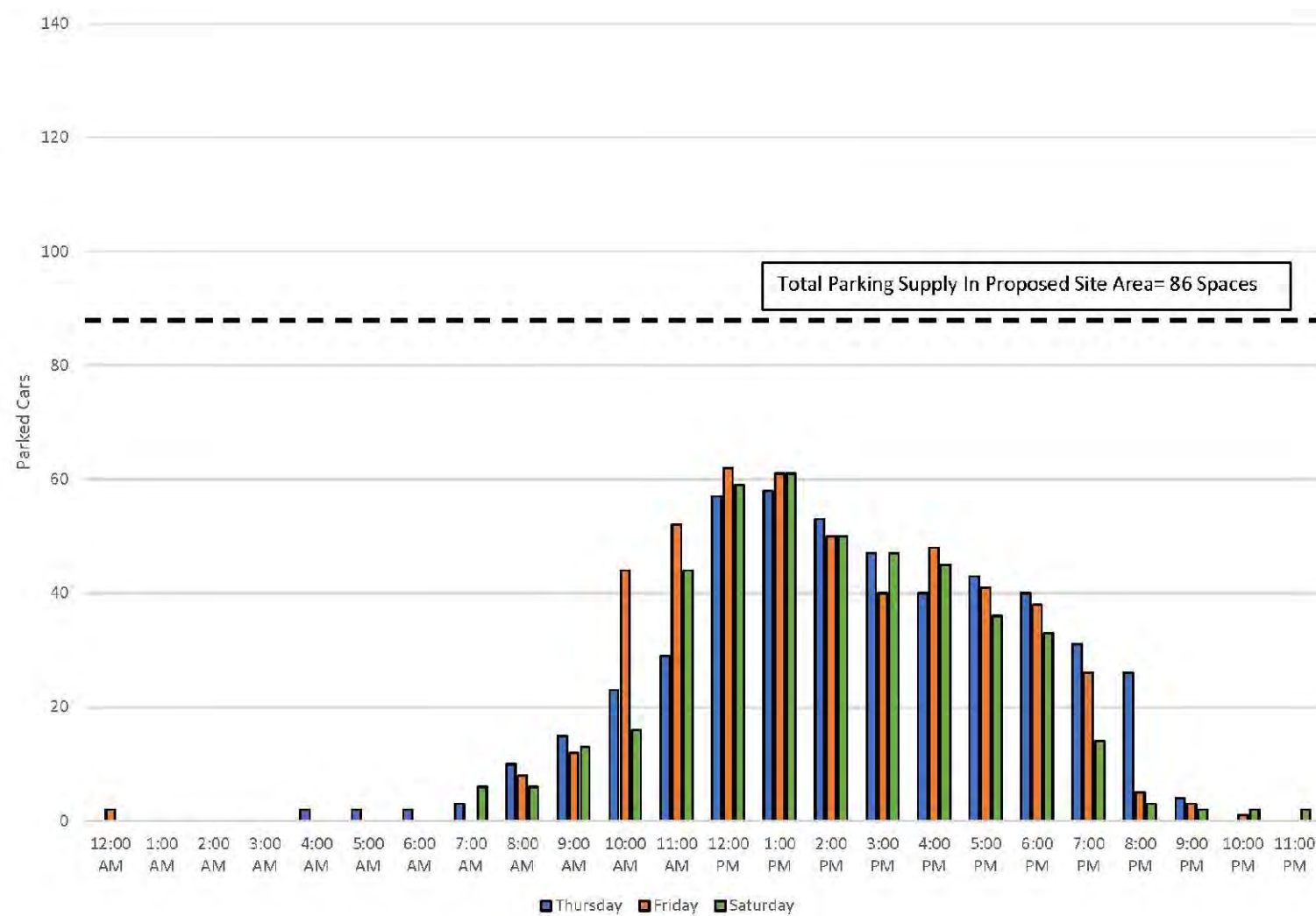
As summarized in **Table 10**, the peak parking demand for the proposed 28 seat restaurant with drive through use ranges from 13 to 19 vehicles based on ITE empirical parking generation rates with peak demands occurring during midday periods (lunch) for a typical fast-food restaurant.

Build Conditions

Under Build conditions, the total marked spaces within the Plaza will be reduced by 33± spaces and the land banked spaces will be increased to 248 to make up the difference resulting in no change in the overall parking supply (1,150 spaces). The Plaza in the area of the proposed fast-food restaurant with drive-thru window, will be reduced from 119 spaces to 86 spaces. The projected restaurant with drive-thru parking demand was added to the No-Build hourly parking demands to create a Build parking graphic as shown in **Figure 14**.

In summary, the critical peak parking demand for the area of the plaza is estimated at 69 parked vehicles which will be accommodated by the proposed 86 parking space supply within the immediate area surrounding the proposed restaurant with drive-thru. The surplus is estimated at 24 spaces in the immediate area which results in a 28% surplus. MDM notes that additional parking will also be available within the plaza including land banked spaces if needed. MDM recommends that the restaurant employees be directed to park away from more critical parking areas to allow customers to park more efficiently on-site.

³ *Parking Generation, 5th Edition*, Institute of Transportation Engineers, Washington D.C. 2019.



MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Figure 14
Build Parking Demand By Hour
With Fast Food Restaurant Added

CONCLUSIONS

In summary, the majority of the trips will be associated with pass-by activity resulting in a nominal increase in new trips to the area. The proposed restaurant with drive-thru is estimated to generate approximately 46 new vehicle trips during the weekday morning peak hour, 32 new vehicle trips during the weekday evening peak hour and 53 new vehicle trips during the Saturday midday peak hour. This level of impact will be imperceptible to the average motorist and well with the day-to-day fluctuations of the adjacent street and Plaza. Adequate capacity is available along Route 53 to accommodate the traffic increases that may occur at the Site driveways under proposed conditions. Projected queue results for the drive-thru window indicate a maximum (95th percentile) 3-vehicle queue will occur during the midday lunch period and is expected to occur from the order board position based on empirical observations. The maximum queue will be contained within the Taco Bell portion of the Plaza with no material impact to on-site circulation or parking. Parking observations indicate a large parking surplus at the Site in the immediate area of the proposed restaurant with drive-thru during both a weekday and Saturday. With the project in place, the critical peak parking demand for the that area of the plaza is estimated at 62 parked vehicles which will be accommodated by the proposed 86 parking space supply within the immediate area surrounding the proposed restaurant with drive-thru. The parking surplus under Build conditions is estimated at 24 spaces in the immediate area which results in a 28% surplus.

MDM recommends the following site circulation improvements and pedestrian and bicycle accommodations to enhance operations, safety, and on-site traffic flow:

Site Circulation Improvements

- *By-Pass Accommodations.* The site has been designed to provide the ability to by-pass the dedicated drive-thru lanes back to the main parking field and Plaza. A bypass area will also be provided adjacent to the pick-up windows to accommodate the expected quicker mobile order transactions.
- *Pavement Markings & Signs.* Provide pavement markings and signage to promote the one-way counterclockwise operations, drive-thru lane, and on-site restrictions. A STOP sign (R1-1) and STOP line pavement marking are included on the site plan for the drive-thru area exit back into the parking field. Likewise, Do Not Enter signs (R5-1) are included facing the main parking field and for the end of the drive-thru lane. The signs and pavement markings shall conform to Manual on Uniform Traffic Control Devices (MUTCD) standards.

- *Design Vehicle Accommodations.* The Site should be designed to accommodate the largest anticipated delivery vehicle including trash removal operations. The site layout should also be designed to accommodate the largest emergency vehicle (ladder truck).

Pedestrian and Bicycle Accommodations

- *Pedestrian Accommodation.* The design incorporates sidewalks that connect the proposed building entrances with the primary parking area. To the maximum extent feasible the sidewalk should connect to the existing sidewalks within the retail plaza.
- *Bicycle Amenities.* The Proponent should incorporate bicycle racks near the buildings entranceways to encourage and facilitate this mode of transportation to/from the Site.

Drive-Thru Management Plan

- *Drive-Thru Management Plan.* The operator should confirm that the window will be properly staffed and managed during peak demand periods to meet applicable processing times and commit to monitoring actual drive-through demand and queuing to ensure impacts to site circulation are avoided. To the extent needed the facility should enhance staffing/management of the drive-through window to minimize processing times and associated vehicle queuing, and designation of parking for drive-through patrons whose orders may be lengthy and require additional processing time. Likewise, designated parking for employees should be provided in areas where longer-term parking (i.e., lower turnover spaces) are preferred within the Site to facilitate higher turnover patron accommodation.

In summary, MDM finds that incremental traffic associated with the proposed development is not expected to materially impact operating conditions at the study intersections. The study intersections exhibit below-average crash rates based on historic crash data; safety countermeasures are therefore not warranted. Implementation of site-circulation improvements, pedestrian and bicycle improvements, and a drive-thru management plan will establish a framework of minimizing Site traffic impacts by encouraging non-motorized travel modes and pedestrian accommodation that is compatible with other projects in the area.

ATTACHMENTS

- Traffic Volume Data
- Seasonal/ Yearly Growth Data
- Crash Data
- Background Growth Data
- Trip Generation
- Capacity Analysis
- Drive-Thru Queue Calculations
- Parking Calculations

□ Traffic Volume Data

MDM Transportation Consultants, Inc.

N/S: Route 53
Just South of Northern Site Driveway
Hanover, MA
Thursday Volumes

28 Lord Road, Suite 280
Marlborough, MA, 01752

Site Code: 1247
Station ID:
1247

Start Time	17-Nov-22 Thu	Northbound		Hour Totals		Southbound		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		5	241			22	267				
12:15		8	269			9	279				
12:30		4	224			13	284				
12:45		3	242	20	976	3	285	47	1115	67	2091
01:00		3	213			6	274				
01:15		3	236			6	271				
01:30		1	212			8	251				
01:45		2	258	9	919	1	330	21	1126	30	2045
02:00		4	194			6	294				
02:15		4	213			6	260				
02:30		4	200			7	310				
02:45		1	213	13	820	3	310	22	1174	35	1994
03:00		12	239			2	288				
03:15		4	239			2	329				
03:30		10	194			1	345				
03:45		13	243	39	915	5	355	10	1317	49	2232
04:00		19	220			5	352				
04:15		25	229			3	361				
04:30		55	239			6	354				
04:45		73	214	172	902	5	329	19	1396	191	2298
05:00		124	279			10	335				
05:15		125	219			9	336				
05:30		106	175			19	287				
05:45		135	193	490	866	25	274	63	1232	553	2098
06:00		146	186			25	278				
06:15		132	162			50	265				
06:30		162	143			56	202				
06:45		198	121	638	612	81	189	212	934	850	1546
07:00		233	135			64	212				
07:15		262	128			109	196				
07:30		243	106			113	159				
07:45		251	95	989	464	146	161	432	728	1421	1192
08:00		198	113			156	151				
08:15		252	84			162	174				
08:30		240	85			143	128				
08:45		252	77	942	359	179	109	640	562	1582	921
09:00		198	57			172	121				
09:15		224	58			197	78				
09:30		206	35			195	64				
09:45		230	55	858	205	184	67	748	330	1606	535
10:00		232	47			196	75				
10:15		195	38			189	49				
10:30		229	20			225	48				
10:45		243	18	899	123	234	36	844	208	1743	331
11:00		231	25			228	42				
11:15		221	19			263	28				
11:30		251	14			234	45				
11:45		257	16	960	74	289	19	1014	134	1974	208
Total		6029	7235			4072	10256			10101	17491
Percent		45.5%	54.5%			28.4%	71.6%			36.6%	63.4%
Total		6029	7235			4072	10256			10101	17491
Percent		45.5%	54.5%			28.4%	71.6%			36.6%	63.4%
Combined Total		13264				14328				27592	

MDM Transportation Consultants, Inc.

N/S: Route 53
Just South of Northern Site Driveway
Hanover, MA
Saturday Volumes

28 Lord Road, Suite 280
Marlborough, MA, 01752

Site Code: 1247
Station ID:
1247

Start Time	19-Nov-22 Sat	Northbound		Hour Totals		Southbound		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		12	343			27	320				
12:15		5	317			20	323				
12:30		9	290			21	315				
12:45		6	301	32	1251	19	328	87	1286	119	2537
01:00		5	304			24	311				
01:15		4	289			11	328				
01:30		3	272			7	335				
01:45		7	299	19	1164	17	335	59	1309	78	2473
02:00		6	300			2	329				
02:15		7	300			2	331				
02:30		1	271			5	317				
02:45		4	249	18	1120	7	304	16	1281	34	2401
03:00		5	231			7	288				
03:15		1	234			6	285				
03:30		3	234			4	291				
03:45		4	239	13	938	8	307	25	1171	38	2109
04:00		11	256			0	272				
04:15		13	266			10	267				
04:30		12	230			1	258				
04:45		21	202	57	954	2	272	13	1069	70	2023
05:00		30	226			6	221				
05:15		28	213			11	206				
05:30		37	162			9	226				
05:45		44	196	139	797	15	219	41	872	180	1669
06:00		36	184			22	223				
06:15		60	161			16	195				
06:30		64	144			28	191				
06:45		85	131	245	620	55	187	121	796	366	1416
07:00		86	118			29	139				
07:15		104	97			74	156				
07:30		109	97			66	130				
07:45		110	90	409	402	115	119	284	544	693	946
08:00		162	85			123	135				
08:15		189	89			138	110				
08:30		163	80			182	118				
08:45		181	73	695	327	227	73	670	436	1365	763
09:00		216	97			203	109				
09:15		219	62			249	105				
09:30		248	57			238	83				
09:45		239	55	922	271	274	78	964	375	1886	646
10:00		258	43			288	70				
10:15		283	23			250	67				
10:30		273	41			284	66				
10:45		274	40	1088	147	333	56	1155	259	2243	406
11:00		340	34			311	53				
11:15		310	35			301	44				
11:30		297	28			303	46				
11:45		299	20	1246	117	340	44	1255	187	2501	304
Total		4883	8108			4690	9585			9573	17693
Percent		37.6%	62.4%			32.9%	67.1%			35.1%	64.9%
Total		4883	8108			4690	9585			9573	17693
Percent		37.6%	62.4%			32.9%	67.1%			35.1%	64.9%
Combined Total		12991				14275				27266	

MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

E/W: Internal Plaza Road
NB: From Benchmark
SB: From Site Area
Hanover, MA

File Name : 1247_Plaza_Driveway_at_Internal_11-17-2022
Site Code : 1247
Start Date : 11/17/2022
Page No : 1

Groups Printed- Lights - Mediums - Articulated Trucks

	To Site Lot From North					To Target From East					To Benchmark From South					To 53 From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
07:00 AM	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	1	1	0	0	2	4
07:15 AM	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	1	2	0	0	3	5
07:30 AM	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	1	7	3	0	11	13
07:45 AM	0	0	0	0	0	0	5	0	0	5	0	0	1	0	1	1	18	3	0	22	28
Total	2	0	0	0	2	0	8	0	0	8	0	0	2	0	2	4	28	6	0	38	50
08:00 AM	3	0	0	0	3	0	3	0	0	3	0	0	0	0	0	3	25	4	0	32	38
08:15 AM	1	0	1	0	2	0	5	0	0	5	0	0	0	0	0	2	17	1	1	21	28
08:30 AM	2	0	0	0	2	0	11	0	0	11	0	0	2	0	2	3	29	9	0	41	56
08:45 AM	4	0	0	0	4	0	13	0	0	13	0	0	1	0	1	3	34	8	0	45	63
Total	10	0	1	0	11	0	32	0	0	32	0	0	3	0	3	11	105	22	1	139	185
04:00 PM	9	0	1	0	10	0	28	0	0	28	0	0	2	0	2	1	51	14	1	67	107
04:15 PM	11	0	1	0	12	0	34	0	0	34	0	0	2	0	2	1	52	12	2	67	115
04:30 PM	20	0	0	0	20	0	37	0	0	37	0	0	7	0	7	2	56	17	0	75	139
04:45 PM	10	0	1	0	11	1	33	1	0	35	0	1	4	0	5	1	30	9	2	42	93
Total	50	0	3	0	53	1	132	1	0	134	0	1	15	0	16	5	189	52	5	251	454
05:00 PM	22	0	0	0	22	1	37	0	0	38	0	0	6	0	6	0	48	17	1	66	132
05:15 PM	12	0	0	0	12	0	31	0	0	31	0	0	0	0	0	0	38	8	1	47	90
05:30 PM	11	0	1	0	12	1	18	0	0	19	0	0	3	0	3	0	39	11	0	50	84
05:45 PM	7	0	2	0	9	2	34	0	0	36	0	0	1	0	1	0	44	13	1	58	104
Total	52	0	3	0	55	4	120	0	0	124	0	0	10	0	10	0	169	49	3	221	410
Grand Total	114	0	7	0	121	5	292	1	0	298	0	1	30	0	31	20	491	129	9	649	1099
Apprch %	94.2	0	5.8	0		1.7	98	0.3	0		0	3.2	96.8	0		3.1	75.7	19.9	1.4		
Total %	10.4	0	0.6	0	11	0.5	26.6	0.1	0	27.1	0	0.1	2.7	0	2.8	1.8	44.7	11.7	0.8	59.1	
Lights	113	0	7	0	120	5	287	1	0	293	0	1	30	0	31	20	484	127	9	640	1084
% Lights	99.1	0	100	0	99.2	100	98.3	100	0	98.3	0	100	100	0	100	100	98.6	98.4	100	98.6	98.6
Mediums	1	0	0	0	1	0	4	0	0	4	0	0	0	0	0	0	5	2	0	7	12
% Mediums	0.9	0	0	0	0.8	0	1.4	0	0	1.3	0	0	0	0	0	0	1	1.6	0	1.1	1.1
Articulated Trucks	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	3
% Articulated Trucks	0	0	0	0	0	0	0.3	0	0	0.3	0	0	0	0	0	0	0.4	0	0	0.3	0.3

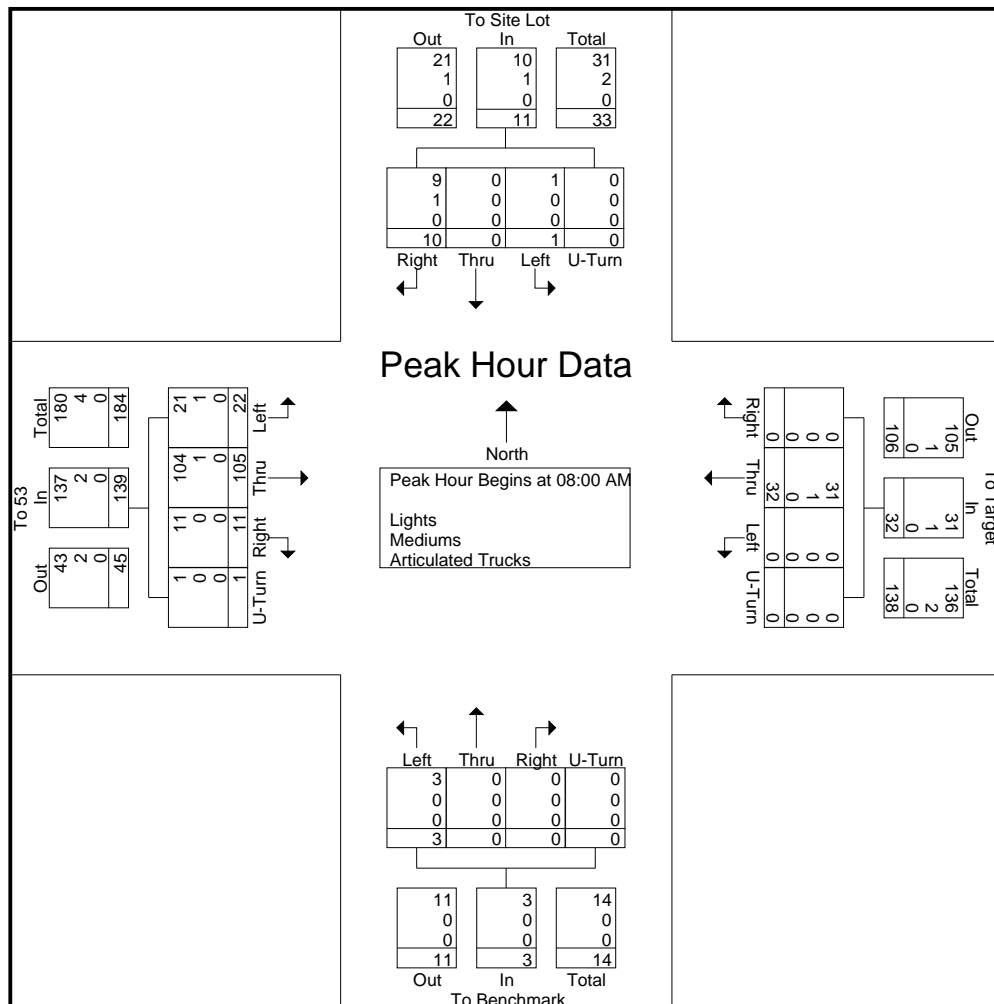
MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

E/W: Internal Plaza Road
NB: From Benchmark
SB: From Site Area
Hanover, MA

File Name : 1247_Plaza_Driveway_at_Internal_11-17-2022
Site Code : 1247
Start Date : 11/17/2022
Page No : 2

	To Site Lot From North					To Target From East					To Benchmark From South					To 53 From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	3	0	0	0	3	0	3	0	0	3	0	0	0	0	0	3	25	4	0	32	38
08:15 AM	1	0	1	0	2	0	5	0	0	5	0	0	0	0	0	2	17	1	1	21	28
08:30 AM	2	0	0	0	2	0	11	0	0	11	0	0	2	0	2	3	29	9	0	41	56
08:45 AM	4	0	0	0	4	0	13	0	0	13	0	0	1	0	1	3	34	8	0	45	63
Total Volume	10	0	1	0	11	0	32	0	0	32	0	0	3	0	3	11	105	22	1	139	185
% App. Total	90.9	0	9.1	0		0	100	0	0		0	0	100	0		7.9	75.5	15.8	0.7		
PHF	.625	.000	.250	.000	.688	.000	.615	.000	.000	.615	.000	.000	.375	.000	.375	.917	.772	.611	.250	.772	.734
Lights	9	0	1	0	10	0	31	0	0	31	0	0	3	0	3	11	104	21	1	137	181
% Lights	90.0	0	100	0	90.9	0	96.9	0	0	96.9	0	0	100	0	100	100	99.0	95.5	100	98.6	97.8
Mediums	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	4
% Mediums	10.0	0	0	0	9.1	0	3.1	0	0	3.1	0	0	0	0	0	0	1.0	4.5	0	1.4	2.2
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



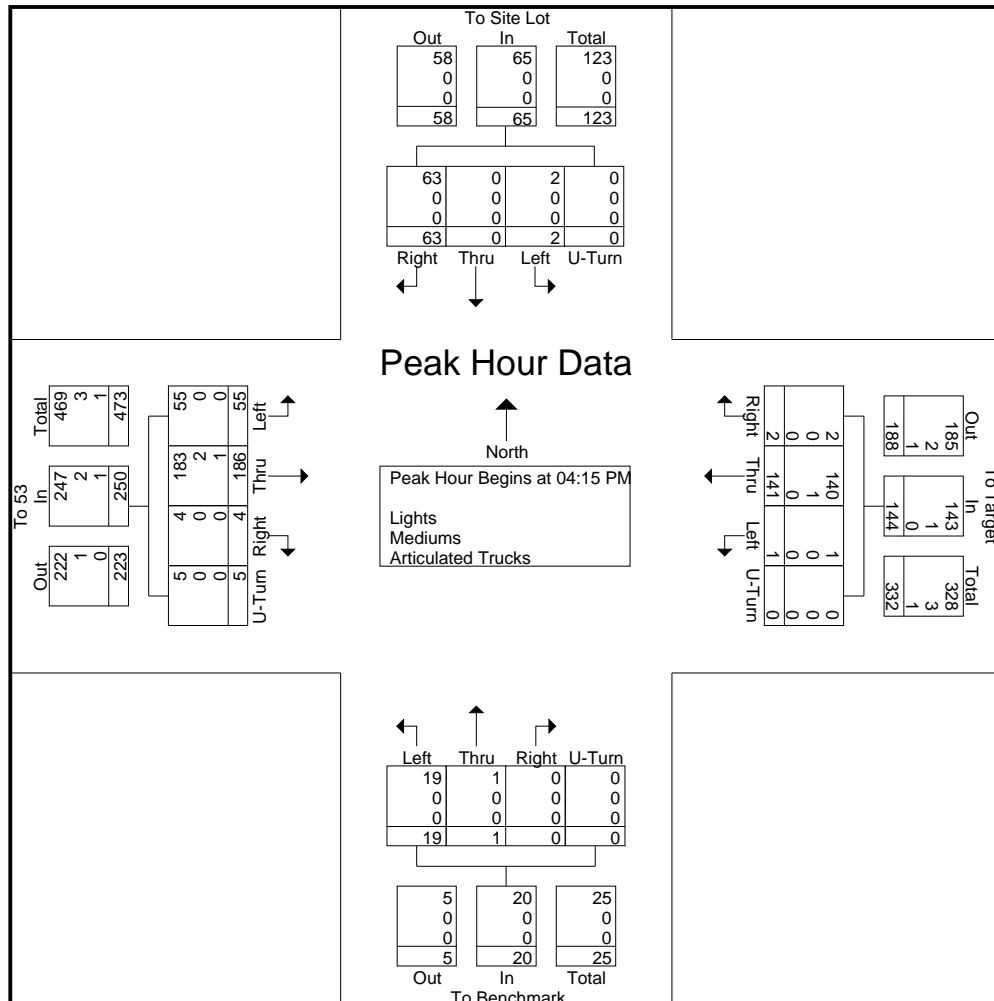
MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

E/W: Internal Plaza Road
NB: From Benchmark
SB: From Site Area
Hanover, MA

File Name : 1247_Plaza_Driveway_at_Internal_11-17-2022
Site Code : 1247
Start Date : 11/17/2022
Page No : 3

	To Site Lot From North					To Target From East					To Benchmark From South					To 53 From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	11	0	1	0	12	0	34	0	0	34	0	0	2	0	2	1	52	12	2	67	115
04:30 PM	20	0	0	0	20	0	37	0	0	37	0	0	7	0	7	2	56	17	0	75	139
04:45 PM	10	0	1	0	11	1	33	1	0	35	0	1	4	0	5	1	30	9	2	42	93
05:00 PM	22	0	0	0	22	1	37	0	0	38	0	0	6	0	6	0	48	17	1	66	132
Total Volume	63	0	2	0	65	2	141	1	0	144	0	1	19	0	20	4	186	55	5	250	479
% App. Total	96.9	0	3.1	0		1.4	97.9	0.7	0		0	5	95	0		1.6	74.4	22	2		
PHF	.716	.000	.500	.000	.739	.500	.953	.250	.000	.947	.000	.250	.679	.000	.714	.500	.830	.809	.625	.833	.862
Lights	63	0	2	0	65	2	140	1	0	143	0	1	19	0	20	4	183	55	5	247	475
% Lights	100	0	100	0	100	100	99.3	100	0	99.3	0	100	100	0	100	100	98.4	100	100	98.8	99.2
Mediums	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	3
% Mediums	0	0	0	0	0	0	0.7	0	0	0.7	0	0	0	0	0	0	1.1	0	0	0.8	0.6
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0.4	0.2



28 Lord Road, Suite 280
Marlborough, MA, 01752

E/W: Internal Road to Target
NB: From Benchmark/Bank
SB: From Site Area
Hanover, MA

File Name : 1247_Plaza_Driveway_at_Internal_SAT 11-19-2022
Site Code : 1247
Start Date : 11/19/2022
Page No : 1

Groups Printed- Lights - Mediums - Articulated Trucks

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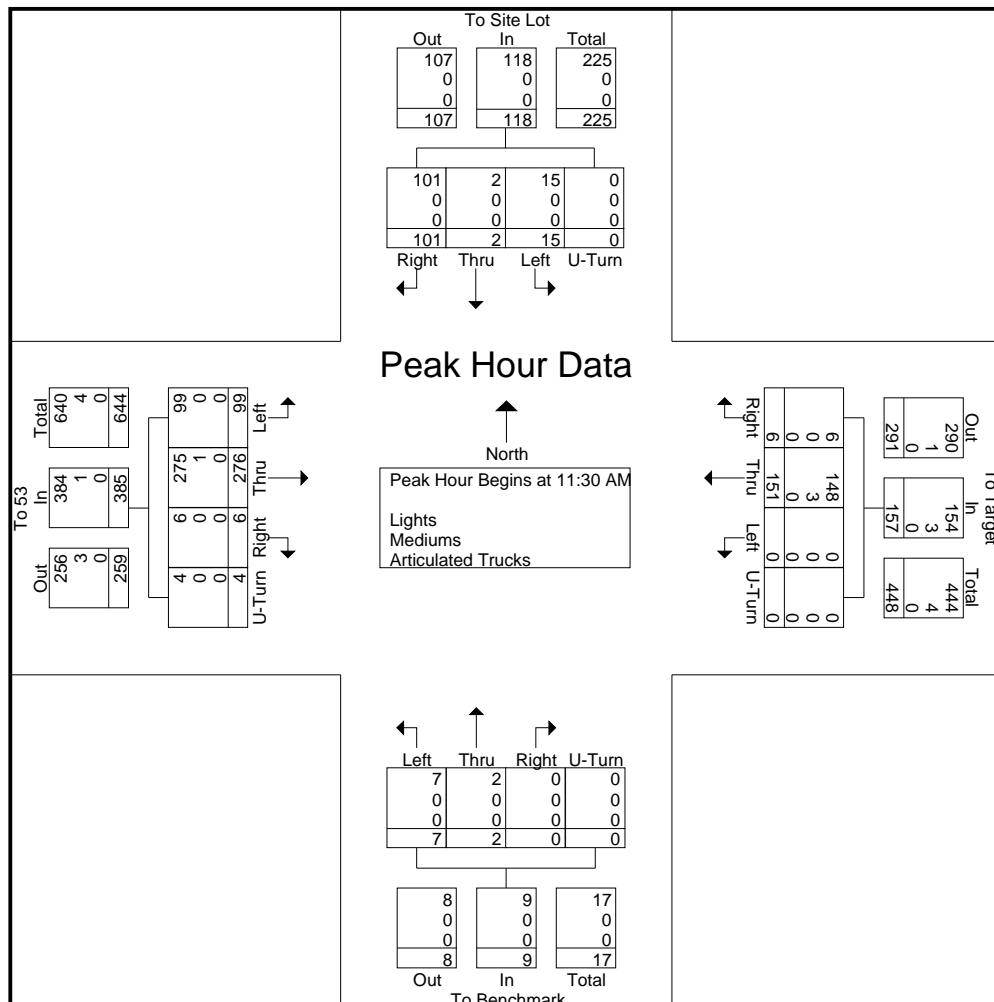
MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

E/W: Internal Road to Target
NB: From Benchmark/Bank
SB: From Site Area
Hanover, MA

File Name : 1247_Plaza_Driveway_at_Internal_SAT 11-19-2022
Site Code : 1247
Start Date : 11/19/2022
Page No : 2

	To Site Lot From North					To Target From East					To Benchmark From South					To 53 From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 11:30 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 11:30 AM																					
11:30 AM	29	0	5	0	34	2	50	0	0	52	0	0	1	0	1	3	63	35	1	102	189
11:45 AM	24	2	1	0	27	1	30	0	0	31	0	1	3	0	4	3	73	20	0	96	158
12:00 PM	26	0	7	0	33	1	35	0	0	36	0	1	3	0	4	0	75	22	2	99	172
12:15 PM	22	0	2	0	24	2	36	0	0	38	0	0	0	0	0	0	65	22	1	88	150
Total Volume	101	2	15	0	118	6	151	0	0	157	0	2	7	0	9	6	276	99	4	385	669
% App. Total	85.6	1.7	12.7	0		3.8	96.2	0	0		0	22.2	77.8	0		1.6	71.7	25.7	1		
PHF	.871	.250	.536	.000	.868	.750	.755	.000	.000	.755	.000	.500	.583	.000	.563	.500	.920	.707	.500	.944	.885
Lights	101	2	15	0	118	6	148	0	0	154	0	2	7	0	9	6	275	99	4	384	665
% Lights	100	100	100	0	100	100	98.0	0	0	98.1	0	100	100	0	100	100	99.6	100	100	99.7	99.4
Mediums	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	1	0	0	1	4
% Mediums	0	0	0	0	0	0	2.0	0	0	1.9	0	0	0	0	0	0	0.4	0	0	0.3	0.6
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	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

N/S: Route 53
WB: Target Plaza Unsignalized
Hanover, MA

File Name : 1247_Washington_Street_at_Gamestop_11-17-2022
Site Code : 1247
Start Date : 11/17/2022
Page No : 1

Groups Printed- Lights - Mediums - Articulated Trucks

Start Time	Route 53 From North				Gamestop Plaza Driveway From East				Route 53 From South				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
07:00 AM	63	0	0	63	2	0	0	2	0	239	0	239	304
07:15 AM	109	4	0	113	0	0	0	0	0	267	0	267	380
07:30 AM	112	3	0	115	1	0	0	1	0	246	0	246	362
07:45 AM	148	6	0	154	1	1	0	2	1	250	0	251	407
Total	432	13	0	445	4	1	0	5	1	1002	0	1003	1453
08:00 AM	157	7	0	164	2	1	0	3	1	200	0	201	368
08:15 AM	160	3	0	163	6	0	0	6	1	252	0	253	422
08:30 AM	145	8	0	153	10	0	0	10	0	238	0	238	401
08:45 AM	182	14	0	196	9	0	0	9	0	257	0	257	462
Total	644	32	0	676	27	1	0	28	2	947	0	949	1653
04:00 PM	358	18	0	376	27	2	0	29	2	228	0	230	635
04:15 PM	358	19	0	377	39	4	0	43	1	230	0	231	651
04:30 PM	350	13	0	363	37	0	0	37	0	240	0	240	640
04:45 PM	311	9	0	320	33	3	0	36	0	212	0	212	568
Total	1377	59	0	1436	136	9	0	145	3	910	0	913	2494
05:00 PM	332	17	0	349	23	1	0	24	3	267	0	270	643
05:15 PM	333	16	0	349	27	2	0	29	1	211	0	212	590
05:30 PM	284	16	0	300	24	4	0	28	2	168	0	170	498
05:45 PM	273	10	0	283	23	3	0	26	3	189	0	192	501
Total	1222	59	0	1281	97	10	0	107	9	835	0	844	2232
Grand Total	3675	163	0	3838	264	21	0	285	15	3694	0	3709	7832
Apprch %	95.8	4.2	0		92.6	7.4	0		0.4	99.6	0		
Total %	46.9	2.1	0	49	3.4	0.3	0	3.6	0.2	47.2	0	47.4	
Lights	3615	161	0	3776	260	21	0	281	15	3622	0	3637	7694
% Lights	98.4	98.8	0	98.4	98.5	100	0	98.6	100	98.1	0	98.1	98.2
Mediums	54	1	0	55	3	0	0	3	0	57	0	57	115
% Mediums	1.5	0.6	0	1.4	1.1	0	0	1.1	0	1.5	0	1.5	1.5
Articulated Trucks	6	1	0	7	1	0	0	1	0	15	0	15	23
% Articulated Trucks	0.2	0.6	0	0.2	0.4	0	0	0.4	0	0.4	0	0.4	0.3

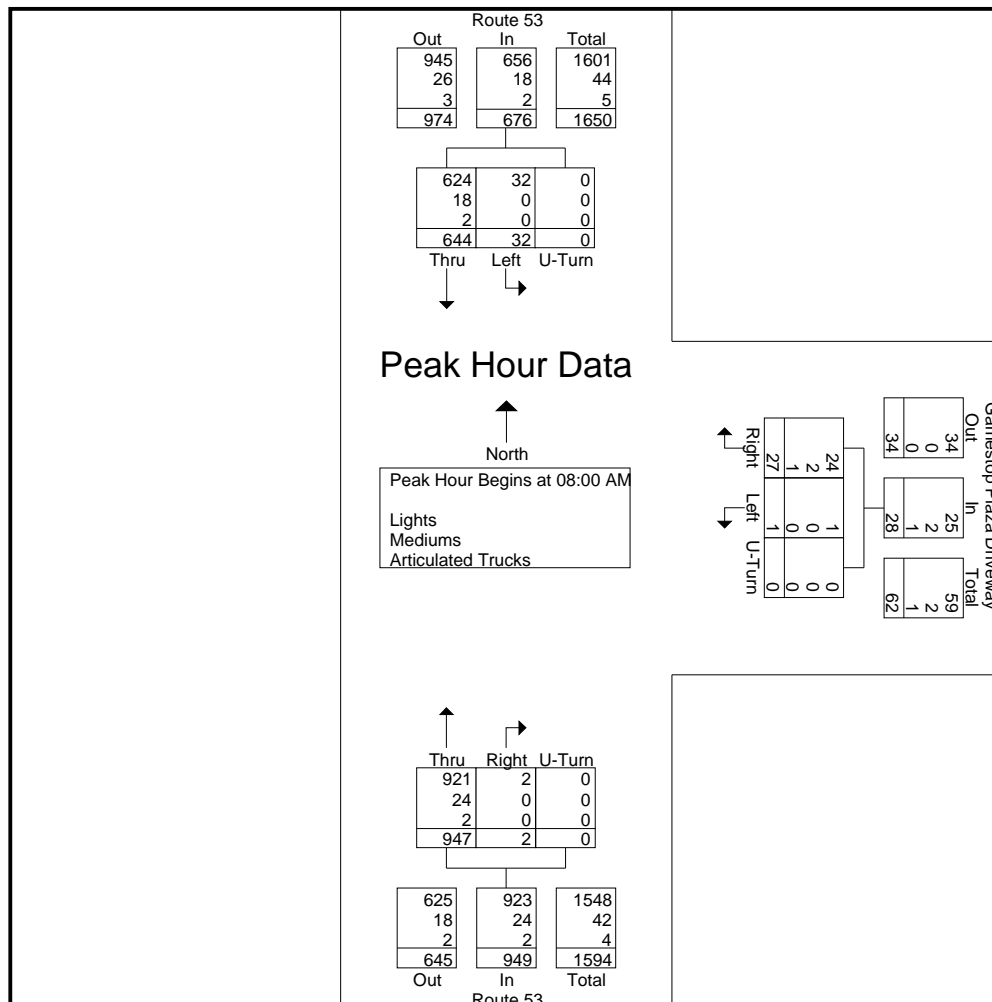
MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

N/S: Route 53
WB: Target Plaza Unsignalized
Hanover, MA

File Name : 1247_Washington_Street_at_Gamestop_11-17-2022
Site Code : 1247
Start Date : 11/17/2022
Page No : 2

	Route 53 From North				Gamestop Plaza Driveway From East				Route 53 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 08:00 AM													
08:00 AM	157	7	0	164	2	1	0	3	1	200	0	201	368
08:15 AM	160	3	0	163	6	0	0	6	1	252	0	253	422
08:30 AM	145	8	0	153	10	0	0	10	0	238	0	238	401
08:45 AM	182	14	0	196	9	0	0	9	0	257	0	257	462
Total Volume	644	32	0	676	27	1	0	28	2	947	0	949	1653
% App. Total	95.3	4.7	0		96.4	3.6	0		0.2	99.8	0		
PHF	.885	.571	.000	.862	.675	.250	.000	.700	.500	.921	.000	.923	.894
Lights	624	32	0	656	24	1	0	25	2	921	0	923	1604
% Lights	96.9	100	0	97.0	88.9	100	0	89.3	100	97.3	0	97.3	97.0
Mediums	18	0	0	18	2	0	0	2	0	24	0	24	44
% Mediums	2.8	0	0	2.7	7.4	0	0	7.1	0	2.5	0	2.5	2.7
Articulated Trucks	2	0	0	2	1	0	0	1	0	2	0	2	5
% Articulated Trucks	0.3	0	0	0.3	3.7	0	0	3.6	0	0.2	0	0.2	0.3



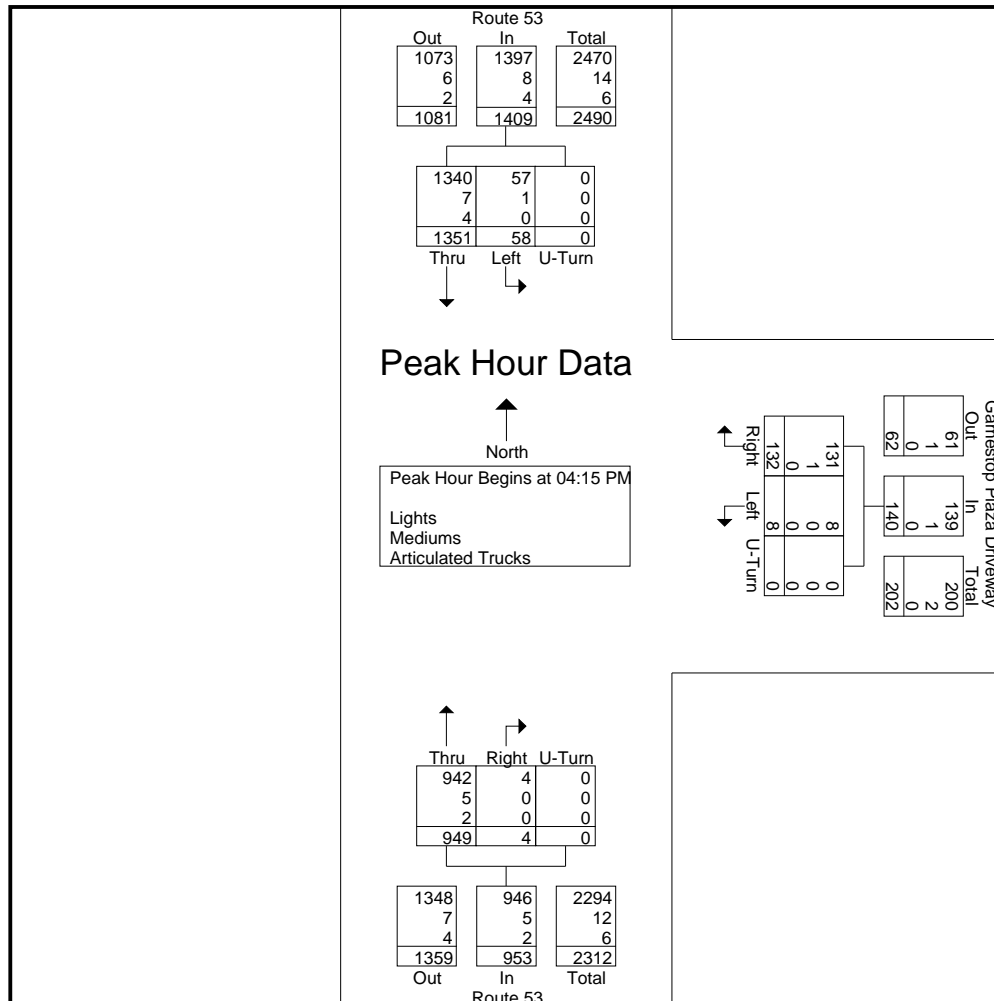
MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

N/S: Route 53
WB: Target Plaza Unsignalized
Hanover, MA

File Name : 1247_Washington_Street_at_Gamestop_11-17-2022
Site Code : 1247
Start Date : 11/17/2022
Page No : 3

	Route 53 From North				Gamestop Plaza Driveway From East				Route 53 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:15 PM													
04:15 PM	358	19	0	377	39	4	0	43	1	230	0	231	651
04:30 PM	350	13	0	363	37	0	0	37	0	240	0	240	640
04:45 PM	311	9	0	320	33	3	0	36	0	212	0	212	568
05:00 PM	332	17	0	349	23	1	0	24	3	267	0	270	643
Total Volume	1351	58	0	1409	132	8	0	140	4	949	0	953	2502
% App. Total	95.9	4.1	0		94.3	5.7	0		0.4	99.6	0		
PHF	.943	.763	.000	.934	.846	.500	.000	.814	.333	.889	.000	.882	.961
Lights	1340	57	0	1397	131	8	0	139	4	942	0	946	2482
% Lights	99.2	98.3	0	99.1	99.2	100	0	99.3	100	99.3	0	99.3	99.2
Mediums	7	1	0	8	1	0	0	1	0	5	0	5	14
% Mediums	0.5	1.7	0	0.6	0.8	0	0	0.7	0	0.5	0	0.5	0.6
Articulated Trucks	4	0	0	4	0	0	0	0	0	2	0	2	6
% Articulated Trucks	0.3	0	0	0.3	0	0	0	0	0	0.2	0	0.2	0.2



MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

N/S: Route 53
EB: Target Lot Unsignalized
Hanover, MA

File Name : 1247_Washington_Street_at_Gamestop_SAT 11-19-2022
Site Code : 1247
Start Date : 11/19/2022
Page No : 1

Groups Printed- Lights - Mediums - Articulated Trucks

Start Time	Route 53 From North				Gamestop Plaza Driveway From East				Route 53 From South				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
11:00 AM	311	10	0	321	36	2	0	38	3	337	0	340	699
11:15 AM	303	14	0	317	45	6	0	51	1	307	0	308	676
11:30 AM	304	18	0	322	32	2	0	34	1	300	0	301	657
11:45 AM	340	22	0	362	45	6	0	51	2	301	0	303	716
Total	1258	64	0	1322	158	16	0	174	7	1245	0	1252	2748
12:00 PM	338	28	0	366	57	2	0	59	0	339	0	339	764
12:15 PM	328	15	0	343	61	2	0	63	5	313	0	318	724
12:30 PM	329	24	0	353	40	4	0	44	2	287	0	289	686
12:45 PM	332	13	0	345	48	4	0	52	3	298	0	301	698
Total	1327	80	0	1407	206	12	0	218	10	1237	0	1247	2872
Grand Total	2585	144	0	2729	364	28	0	392	17	2482	0	2499	5620
Apprch %	94.7	5.3	0		92.9	7.1	0		0.7	99.3	0		
Total %	46	2.6	0	48.6	6.5	0.5	0	7	0.3	44.2	0	44.5	
Lights	2561	143	0	2704	362	28	0	390	17	2461	0	2478	5572
% Lights	99.1	99.3	0	99.1	99.5	100	0	99.5	100	99.2	0	99.2	99.1
Mediums	22	1	0	23	2	0	0	2	0	19	0	19	44
% Mediums	0.9	0.7	0	0.8	0.5	0	0	0.5	0	0.8	0	0.8	0.8
Articulated Trucks	2	0	0	2	0	0	0	0	0	2	0	2	4
% Articulated Trucks	0.1	0	0	0.1	0	0	0	0	0	0.1	0	0.1	0.1

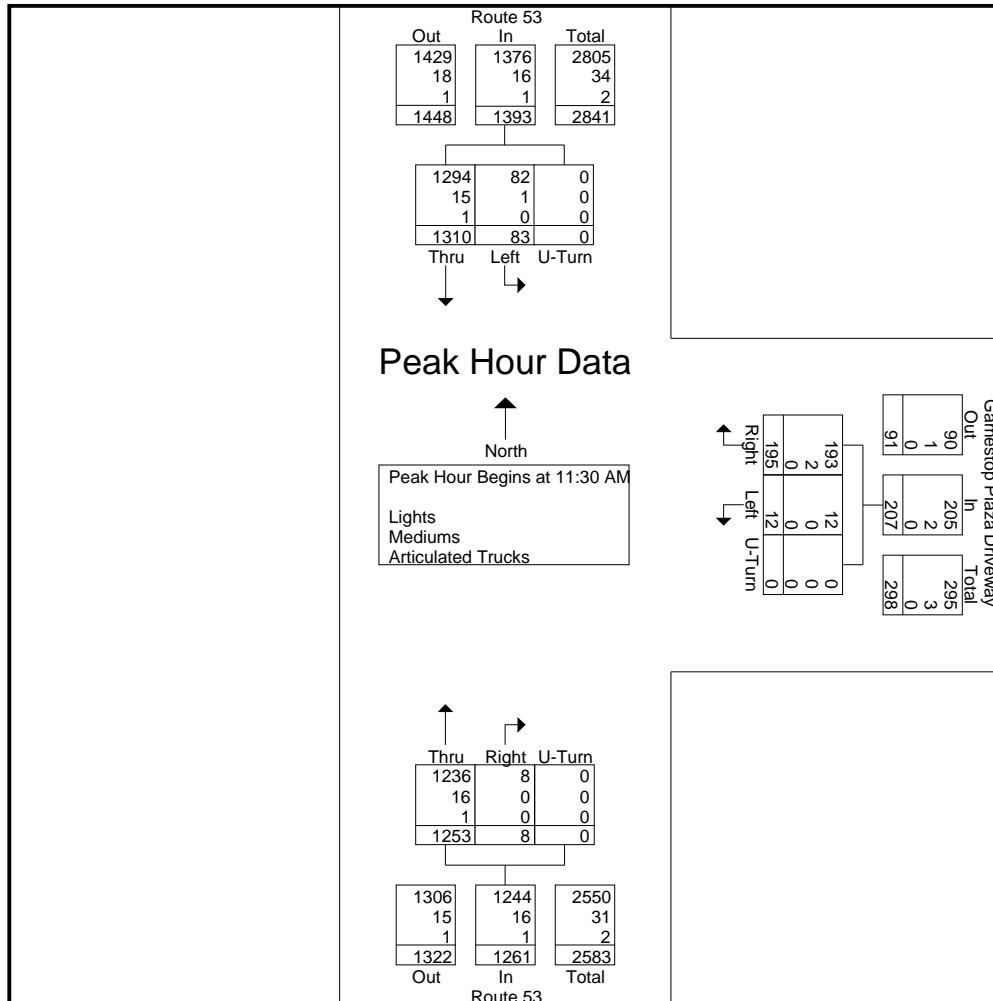
MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

N/S: Route 53
EB: Target Lot Unsignalized
Hanover, MA

File Name : 1247_Washington_Street_at_Gamestop_SAT 11-19-2022
Site Code : 1247
Start Date : 11/19/2022
Page No : 2

	Route 53 From North				Gamestop Plaza Driveway From East				Route 53 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 11:00 AM to 12:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:30 AM													
11:30 AM	304	18	0	322	32	2	0	34	1	300	0	301	657
11:45 AM	340	22	0	362	45	6	0	51	2	301	0	303	716
12:00 PM	338	28	0	366	57	2	0	59	0	339	0	339	764
12:15 PM	328	15	0	343	61	2	0	63	5	313	0	318	724
Total Volume	1310	83	0	1393	195	12	0	207	8	1253	0	1261	2861
% App. Total	94	6	0		94.2	5.8	0		0.6	99.4	0		
PHF	.963	.741	.000	.952	.799	.500	.000	.821	.400	.924	.000	.930	.936
Lights	1294	82	0	1376	193	12	0	205	8	1236	0	1244	2825
% Lights	98.8	98.8	0	98.8	99.0	100	0	99.0	100	98.6	0	98.7	98.7
Mediums	15	1	0	16	2	0	0	2	0	16	0	16	34
% Mediums	1.1	1.2	0	1.1	1.0	0	0	1.0	0	1.3	0	1.3	1.2
Articulated Trucks	1	0	0	1	0	0	0	0	0	1	0	1	2
% Articulated Trucks	0.1	0	0	0.1	0	0	0	0	0	0.1	0	0.1	0.1



MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

N/S: Route 53
WB: Target Plaza Drive
Hanover, MA

File Name : 1247_Washington_Street_at_Plaza_Signal_11-17-2022
Site Code : 1247
Start Date : 11/17/2022
Page No : 1

Groups Printed- Lights - Mediums - Articulated Trucks

Route 53 From North						Target Plaza From East					Route 53 From South					Appliance Store From West					Int. Total
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
07:00 AM	0	63	1	0	64	3	0	0	0	3	0	221	0	0	221	0	0	0	0	0	288
07:15 AM	0	105	2	0	107	0	0	1	0	1	1	257	0	0	258	0	0	0	0	0	366
07:30 AM	0	109	3	0	112	1	0	1	0	2	8	245	0	0	253	0	0	0	0	0	367
07:45 AM	1	140	9	0	150	5	0	1	0	6	14	236	0	0	250	0	0	0	0	0	406
Total	1	417	15	0	433	9	0	3	0	12	23	959	0	0	982	0	0	0	0	0	1427
08:00 AM	0	142	18	0	160	4	0	2	0	6	15	202	0	0	217	0	0	0	0	0	383
08:15 AM	2	139	17	0	158	1	0	5	0	6	7	254	2	0	263	0	0	1	0	1	428
08:30 AM	0	125	19	0	144	6	0	9	0	15	21	236	1	0	258	0	0	1	0	1	418
08:45 AM	1	163	20	0	184	10	0	8	0	18	22	251	0	0	273	0	0	0	0	0	475
Total	3	569	74	0	646	21	0	24	0	45	65	943	3	0	1011	0	0	2	0	2	1704
04:00 PM	0	312	45	0	357	18	0	23	0	41	29	201	1	0	231	0	0	1	0	1	630
04:15 PM	0	332	40	0	372	14	0	35	0	49	24	216	0	0	240	1	0	0	0	1	662
04:30 PM	1	305	45	0	351	27	0	39	0	66	28	214	0	0	242	0	0	3	0	3	662
04:45 PM	1	330	14	0	345	11	0	32	0	43	28	204	0	0	232	1	0	1	0	2	622
Total	2	1279	144	0	1425	70	0	129	0	199	109	835	1	0	945	2	0	5	0	7	2576
05:00 PM	1	299	34	0	334	28	0	43	0	71	28	228	0	0	256	1	0	1	0	2	663
05:15 PM	0	301	25	0	326	21	0	23	0	44	24	193	0	0	217	1	0	0	0	1	588
05:30 PM	0	266	24	0	290	12	0	20	0	32	24	163	1	0	188	0	1	0	0	1	511
05:45 PM	0	240	29	0	269	16	1	28	0	45	28	175	0	0	203	1	0	1	0	2	519
Total	1	1106	112	0	1219	77	1	114	0	192	104	759	1	0	864	3	1	2	0	6	2281
Grand Total		3371	345	0	3723	177	1	270	0	448	301	3496	5	0	3802	5	1	9	0	15	7988
Apprch %	0.2	90.5	9.3	0		39.5	0.2	60.3	0		7.9	92	0.1	0		33.3	6.7	60	0		
Total %	0.1	42.2	4.3	0	46.6	2.2	0	3.4	0	5.6	3.8	43.8	0.1	0	47.6	0.1	0	0.1	0	0.2	
Lights	7	3323	341	0	3671	173	1	269	0	443	298	3437	5	0	3740	5	1	9	0	15	7869
% Lights	100	98.6	98.8	0	98.6	97.7	100	99.6	0	98.9	99	98.3	100	0	98.4	100	100	100	0	100	98.5
Mediums	0	43	3	0	46	3	0	1	0	4	2	47	0	0	49	0	0	0	0	0	99
% Mediums	0	1.3	0.9	0	1.2	1.7	0	0.4	0	0.9	0.7	1.3	0	0	1.3	0	0	0	0	0	1.2
Articulated Trucks																					
% Articulated Trucks	0	0.1	0.3	0	0.2	0.6	0	0	0	0.2	0.3	0.3	0	0	0.3	0	0	0	0	0	0.3

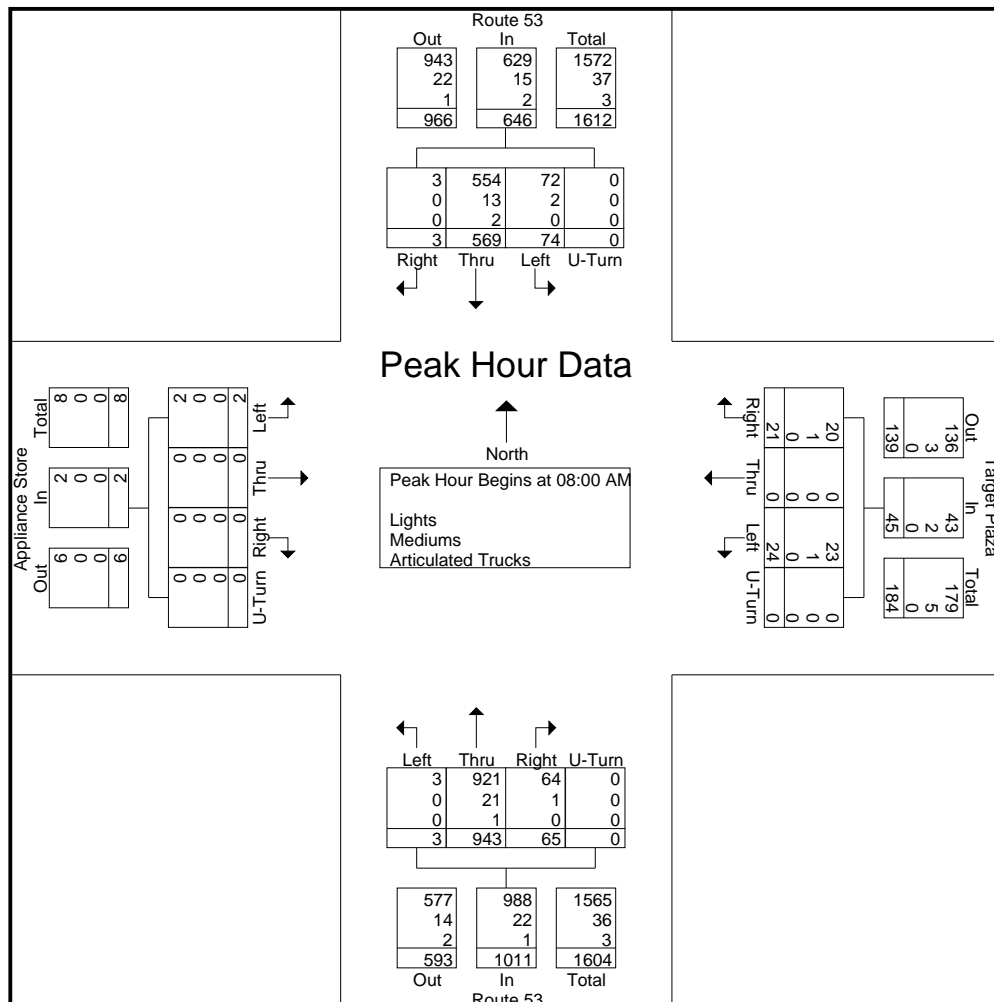
MDM Transportation Consultants, Inc.

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File Name : 1247_Washington_Street_at_Plaza_Signal_11-17-2022
Site Code : 1247
Start Date : 11/17/2022
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	Route 53 From North					Target Plaza From East					Route 53 From South					Appliance Store From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	142	18	0	160	4	0	2	0	6	15	202	0	0	217	0	0	0	0	0	383
08:15 AM	2	139	17	0	158	1	0	5	0	6	7	254	2	0	263	0	0	1	0	1	428
08:30 AM	0	125	19	0	144	6	0	9	0	15	21	236	1	0	258	0	0	1	0	1	418
08:45 AM	1	163	20	0	184	10	0	8	0	18	22	251	0	0	273	0	0	0	0	0	475
Total Volume	3	569	74	0	646	21	0	24	0	45	65	943	3	0	1011	0	0	2	0	2	1704
% App. Total	0.5	88.1	11.5	0		46.7	0	53.3	0		6.4	93.3	0.3	0		0	0	100	0		
PHF	.375	.873	.925	.000	.878	.525	.000	.667	.000	.625	.739	.928	.375	.000	.926	.000	.000	.500	.000	.500	.897
Lights	3	554	72	0	629	20	0	23	0	43	64	921	3	0	988	0	0	2	0	2	1662
% Lights	100	97.4	97.3	0	97.4	95.2	0	95.8	0	95.6	98.5	97.7	100	0	97.7	0	0	100	0	100	97.5
Mediums	0	13	2	0	15	1	0	1	0	2	1	21	0	0	22	0	0	0	0	0	39
% Mediums	0	2.3	2.7	0	2.3	4.8	0	4.2	0	4.4	1.5	2.2	0	0	2.2	0	0	0	0	0	2.3
Articulated Trucks	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
% Articulated Trucks	0	0.4	0	0	0.3	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0.2



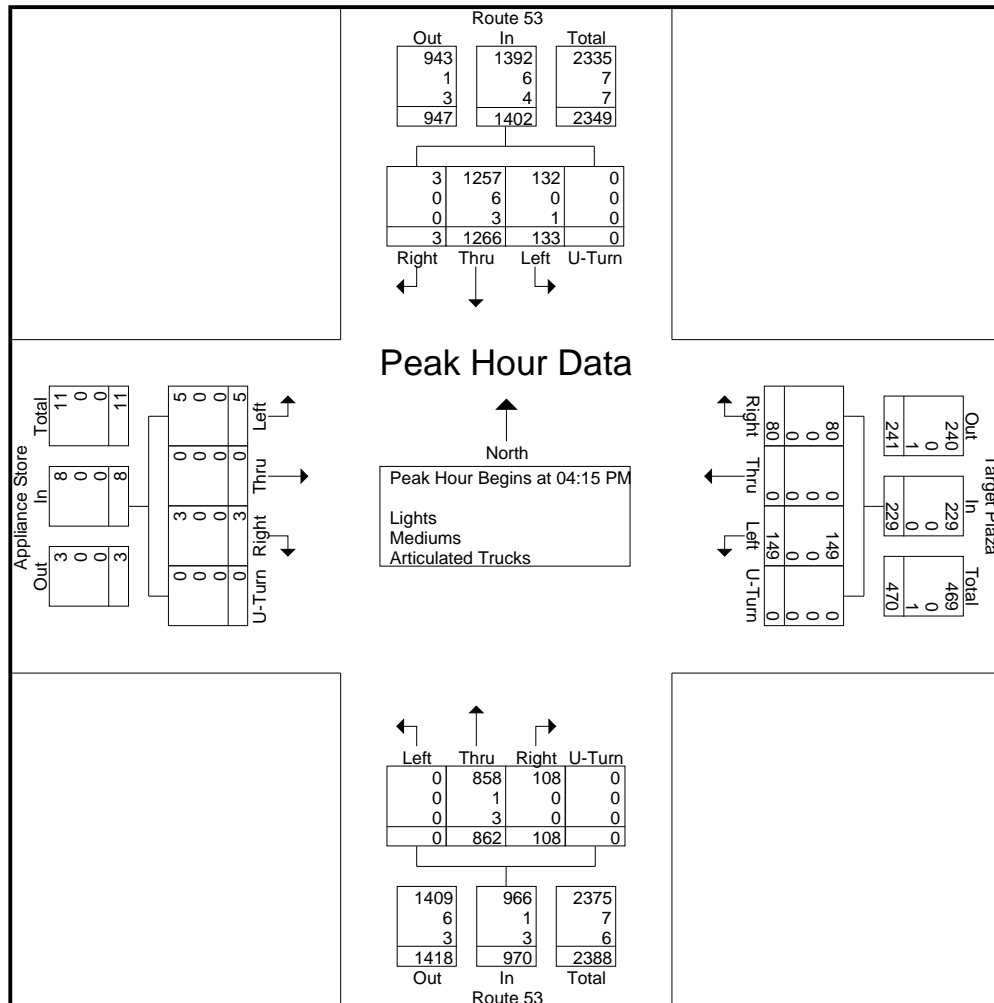
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File Name : 1247_Washington_Street_at_Plaza_Signal_11-17-2022
Site Code : 1247
Start Date : 11/17/2022
Page No : 3

	Route 53 From North					Target Plaza From East					Route 53 From South					Appliance Store From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	332	40	0	372	14	0	35	0	49	24	216	0	0	240	1	0	0	0	1	662
04:30 PM	1	305	45	0	351	27	0	39	0	66	28	214	0	0	242	0	0	3	0	3	662
04:45 PM	1	330	14	0	345	11	0	32	0	43	28	204	0	0	232	1	0	1	0	2	622
05:00 PM	1	299	34	0	334	28	0	43	0	71	28	228	0	0	256	1	0	1	0	2	663
Total Volume	3	1266	133	0	1402	80	0	149	0	229	108	862	0	0	970	3	0	5	0	8	2609
% App. Total		90.3				34.9		65.1			11.1	88.9				37.5		62.5			
PHF	.750	.953	.739	.000	.942	.714	.000	.866	.000	.806	.964	.945	.000	.000	.947	.750	.000	.417	.000	.667	.984
Lights	3	1257	132	0	1392	80	0	149	0	229	108	858	0	0	966	3	0	5	0	8	2595
% Lights	100	99.3	99.2									99.5									
Mediums	0	6	0	0	6	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	7
% Mediums	0	0.5	0	0	0.4	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0.3
Articulated Trucks	0	3	1	0	4	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	7
% Articulated Trucks	0	0.2	0.8	0	0.3	0	0	0	0	0	0	0.3	0	0	0.3	0	0	0	0	0	0.3



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N/S: Route 53
WB: Target Plaza
Hanover, MA

File Name : 1247_Washington_Street_at_Plaza_Signal_SAT 11-19-2022
Site Code : 1247
Start Date : 11/19/2022
Page No : 1

Groups Printed- Lights - Mediums - Articulated Trucks

Route 53 From North						Target Plaza From East					Route 53 From South					Appliance Store From West					Int. Total
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
11:00 AM	2	257	43	0	302	26	0	35	0	61	47	320	1	0	368	1	2	2	0	5	736
11:15 AM	1	264	53	0	318	27	0	31	0	58	49	270	1	0	320	1	0	3	0	4	700
11:30 AM	0	253	54	0	307	32	0	51	0	83	46	248	0	0	294	2	1	1	1	5	689
11:45 AM	0	288	70	0	358	35	0	19	0	54	32	285	0	0	317	0	0	0	1	1	730
Total	3	1062	220	0	1285	120	0	136	0	256	174	1123	2	0	1299	4	3	6	2	15	2855
12:00 PM	0	284	46	0	330	42	0	29	0	71	44	294	2	0	340	0	0	0	0	0	741
12:15 PM	1	287	46	0	334	25	0	28	0	53	49	291	1	0	341	0	0	0	0	0	728
12:30 PM	1	264	48	0	313	32	1	40	0	73	35	247	0	0	282	1	0	1	0	2	670
12:45 PM	1	289	46	0	336	26	0	44	0	70	40	283	0	0	323	0	0	1	0	1	730
Total	3	1124	186	0	1313	125	1	141	0	267	168	1115	3	0	1286	1	0	2	0	3	2869
Grand Total		2186	406	0	2598	245	1	277	0	523	342	2238	5	0	2585	5	3	8	2	18	5724
Apprch %	0.2	84.1	15.6	0		46.8	0.2	53	0		13.2	86.6	0.2	0		27.8	16.7	44.4	11.1		
Total %	0.1	38.2	7.1	0	45.4	4.3	0	4.8	0	9.1	6	39.1	0.1	0	45.2	0.1	0.1	0.1	0	0.3	
Lights	6	2165	404	0	2575	243	1	276	0	520	338	2218	5	0	2561	5	3	8	2	18	5674
% Lights	100	99	99.5	0	99.1	99.2	100	99.6	0	99.4	98.8	99.1	100	0	99.1	100	100	100	100	100	99.1
Mediums	0	20	2	0	22	2	0	1	0	3	4	18	0	0	22	0	0	0	0	0	47
% Mediums	0	0.9	0.5	0	0.8	0.8	0	0.4	0	0.6	1.2	0.8	0	0	0.9	0	0	0	0	0	0.8
Articulated Trucks																					
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0.1

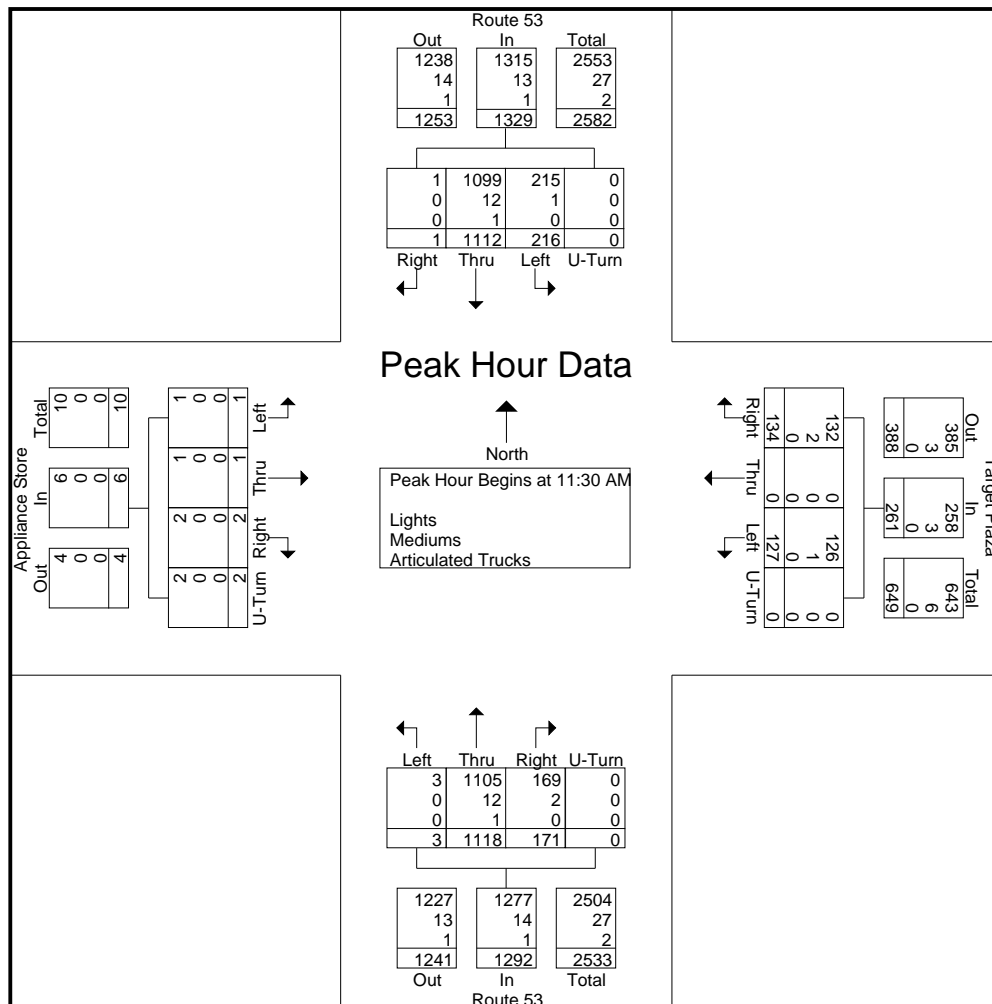
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	Route 53 From North					Target Plaza From East					Route 53 From South					Appliance Store From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 11:00 AM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 11:30 AM																					
11:30 AM	0	253	54	0	307	32	0	51	0	83	46	248	0	0	294	2	1	1	1	5	689
11:45 AM	0	288	70	0	358	35	0	19	0	54	32	285	0	0	317	0	0	0	1	1	730
12:00 PM	0	284	46	0	330	42	0	29	0	71	44	294	2	0	340	0	0	0	0	0	741
12:15 PM	1	287	46	0	334	25	0	28	0	53	49	291	1	0	341	0	0	0	0	0	728
Total Volume	1	1112	216	0	1329	134	0	127	0	261	171	1118	3	0	1292	2	1	1	2	6	2888
% App. Total		83.7	16.3			51.3		48.7			13.2	86.5				33.3	16.7	16.7	33.3		
PHF	.250	.965	.771	.000	.928	.798	.000	.623	.000	.786	.872	.951	.375	.000	.947	.250	.250	.250	.500	.300	.974
Lights	1	1099	215	0	1315	132	0	126	0	258	169	1105	3	0	1277	2	1	1	2	6	2856
% Lights	100	98.8	99.5			98.5		99.2			98.8	98.8									
Mediums	0	12	1	0	13	2	0	1	0	3	2	12	0	0	14	0	0	0	0	0	30
% Mediums	0	1.1	0.5	0	1.0	1.5	0	0.8	0	1.1	1.2	1.1	0	0	1.1	0	0	0	0	0	1.0
Articulated Trucks	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
% Articulated Trucks	0	0.1	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0.1



□ Seasonal Data/ Yearly Growth

STATION 703 - ABINGTON - RTE.123 - AT THE BROCKTON C.L.													
YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
12	12382	13150	13430	13546	13366	13534	12225	13018	13740	13653	13399	13378	13235
	-1%	-6%	-3%	0%	0%	0%	5%	0%	-1%	0%	-1%	-1%	-1%
13	12301	12335	13001	13557	13321	13558	12876	13055	13640	13635	13199	13188	13139
	-3%	3%	2%	-1%	0%	0%	-1%	-1%	-2%	-2%	-2%	1%	-1%
14	11894	12651	13252	13385	13345	13524	12759	12893	13376	13379	12882	13315	13055
	1%	-5%	-5%	-2%	0%	-1%	1%	0%	-1%	-1%	0%	-2%	-1%
15	11974	11975	12649	13151	13378	13433	12829	12941	13230	13222	12868	12985	12886
	1%	3%	3%	-1%	-2%	1%	-1%	0%	-1%	-1%	-1%	0%	0%
16	12035	12304	13075	13076	13171	13574	12742	12986	13061	13140	12743	12940	12904
	-4%	-2%	-6%	-2%	-3%	-5%	-3%	-5%	-2%	-4%	-3%	-1%	-3%
19	11582	12046	12326	12811	12826	12897	12375	12393	12763	12602	12347	12748	12476
Seasonal Adjustment Factor (to average month)	1.08	1.04	1.00	0.98	0.98	0.96	1.03	1.01	0.97	0.98	1.00	0.99	
	Growth												-0.73%

Average Yearly Growth Calculated -0.7%
 Yearly Growth Factor Used 0.5%

□ Crash Data

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Hanover, MA COUNT DATE : Nov-22

DISTRICT : 5 UNSIGNALIZED : ☐ SIGNALIZED : ☒

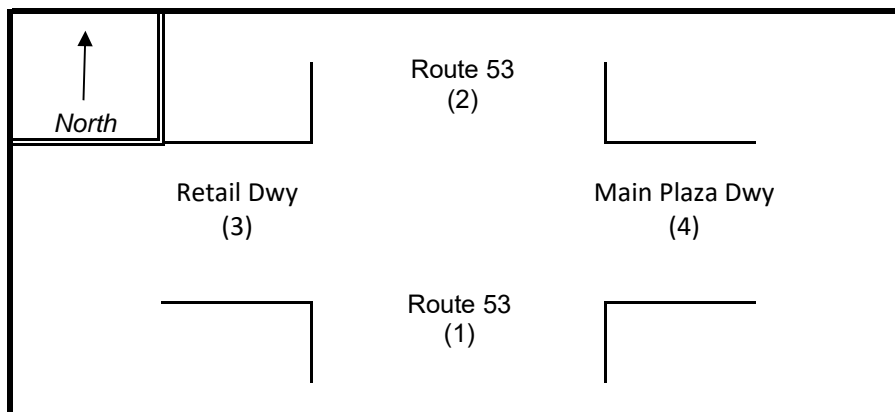
~ INTERSECTION DATA ~

MAJOR STREET : Washington Street (Route 53)

MINOR STREET(S) : Main Plaza Driveway

Retail Driveway

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) :	970	1,602	8	229		2,809

"K" FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY
 APPROACH VOLUME : **31,211**

TOTAL # OF CRASHES : **2** # OF
 YEARS : **5** AVERAGE # OF
 CRASHES PER YEAR (**A**) : **0.40**

CRASH RATE CALCULATION :

0.04

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

Comments : MassDOT District 5 Avg: Signalized = 0.75; Unsignalized = 0.57

Project Title & Date: 1247 - Hanover

Crash Number	City Town	Crash Date	Crash Severity	Crash Time	Max Injury Severity Reported	Number of Vehicles	First Harmful Event	Light Conditions	Manner of Collision	Road Surface Condition	Total Fatalities	Vehicle Travel Directions (All)	Weather Conditions
4362119	HANOVER	04/26/2017	Property damage only	10:34 PM	No injury	2	Collision with motor vehicle in traffic	Dark - lighted roadway	Rear-end	Wet	0	V1: S / V2: S	Rain/Rain
4900236	HANOVER	11/20/2020	Property damage only	12:12 PM	No Apparent Injury (O)	3	Collision with motor vehicle in traffic	Daylight	Rear-end	Dry	0	V1: N / V2: N / V3: N	Clear/Clear

Data Level: CRASH
Query Type: Spatial
Criteria: If you conducted an Advanced Query your SQL statement will be listed here

□ Background Growth Data

Institute of Transportation Engineers (ITE) 11th Edition Land Use Code (LUC) 820 - Shopping Center

Average Vehicle Trips Ends vs:	1,000 Sq. Feet Gross Leasable Area
Independent Variable (X):	200.700 Plaza Total
	6.8 Retail Component

AVERAGE WEEKDAY DAILY

$$T = 26.11 * (X) + 5863.73$$

$$T = 26.11 * (200.70) + 5863.73$$

$$T = 11,104.01$$

$$T = 11104.00 \text{ vehicle trips}$$

$$\text{with } 50\% \left(\begin{array}{c} 5,552 \\ 28 \end{array} \text{ vpd} \right) \text{ entering and } 50\% \left(\begin{array}{c} 5,552 \\ 28 \end{array} \text{ vpd} \right) \text{ exiting.}$$

Prorated:	188	188	376
------------------	------------	------------	------------

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

$$T = 0.59 * (X) + 133.55$$

$$T = 0.59 * (200.70) + 133.55$$

$$T = 251.96$$

$$T = 252 \text{ vehicle trips}$$

$$\text{with } 62\% \left(\begin{array}{c} 156 \\ 1 \end{array} \text{ vph} \right) \text{ entering and } 38\% \left(\begin{array}{c} 96 \\ 0 \end{array} \text{ vph} \right) \text{ exiting.}$$

Prorated:	5	3	9
------------------	----------	----------	----------

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

$$\ln T = 0.72 * \ln(X) + 3.02$$

$$\ln T = 0.72 * \ln(200.70) + 3.02$$

$$\ln T = 6.84$$

$$T = 931.97$$

$$T = 932 \text{ vehicle trips}$$

$$\text{with } 48\% \left(\begin{array}{c} 447 \\ 2 \end{array} \text{ vph} \right) \text{ entering and } 52\% \left(\begin{array}{c} 485 \\ 2 \end{array} \text{ vph} \right) \text{ exiting.}$$

Prorated:	15	16	32
------------------	-----------	-----------	-----------

SATURDAY DAILY

$$T = 36.03 * (X) + 6840.22$$

$$T = 36.03 * (200.70) + 6840.22$$

$$T = 14,071.44$$

$$T = 14,071 \text{ vehicle trips}$$

$$\text{with } 50\% \left(\begin{array}{c} 7,036 \\ 35 \end{array} \text{ vph} \right) \text{ entering and } 50\% \left(\begin{array}{c} 7,035 \\ 35 \end{array} \text{ vph} \right) \text{ exiting.}$$

Prorated:	238	238	477
------------------	------------	------------	------------

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

$$\ln T = 0.76 * \ln(X) + 3.00$$

$$\ln T = 0.76 * \ln(200.70) + 3.00$$

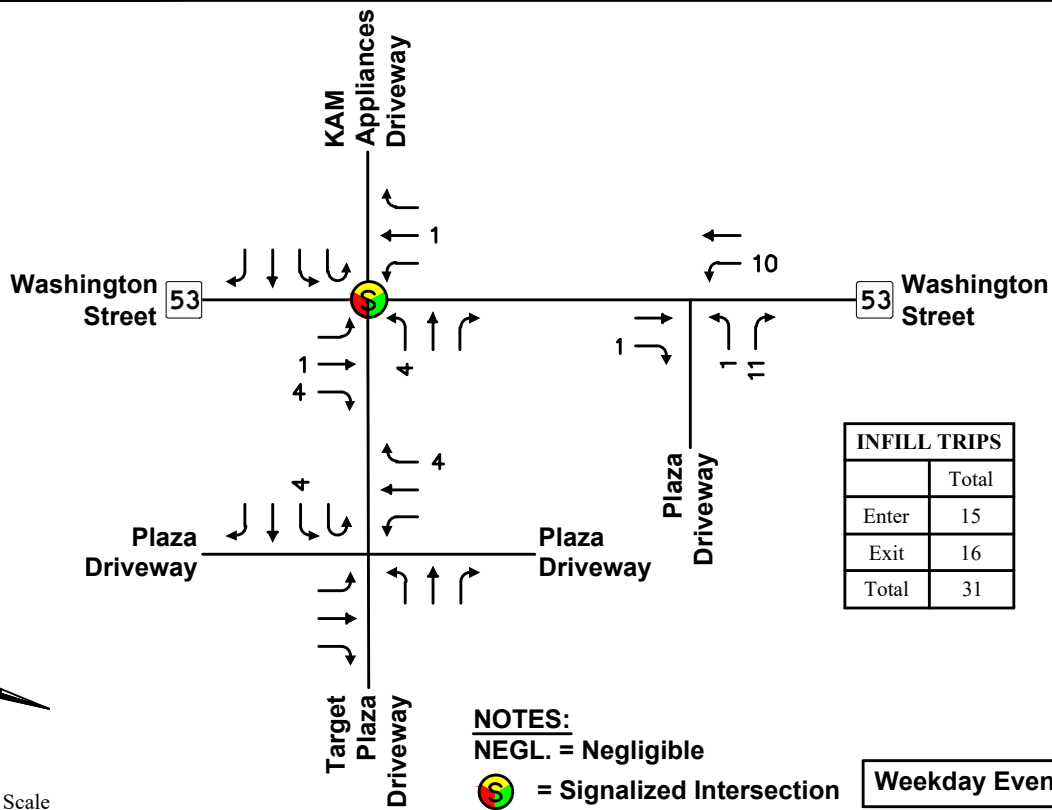
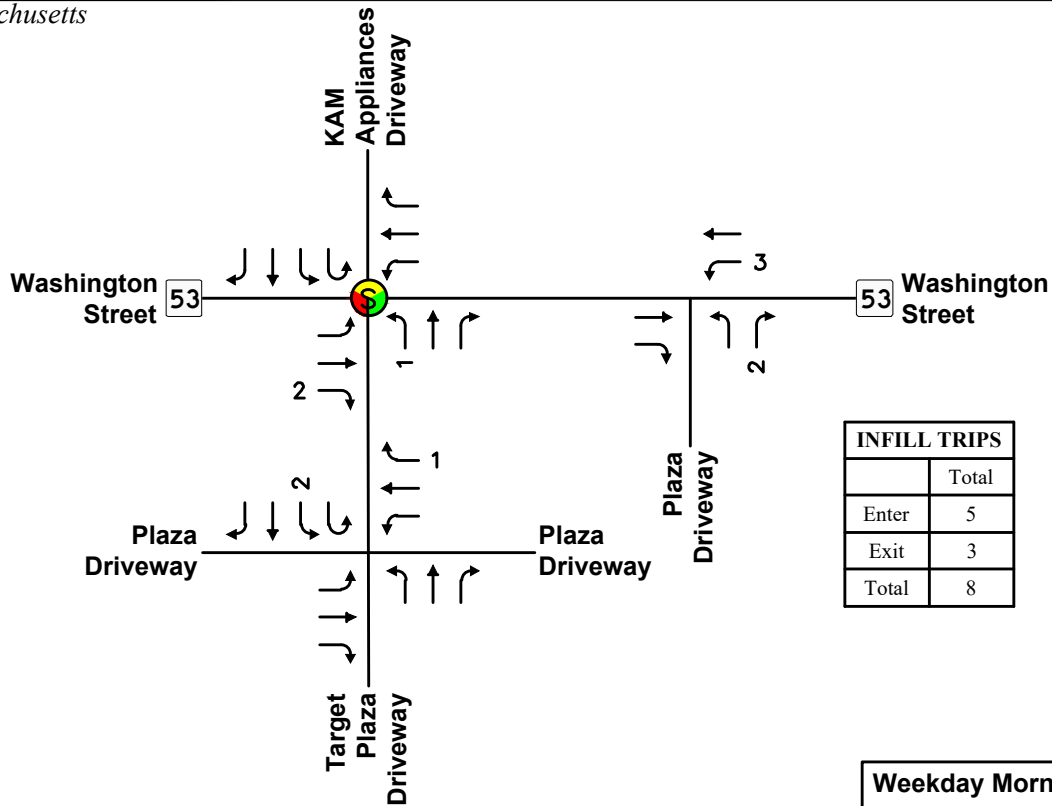
$$\ln T = 7.03$$

$$T = 1129.33$$

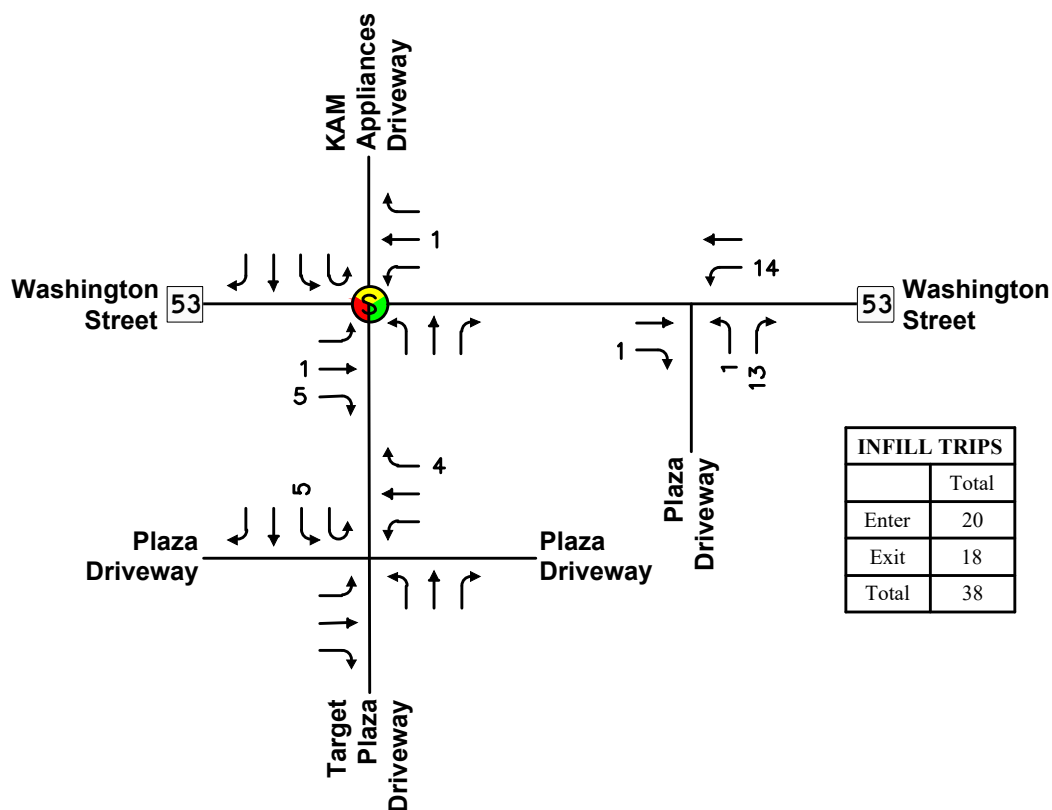
$$T = 1,129 \text{ vehicle trips}$$

$$\text{with } 52\% \left(\begin{array}{c} 587 \\ 3 \end{array} \text{ vph} \right) \text{ entering and } 48\% \left(\begin{array}{c} 542 \\ 3 \end{array} \text{ vph} \right) \text{ exiting.}$$

Prorated:	20	18	38
------------------	-----------	-----------	-----------



North
Scale: Not to Scale




North

Scale: Not to Scale

NOTES:

NEGL. = Negligible

 = Signalized Intersection

Saturday Midday Peak Hour

□ Trip Generation

Institute of Transportation Engineers (ITE) 11th Edition
Land Use Code (LUC) 934 - Fast-Food Restaurant with Drive-Through Window

Average Vehicle Trips Ends vs: 1,000 Sq. Feet Gross Floor Area
 Independent Variable (X): 2.114

AM/MID PM/SAT
 Pass-By: 0.5 0.55

AVERAGE WEEKDAY DAILY

T = 467.48 * (X)
 T = 467.48 * 2.11
 T = 988.25
 T = 988 vehicle trips
 with 50% (494 vpd) entering and 50% (494 vpd) exiting.

	Total	Pass-By	Net New
AM			
In	48	24	24
Out	<u>46</u>	<u>24</u>	<u>22</u>
Total	94	48	46

Midday

In	55	27	28
Out	<u>53</u>	<u>27</u>	<u>26</u>
Total	108	54	54

PM

In	36	19	17
Out	<u>34</u>	<u>19</u>	<u>15</u>
Total	70	38	32

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 44.61 * (X)
 T = 44.61 * 2.11
 T = 94.31
 T = 94 vehicle trips
 with 51% (48 vph) entering and 49% (46 vph) exiting.

Sat

In	60	32	28
Out	<u>57</u>	<u>32</u>	<u>25</u>
Total	117	64	53

WEEKDAY MIDDAY PEAK HOUR OF GENERATOR - LUNCH

T = 50.94 * (X)
 T = 50.94 * vpd) entering and 50% (
 T = 107.69
 T = 108 vehicle trips
 with 51% (55 vph) entering and 49% (53 vph) exiting.

Weekday Daily

988	494	494
-----	-----	------------

Saturday Daily

1,302	716	586
-------	-----	------------

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 33.03 * (X)
 T = 33.03 * 2.11
 T = 69.83
 T = 70 vehicle trips
 with 52% (36 vph) entering and 48% (34 vph) exiting.

SATURDAY DAILY

T = 616.12 * (X)
 T = 616.12 * 2.11
 T = 1,302.48
 T = 1,302 vehicle trips
 with 50% (651 vpd) entering and 50% (651 vpd) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

T = 55.25 * (X)
 T = 55.25 * 2.11
 T = 116.80
 T = 117 vehicle trips
 with 51% (60 vph) entering and 49% (57 vph) exiting.

□ Capacity Analysis

LEVEL OF SERVICE METHODOLOGY

Capacity analysis of intersections is developed using the Synchro® computer software, which implements the methods of the Highway Capacity Manual 6th Edition (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 *Highway Capacity Manual 6th Edition*.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 INTERSECTIONS¹

Control (Signal) Delay per Vehicle (seconds per vehicle)	Level of Service	
	$v/c \leq 1$	$v/c > 1$
≤ 10.0	A	F
10.1 to 20.0	B	F
20.1 to 35.0	C	F
35.1 to 55.0	D	F
55.1 to 80.0	E	F
> 80.0	F	F

¹Source: *Highway Capacity Manual 6th Edition*, Transportation Research Board; Washington, DC; 2016.

¹*Highway Capacity Manual 6th Edition*; Transportation Research Board; Washington, DC; 2016.

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 *Highway Capacity Manual 6th Edition*.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 6th Edition*. **Table A2** summarizes the relationship between LOS and average control delay.

Table A2
LEVEL-OF-SERVICE CRITERIA FOR
UNSIGNALIZED INTERSECTIONS¹

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




















¹Source: *Highway Capacity Manual 6th Edition*, Transportation Research Board; Washington, DC; 2016.

² *ibid*

Lanes, Volumes, Timings

2022 Baseline Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Morning Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	0	24	0	21	3	943	65	74	569	3
Future Volume (vph)	2	0	0	24	0	21	3	943	65	74	569	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	14	14	14	12	14	12	12	12	12	12
Storage Length (ft)	0		0	0		0	220		0	240		0
Storage Lanes	0		0	0		1	1		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Frt						0.850		0.990			0.999	
Flt Protected		0.950			0.950		0.950			0.950		
Satd. Flow (prot)	0	1925	0	0	1851	1538	1925	3504	0	3400	3502	0
Flt Permitted		0.889			0.889		0.950			0.950		
Satd. Flow (perm)	0	1802	0	0	1732	1538	1925	3504	0	3400	3502	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						103		13			1	
Link Speed (mph)		30			30			40			40	
Link Distance (ft)		418			340			266			519	
Travel Time (s)		9.5			7.7			4.5			8.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	4%	0%	5%	0%	2%	2%	3%	3%	0%
Adj. Flow (vph)	2	0	0	27	0	23	3	1048	72	82	632	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2	0	0	27	23	3	1120	0	82	635	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			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	0.92	0.92	0.92	0.92	0.92	1.00	0.92	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50		50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	50	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	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	pm+ov	Prot	NA		Prot	NA	
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4			8		8						
Detector Phase	4	4		8	8	1	5	2		1	6	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	15.0		8.0	15.0	













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Lanes, Volumes, Timings

2022 Baseline Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Morning Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	21.0		13.0	21.0	
Total Split (s)	17.0	17.0		17.0	17.0	17.0	17.0	51.0		17.0	51.0	
Total Split (%)	20.0%	20.0%		20.0%	20.0%	20.0%	20.0%	60.0%		20.0%	60.0%	
Maximum Green (s)	12.0	12.0		12.0	12.0	12.0	12.0	45.0		12.0	45.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0	-1.0	-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0	4.0	4.0	5.0		4.0	5.0	
Lead/Lag						Lag	Lead	Lead		Lag	Lag	
Lead-Lag Optimize?						Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	C-Max		None	C-Max	
Act Effect Green (s)		9.3			9.3	17.7	9.0	61.9		12.2	74.9	
Actuated g/C Ratio		0.11			0.11	0.21	0.11	0.73		0.14	0.88	
v/c Ratio		0.01			0.14	0.06	0.01	0.44		0.17	0.21	
Control Delay		33.5			36.0	0.3	34.3	7.7		32.3	2.9	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		33.5			36.0	0.3	34.3	7.7		32.3	2.9	
LOS		C			D	A	C	A		C	A	
Approach Delay		33.5			19.6			7.8			6.2	
Approach LOS		C			B			A			A	
90th %ile Green (s)	9.4	9.4		9.4	9.4	12.0	8.0	47.6		12.0	51.6	
90th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Min	Coord		Hold	Coord	
70th %ile Green (s)	8.0	8.0		8.0	8.0	12.0	0.0	49.0		12.0	66.0	
70th %ile Term Code	Hold	Hold		Min	Min	Hold	Skip	Coord		Hold	Coord	
50th %ile Green (s)	0.0	0.0		0.0	0.0	12.0	0.0	62.0		12.0	79.0	
50th %ile Term Code	Skip	Skip		Skip	Skip	Hold	Skip	Coord		Hold	Coord	
30th %ile Green (s)	0.0	0.0		0.0	0.0	12.0	0.0	62.0		12.0	79.0	
30th %ile Term Code	Skip	Skip		Skip	Skip	Hold	Skip	Coord		Hold	Coord	
10th %ile Green (s)	0.0	0.0		0.0	0.0	0.0	0.0	79.0		0.0	79.0	
10th %ile Term Code	Skip	Skip		Skip	Skip	Skip	Skip	Coord		Skip	Coord	
Queue Length 50th (ft)		1			13	0	2	94		20	0	
Queue Length 95th (ft)		7			37	0	10	235		39	102	
Internal Link Dist (ft)		338			260			186			439	
Turn Bay Length (ft)							220			240		
Base Capacity (vph)		275			264	414	294	2556		520	3087	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.01			0.10	0.06	0.01	0.44		0.16	0.21	

Intersection Summary

Area Type: Other
 Cycle Length: 85
 Actuated Cycle Length: 85
 Offset: 11 (13%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
 Natural Cycle: 50
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.44

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Lanes, Volumes, Timings

2022 Baseline Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Morning Peak Hour

Intersection Signal Delay: 7.5

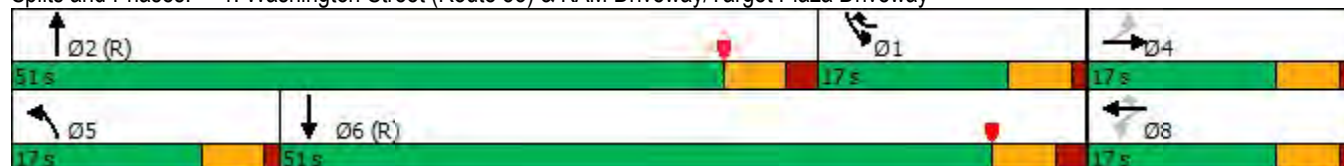
Intersection LOS: A

Intersection Capacity Utilization 52.3%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway



HCM 6th TWSC
12: Washington Street (Route 53) & Northern Driveway

2022 Baseline Conditions
Weekday Morning Peak Hour

Intersection

Int Delay, s/veh 0.6

Movement WBL WBR NBT NBR SBL SBT

Lane Configurations 

Traffic Vol, veh/h 1 27 947 2 32 644

Future Vol, veh/h 1 27 947 2 32 644

Conflicting Peds, #/hr 0 0 0 0 0 0

Sign Control Stop Stop Free Free Free Free

RT Channelized - None - None - None

Storage Length 0 - - - - -

Veh in Median Storage, # 2 - 0 - - 0

Grade, % 0 - 0 - - 0

Peak Hour Factor 89 89 89 89 89 89

Heavy Vehicles, % 0 11 3 0 0 3

Mvmt Flow 1 30 1064 2 36 724

Major/Minor Minor1 Major1 Major2

Conflicting Flow All 1499 533 0 0 1066 0

Stage 1 1065 - - - - -

Stage 2 434 - - - - -

Critical Hdwy 6.8 7.12 - - 4.1 -

Critical Hdwy Stg 1 5.8 - - - - -

Critical Hdwy Stg 2 5.8 - - - - -

Follow-up Hdwy 3.5 3.41 - - 2.2 -

Pot Cap-1 Maneuver 115 469 - - 661 -

Stage 1 297 - - - - -

Stage 2 627 - - - - -

Platoon blocked, % - - - - -

Mov Cap-1 Maneuver 105 469 - - 661 -

Mov Cap-2 Maneuver 262 - - - - -

Stage 1 297 - - - - -

Stage 2 570 - - - - -

Approach WB NB SB

HCM Control Delay, s 13.5 0 0.9

HCM LOS B

Minor Lane/Major Mvmt NBT NBRWBLn1 SBL SBT

Capacity (veh/h) - - 456 661 -

HCM Lane V/C Ratio - - 0.069 0.054 -

HCM Control Delay (s) - - 13.5 10.8 0.4

HCM Lane LOS - - B B A

HCM 95th %tile Q(veh) - - 0.2 0.2 -

HCM 6th TWSC
14: Internal Driveway & Target Plaza Driveway

2022 Baseline Conditions
Weekday Morning Peak Hour

Intersection

Int Delay, s/veh 1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
----------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Lane Configurations

Traffic Vol, veh/h	22	105	11	0	32	0	3	0	0	1	0	10
Future Vol, veh/h	22	105	11	0	32	0	3	0	0	1	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	73	73	73	73	73	73	73	73	73	73	73	73
Heavy Vehicles, %	5	1	0	0	3	0	0	0	0	0	0	10
Mvmt Flow	30	144	15	0	44	0	4	0	0	1	0	14

Major/Minor	Major1	Major2	Minor1	Minor2
-------------	--------	--------	--------	--------

Conflicting Flow All	44	0	0	159	0	0	234	256	80	176	263	22
Stage 1	-	-	-	-	-	-	212	212	-	44	44	-
Stage 2	-	-	-	-	-	-	22	44	-	132	219	-
Critical Hdwy	4.2	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	7.1
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.25	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.4
Pot Cap-1 Maneuver	1541	-	-	1433	-	-	706	651	971	776	646	1024
Stage 1	-	-	-	-	-	-	776	731	-	970	862	-
Stage 2	-	-	-	-	-	-	999	862	-	864	726	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1541	-	-	1433	-	-	686	637	971	764	632	1024
Mov Cap-2 Maneuver	-	-	-	-	-	-	686	637	-	764	632	-
Stage 1	-	-	-	-	-	-	760	716	-	950	862	-
Stage 2	-	-	-	-	-	-	986	862	-	846	711	-

Approach	EB	WB	NB	SB
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HCM Control Delay, s	1.3	0	10.3	8.7
HCM LOS			B	A





















Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
-----------------------	-------	-----	-----	-----	-----	-----	-----	-------

Capacity (veh/h)	686	1541	-	-	1433	-	-	993
HCM Lane V/C Ratio	0.006	0.02	-	-	-	-	-	0.015
HCM Control Delay (s)	10.3	7.4	0.1	-	0	-	-	8.7
HCM Lane LOS	B	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0

Lanes, Volumes, Timings

2022 Baseline Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Evening Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	0	3	149	0	80	0	862	108	133	1266	3
Future Volume (vph)	5	0	3	149	0	80	0	862	108	133	1266	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	14	14	14	12	14	12	12	12	12	12
Storage Length (ft)	0		0	0		0	220		0	240		0
Storage Lanes	0		0	0		1	1		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Frt		0.949				0.850		0.983				
Flt Protected		0.970			0.950					0.950		
Satd. Flow (prot)	0	1866	0	0	1925	1615	2027	3549	0	3467	3574	0
Flt Permitted		0.856			0.752					0.950		
Satd. Flow (perm)	0	1646	0	0	1524	1615	2027	3549	0	3467	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		153				87		19				
Link Speed (mph)		30			30			40			40	
Link Distance (ft)		418			340			266			519	
Travel Time (s)		9.5			7.7			4.5			8.8	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%
Adj. Flow (vph)	5	0	3	152	0	82	0	880	110	136	1292	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	8	0	0	152	82	0	990	0	136	1295	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			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	0.92	0.92	0.92	0.92	0.92	1.00	0.92	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50		50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	50	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	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	pm+ov	Prot	NA		Prot	NA	
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4			8		8						
Detector Phase	4	4		8	8	1	5	2		1	6	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	15.0		8.0	15.0	













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Lanes, Volumes, Timings

2022 Baseline Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Evening Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	21.0		13.0	21.0	
Total Split (s)	26.0	26.0		26.0	26.0	21.0	21.0	53.0		21.0	53.0	
Total Split (%)	26.0%	26.0%		26.0%	26.0%	21.0%	21.0%	53.0%		21.0%	53.0%	
Maximum Green (s)	21.0	21.0		21.0	21.0	16.0	16.0	47.0		16.0	47.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0	-1.0	-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0	4.0	4.0	5.0		4.0	5.0	
Lead/Lag						Lag	Lead	Lead		Lag	Lag	
Lead-Lag Optimize?						Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	C-Max		None	C-Max	
Act Effect Green (s)		16.1			16.1	37.1		53.9		17.0	74.9	
Actuated g/C Ratio		0.16			0.16	0.37		0.54		0.17	0.75	
v/c Ratio		0.02			0.62	0.13		0.52		0.23	0.48	
Control Delay		0.1			49.4	4.2		16.3		37.1	6.2	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		0.1			49.4	4.2		16.3		37.1	6.2	
LOS		A			D	A		B		D	A	
Approach Delay		0.1			33.6			16.3			9.1	
Approach LOS		A			C			B			A	
90th %ile Green (s)	21.0	21.0		21.0	21.0	16.0	0.0	47.0		16.0	68.0	
90th %ile Term Code	Hold	Hold		Max	Max	Hold	Skip	Coord		Hold	Coord	
70th %ile Green (s)	17.7	17.7		17.7	17.7	16.0	0.0	50.3		16.0	71.3	
70th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
50th %ile Green (s)	15.2	15.2		15.2	15.2	16.0	0.0	52.8		16.0	73.8	
50th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
30th %ile Green (s)	12.7	12.7		12.7	12.7	16.0	0.0	55.3		16.0	76.3	
30th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
10th %ile Green (s)	9.1	9.1		9.1	9.1	16.0	0.0	58.9		16.0	79.9	
10th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
Queue Length 50th (ft)		0			91	0		197		39	142	
Queue Length 95th (ft)		0			147	25		288		66	232	
Internal Link Dist (ft)		338			260			186			439	
Turn Bay Length (ft)										240		
Base Capacity (vph)		481			335	654		1920		589	2675	
Starvation Cap Reductn		0			0	0		0		0	0	
Spillback Cap Reductn		0			0	0		0		0	0	
Storage Cap Reductn		0			0	0		0		0	0	
Reduced v/c Ratio		0.02			0.45	0.13		0.52		0.23	0.48	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 91 (91%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

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Lanes, Volumes, Timings

2022 Baseline Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Evening Peak Hour

Intersection Signal Delay: 13.9

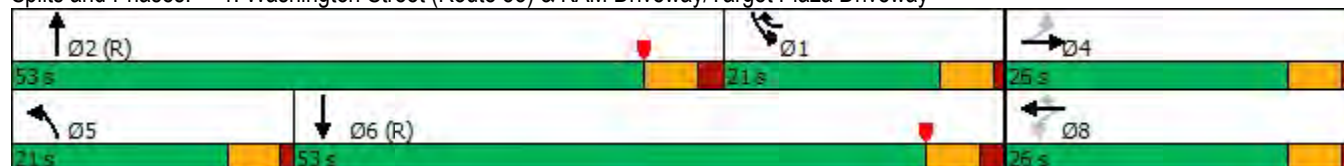
Intersection LOS: B

Intersection Capacity Utilization 64.5%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway






HCM 6th TWSC
12: Washington Street (Route 53) & Northern Driveway

2022 Baseline Conditions
Weekday Evening Peak Hour

Intersection

Int Delay, s/veh 2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	8	132	949	4	58	1351
Future Vol, veh/h	8	132	949	4	58	1351
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	1	1	0	2	1
Mvmt Flow	8	138	989	4	60	1407

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1815	497	0
Stage 1	991	-	-
Stage 2	824	-	-
Critical Hdwy	6.8	6.92	-
Critical Hdwy Stg 1	5.8	-	-
Critical Hdwy Stg 2	5.8	-	-
Follow-up Hdwy	3.5	3.31	-
Pot Cap-1 Maneuver	71	521	-
Stage 1	325	-	-
Stage 2	396	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	43	521	-
Mov Cap-2 Maneuver	186	-	-
Stage 1	325	-	-
Stage 2	239	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16	0	2.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	472	692
HCM Lane V/C Ratio	-	-	0.309	0.087
HCM Control Delay (s)	-	-	16	10.7
HCM Lane LOS	-	-	C	B
HCM 95th %tile Q(veh)	-	-	1.3	0.3

HCM 6th TWSC
14: Internal Driveway & Target Plaza Driveway

2022 Baseline Conditions
Weekday Evening Peak Hour

Intersection

Int Delay, s/veh 2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
----------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Lane Configurations		EBT			WBT			NBT			SBT	
Traffic Vol, veh/h	55	186	4	1	141	2	19	1	0	2	0	63
Future Vol, veh/h	55	186	4	1	141	2	19	1	0	2	0	63
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	0	2	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	64	216	5	1	164	2	22	1	0	2	0	73

Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	166	0	0	221	0	0	431	515	111	404	516	83
Stage 1	-	-	-	-	-	-	347	347	-	167	167	-
Stage 2	-	-	-	-	-	-	84	168	-	237	349	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1424	-	-	1360	-	-	513	466	927	536	466	966
Stage 1	-	-	-	-	-	-	648	638	-	824	764	-
Stage 2	-	-	-	-	-	-	920	763	-	751	637	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1424	-	-	1360	-	-	455	442	927	513	442	966
Mov Cap-2 Maneuver	-	-	-	-	-	-	455	442	-	513	442	-
Stage 1	-	-	-	-	-	-	615	605	-	782	763	-
Stage 2	-	-	-	-	-	-	849	762	-	711	605	-





















Approach	EB	WB	NB	SB
HCM Control Delay, s	1.8	0.1	13.4	9.2
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	454	1424	-	-	1360	-	-	940
HCM Lane V/C Ratio	0.051	0.045	-	-	0.001	-	-	0.08
HCM Control Delay (s)	13.4	7.6	0.1	-	7.6	0	-	9.2
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	0.3

Lanes, Volumes, Timings

2022 Baseline Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Saturday Midday Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	1	2	127	0	134	3	1118	171	216	1112	1
Future Volume (vph)	1	1	2	127	0	134	3	1118	171	216	1112	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	14	14	14	12	14	12	12	12	12	12
Storage Length (ft)	0		0	0		0	220		0	240		0
Storage Lanes	0		0	0		1	1		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Frt		0.932				0.850		0.980				
Flt Protected		0.988			0.950		0.950			0.950		
Satd. Flow (prot)	0	1866	0	0	1906	1583	1925	3503	0	3467	3574	0
Flt Permitted		0.945			0.755		0.950			0.950		
Satd. Flow (perm)	0	1785	0	0	1515	1583	1925	3503	0	3467	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2				92		28				
Link Speed (mph)		30			30			40			40	
Link Distance (ft)		418			340			266			519	
Travel Time (s)		9.5			7.7			4.5			8.8	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	0%	0%	1%	0%	2%	0%	1%	1%	1%	1%	0%
Adj. Flow (vph)	1	1	2	131	0	138	3	1153	176	223	1146	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	4	0	0	131	138	3	1329	0	223	1147	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			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	0.92	0.92	0.92	0.92	0.92	1.00	0.92	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50		50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	50	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	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	pm+ov	Prot	NA		Prot	NA	
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4			8		8						
Detector Phase	4	4		8	8	1	5	2		1	6	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	15.0		8.0	15.0	













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Lanes, Volumes, Timings

2022 Baseline Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Saturday Midday Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	21.0		13.0	21.0	
Total Split (s)	22.0	22.0		22.0	22.0	17.0	17.0	56.0		17.0	56.0	
Total Split (%)	23.2%	23.2%		23.2%	23.2%	17.9%	17.9%	58.9%		17.9%	58.9%	
Maximum Green (s)	17.0	17.0		17.0	17.0	12.0	12.0	50.0		12.0	50.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0	-1.0	-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0	4.0	4.0	5.0		4.0	5.0	
Lead/Lag						Lag	Lead	Lead		Lag	Lag	
Lead-Lag Optimize?						Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	C-Max		None	C-Max	
Act Effect Green (s)		14.1			14.1	31.1	9.0	54.9		13.0	69.3	
Actuated g/C Ratio		0.15			0.15	0.33	0.09	0.58		0.14	0.73	
v/c Ratio		0.02			0.58	0.24	0.02	0.65		0.47	0.44	
Control Delay		26.5			47.9	9.5	39.3	15.7		41.5	6.9	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		26.5			47.9	9.5	39.3	15.7		41.5	6.9	
LOS		C			D	A	D	B		D	A	
Approach Delay		26.5			28.2			15.8			12.6	
Approach LOS		C			C			B			B	
90th %ile Green (s)	17.0	17.0		17.0	17.0	12.0	8.0	50.0		12.0	54.0	
90th %ile Term Code	Hold	Hold		Max	Max	Max	Min	Coord		Max	Coord	
70th %ile Green (s)	15.7	15.7		15.7	15.7	12.0	0.0	51.3		12.0	68.3	
70th %ile Term Code	Hold	Hold		Gap	Gap	Max	Skip	Coord		Max	Coord	
50th %ile Green (s)	13.4	13.4		13.4	13.4	12.0	0.0	53.6		12.0	70.6	
50th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
30th %ile Green (s)	11.2	11.2		11.2	11.2	12.0	0.0	55.8		12.0	72.8	
30th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
10th %ile Green (s)	8.0	8.0		8.0	8.0	12.0	0.0	59.0		12.0	76.0	
10th %ile Term Code	Hold	Hold		Min	Min	Hold	Skip	Coord		Hold	Coord	
Queue Length 50th (ft)		1			74	19	2	262		64	107	
Queue Length 95th (ft)		10			128	57	11	368		101	266	
Internal Link Dist (ft)		338			260			186			439	
Turn Bay Length (ft)							220			240		
Base Capacity (vph)		339			287	579	263	2037		474	2608	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.01			0.46	0.24	0.01	0.65		0.47	0.44	

Intersection Summary

Area Type: Other
 Cycle Length: 95
 Actuated Cycle Length: 95
 Offset: 90 (95%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.65

MDM Transportation Consultants, Inc.

G:\Projects\1247 - Hanover (Katzen_Restaurant)\Synchro\1247 Baseline SAT.syn

Lanes, Volumes, Timings

2022 Baseline Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Saturday Midday Peak Hour

Intersection Signal Delay: 15.4

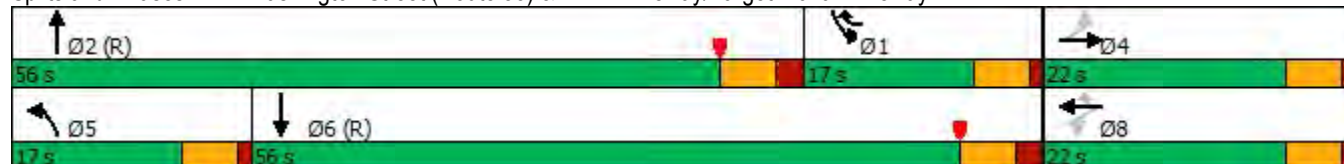
Intersection LOS: B

Intersection Capacity Utilization 67.6%

ICU Level of Service C

Analysis Period (min) 15




Splits and Phases: 1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway



HCM 6th TWSC
12: Washington Street (Route 53) & Northern Driveway

2022 Baseline Conditions
Saturday MIDDAY Peak Hour

Intersection

Int Delay, s/veh	5.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	12	195	1253	8	83	1310
Future Vol, veh/h	12	195	1253	8	83	1310
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	1	1	0	1	1
Mvmt Flow	13	207	1333	9	88	1394

Major/Minor	Minor1	Major1		Major2	
Conflicting Flow All	2211	671	0	0	1342
Stage 1	1338	-	-	-	-
Stage 2	873	-	-	-	-
Critical Hdwy	6.8	6.92	-	-	4.12
Critical Hdwy Stg 1	5.8	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-
Follow-up Hdwy	3.5	3.31	-	-	2.21
Pot Cap-1 Maneuver	38	401	-	-	515
Stage 1	213	-	-	-	-
Stage 2	374	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	~ 9	401	-	-	515
Mov Cap-2 Maneuver	78	-	-	-	-
Stage 1	213	-	-	-	-
Stage 2	91	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	37	0	5
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	323	515
HCM Lane V/C Ratio	-	-	0.682	0.171
HCM Control Delay (s)	-	-	37	13.4
HCM Lane LOS	-	-	E	B
HCM 95th %tile Q(veh)	-	-	4.7	0.6

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
14: Internal Driveway & Target Plaza Driveway

2022 Baseline Conditions
Saturday Midday Peak Hour

Intersection

Int Delay, s/veh 3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		EBT			WBT			NBT			SBT	
Traffic Vol, veh/h	99	276	6	0	151	6	7	2	0	15	2	101
Future Vol, veh/h	99	276	6	0	151	6	7	2	0	15	2	101
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	0	2	0	0	0	0	0	0	0
Mvmt Flow	111	310	7	0	170	7	8	2	0	17	2	113

Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	177	0	0	317	0	0	622	713	159	552	713	89
Stage 1	-	-	-	-	-	-	536	536	-	174	174	-
Stage 2	-	-	-	-	-	-	86	177	-	378	539	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1411	-	-	1255	-	-	375	360	864	421	360	958
Stage 1	-	-	-	-	-	-	501	527	-	817	759	-
Stage 2	-	-	-	-	-	-	918	756	-	621	525	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1411	-	-	1255	-	-	305	325	864	388	325	958
Mov Cap-2 Maneuver	-	-	-	-	-	-	305	325	-	388	325	-
Stage 1	-	-	-	-	-	-	453	476	-	739	759	-
Stage 2	-	-	-	-	-	-	807	756	-	559	475	-






















Approach	EB		WB		NB		SB
HCM Control Delay, s	2.2		0		17		10.5
HCM LOS					C		B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	309	1411	-	-	1255	-	-	785
HCM Lane V/C Ratio	0.033	0.079	-	-	-	-	-	0.169
HCM Control Delay (s)	17	7.8	0.2	-	0	-	-	10.5
HCM Lane LOS	C	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0.3	-	-	0	-	-	0.6

Lanes, Volumes, Timings

2029 No-Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Morning Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	0	26	0	22	3	1004	69	77	613	3
Future Volume (vph)	2	0	0	26	0	22	3	1004	69	77	613	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	14	14	14	12	14	12	12	12	12	12
Storage Length (ft)	0		0	0		0	220		0	240		0
Storage Lanes	0		0	0		1	1		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Frt						0.850		0.990			0.999	
Flt Protected		0.950			0.950		0.950			0.950		
Satd. Flow (prot)	0	1925	0	0	1851	1538	1925	3504	0	3400	3502	0
Flt Permitted		0.889			0.889		0.950			0.950		
Satd. Flow (perm)	0	1802	0	0	1732	1538	1925	3504	0	3400	3502	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						103		13			1	
Link Speed (mph)		30			30			40			40	
Link Distance (ft)		418			340			266			519	
Travel Time (s)		9.5			7.7			4.5			8.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	4%	0%	5%	0%	2%	2%	3%	3%	0%
Adj. Flow (vph)	2	0	0	29	0	24	3	1116	77	86	681	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2	0	0	29	24	3	1193	0	86	684	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			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	0.92	0.92	0.92	0.92	0.92	1.00	0.92	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50		50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	50	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	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	pm+ov	Prot	NA		Prot	NA	
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4			8		8						
Detector Phase	4	4		8	8	1	5	2		1	6	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	15.0		8.0	15.0	













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Lanes, Volumes, Timings

2029 No-Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Morning Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	21.0		13.0	21.0	
Total Split (s)	17.0	17.0		17.0	17.0	17.0	17.0	51.0		17.0	51.0	
Total Split (%)	20.0%	20.0%		20.0%	20.0%	20.0%	20.0%	60.0%		20.0%	60.0%	
Maximum Green (s)	12.0	12.0		12.0	12.0	12.0	12.0	45.0		12.0	45.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0	-1.0	-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0	4.0	4.0	5.0		4.0	5.0	
Lead/Lag						Lag	Lead	Lead		Lag	Lag	
Lead-Lag Optimize?						Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	C-Max		None	C-Max	
Act Effect Green (s)		9.3			9.3	17.7	9.0	61.9		12.2	74.9	
Actuated g/C Ratio		0.11			0.11	0.21	0.11	0.73		0.14	0.88	
v/c Ratio		0.01			0.15	0.06	0.01	0.47		0.18	0.22	
Control Delay		33.5			36.0	0.3	34.3	8.0		32.4	2.9	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		33.5			36.0	0.3	34.3	8.0		32.4	2.9	
LOS		C			D	A	C	A		C	A	
Approach Delay		33.5			19.8			8.1			6.2	
Approach LOS		C			B			A			A	
90th %ile Green (s)	9.6	9.6		9.6	9.6	12.0	8.0	47.4		12.0	51.4	
90th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Min	Coord		Hold	Coord	
70th %ile Green (s)	8.1	8.1		8.1	8.1	12.0	0.0	48.9		12.0	65.9	
70th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
50th %ile Green (s)	0.0	0.0		0.0	0.0	12.0	0.0	62.0		12.0	79.0	
50th %ile Term Code	Skip	Skip		Skip	Skip	Hold	Skip	Coord		Hold	Coord	
30th %ile Green (s)	0.0	0.0		0.0	0.0	12.0	0.0	62.0		12.0	79.0	
30th %ile Term Code	Skip	Skip		Skip	Skip	Hold	Skip	Coord		Hold	Coord	
10th %ile Green (s)	0.0	0.0		0.0	0.0	0.0	0.0	79.0		0.0	79.0	
10th %ile Term Code	Skip	Skip		Skip	Skip	Skip	Skip	Coord		Skip	Coord	
Queue Length 50th (ft)		1			14	0	2	104		20	0	
Queue Length 95th (ft)		7			39	0	10	260		41	112	
Internal Link Dist (ft)		338			260			186			439	
Turn Bay Length (ft)							220			240		
Base Capacity (vph)		275			264	415	294	2553		520	3084	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.01			0.11	0.06	0.01	0.47		0.17	0.22	

Intersection Summary

Area Type: Other
 Cycle Length: 85
 Actuated Cycle Length: 85
 Offset: 11 (13%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.47

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Lanes, Volumes, Timings

2029 No-Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Morning Peak Hour

Intersection Signal Delay: 7.7

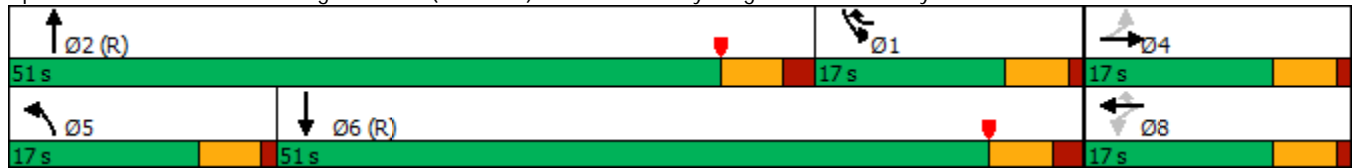
Intersection LOS: A

Intersection Capacity Utilization 54.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway






HCM 6th TWSC
12: Washington Street (Route 53) & Northern Driveway

2029 No-Build Conditions
Weekday Morning Peak Hour

Intersection

Int Delay, s/veh 0.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	30	1008	2	36	691
Future Vol, veh/h	1	30	1008	2	36	691
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	11	3	0	0	3
Mvmt Flow	1	34	1133	2	40	776

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1602	568	0
Stage 1	1134	-	-
Stage 2	468	-	-
Critical Hdwy	6.8	7.12	-
Critical Hdwy Stg 1	5.8	-	-
Critical Hdwy Stg 2	5.8	-	-
Follow-up Hdwy	3.5	3.41	-
Pot Cap-1 Maneuver	98	444	-
Stage 1	273	-	-
Stage 2	602	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	87	444	-
Mov Cap-2 Maneuver	240	-	-
Stage 1	273	-	-
Stage 2	534	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.1	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	432	623
HCM Lane V/C Ratio	-	-	0.081	0.065
HCM Control Delay (s)	-	-	14.1	11.2
HCM Lane LOS	-	-	B	B
HCM 95th %tile Q(veh)	-	-	0.3	0.2

HCM 6th TWSC
14: Internal Driveway & Target Plaza Driveway

2029 No-Build Conditions
Weekday Morning Peak Hour

Intersection

Int Delay, s/veh 1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
----------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	26	109	11	0	33	0	3	0	0	1	0	11
Future Vol, veh/h	26	109	11	0	33	0	3	0	0	1	0	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	73	73	73	73	73	73	73	73	73	73	73	73
Heavy Vehicles, %	5	1	0	0	3	0	0	0	0	0	0	10
Mvmt Flow	36	149	15	0	45	0	4	0	0	1	0	15

Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	45	0	0	164	0	0	252	274	82	192	281	23
Stage 1	-	-	-	-	-	-	229	229	-	45	45	-
Stage 2	-	-	-	-	-	-	23	45	-	147	236	-
Critical Hdwy	4.2	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	7.1
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.25	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.4
Pot Cap-1 Maneuver	1540	-	-	1427	-	-	686	637	968	756	631	1023
Stage 1	-	-	-	-	-	-	759	718	-	969	861	-
Stage 2	-	-	-	-	-	-	998	861	-	847	713	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1540	-	-	1427	-	-	663	620	968	741	615	1023
Mov Cap-2 Maneuver	-	-	-	-	-	-	663	620	-	741	615	-
Stage 1	-	-	-	-	-	-	739	699	-	944	861	-
Stage 2	-	-	-	-	-	-	983	861	-	825	694	-






















Approach	EB	WB	NB	SB
HCM Control Delay, s	1.4	0	10.5	8.7
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	663	1540	-	-	1427	-	-	992
HCM Lane V/C Ratio	0.006	0.023	-	-	-	-	-	0.017
HCM Control Delay (s)	10.5	7.4	0.1	-	0	-	-	8.7
HCM Lane LOS	B	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.1

Lanes, Volumes, Timings

2029 No-Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Evening Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	0	3	158	0	83	0	969	116	138	1389	3
Future Volume (vph)	5	0	3	158	0	83	0	969	116	138	1389	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	14	14	14	12	14	12	12	12	12	12
Storage Length (ft)	0		0	0		0	220		0	240		0
Storage Lanes	0		0	0		1	1		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Frt		0.949				0.850		0.984				
Flt Protected		0.970			0.950					0.950		
Satd. Flow (prot)	0	1866	0	0	1925	1615	2027	3552	0	3467	3574	0
Flt Permitted		0.856			0.752					0.950		
Satd. Flow (perm)	0	1646	0	0	1524	1615	2027	3552	0	3467	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		153				87		18				
Link Speed (mph)		30			30			40			40	
Link Distance (ft)		418			340			266			519	
Travel Time (s)		9.5			7.7			4.5			8.8	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%
Adj. Flow (vph)	5	0	3	161	0	85	0	989	118	141	1417	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	8	0	0	161	85	0	1107	0	141	1420	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			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	0.92	0.92	0.92	0.92	0.92	1.00	0.92	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50		50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	50	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	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	pm+ov	Prot	NA		Prot	NA	
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4			8		8						
Detector Phase	4	4		8	8	1	5	2		1	6	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	15.0		8.0	15.0	













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Lanes, Volumes, Timings

2029 No-Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Evening Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	21.0		13.0	21.0	
Total Split (s)	26.0	26.0		26.0	26.0	21.0	21.0	53.0		21.0	53.0	
Total Split (%)	26.0%	26.0%		26.0%	26.0%	21.0%	21.0%	53.0%		21.0%	53.0%	
Maximum Green (s)	21.0	21.0		21.0	21.0	16.0	16.0	47.0		16.0	47.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0	-1.0	-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0	4.0	4.0	5.0		4.0	5.0	
Lead/Lag						Lag	Lead	Lead		Lag	Lag	
Lead-Lag Optimize?						Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	C-Max		None	C-Max	
Act Effect Green (s)		16.6			16.6	37.6		53.4		17.0	74.4	
Actuated g/C Ratio		0.17			0.17	0.38		0.53		0.17	0.74	
v/c Ratio		0.02			0.64	0.13		0.58		0.24	0.53	
Control Delay		0.1			49.9	4.3		17.7		37.2	6.8	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		0.1			49.9	4.3		17.7		37.2	6.8	
LOS		A			D	A		B		D	A	
Approach Delay		0.1			34.2			17.7			9.6	
Approach LOS		A			C			B			A	
90th %ile Green (s)	21.0	21.0		21.0	21.0	16.0	0.0	47.0		16.0	68.0	
90th %ile Term Code	Hold	Hold		Max	Max	Hold	Skip	Coord		Hold	Coord	
70th %ile Green (s)	18.3	18.3		18.3	18.3	16.0	0.0	49.7		16.0	70.7	
70th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
50th %ile Green (s)	15.8	15.8		15.8	15.8	16.0	0.0	52.2		16.0	73.2	
50th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
30th %ile Green (s)	13.2	13.2		13.2	13.2	16.0	0.0	54.8		16.0	75.8	
30th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
10th %ile Green (s)	9.5	9.5		9.5	9.5	16.0	0.0	58.5		16.0	79.5	
10th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
Queue Length 50th (ft)		0			97	0		235		40	171	
Queue Length 95th (ft)		0			155	26		336		68	268	
Internal Link Dist (ft)		338			260			186			439	
Turn Bay Length (ft)										240		
Base Capacity (vph)		481			335	660		1906		589	2660	
Starvation Cap Reductn		0			0	0		0		0	0	
Spillback Cap Reductn		0			0	0		0		0	0	
Storage Cap Reductn		0			0	0		0		0	0	
Reduced v/c Ratio		0.02			0.48	0.13		0.58		0.24	0.53	

Intersection Summary

Area Type: Other
 Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 91 (91%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.64

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Lanes, Volumes, Timings

2029 No-Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Evening Peak Hour

Intersection Signal Delay: 14.7

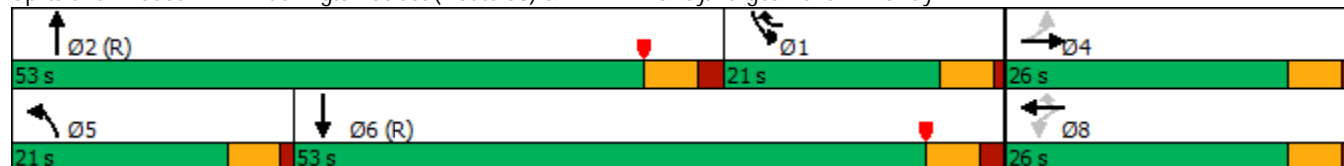
Intersection LOS: B

Intersection Capacity Utilization 68.6%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway






HCM 6th TWSC
12: Washington Street (Route 53) & Northern Driveway

2029 No-Build Conditions
Weekday Evening Peak Hour

Intersection

Int Delay, s/veh 3.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	9	148	1058	5	70	1476
Future Vol, veh/h	9	148	1058	5	70	1476
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	1	1	0	2	1
Mvmt Flow	9	154	1102	5	73	1538

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	2020	554	0
Stage 1	1105	-	-
Stage 2	915	-	-
Critical Hdwy	6.8	6.92	-
Critical Hdwy Stg 1	5.8	-	-
Critical Hdwy Stg 2	5.8	-	-
Follow-up Hdwy	3.5	3.31	-
Pot Cap-1 Maneuver	52	479	-
Stage 1	283	-	-
Stage 2	356	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	10	479	-
Mov Cap-2 Maneuver	65	-	-
Stage 1	283	-	-
Stage 2	71	-	-

Approach	WB	NB	SB
HCM Control Delay, s	23.9	0	4.5
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	351	626
HCM Lane V/C Ratio	-	-	0.466	0.116
HCM Control Delay (s)	-	-	23.9	11.5
HCM Lane LOS	-	-	C	B
HCM 95th %tile Q(veh)	-	-	2.4	0.4

HCM 6th TWSC
14: Internal Driveway & Target Plaza Driveway

2029 No-Build Conditions
Weekday Evening Peak Hour

Intersection

Int Delay, s/veh 3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	66	193	4	1	146	2	20	1	0	2	0	69
Future Vol, veh/h	66	193	4	1	146	2	20	1	0	2	0	69
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	0	2	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	77	224	5	1	170	2	23	1	0	2	0	80

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	172	0	0	229	0	0	468	555	115	440	556	86
Stage 1	-	-	-	-	-	-	381	381	-	173	173	-
Stage 2	-	-	-	-	-	-	87	174	-	267	383	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1417	-	-	1351	-	-	483	443	922	505	442	962
Stage 1	-	-	-	-	-	-	619	617	-	818	760	-
Stage 2	-	-	-	-	-	-	917	759	-	721	616	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1417	-	-	1351	-	-	422	415	922	480	414	962
Mov Cap-2 Maneuver	-	-	-	-	-	-	422	415	-	480	414	-
Stage 1	-	-	-	-	-	-	581	579	-	767	759	-
Stage 2	-	-	-	-	-	-	840	758	-	675	578	-




















Approach	EB	WB	NB	SB
HCM Control Delay, s	2	0.1	14.1	9.2
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	422	1417	-	-	1351	-	-	936
HCM Lane V/C Ratio	0.058	0.054	-	-	0.001	-	-	0.088
HCM Control Delay (s)	14.1	7.7	0.1	-	7.7	0	-	9.2
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.2	0.2	-	-	0	-	-	0.3

Lanes, Volumes, Timings

2029 No-Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Saturday Midday Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	1	2	132	0	139	3	1267	182	224	1252	1
Future Volume (vph)	1	1	2	132	0	139	3	1267	182	224	1252	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	14	14	14	12	14	12	12	12	12	12
Storage Length (ft)	0		0	0		0	220		0	240		0
Storage Lanes	0		0	0		1	1		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Frt		0.932				0.850		0.981				
Flt Protected		0.988			0.950		0.950			0.950		
Satd. Flow (prot)	0	1866	0	0	1906	1583	1925	3506	0	3467	3574	0
Flt Permitted		0.945			0.755		0.950			0.950		
Satd. Flow (perm)	0	1785	0	0	1515	1583	1925	3506	0	3467	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2				92		26				
Link Speed (mph)		30			30			40			40	
Link Distance (ft)		418			340			266			519	
Travel Time (s)		9.5			7.7			4.5			8.8	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	0%	0%	1%	0%	2%	0%	1%	1%	1%	1%	0%
Adj. Flow (vph)	1	1	2	136	0	143	3	1306	188	231	1291	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	4	0	0	136	143	3	1494	0	231	1292	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			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	0.92	0.92	0.92	0.92	0.92	1.00	0.92	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50		50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	50	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	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	pm+ov	Prot	NA		Prot	NA	
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4			8		8						
Detector Phase	4	4		8	8	1	5	2		1	6	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	15.0		8.0	15.0	













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Lanes, Volumes, Timings

2029 No-Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Saturday Midday Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	21.0		13.0	21.0	
Total Split (s)	22.0	22.0		22.0	22.0	17.0	17.0	56.0		17.0	56.0	
Total Split (%)	23.2%	23.2%		23.2%	23.2%	17.9%	17.9%	58.9%		17.9%	58.9%	
Maximum Green (s)	17.0	17.0		17.0	17.0	12.0	12.0	50.0		12.0	50.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0	-1.0	-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0	4.0	4.0	5.0		4.0	5.0	
Lead/Lag						Lag	Lead	Lead		Lag	Lag	
Lead-Lag Optimize?						Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	C-Max		None	C-Max	
Act Effect Green (s)		14.2			14.2	31.2	9.0	54.8		13.0	69.2	
Actuated g/C Ratio		0.15			0.15	0.33	0.09	0.58		0.14	0.73	
v/c Ratio		0.01			0.60	0.25	0.02	0.74		0.49	0.50	
Control Delay		26.2			48.3	9.8	39.3	17.9		41.8	7.6	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		26.2			48.3	9.8	39.3	17.9		41.8	7.6	
LOS		C			D	A	D	B		D	A	
Approach Delay		26.3			28.6			18.0			12.8	
Approach LOS		C			C			B			B	
90th %ile Green (s)	17.0	17.0		17.0	17.0	12.0	8.0	50.0		12.0	54.0	
90th %ile Term Code	Hold	Hold		Max	Max	Max	Min	Coord		Max	Coord	
70th %ile Green (s)	16.0	16.0		16.0	16.0	12.0	0.0	51.0		12.0	68.0	
70th %ile Term Code	Hold	Hold		Gap	Gap	Max	Skip	Coord		Max	Coord	
50th %ile Green (s)	13.7	13.7		13.7	13.7	12.0	0.0	53.3		12.0	70.3	
50th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
30th %ile Green (s)	11.4	11.4		11.4	11.4	12.0	0.0	55.6		12.0	72.6	
30th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
10th %ile Green (s)	8.1	8.1		8.1	8.1	12.0	0.0	58.9		12.0	75.9	
10th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
Queue Length 50th (ft)		1			77	21	2	323		67	131	
Queue Length 95th (ft)		10			133	60	11	448		105	317	
Internal Link Dist (ft)		338			260			186			439	
Turn Bay Length (ft)							220			240		
Base Capacity (vph)		339			287	582	263	2032		474	2601	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.01			0.47	0.25	0.01	0.74		0.49	0.50	

Intersection Summary

Area Type: Other
 Cycle Length: 95
 Actuated Cycle Length: 95
 Offset: 90 (95%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.74

MDM Transportation Consultants, Inc.

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Lanes, Volumes, Timings

2029 No-Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Saturday Midday Peak Hour

Intersection Signal Delay: 16.5

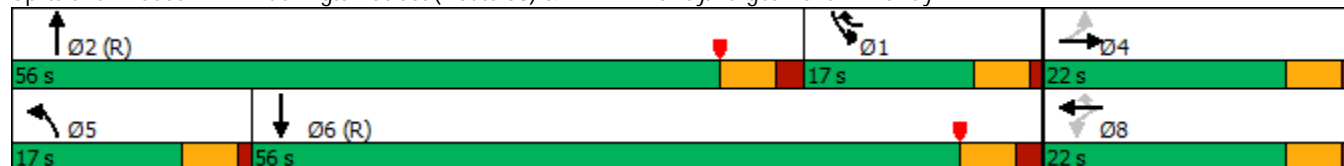
Intersection LOS: B

Intersection Capacity Utilization 72.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway






HCM 6th TWSC
12: Washington Street (Route 53) & Northern Driveway

2029 No-Build Conditions
Saturday Midday Peak Hour

Intersection

Int Delay, s/veh 6.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	215	1406	9	100	1456
Future Vol, veh/h	13	215	1406	9	100	1456
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	1	1	0	1	1
Mvmt Flow	14	229	1496	10	106	1549

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	2488	753	0
Stage 1	1501	-	-
Stage 2	987	-	-
Critical Hdwy	6.8	6.92	-
Critical Hdwy Stg 1	5.8	-	-
Critical Hdwy Stg 2	5.8	-	-
Follow-up Hdwy	3.5	3.31	-
Pot Cap-1 Maneuver	25	354	-
Stage 1	174	-	-
Stage 2	326	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	0	354	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	174	-	-
Stage 2	0	-	-

Approach	WB	NB	SB
HCM Control Delay, s	34.6	0	7.5
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	354	445
HCM Lane V/C Ratio	-	-	0.685	0.239
HCM Control Delay (s)	-	-	34.6	15.6
HCM Lane LOS	-	-	D	C
HCM 95th %tile Q(veh)	-	-	4.8	0.9

HCM 6th TWSC
14: Internal Driveway & Target Plaza Driveway

2029 No-Build Conditions
Saturday Midday Peak Hour

Intersection

Int Delay, s/veh 3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
----------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Lane Configurations		↔↔			↔↔			↔			↔	
Traffic Vol, veh/h	112	286	6	0	156	6	7	2	0	16	2	109
Future Vol, veh/h	112	286	6	0	156	6	7	2	0	16	2	109
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	0	2	0	0	0	0	0	0	0
Mvmt Flow	126	321	7	0	175	7	8	2	0	18	2	122

Major/Minor	Major1	Major2	Minor1	Minor2
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Conflicting Flow All	182	0	0	328	0	0	666	759	164	593	759	91
Stage 1	-	-	-	-	-	-	577	577	-	179	179	-
Stage 2	-	-	-	-	-	-	89	182	-	414	580	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1405	-	-	1243	-	-	349	338	858	393	338	955
Stage 1	-	-	-	-	-	-	474	505	-	811	755	-
Stage 2	-	-	-	-	-	-	914	753	-	592	503	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1405	-	-	1243	-	-	277	301	858	358	301	955
Mov Cap-2 Maneuver	-	-	-	-	-	-	277	301	-	358	301	-
Stage 1	-	-	-	-	-	-	422	449	-	722	755	-
Stage 2	-	-	-	-	-	-	794	753	-	524	448	-

Approach	EB	WB	NB	SB
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HCM Control Delay, s	2.3	0	18.2	10.8
HCM LOS			C	B





















Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
-----------------------	-------	-----	-----	-----	-----	-----	-----	-------

Capacity (veh/h)	282	1405	-	-	1243	-	-	767
HCM Lane V/C Ratio	0.036	0.09	-	-	-	-	-	0.186
HCM Control Delay (s)	18.2	7.8	0.2	-	0	-	-	10.8
HCM Lane LOS	C	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0.3	-	-	0	-	-	0.7

Lanes, Volumes, Timings

2030 Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Morning Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	0	50	0	28	3	1007	73	82	596	3
Future Volume (vph)	2	0	0	50	0	28	3	1007	73	82	596	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	14	14	14	12	14	12	12	12	12	12
Storage Length (ft)	0		0	0		0	220		0	240		0
Storage Lanes	0		0	0		1	1		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Frt						0.850		0.990			0.999	
Flt Protected		0.950			0.950		0.950			0.950		
Satd. Flow (prot)	0	1925	0	0	1851	1538	1925	3504	0	3400	3502	0
Flt Permitted		0.720			0.757		0.950			0.950		
Satd. Flow (perm)	0	1459	0	0	1475	1538	1925	3504	0	3400	3502	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						103		14			1	
Link Speed (mph)		30			30			40			40	
Link Distance (ft)		418			340			266			519	
Travel Time (s)		9.5			7.7			4.5			8.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	4%	0%	5%	0%	2%	2%	3%	3%	0%
Adj. Flow (vph)	2	0	0	56	0	31	3	1119	81	91	662	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2	0	0	56	31	3	1200	0	91	665	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			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	0.92	0.92	0.92	0.92	0.92	1.00	0.92	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50		50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	50	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	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	pm+ov	Prot	NA		Prot	NA	
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4			8		8						
Detector Phase	4	4		8	8	1	5	2		1	6	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	15.0		8.0	15.0	













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Lanes, Volumes, Timings

2030 Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Morning Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	21.0		13.0	21.0	
Total Split (s)	17.0	17.0		17.0	17.0	17.0	17.0	51.0		17.0	51.0	
Total Split (%)	20.0%	20.0%		20.0%	20.0%	20.0%	20.0%	60.0%		20.0%	60.0%	
Maximum Green (s)	12.0	12.0		12.0	12.0	12.0	12.0	45.0		12.0	45.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0	-1.0	-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0	4.0	4.0	5.0		4.0	5.0	
Lead/Lag						Lag	Lead	Lead		Lag	Lag	
Lead-Lag Optimize?						Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	C-Max		None	C-Max	
Act Effect Green (s)		10.3			10.3	21.3	9.0	58.3		12.2	70.3	
Actuated g/C Ratio		0.12			0.12	0.25	0.11	0.69		0.14	0.83	
v/c Ratio		0.01			0.31	0.07	0.01	0.50		0.19	0.23	
Control Delay		31.5			38.4	0.3	34.3	10.3		32.6	3.9	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		31.5			38.4	0.3	34.3	10.3		32.6	3.9	
LOS		C			D	A	C	B		C	A	
Approach Delay		31.5			24.8			10.4			7.4	
Approach LOS		C			C			B			A	
90th %ile Green (s)	12.0	12.0		12.0	12.0	12.0	8.0	45.0		12.0	49.0	
90th %ile Term Code	Hold	Hold		Max	Max	Hold	Min	Coord		Hold	Coord	
70th %ile Green (s)	10.0	10.0		10.0	10.0	12.0	0.0	47.0		12.0	64.0	
70th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
50th %ile Green (s)	8.6	8.6		8.6	8.6	12.0	0.0	48.4		12.0	65.4	
50th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
30th %ile Green (s)	0.0	0.0		0.0	0.0	12.0	0.0	62.0		12.0	79.0	
30th %ile Term Code	Skip	Skip		Skip	Skip	Hold	Skip	Coord		Hold	Coord	
10th %ile Green (s)	0.0	0.0		0.0	0.0	0.0	0.0	79.0		0.0	79.0	
10th %ile Term Code	Skip	Skip		Skip	Skip	Skip	Skip	Coord		Skip	Coord	
Queue Length 50th (ft)		1			28	0	2	194		22	37	
Queue Length 95th (ft)		7			61	0	10	282		43	118	
Internal Link Dist (ft)		338			260			186			439	
Turn Bay Length (ft)							220			240		
Base Capacity (vph)		223			225	476	294	2406		520	2895	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.01			0.25	0.07	0.01	0.50		0.17	0.23	

Intersection Summary

Area Type: Other
 Cycle Length: 85
 Actuated Cycle Length: 85
 Offset: 11 (13%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.50

Lanes, Volumes, Timings

2030 Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Morning Peak Hour

Intersection Signal Delay: 9.9

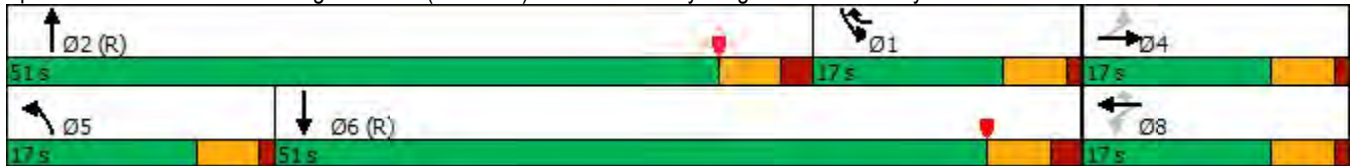
Intersection LOS: A

Intersection Capacity Utilization 54.3%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway



HCM 6th TWSC
12: Washington Street (Route 53) & Northern Driveway

2030 Build Conditions
Weekday Morning Peak Hour

Intersection

Int Delay, s/veh 1.2

Movement WBL WBR NBT NBR SBL SBT

Lane Configurations 

Traffic Vol, veh/h 1 46 1007 12 65 679

Future Vol, veh/h 1 46 1007 12 65 679

Conflicting Peds, #/hr 0 0 0 0 0 0

Sign Control Stop Stop Free Free Free Free

RT Channelized - None - None - None

Storage Length 0 - - - - -

Veh in Median Storage, # 2 - 0 - - 0

Grade, % 0 - 0 - - 0

Peak Hour Factor 89 89 89 89 89 89

Heavy Vehicles, % 0 11 3 0 0 3

Mvmt Flow 1 52 1131 13 73 763

Major/Minor Minor1 Major1 Major2

Conflicting Flow All 1666 572 0 0 1144 0

Stage 1 1138 - - - - -

Stage 2 528 - - - - -

Critical Hdwy 6.8 7.12 - - 4.1 -

Critical Hdwy Stg 1 5.8 - - - - -

Critical Hdwy Stg 2 5.8 - - - - -

Follow-up Hdwy 3.5 3.41 - - 2.2 -

Pot Cap-1 Maneuver 89 441 - - 618 -

Stage 1 272 - - - - -

Stage 2 562 - - - - -

Platoon blocked, % - - - - -

Mov Cap-1 Maneuver 71 441 - - 618 -

Mov Cap-2 Maneuver 228 - - - - -

Stage 1 272 - - - - -

Stage 2 447 - - - - -

Approach WB NB SB

HCM Control Delay, s 14.5 0 1.9

HCM LOS B

Minor Lane/Major Mvmt NBT NBRWBLn1 SBL SBT

Capacity (veh/h) - - 432 618 -

HCM Lane V/C Ratio - - 0.122 0.118 -

HCM Control Delay (s) - - 14.5 11.6 1

HCM Lane LOS - - B B A

HCM 95th %tile Q(veh) - - 0.4 0.4 -

HCM 6th TWSC
14: Internal Driveway & Target Plaza Driveway

2030 Build Conditions
Weekday Morning Peak Hour

Intersection

Int Delay, s/veh 2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
----------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Lane Configurations		EBT			WBT			NBT			SBT	
Traffic Vol, veh/h	35	109	11	0	33	0	3	0	0	1	0	41
Future Vol, veh/h	35	109	11	0	33	0	3	0	0	1	0	41
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	73	73	73	73	73	73	73	73	73	73	73	73
Heavy Vehicles, %	5	1	0	0	3	0	0	0	0	0	0	10
Mvmt Flow	48	149	15	0	45	0	4	0	0	1	0	56

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	45	0	0	164
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.2	-	-	4.1
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.25	-	-	2.2
Pot Cap-1 Maneuver	1540	-	-	1427
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1540	-	-	1427
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-




















Approach	EB	WB	NB	SB
HCM Control Delay, s	1.7	0	11	8.8
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	608	1540	-	-	1427	-	-	1012
HCM Lane V/C Ratio	0.007	0.031	-	-	-	-	-	0.057
HCM Control Delay (s)	11	7.4	0.1	-	0	-	-	8.8
HCM Lane LOS	B	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.2

Lanes, Volumes, Timings

2030 Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Evening Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	0	3	175	0	88	0	971	119	142	1376	3
Future Volume (vph)	5	0	3	175	0	88	0	971	119	142	1376	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	14	14	14	12	14	12	12	12	12	12
Storage Length (ft)	0		0	0		0	220		0	240		0
Storage Lanes	0		0	0		1	1		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Frt		0.949				0.850		0.984				
Flt Protected		0.970			0.950					0.950		
Satd. Flow (prot)	0	1866	0	0	1925	1615	2027	3552	0	3467	3574	0
Flt Permitted		0.855			0.752					0.950		
Satd. Flow (perm)	0	1644	0	0	1524	1615	2027	3552	0	3467	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		153				87		18				
Link Speed (mph)		30			30			40			40	
Link Distance (ft)		418			340			266			519	
Travel Time (s)		9.5			7.7			4.5			8.8	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%
Adj. Flow (vph)	5	0	3	179	0	90	0	991	121	145	1404	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	8	0	0	179	90	0	1112	0	145	1407	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			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	0.92	0.92	0.92	0.92	0.92	1.00	0.92	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50		50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	50	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	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	pm+ov	Prot	NA		Prot	NA	
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4			8		8						
Detector Phase	4	4		8	8	1	5	2		1	6	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	15.0		8.0	15.0	













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Lanes, Volumes, Timings

2030 Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Evening Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	21.0		13.0	21.0	
Total Split (s)	26.0	26.0		26.0	26.0	21.0	21.0	53.0		21.0	53.0	
Total Split (%)	26.0%	26.0%		26.0%	26.0%	21.0%	21.0%	53.0%		21.0%	53.0%	
Maximum Green (s)	21.0	21.0		21.0	21.0	16.0	16.0	47.0		16.0	47.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0	-1.0	-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0	4.0	4.0	5.0		4.0	5.0	
Lead/Lag						Lag	Lead	Lead		Lag	Lag	
Lead-Lag Optimize?						Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	C-Max		None	C-Max	
Act Effect Green (s)		17.4			17.4	38.4		52.6		17.0	73.6	
Actuated g/C Ratio		0.17			0.17	0.38		0.53		0.17	0.74	
v/c Ratio		0.02			0.68	0.13		0.59		0.25	0.53	
Control Delay		0.1			51.1	4.7		18.3		37.2	7.1	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		0.1			51.1	4.7		18.3		37.2	7.1	
LOS		A			D	A		B		D	A	
Approach Delay		0.1			35.6			18.3			10.0	
Approach LOS		A			D			B			A	
90th %ile Green (s)	21.0	21.0		21.0	21.0	16.0	0.0	47.0		16.0	68.0	
90th %ile Term Code	Hold	Hold		Max	Max	Hold	Skip	Coord		Hold	Coord	
70th %ile Green (s)	19.6	19.6		19.6	19.6	16.0	0.0	48.4		16.0	69.4	
70th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
50th %ile Green (s)	16.9	16.9		16.9	16.9	16.0	0.0	51.1		16.0	72.1	
50th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
30th %ile Green (s)	14.2	14.2		14.2	14.2	16.0	0.0	53.8		16.0	74.8	
30th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
10th %ile Green (s)	10.3	10.3		10.3	10.3	16.0	0.0	57.7		16.0	78.7	
10th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
Queue Length 50th (ft)		0			107	1		243		41	177	
Queue Length 95th (ft)		0			172	29		337		70	264	
Internal Link Dist (ft)		338			260			186			439	
Turn Bay Length (ft)										240		
Base Capacity (vph)		481			335	673		1876		589	2630	
Starvation Cap Reductn		0			0	0		0		0	0	
Spillback Cap Reductn		0			0	0		0		0	0	
Storage Cap Reductn		0			0	0		0		0	0	
Reduced v/c Ratio		0.02			0.53	0.13		0.59		0.25	0.53	

Intersection Summary

Area Type: Other
 Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 91 (91%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.68

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Lanes, Volumes, Timings

2030 Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Weekday Evening Peak Hour

Intersection Signal Delay: 15.4

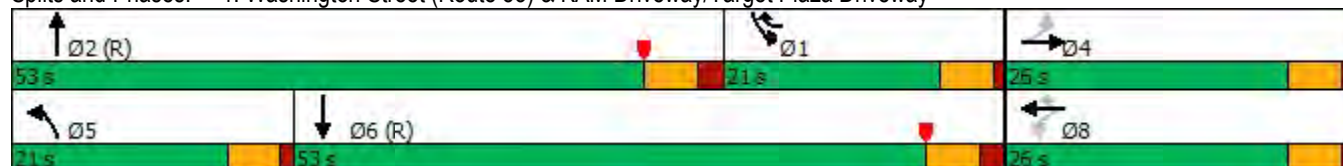
Intersection LOS: B

Intersection Capacity Utilization 69.6%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway






HCM 6th TWSC
12: Washington Street (Route 53) & Northern Driveway

2030 Build Conditions
Weekday Evening Peak Hour

Intersection

Int Delay, s/veh 4.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	9	160	1057	13	91	1467
Future Vol, veh/h	9	160	1057	13	91	1467
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	1	1	0	2	1
Mvmt Flow	9	167	1101	14	95	1528

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	2062	558	0
Stage 1	1108	-	-
Stage 2	954	-	-
Critical Hdwy	6.8	6.92	-
Critical Hdwy Stg 1	5.8	-	-
Critical Hdwy Stg 2	5.8	-	-
Follow-up Hdwy	3.5	3.31	-
Pot Cap-1 Maneuver	48	476	-
Stage 1	282	-	-
Stage 2	339	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	0	476	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	282	-	-
Stage 2	0	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.9	0	5.7
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	476	622
HCM Lane V/C Ratio	-	-	0.37	0.152
HCM Control Delay (s)	-	-	16.9	11.8
HCM Lane LOS	-	-	C	B
HCM 95th %tile Q(veh)	-	-	1.7	0.5

HCM 6th TWSC
14: Internal Driveway & Target Plaza Driveway

2030 Build Conditions
Weekday Evening Peak Hour

Intersection

Int Delay, s/veh 3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
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Lane Configurations

Traffic Vol, veh/h	73	193	4	1	146	2	20	1	0	2	0	91
Future Vol, veh/h	73	193	4	1	146	2	20	1	0	2	0	91
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	0	2	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	85	224	5	1	170	2	23	1	0	2	0	106

Major/Minor	Major1	Major2	Minor1	Minor2
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Conflicting Flow All	172	0	0	229	0	0	484	571	115	456	572	86
Stage 1	-	-	-	-	-	-	397	397	-	173	173	-
Stage 2	-	-	-	-	-	-	87	174	-	283	399	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1417	-	-	1351	-	-	470	434	922	492	433	962
Stage 1	-	-	-	-	-	-	605	607	-	818	760	-
Stage 2	-	-	-	-	-	-	917	759	-	706	606	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1417	-	-	1351	-	-	396	404	922	464	403	962
Mov Cap-2 Maneuver	-	-	-	-	-	-	396	404	-	464	403	-
Stage 1	-	-	-	-	-	-	563	565	-	762	759	-
Stage 2	-	-	-	-	-	-	815	758	-	656	564	-

Approach	EB	WB	NB	SB
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HCM Control Delay, s	2.2	0.1	14.7	9.3
HCM LOS			B	A




















Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
-----------------------	-------	-----	-----	-----	-----	-----	-----	-------

Capacity (veh/h)	396	1417	-	-	1351	-	-	940
HCM Lane V/C Ratio	0.062	0.06	-	-	0.001	-	-	0.115
HCM Control Delay (s)	14.7	7.7	0.2	-	7.7	0	-	9.3
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.2	0.2	-	-	0	-	-	0.4

Lanes, Volumes, Timings

2030 Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Saturday Midday Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	1	2	161	0	147	3	1270	187	230	1230	1
Future Volume (vph)	3	1	2	161	0	147	3	1270	187	230	1230	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	14	14	14	12	14	12	12	12	12	12
Storage Length (ft)	0		0	0		0	220		0	240		0
Storage Lanes	0		0	0		1	1		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Frt		0.955				0.850		0.981				
Flt Protected		0.976			0.950		0.950			0.950		
Satd. Flow (prot)	0	1889	0	0	1906	1583	1925	3506	0	3467	3574	0
Flt Permitted		0.885			0.754		0.950			0.950		
Satd. Flow (perm)	0	1713	0	0	1513	1583	1925	3506	0	3467	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2				92		26				
Link Speed (mph)		30			30			40			40	
Link Distance (ft)		418			340			266			519	
Travel Time (s)		9.5			7.7			4.5			8.8	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	0%	0%	1%	0%	2%	0%	1%	1%	1%	1%	0%
Adj. Flow (vph)	3	1	2	166	0	152	3	1309	193	237	1268	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	6	0	0	166	152	3	1502	0	237	1269	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			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	0.92	0.92	0.92	0.92	0.92	1.00	0.92	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50		50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	50	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	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	pm+ov	Prot	NA		Prot	NA	
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4			8		8						
Detector Phase	4	4		8	8	1	5	2		1	6	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	15.0		8.0	15.0	













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Lanes, Volumes, Timings

2030 Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Saturday Midday Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	21.0		13.0	21.0	
Total Split (s)	22.0	22.0		22.0	22.0	17.0	17.0	56.0		17.0	56.0	
Total Split (%)	23.2%	23.2%		23.2%	23.2%	17.9%	17.9%	58.9%		17.9%	58.9%	
Maximum Green (s)	17.0	17.0		17.0	17.0	12.0	12.0	50.0		12.0	50.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	2.0		1.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0	-1.0	-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0	4.0	4.0	5.0		4.0	5.0	
Lead/Lag						Lag	Lead	Lead		Lag	Lag	
Lead-Lag Optimize?						Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	C-Max		None	C-Max	
Act Effect Green (s)		15.4			15.4	32.4	9.0	53.6		13.0	68.0	
Actuated g/C Ratio		0.16			0.16	0.34	0.09	0.56		0.14	0.72	
v/c Ratio		0.02			0.68	0.25	0.02	0.76		0.50	0.50	
Control Delay		27.5			51.4	10.3	39.3	19.1		42.1	7.9	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		27.5			51.4	10.3	39.3	19.1		42.1	7.9	
LOS		C			D	B	D	B		D	A	
Approach Delay		27.5			31.7			19.1			13.3	
Approach LOS		C			C			B			B	
90th %ile Green (s)	17.0	17.0		17.0	17.0	12.0	8.0	50.0		12.0	54.0	
90th %ile Term Code	Hold	Hold		Max	Max	Max	Min	Coord		Max	Coord	
70th %ile Green (s)	17.0	17.0		17.0	17.0	12.0	0.0	50.0		12.0	67.0	
70th %ile Term Code	Hold	Hold		Max	Max	Max	Skip	Coord		Max	Coord	
50th %ile Green (s)	15.6	15.6		15.6	15.6	12.0	0.0	51.4		12.0	68.4	
50th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
30th %ile Green (s)	13.0	13.0		13.0	13.0	12.0	0.0	54.0		12.0	71.0	
30th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
10th %ile Green (s)	9.4	9.4		9.4	9.4	12.0	0.0	57.6		12.0	74.6	
10th %ile Term Code	Hold	Hold		Gap	Gap	Hold	Skip	Coord		Hold	Coord	
Queue Length 50th (ft)		2			94	24	2	344		69	141	
Queue Length 95th (ft)		13			159	65	11	453		107	309	
Internal Link Dist (ft)		338			260			186			439	
Turn Bay Length (ft)							220			240		
Base Capacity (vph)		326			286	600	263	1989		474	2558	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.02			0.58	0.25	0.01	0.76		0.50	0.50	

Intersection Summary

Area Type: Other
 Cycle Length: 95
 Actuated Cycle Length: 95
 Offset: 90 (95%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.76

Lanes, Volumes, Timings

2030 Build Conditions

1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway Saturday Midday Peak Hour

Intersection Signal Delay: 17.7

Intersection LOS: B

Intersection Capacity Utilization 74.2%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Washington Street (Route 53) & KAM Driveway/Target Plaza Driveway






HCM 6th TWSC
12: Washington Street (Route 53) & Northern Driveway

2030 Build Conditions
Saturday Midday Peak Hour

Intersection

Int Delay, s/veh 7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	235	1404	22	136	1440
Future Vol, veh/h	13	235	1404	22	136	1440
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	1	1	0	1	1
Mvmt Flow	14	250	1494	23	145	1532

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	2562	759	0
Stage 1	1506	-	-
Stage 2	1056	-	-
Critical Hdwy	6.8	6.92	-
Critical Hdwy Stg 1	5.8	-	-
Critical Hdwy Stg 2	5.8	-	-
Follow-up Hdwy	3.5	3.31	-
Pot Cap-1 Maneuver	22	351	-
Stage 1	173	-	-
Stage 2	300	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	0	351	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	173	-	-
Stage 2	0	-	-

Approach	WB	NB	SB
HCM Control Delay, s	40.6	0	8.1
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	351	441
HCM Lane V/C Ratio	-	-	0.752	0.328
HCM Control Delay (s)	-	-	40.6	17.1
HCM Lane LOS	-	-	E	C
HCM 95th %tile Q(veh)	-	-	5.9	1.4

HCM 6th TWSC
14: Internal Driveway & Target Plaza Driveway

2030 Build Conditions
Saturday Midday Peak Hour

Intersection

Int Delay, s/veh 4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
----------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Lane Configurations		EBT			WBT			NBT			SBT	
Traffic Vol, veh/h	123	286	6	0	156	6	7	2	0	16	2	146
Future Vol, veh/h	123	286	6	0	156	6	7	2	0	16	2	146
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	0	2	0	0	0	0	0	0	0
Mvmt Flow	138	321	7	0	175	7	8	2	0	18	2	164

Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	182	0	0	328	0	0	690	783	164	617	783	91
Stage 1	-	-	-	-	-	-	601	601	-	179	179	-
Stage 2	-	-	-	-	-	-	89	182	-	438	604	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1405	-	-	1243	-	-	335	328	858	378	328	955
Stage 1	-	-	-	-	-	-	459	493	-	811	755	-
Stage 2	-	-	-	-	-	-	914	753	-	573	491	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1405	-	-	1243	-	-	251	289	858	341	289	955
Mov Cap-2 Maneuver	-	-	-	-	-	-	251	289	-	341	289	-
Stage 1	-	-	-	-	-	-	404	434	-	714	755	-
Stage 2	-	-	-	-	-	-	755	753	-	502	432	-

Approach	EB		WB		NB		SB
HCM Control Delay, s	2.5		0		19.5		10.9
HCM LOS					C		B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	259	1405	-	-	1243	-	-	793
HCM Lane V/C Ratio	0.039	0.098	-	-	-	-	-	0.232
HCM Control Delay (s)	19.5	7.8	0.3	-	0	-	-	10.9
HCM Lane LOS	C	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0.3	-	-	0	-	-	0.9

□ Drive-Thru Queue Calculations

Taco Bell (And KFC) Spot count

Hudson, MA

282 Washington Street

Job # 1247

Date: Wednesday, October 11th, 2023

Weekday Morning

This Location opens at 10:00 AM

	Entering	Exiting	Used Drive-Thru	% Drive-Thru
TOTAL				

Weekday Midday

	Entering	Exiting	Used Drive-Thru	% Drive-Thru
12:00 PM	20	15	14	70%
12:15 PM	16	14	12	75%
12:30 PM	19	16	13	68%
12:45 PM	11	17	8	73%
TOTAL	66	62	47	71%

Weekday Evening

	Entering	Exiting	Used Drive-Thru	% Drive-Thru
5:00 PM	10	7	7	70%
5:15 PM	17	13	8	47%
5:30 PM	5	6	4	80%
5:45 PM	12	12	7	58%
TOTAL	44	38	26	59%

Date: Saturday, October 14th, 2023

Saturday Midday

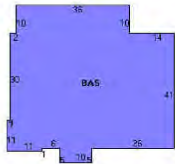
	Entering	Exiting	Used Drive-Thru	% Drive-Thru
12:00 PM	7	6	5	71%
12:15 PM	15	9	10	67%
12:30 PM	12	15	5	42%
12:45 PM	12	12	5	42%
TOTAL	46	42	25	54%

Building Photo



(https://images.vgsi.com/photos/HudsonMAPPhotos/0007/IMG_5211_7553

Building Layout



(https://images.vgsi.com/photos/HudsonMAPPhotos/Sketches/0608_5608.j

Building Sub-Areas (sq ft)			Legend
Code	Description	Gross Area	Living Area
BAS	First Floor	2,563	2,563
		2,563	2,563

Hours

^ Taco Bell

Tuesday	10 AM–12 AM
Wednesday	10 AM–12 AM
Thursday	10 AM–12 AM
Friday	10 AM–1 AM
Saturday	10 AM–1 AM
Sunday	10 AM–12 AM
Monday	10 AM–12 AM

[Suggest new hours](#)

v Drive through

10 AM–12 AM

12:00 PM to 12:15 PM - Drive Thru Window Processing Time

Car	Time (seconds)
1	16
2	53
3	35
4	43
5	30
6	25
7	42
8	41
9	129
10	54
11	20
12	24
13	51
14	45
AVERAGE:	43.4 seconds

**Proposed Drive-Through Queue Analysis: Taco Bell
Route 53 - Hanover, MA**

Period: Weekday Morning Peak Hour
 Input Rate (q) 32 Vehicles/hour
 Service Rate (u) 90 Vehicles/hour = 0.67 Minutes/Vehicle
 No. Servers 1
 k 100

<u>n</u>	<u>p(n)</u>	<u>Cdist</u>	
0	0.644444	-	
1	0.229136	0.87	Avg Q
2	0.081471	0.96	Max Q
3	0.028967	0.98	
4	0.010299	0.99	
5	0.003662	1.00	
6	0.001302	1.00	
7	0.000463	1.00	
8	0.000165	1.00	
9	5.85E-05	1.00	
10	2.08E-05	1.00	
11	7.4E-06	1.00	
12	2.63E-06	1.00	
13	9.35E-07	1.00	
14	3.33E-07	1.00	
15	1.18E-07	1.00	
16	4.2E-08	1.00	
17	1.49E-08	1.00	
18	5.32E-09	1.00	
19	1.89E-09	1.00	
20	6.72E-10	1.00	

n = Number of Queued Vehicles

P(n)= probability of n queued vehicles

Cdist= Cumulative probability of n queued vehicles or less

Assumptions

1. Average customer service time is based on empirical data for 282 Washington Street, Hudson Taco Bell (and KFC).
2. Average arrival for peak hour is based on entering trip generation and drive-through percentage for 282 Washington Street, Hudson Taco Bell. (and KFC).
3. Queuing algorithm based on M/M/S model, per Introduction to Operations Research, 6th Ed., Hillier & Lieberman, 1995 P. 686-689.

**Proposed Drive-Through Queue Analysis: Taco Bell
Route 53 - Hanover, MA**

Period: Weekday Evening Peak Hour
Input Rate (q) 24 Vehicles/hour
Service Rate (u) 90 Vehicles/hour = 0.67 Minutes/Vehicle
No. Servers 1
k 100

<u>n</u>	<u>p(n)</u>	<u>Cdist</u>	
0	0.733333	-	
1	0.195556	0.93	Avg Q
2	0.052148	0.98	Max Q
3	0.013906	0.99	
4	0.003708	1.00	
5	0.000989	1.00	
6	0.000264	1.00	
7	7.03E-05	1.00	
8	1.88E-05	1.00	
9	5E-06	1.00	
10	1.33E-06	1.00	
11	3.56E-07	1.00	
12	9.48E-08	1.00	
13	2.53E-08	1.00	
14	6.74E-09	1.00	
15	1.8E-09	1.00	
16	4.8E-10	1.00	
17	1.28E-10	1.00	
18	3.41E-11	1.00	
19	9.09E-12	1.00	
20	2.42E-12	1.00	

n = Number of Queued Vehicles

P(n)= probability of n queued vehicles

Cdist= Cumulative probability of n queued vehicles or less

Assumptions

1. Average customer service time is based on empirical data for 282 Washington Street, Hudson Taco Bell (and KFC).
2. Average arrival for peak hour is based on entering trip generation and drive-through percentage for 282 Washington Street, Hudson Taco Bell. (and KFC).
3. Queuing algorithm based on M/M/S model, per Introduction to Operations Research, 6th Ed., Hillier & Lieberman, 1995 P. 686-689.

**Proposed Drive-Through Queue Analysis: Taco Bell
Route 53 - Hanover, MA**

Period: Saturday Midday Peak Hour
 Input Rate (q) 39 Vehicles/hour
 Service Rate (u) 90 Vehicles/hour = 0.67 Minutes/Vehicle
 No. Servers 1
 k 100

<u>n</u>	<u>p(n)</u>	<u>Cdist</u>	
0	0.566667	-	
1	0.245556	0.81	Avg Q
2	0.106407	0.92	
3	0.04611	0.96	Max Q
4	0.019981	0.98	
5	0.008658	0.99	
6	0.003752	1.00	
7	0.001626	1.00	
8	0.000705	1.00	
9	0.000305	1.00	
10	0.000132	1.00	
11	5.73E-05	1.00	
12	2.48E-05	1.00	
13	1.08E-05	1.00	
14	4.66E-06	1.00	
15	2.02E-06	1.00	
16	8.76E-07	1.00	
17	3.8E-07	1.00	
18	1.64E-07	1.00	
19	7.13E-08	1.00	
20	3.09E-08	1.00	

n = Number of Queued Vehicles

P(n)= probability of n queued vehicles

Cdist= Cumulative probability of n queued vehicles or less

Assumptions

1. Average customer service time is based on empirical data for 282 Washington Street, Hudson Taco Bell (and KFC).
2. Average arrival for peak hour is based on entering trip generation and drive-through percentage for 282 Washington Street, Hudson Taco Bell. (and KFC).
3. Queuing algorithm based on M/M/S model, per Introduction to Operations Research, 6th Ed., Hillier & Lieberman, 1995 P. 686-689.

□ Parking Calculations

1247 Hanover

Parking Count of Plaza Lot near Proposed Restaurant Location

	Time	Zone 1	Zone 2	Zone 3		Time	Zone 1	Zone 2	Zone 3		Time	Zone 1	Zone 2	Zone 3
Thursday	12:00 AM	0	0	0	Friday	12:00 AM	2	0	0	Saturday	12:00 AM	0	0	0
11/17/2022	1:00 AM	0	0	0	11/18/2022	1:00 AM	0	0	0	11/19/2022	1:00 AM	0	0	0
	2:00 AM	0	0	0		2:00 AM	0	0	0		2:00 AM	0	0	0
	3:00 AM	0	0	0		3:00 AM	0	0	0		3:00 AM	0	0	0
	4:00 AM	0	0	2		4:00 AM	0	0	0		4:00 AM	0	0	0
	5:00 AM	0	0	2		5:00 AM	0	0	0		5:00 AM	0	0	0
	6:00 AM	0	0	2		6:00 AM	0	0	0		6:00 AM	0	0	0
	7:00 AM	0	0	3		7:00 AM	0	0	0		7:00 AM	1	3	2
	8:00 AM	0	5	5		8:00 AM	0	5	3		8:00 AM	1	3	2
	9:00 AM	1	5	9		9:00 AM	1	7	4		9:00 AM	5	3	5
	10:00 AM	3	6	10		10:00 AM	3	7	10		10:00 AM	2	2	6
	11:00 AM	1	7	13		11:00 AM	0	8	11		11:00 AM	2	2	9
	12:00 PM	1	9	15		12:00 PM	0	8	12		12:00 PM	2	2	14
	1:00 PM	1	8	13		1:00 PM	2	8	11		1:00 PM	0	4	13
	2:00 PM	2	7	12		2:00 PM	0	5	11		2:00 PM	0	2	9
	3:00 PM	3	5	10		3:00 PM	0	0	11		3:00 PM	1	3	9
	4:00 PM	2	5	8		4:00 PM	2	1	15		4:00 PM	2	2	13
	5:00 PM	1	3	10		5:00 PM	2	1	8		5:00 PM	2	1	4
	6:00 PM	1	0	9		6:00 PM	2	0	5		6:00 PM	2	1	1
	7:00 PM	1	0	5		7:00 PM	2	1	4		7:00 PM	1	1	0
	8:00 PM	1	0	4		8:00 PM	2	1	2		8:00 PM	1	1	1
	9:00 PM	1	0	3		9:00 PM	1	1	1		9:00 PM	2	0	0
	10:00 PM	0	0	0		10:00 PM	1	0	0		10:00 PM	2	0	0
	11:00 PM	0	0	0		11:00 PM	0	0	0		11:00 PM	2	0	0
Supply		34	34	51	Supply		34	34	51	Supply		34	34	51

Fast-Food Restaurant with Drive-Through Window (934)

Peak Period Parking Demand vs: Seats

On a: Weekday (Monday - Thursday)

Setting/Location: General Urban/Suburban

Peak Period of Parking Demand: 12:00 - 1:00 p.m.

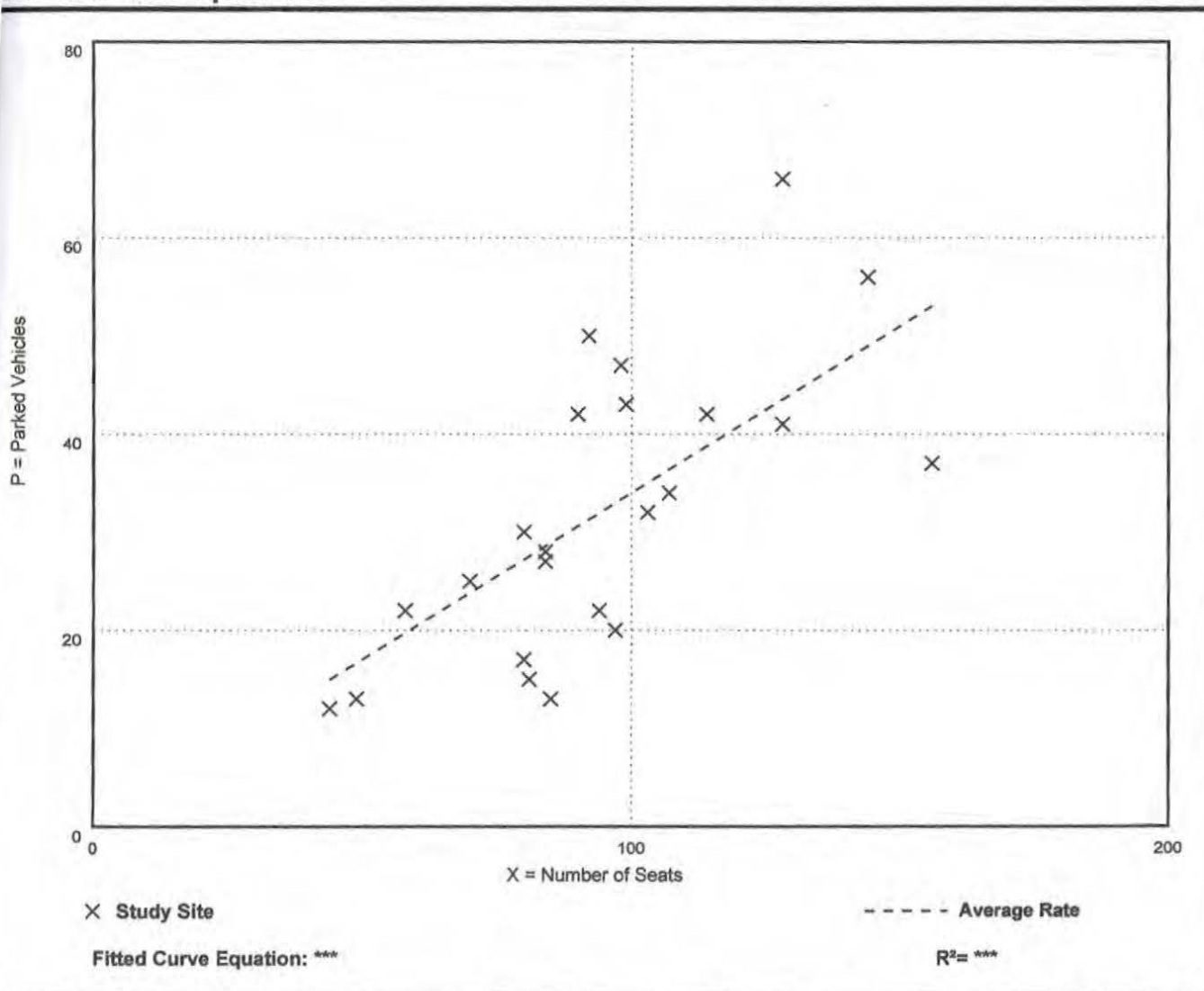
Number of Studies: 23

Avg. Num. of Seats: 94

Peak Period Parking Demand per Seat

Average Rate	Range of Rates	33rd / 85th Percentile	95% Confidence Interval	Standard Deviation (Coeff. of Variation)
0.34	0.15 - 0.54	0.27 / 0.47	0.30 - 0.38	0.11 (32%)

Data Plot and Equation



Fast-Food Restaurant with Drive-Through Window (934)

Peak Period Parking Demand vs: Seats

On a: Friday

Setting/Location: General Urban/Suburban

Peak Period of Parking Demand: 12:00 - 1:00 p.m.

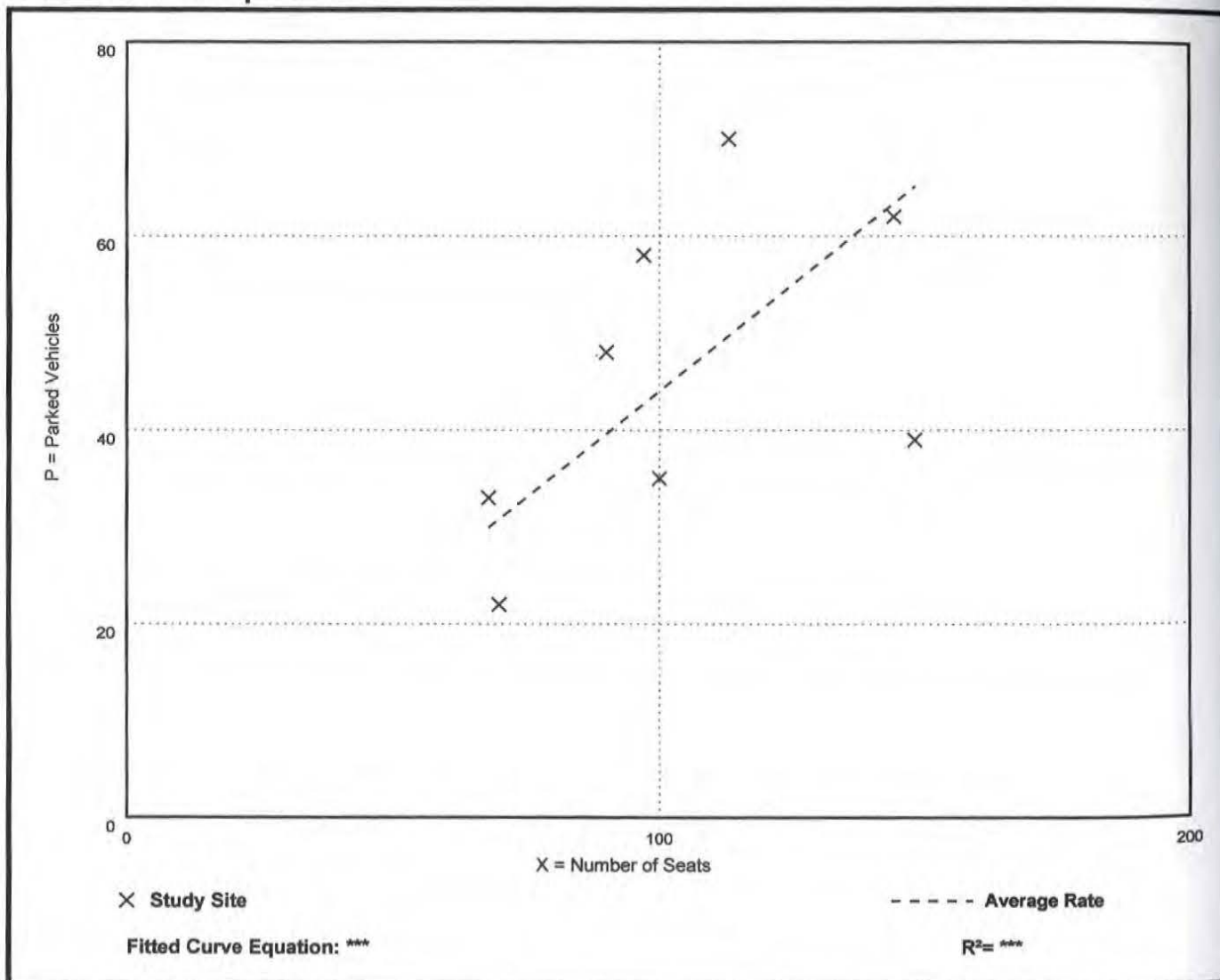
Number of Studies: 8

Avg. Num. of Seats: 104

Peak Period Parking Demand per Seat

Average Rate	Range of Rates	33rd / 85th Percentile	95% Confidence Interval	Standard Deviation (Coeff. of Variation)
0.44	0.26 - 0.62	0.35 / 0.61	***	0.14 (32%)

Data Plot and Equation



Fast-Food Restaurant with Drive-Through Window (934)

Peak Period Parking Demand vs: Seats

On a: Saturday

Setting/Location: General Urban/Suburban

Peak Period of Parking Demand: 12:00 - 2:00 p.m.

Number of Studies: 19

Avg. Num. of Seats: 95

Peak Period Parking Demand per Seat

Average Rate	Range of Rates	33rd / 85th Percentile	95% Confidence Interval	Standard Deviation (Coeff. of Variation)
0.37	0.14 - 0.77	0.29 / 0.68	***	0.19 (51%)

Data Plot and Equation

