Vanasse & Associates, Inc.
Transportation Engineers & Planners

35 New England Business Center Drive
Suite 140
Andover, MA 01810-1066
Office 978-474-8800
Fax 978-688-6508
Web: www.rdva.com

Ref: 7738

October 3, 2018

Ms. Elizabeth Hughes, Town Planner
Concord Planning Division
Town of Concord
141 Keyes Road
Concord, MA 01742

Re: Response to Traffic Engineering Peer Review
Proposed Residential Development - 1450 Main Street
Concord, Massachusetts

Dear Ms. Hughes:

Vanasse & Associates, Inc. (VAI) is providing responses to the comments that were raised in the September 6, 2018 letter prepared by The Engineering Corp (TEC) on behalf of the Planning Board and in the September 7, 2018 memorandum from the Engineering Division of Concord Public Works (CPW) in reference to their review of the July 2018 *Transportation Impact Assessment* (the "July 2018 TIA") prepared by VAI in support of the proposed residential development to be located at 1450 Main Street in Concord, Massachusetts (hereafter referred to as the "Project"). Responses to the comments pertaining to the Site Development Plans will be provided by others under separate cover. Listed below are the comments that were identified in the subject documents pertaining to the July 2018 TIA that required a response followed by the requested information.

SEPTEMBER 6, 2018 LETTER FROM TEC

Comment 1: *The Traffic Impact Assessment (TIA) presents a study area extending along Main Street from Conant Street to the west and Church Street to the east. Although operational characteristics of the intersection of Main Street at Highland Street are not projected to be significantly affected by the project, TEC requests that the Applicant provide documentation of the geometrics, sight distance, and traffic safety information for this intersection as it is directly impacted by residential units for the project. TEC does not intend that this comment include acquisition of additional traffic volumes.*

Response: Highland Street intersects Main Street from the north to form a three-legged, 'T'-type intersection that is under stop control. The Main Street approaches provide a single 12-foot wide travel lane with a 2 to 3-foot wide marked shoulder. The directions of travel along Main Street are separated by a double-yellow centerline. Highland Street provides a 24-foot wide paved traveled-way that accommodates two-way traffic with no pavement markings and vehicles approaching Main Street under stop control; a marked stop-line is provided, however a STOP-sign is not. Sidewalks are provided along both sides of Main Street with a marked crosswalk provided for crossing Highland Street; sidewalks are not provided along Highland Street. The wheelchair ramps associated with

the Highland Street crosswalk do not appear to meet Americans with Disabilities Act (ADA) standards. A sign is posted on the Main Street eastbound approach that prohibits left-turns from Main Street eastbound to Highland Street between 7:00 and 9:00 AM.

Table 1 summarizes the measured stopping sight distance (SSD) along Main Street approaching Highland Street and the intersection sight distance (ISD) for a motorist exiting Highland Street.

Table 1
SIGHT DISTANCE MEASUREMENTS[a]

Intersection/Sight Distance Measurement	Feet		
	Required Minimum (SSD)	Desirable (ISD)[b]	Measured
Main Street at Highland Street			
Stopping Sight Distance:			
Main Street approaching from the east	305	--	423
Main Street approaching from the west	305	--	650+
Intersection Sight Distance:			
Looking to the east from Highland Street	305	385/445	358
Looking to the west from Highland Street	305	385/445	561

[a]Recommended minimum values obtained from *A Policy on Geometric Design of Highways and Streets,* 6th Edition; American Association of State Highway and Transportation Officials (AASHTO); 2011; and based on an approach speed of 40 mph along Main Street.
[b]Values shown are the intersection sight distance for a vehicle turning right/left exiting a roadway under STOP control such that motorists approaching the intersection on the major street should not need to adjust their travel speed to less than 70 percent of their initial approach speed.

As can be seen in Table 1, lines of sight at the Main Street/Highland Street intersection exceed the required minimum distance for safe operation (SSD) based on an approach speed of 40 mph, which is slightly above the measured 85th percentile vehicle travel speed documented in the July 2018 TIA (38 mph) and 10 mph above the posted speed limit.

A review of the motor vehicle crash history at the intersection as provided by the Massachusetts Department of Transportation (MassDOT) for the period 2011 through 2016 (a 6-year period) indicates that a total of three (3) crashes were reported at or within 300-feet of the Main Street/Highland Street intersection over the 6-year review period, or less than one (1) crash per year. The majority of the reported crashes occurred during daylight, under clear weather, and involved rear-end type crashes that resulted in property damage only. No fatal motor vehicle crashes were reported at the intersection during the review period. As such, no discernable safety deficiencies were apparent at the intersection.

Comment 2: *The intersection of Main Street at Commonwealth Avenue is currently under construction as part of a separate project. The project has the potential to contribute a new level of traffic volume to the intersection; however, as the intersection's reconstruction modifies the intersection layout to allow for Main Street westbound-to-eastbound to operate as the mainline (where Main Street westbound to Commonwealth Avenue previously operated as the mainline), all traffic to/from the project site is expected to be through movements.*

Therefore, TEC does not find that additional analysis of this intersection is warranted based on the documented trip generation levels. No response required.

Response: No response required.

Comment 3: *The TIA reports that June 2018 traffic counts were conducted while public schools were in session. The counts as conducted on June 19th and June 20th occurred following the end of the semester for seniors, following final exams, and during the Q5 period for Concord-Carlisle High School (CCHS), which indicates that traffic volumes in the vicinity may be lower than a typical school session. The Applicant should provide a sensitivity analysis which looks at a spot-traffic count at one of the major study area intersections and provide a comparison to the counts collected on June 19th and June 20th. The Applicant should revise the TIA, if applicable; accounting for any change in traffic volumes, adjusted to all TIA intersections, while school is in full session.*

Response: Supplemental traffic counts were conducted at the study area intersections that were assessed in the July 2018 TIA on Thursday, September 27, 2018, during the weekday morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak periods. Table 2 summarizes and compares the weekday morning and evening peak-hour traffic volumes at the study intersections as measured in June and September 2018. We note that traffic volumes during the months of June and September are between 3 and 5 percent above average-month conditions.

Table 2
PEAK-HOUR TRAFFIC VOLUME COMPARISON

	Vehicles Per Hour					
	June 2018		September 2018		Difference	
Intersection:	AM	PM	AM	PM	AM	PM
Main Street/Conant Street	1,173	1,289	1,199	1,188	+26 (2.2%)	-101 (-7.8%)
Main Street/West Street	1,005	1,061	1,001	987	-4 (-0.4%)	-74 (-7.0%)
Main Street/Church Street/ Pine Street/	1,003	1,303	1,098	1,208	+95 (9.5%)	-95 (-7.3%)

As can be seen in Table 2, peak-hour traffic volume variations at the study area intersections between June and September were shown to range from a decrease of 7.8 percent to an increase of 9.5 percent, which are within the range of normal daily traffic volume fluctuations that occur between Monday and Friday (typically 10 percent) and would not impact the analysis results or the findings that were presented in the July 2018 TIA with respect to the overall impact of the Project. The September 2018 traffic volume data is attached.

Comment 4: *The Applicant utilized no seasonal adjustment factor as June volumes in the vicinity are generally above average-month conditions. TEC concurs with this adjustment of traffic volumes. No response required.*

Response: No response required.

Comment 5: *The Applicant has utilized a conservative travel speed along Main Street of 40 mph to assess operations and safety, including sight distance; which is greater than as measured by the Automatic Traffic Recorders (ATR). TEC concurs with this speed assessment. No response required.*

Response: No response required.

Comment 6: *The safety analysis indicates the number, type, and severity of crashes at the study area intersections between 2011 and 2015. Upon review of the MassDOT's online crash portal, it appears that some crashes, although limited, may not be represented in the TIA for intersections in the study area. The Applicant should review the crash data for the study area intersections and update as necessary; including the potential to include 2016 data which is currently available from MassDOT. TEC notes that six (6) crashes at the study area intersections are noted for the year 2016. TEC also requests that crash analysis be conducted for the intersection of Main Street at Highland Street as noted in Comment #1.*

Response: Table 3 summarizes the MassDOT motor vehicle crash data for the period 2011 through 2016 (6-year review period) for the study area intersections and as expanded to include the Main Street/Highland Street intersection and a reporting of crashes that occurred along Main Street between Conant Street and Pine Street/Church Street that did not occur at an intersection. For the purpose of this evaluation, any crash reported to have occurred within 300-feet of a study area intersection was assigned to the intersection even if the crash was not directly attributable to a specific design feature or operation of the intersection (such crashes would typically be excluded).

As can be seen in Table 3, the study area intersections experienced an average of less than two (2) reported motor vehicle crashes per year over the six-year review period and were found to have a motor vehicle crash rate <u>below</u> both the MassDOT statewide and District averages for an unsignalized intersection for the MassDOT Highway Division District in which the intersections are located (District 4). The majority of the crashes were reported to have occurred on a weekday; during daylight; under clear weather conditions; and involved rear-end-type collisions that resulted in property damage only. No fatal motor vehicle crashes were reported to have occurred at the study area intersections over the expanded six-year review period.

Based on a review of the MassDOT motor vehicle crash data and consistent with the findings of the July 2018 TIA, no discernible safety deficiencies were apparent within the study area. The detailed MassDOT crash data and Crash Rate Worksheets are attached.

Table 3
MOTOR VEHICLE CRASH DATA SUMMARY[a]

	Main St./ Conant St.	Main St./ West St.	Main St./ Pine St./ Church St.	High St./ Highland St.	Main St./ between Conant St. and Church St.
Traffic Control Type:[b]	U	U	TS	U	--
Year:					
2011	0	1	3	0	1
2012	2	1	2	1	1
2013	2	2	1	0	2
2014	1	0	0	1	0
2015	1	1	2	1	1
2016	4	1	0	0	1
Total	10	6	8	3	6
Average	1.67	1.00	1.33	0.50	1.0
Rate[c]	0.32	0.23	0.25	--	--
MassDOT Crash Rate:[d]	0.57/0.57	0.57/0.57	0.78/0.73	0.57/0.57	--
Significant?[e]	No	No	No	--	--
Type:					
Angle	1	1	2	1	0
Rear-End	8	5	1	2	0
Head-On	0	0	1	0	0
Sideswipe	0	0	1	0	0
Fixed Object	0	0	0	0	0
Pedestrian/Bicycle	0	0	0	0	0
Unknown/Other	1	0	3	0	6
Total	10	6	8	3	6
Conditions:					
Clear	7	2	7	3	5
Cloudy	1	2	1	0	1
Rain	2	1	0	0	0
Snow/Ice	0	1	0	0	0
Total	10	6	8	3	6
Lighting:					
Daylight	8	6	4	2	4
Dawn/Dusk	0	0	1	0	1
Dark (Road Lit)	2	0	3	1	1
Dark (Road Unlit)	0	0	0	0	0
Total	10	6	8	3	6
Day of Week:					
Monday through Friday	9	6	6	1	6
Saturday	1	0	1	1	0
Sunday	0	0	1	1	0
Total	10	6	8	3	6
Severity:					
Property Damage Only	6	4	4	2	5
Personal Injury	4	2	4	1	1
Fatality	0	0	0	0	0
Total	10	6	8	3	6

[a]Source: MassDOT Safety Management/Traffic Operations Unit records, 2011 through 2016.
[b]Traffic Control Type: U = unsignalized; TS = traffic signal.
[c]Crash rate per million vehicles entering the intersection.
[d]Statewide/District crash rate.
[e]The intersection crash rate is significant if it is found to exceed the MassDOT crash rate for the MassDOT Highway Division District in which the Project is located (District 4).

Comment 7: *Upon review of the MassDOT's online crash portal and data provided, TEC concurs that there appears to be no identifiable crash issue and/or trend at the study area intersection. Although no specific crash trend exists, the Applicant should provide documentation of other traffic safety related issues/deficiencies at the intersections and subject roadways, if applicable.*

Response: Based on our review of the motor vehicle crash data and roadway/intersection geometry, there are no apparent safety related issues or deficiencies within the study area. Independent of the Project, we recommend that a STOP-sign be installed on the Highland Street approach to Main Street in order to reinforce the assignment of the vehicular right-of-way at the intersection and that the wheelchair ramps that are associated with crosswalk across Highland Street be reconstructed to meet ADA requirements.

Comment 8: *The Applicant utilized an annual growth adjustment factor of 1.0 percent per year based on stable volume rates reported from 2007 to 2017 as provided by MassDOT. TEC concurs with this adjustment of traffic volumes for annual growth. No response required.*

Response: No response required.

Comment 9: *The Applicant has estimated the site generated trips based on the Institute of Transportation Engineers (ITE) industry standard publication Trip Generation, 10th Edition for Land Use Code (LUC) 210 – Single-Family Detached Housing. Although some housing on-site will consist of "attached" units, the use of LUC 210 provides a conservative assessment of the overall project. The development is anticipated to generate approximately 30 vehicle trips during the weekday morning peak hour and 36 vehicle trips during the weekday evening peak hour. TEC concurs with the methodology and results of the trip generation calculations.*

Response: No response required.

Comment 10: *The project is in close proximity to the West Concord Massachusetts Bay Transportation Authority (MBTA) Commuter Rail Station. It is reasonable to assume that a percentage of site generated traffic would utilize the commuter rail, rather than personal vehicle travel during commuter hours and other portions of the day. The TIA does not take credit for the potential transit trips and therefore the projection of site generated traffic is conservative. TEC concurs with this trip generation calculation. No response required.*

Response: No response required.

Comment 11: *In addition to the project being in close proximity to the West Concord MBTA Commuter Rail Station, the project is also within walking/biking distance to the retail and restaurants provided along Main Street and Commonwealth Avenue within West Concord Center. It is reasonable to assume that a percentage of site generated traffic would walk and/or bike, rather than personal vehicle travel during commuter hours and other portions of the day. The TIA does not take credit for the potential walking and biking trips and therefore the projection of site generated traffic is conservative. TEC concurs with this trip generation calculation. No response required.*

Response: No response required.

Comment 12: *The vehicular traffic generated by the proposed project was distributed onto the adjacent roadway system based upon available Journey-to-Work data published by the US Census Bureau for persons residing in the Town of Concord. This form of trip distribution is consistent with industry standards for residential developments and therefore TEC concurs with the methodology. No response required.*

Response: No response required.

Comment 13: *The Site Development Plans call for the project's driveways to be classified as an entry driveway and an egress driveway. This alignment would force all entering vehicles to utilize the one entry driveway and all exiting vehicles to utilize the one egress driveway. The TIA provides a proportional distribution of site generated trips to/from each of the driveways. This distribution should be modified to reflect the condition as shown in the Site Development Plans. This modification will only change operational analysis at the site driveways and will not change the results of the capacity and queue analysis at other study area intersections.*

Response: The Trip Distribution Map (Figure 5), Project-Generated Peak Hour Traffic Volumes (Figure 6) and 2025 Build Peak Hour Traffic Volumes (Figure 7) figures that were presented in the July 2018 TIA have been revised to reflect the one-way access drive configuration for the Project and are attached. In addition, the traffic operations analysis for the Project site driveway intersections with Main Street was also revised, the results of which are summarized in Table 4. As can be seen in Table 4 and consistent with the results that were presented in the July 2018 TIA (Table 9), all movements exiting the Project site were shown to operate at a level-of-service (LOS) C during both the weekday morning and evening peak hours with residual vehicle queues of up to one (1) vehicle. All movements along Main Street approaching the Project site roadways were shown to operate at LOS A during both peak hours with negligible vehicle queuing predicted.

Comment 14: *There is a discrepancy between the 2018 Existing Traffic Volume Network and the capacity and queue analysis for the southbound right-turn movement from Conant Street to Main Street during the weekday evening peak hour. There are 104 vehicles per the network and 102 per the capacity and queue analysis. This parameter should be corrected.*

Response: The noted discrepancy has been corrected.

Comment 15: *TEC does concur with the Highway Capacity Manual 2010 (HCM 2010) methodology as presented in the development of the capacity and queue analysis results. The signalized intersection of Main Street / Pine Street / Church Street was reported however using Synchro percentile queue / percentile delay methodology. The Applicant should correct this methodology although TEC agrees that this will have minimal effect on the result of the capacity and queue analysis.*

Response: The traffic operations analysis for the Main Street/Pine Street/Church Street intersection was revised to use the HCM methodology, the results of which are presented in Table 5.

As shown therein, the subject intersection was shown to operate at an overall LOS B or better during the peak hours under all analysis conditions, with Project-related impacts defined as an increase in overall motorist delay of less than 1.0 seconds and in vehicle queuing of up to one (1) vehicle, consistent with the findings that were presented in the July 2018 TIA.

Comment 16: *The comments as noted above may result in modifications to the results of the capacity and queue analysis and therefore TEC has not provided direct comment on the analysis as presented at this time. TEC reserves the right to provide additional comments upon completion of the peer review comment responses.*

Response: The supplemental traffic count data and revised traffic operations analyses presented herein have demonstrated that the findings that were presented in the July 2018 TIA relative to the impact of the Project on the transportation infrastructure remain valid.

Comment 17: *Overall, TEC concurs that the general impact of the project on the control delay, queue, and level of service along the approaches to the study area intersections is anticipated to be nominal in terms of 'vehicular' traffic.*

Response: No response required.

Comment 18: *As driveways are proposed along Highland Street, the Applicant should provide Intersection Sight Distance (ISD) and Stopping Sight Distance (SSD) information for the intersection with Main Street. The Applicant should provide any sight line mitigation as necessary.*

Response: Table 1 summarizes lines of sight at the Main Street/Highland Street intersection and demonstrates that sight lines at the intersection exceed the required minimum distance for safe operation of the intersection.

Comment 19: *In concurrence with recommendations provided in the TIA, the Applicant should commit to remove and consistently maintain vegetation along the site frontage and at the intersection of Main Street / Highland Street, to ensure sight lines remain unobstructed at the site driveways as noted in the TIA. All new vegetation and site signage should be kept low to not impede sight lines to/from the project driveways and Highland Street. See Comment #36 for specific information regarding sight distance observations.*

Response: The Applicant has committed to design and maintain signs and landscaping to be installed as a part of the Project within intersection sight triangle areas so as not to restrict lines of sight. This commitment will be expanded to include trees and vegetation located within the public right-of-way along the Project site frontage on Main Street and at the Main Street/Highland Street intersection to the extent that such features inhibit lines of sight to/from the Project site roadways or Highland Street, and to the extent that the Town grants all necessary rights, permits and approvals.

Comment 20: *The Applicant should provide a commitment to implement all transportation related recommendations identified in the TIA. Further discussion of these measures may be documented in the following Site Development Plans comment section.*

Response: The Applicant has committed to implement the recommendations that were included as a part of the July 2018 TIA and will accept a condition requiring implementation of the recommendations as a part of any approval that may be granted for the Project.

Comment 21: *In addition to recommendations outlined in the TIA, the Applicant should consider upgrades to the accessible ramps and existing crossings at the intersections of Main Street / West Street and Main Street / Highland Street. These crossings will provide a direct path of travel for children of future residents to access the Thoreau Elementary School and provide the path of travel for residents to safely access the MBTA Commuter Rail Station and business district of West Concord; further lowering single occupancy vehicle trips.*

Response: The Applicant agrees to reconstruct the wheelchair ramps associated with the crossings at the Main Street/Highland Street and Main Street/West Street intersections for compliance with ADA requirements.

SEPTEMBER 7, 2018 MEMORANDUM FROM THE ENGINEERING DIVISION OF CPW

Comment: *Amend comment 15 of the [TEC] peer review to the following:*

TEC does concur with the Highway Capacity Manual 2010 (HCM 2010) methodology as presented in the development of the capacity and queue analysis results. The signalized intersection of Main Street / Pine Street / Church Street was reported however using Synchro percentile queue / percentile delay methodology. The Applicant should correct this methodology although TEC agrees that this will have minimal effect on the result of the capacity and queue analysis. CPW recommends that the methodology should be corrected, if the applicant revises the TIA to account for the changes in traffic volumes as a result of the sensitivity analysis recommended in comment #3.

Response: See response to TEC Comments 3 and 15.

Comment: *Amend comment 22 to the following:*

The TIA as provided by the Applicant notes that a school bus waiting area should be provided at an appropriate location in consultation with the Town. CPW recommends that the Applicant should determine a location for a community bus stop within the PRD site and provide detailed information on the location and associated amenities within the Site Development Plans. The bus stop should be located at an area that will not impact the traffic patterns along Main Street and provide a safe environment for the children.

Response: The requested information will be added to the Site Development Plans.

Comment: *In response to comment #28:*

CPW suggests removing the comment since we have no concerns with the catch basin being located within the driveway opening.

Response: No response required.

We trust that this information is responsive to the comments that were raised in the September 6, 2018 letter from TEC and in the September 7, 2018 memorandum from the Engineering Division of CPW concerning their review of the July 2018 TIA prepared in support of the Project. If you should have any questions or would like to discuss our responses in more detail, please feel free to contact me.

Sincerely,

VANASSE & ASSOCIATES, INC.

Jeffrey S. Dirk

Jeffrey S. Dirk, P.E., PTOE, FITE
Principal

Professional Engineer in CT, MA, ME, NH, RI and VA

JSD/jsd

Attachment

cc: J. Rhuda – Symes Development & Permitting LLC (via email)
R. Harrington, P.E. - Stamski and McNary, Inc. (via email)
File

Table 4
UNSIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

Unsignalized Intersection/ Peak Hour/Movement	2018 Existing				2025 No-Build				2025 Build			
	Demand[a]	Delay[b]	LOS[c]	Queue[d] 95th	Demand	Delay	LOS	Queue 95th	Demand	Delay	LOS	Queue 95th
Main Street at Conant Street												
Weekday Morning:												
Main Street EB LT/TH	814	0.8	A	0	873	0.8	A	0	874	0.8	A	0
Main Street WB TH/RT	190	0.0	A	0	204	0.0	A	0	208	0.0	A	0
Conant Street SB LT/RT	169	34.3	D	4	181	48.4	E	5	182	49.8	E	5
Weekday Evening:												
Main Street EB LT/TH	486	2.3	A	1	521	2.4	A	1	523	2.4	A	1
Main Street WB TH/RT	675	0.0	A	0	724	0.0	A	0	726	0.0	A	0
Conant Street SB LT/RT	128	24.0	C	2	138	29.8	D	3	140	31.2	D	3
Main Street at West Street												
Weekday Morning:												
Main Street EB TH/RT	819	0.0	A	0	878	0.0	A	0	896	0.0	A	0
Main Street WB LT/TH	180	0.4	A	0	193	0.4	A	0	199	0.4	A	0
West Street NB LT/RT	6	16.2	C	0	6	17.2	C	0	6	17.6	C	0
Weekday Evening:												
Main Street EB TH/RT	384	0.0	A	0	412	0.0	A	0	423	0.0	A	0
Main Street WB LT/TH	620	0.1	A	0	664	0.1	A	0	682	0.1	A	0
West Street NB LT/RT	57	22.3	C	1	61	25.2	D	1	62	26.5	D	1
Main Street at the East Project Site Roadway												
Weekday Morning:												
Main Street EB LT/TH	--	--	--	--	--	--	--	--	898	0.0	A	0
Main Street WB TH/RT	--	--	--	--	--	--	--	--	195	0.0	A	0
Weekday Evening:												
Main Street EB LT/TH	--	--	--	--	--	--	--	--	427	0.0	A	0
Main Street WB TH/RT	--	--	--	--	--	--	--	--	729	0.0	A	0
Main Street at the East Project Site Roadway												
Weekday Morning:												
Main Street EB TH	--	--	--	--	--	--	--	--	880	0.0	A	0
Main Street WB TH	--	--	--	--	--	--	--	--	189	0.0	A	0
East Project Site Roadway SB LT/RT	--	--	--	--	--	--	--	--	22	20.9	C	1
Weekday Evening:												
Main Street EB TH	--	--	--	--	--	--	--	--	416	0.0	A	0
Main Street WB TH	--	--	--	--	--	--	--	--	710	0.0	A	0
East Project Site Roadway SB LT/RT	--	--	--	--	--	--	--	--	13	22.9	C	1

[a]Demand in vehicles per hour.
[b]Average control delay per vehicle (in seconds).
[c]Level-of-Service.
[d]Queue length in vehicles.
NB = northbound; SB = southbound; EB = eastbound; WB = westbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.

Table 5
SIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

Unsignalized Intersection/ Peak Hour/Movement	2018 Existing				2025 No-Build				2025 Build			
	V/C[a]	Delay[b]	LOS[c]	Queue[d] 50th/95th	V/C	Delay	LOS	Queue 50th/95th	V/C	Delay	LOS	Queue 50th/95th
Main Street at Church Street and Pine Street												
Weekday Morning:												
Main Street EB LT	0.11	4.9	A	1/2	0.12	4.8	A	1/2	0.12	4.8	A	1/2
Main Street EB TH/RT	0.64	8.6	A	3/8	0.66	8.8	A	4/20	0.66	8.8	A	4/20
Main Street WB LT	0.03	4.7	A	0/1	0.04	4.5	A	0/1	0.04	4.5	A	0/1
Main Street WB TH/RT	0.19	5.2	A	1/4	0.20	5.1	A	1/4	0.20	5.1	A	1/5
Pine Street NB LT/TH/RT	0.36	20.9	C	1/4	0.40	22.8	C	1/4	0.41	24.0	C	1/4
Church Street SB LT/TH/RT	0.35	20.7	C	1/4	0.39	22.6	C	1/4	0.41	23.8	C	1/4
Overall	--	**9.9**	**A**	--	--	**10.3**	**B**	--	--	**10.4**	**B**	--
Weekday Evening:												
Main Street EB LT	0.24	11.6	B	1/2	0.30	13.1	B	1/2	0.33	13.5	B	1/2
Main Street EB TH/RT	0.53	13.3	B	3/9	0.57	14.7	B	4/10	0.58	15.0	B	4/10
Main Street WB LT	0.04	10.1	B	0/1	0.05	10.9	B	0/1	0.05	10.9	B	0/1
Main Street WB TH/RT	0.71	17.2	B	5/13	0.77	20.3	C	5/14	0.79	21.1	C	6/15
Pine Street NB LT/TH/RT	0.56	15.8	B	3/11	0.58	16.5	B	3/12	0.58	16.8	B	3/12
Church Street SB LT/TH/RT	0.24	12.9	B	1/5	0.24	13.2	B	1/5	0.25	13.4	B	1/5
Overall	--	**15.1**	**B**	--	--	**16.9**	**B**	--	--	**17.4**	**B**	--

[a]Volume-to-capacity ratio.
[b]Percentile delay per vehicle in seconds.
[c]Level-of-Service.
[d]Queue length in vehicles.
NB = northbound; SB = southbound; EB = eastbound; WB = westbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.

ATTACHMENTS

PEER REVIEW COMMENT LETTER
MANUAL TURNING MOVEMENT COUNT DATA
SEASONAL ADJUSTMENT DATA
MASSDOT CRASH RATE WORKSHEETS
REVISED TRAFFIC-VOLUME NETWORKS
CAPACITY ANALYSIS WORKSHEETS

PEER REVIEW COMMENT LETTER

TEC
The Engineering Corp

146 Dascomb Road
Andover, MA 01810
978.794.1792

169 Ocean Blvd., Unit 101
PO Box 249
Hampton, NH 03842
603.601.8154

TheEngineeringCorp.com

Ms. Elizabeth Hughes
Town Planner
Town of Concord
141 Keyes Road
Concord, Massachusetts 01742

September 6, 2018

Ref. T0813

Re: Transportation Engineering Peer Review
1440 & 1450 Main Street – Concord, Massachusetts

Dear Ms. Hughes:

On behalf of the Town of Concord, TEC, Inc. (TEC) has reviewed documents as part of the transportation engineering peer review of a Site Plan Special Permit application for the proposed 1440 & 1450 Main Street residential development, referred to as "Center & Main," to be located along the northerly side of Main Street in West Concord, Massachusetts. The project consists of constructing 36 single-family homes; of which 34 units will be accessed/egressed by two new one-way driveways along the northerly side of Main Street (Route 62) and of which two (2) units will be accessed/egressed along Highland Street.

The following documents were received as part of our review:

- *Transportation Impact Assessment – Proposed Planned Residential Development – 1450 Main Street – Concord, Massachusetts*; prepared by Vanasse & Associates, Inc.; July 2018;
- *Center & Main – A Planned Residential Development – Concord, Massachusetts (Site Development Plans)*; prepared by Stamski and McNary, Inc.; July 11, 2018;
- *Representative Building Elevations and Floor Plans - Center & Main –Concord, Massachusetts*; prepared by MZO Group; July 2, 2018

TEC completed a review of these documents for the Town of Concord, and the following provides a summary of the comments that we compiled during our review:

Transportation Impact Assessment

1.) The Traffic Impact Assessment (TIA) presents a study area extending along Main Street from Conant Street to the west and Church Street to the east. Although operational characteristics of the intersection of Main Street at Highland Street are not projected to be significantly affected by the project, TEC requests that the Applicant provide documentation of the geometrics, sight distance, and traffic safety information for this intersection as it is directly impacted by residential units for the project. TEC does not intend that this comment include acquisition of additional traffic volumes.

2.) The intersection of Main Street at Commonwealth Avenue is currently under construction as part of a separate project. The project has the potential to contribute a new level of traffic volume to the intersection; however, as the intersection's reconstruction modifies the intersection layout to allow for Main Street westbound-to-eastbound to operate as the mainline (where Main Street westbound to Commonwealth Avenue previously operated as the mainline), all traffic to/from the project site is expected to be through movements. Therefore, TEC does not find that additional analysis of this intersection is warranted based on the documented trip generation levels. No response required.

3.) The TIA reports that June 2018 traffic counts were conducted while public schools were in session. The counts as conducted on June 19th and June 20th occurred following the end of the semester for seniors, following final exams, and during the Q5 period for Concord-Carlisle High School (CCHS), which indicates that traffic volumes in the vicinity may be lower than a typical school session. The Applicant should provide a sensitivity analysis which looks at a spot-traffic count at one of the major study area intersections and provide a comparison to the counts collected on June 19th and June 20th. The Applicant should revise the TIA, if applicable; accounting for any change in traffic volumes, adjusted to all TIA intersections, while school is in full session.

4.) The Applicant utilized no seasonal adjustment factor as June volumes in the vicinity are generally above average-month conditions. TEC concurs with this adjustment of traffic volumes. No response required.

5.) The Applicant has utilized a conservative travel speed along Main Street of 40 mph to assess operations and safety, including sight distance; which is greater than as measured by the Automatic Traffic Recorders (ATR). TEC concurs with this speed assessment. No response required.

6.) The safety analysis indicates the number, type, and severity of crashes at the study area intersections between 2011 and 2015. Upon review of the MassDOT's online crash portal, it appears that some crashes, although limited, may not be represented in the TIA for intersections in the study area. The Applicant should review the crash data for the study area intersections and update as necessary; including the potential to include 2016 data which is currently available from MassDOT. TEC notes that six (6) crashes at the study area intersections are noted for the year 2016. TEC also requests that crash analysis be conducted for the intersection of Main Street at Highland Street as noted in Comment #1.

7.) Upon review of the MassDOT's online crash portal and data provided, TEC concurs that there appears to be no identifiable crash issue and/or trend at the study area intersection. Although no specific crash trend exists, the Applicant should provide documentation of other traffic safety related issues/deficiencies at the intersections and subject roadways, if applicable.

8.) The Applicant utilized an annual growth adjustment factor of 1.0 percent per year based on stable volume rates reported from 2007 to 2017 as provided by MassDOT. TEC concurs with this adjustment of traffic volumes for annual growth. No response required.

9.) The Applicant has estimated the site generated trips based on the Institute of Transportation Engineers (ITE) industry standard publication *Trip Generation, 10th Edition* for Land Use Code (LUC) 210 – Single-Family Detached Housing. Although some housing on-site will consist of "attached" units, the use of LUC 210 provides a conservative assessment of the overall project. The development is anticipated to generate approximately 30 vehicle trips during the weekday morning peak hour and 36 vehicle trips during the weekday evening peak hour. TEC concurs with the methodology and results of the trip generation calculations.

10.) The project is in close proximity to the West Concord Massachusetts Bay Transportation Authority (MBTA) Commuter Rail Station. It is reasonable to assume that a percentage of site generated traffic would utilize the commuter rail, rather than personal vehicle travel during commuter hours and other portions of the day. The TIA does not take credit for the potential transit trips and therefore the projection of site generated traffic is conservative. TEC concurs with this trip generation calculation. No response required.

11.) In addition to the project being in close proximity to the West Concord MBTA Commuter Rail Station, the project is also within walking/biking distance to the retail and restaurants provided along Main Street and Commonwealth Avenue within West Concord Center. It is reasonable to assume that a percentage of site generated traffic would walk and/or bike, rather than personal vehicle travel during commuter hours and other portions of the day. The TIA does not take credit for the potential walking and biking trips and therefore the projection of site generated traffic is conservative. TEC concurs with this trip generation calculation. No response required.

12.) The vehicular traffic generated by the proposed project was distributed onto the adjacent roadway system based upon available Journey-to-Work data published by the US Census Bureau for persons residing in the Town of Concord. This form of trip distribution is consistent with industry standards for residential developments and therefore TEC concurs with the methodology. No response required.

13.) The Site Development Plans call for the project's driveways to be classified as an entry driveway and an egress driveway. This alignment would force all entering vehicles to utilize the one entry driveway and all exiting vehicles to utilize the one egress driveway. The TIA provides a proportional distribution of site generated trips to/from each of the driveways. This distribution should be modified to reflect the condition as shown in the Site Development Plans. This modification will only change operational analysis at the site driveways and will not change the results of the capacity and queue analysis at other study area intersections.

14.) There is a discrepancy between the 2018 Existing Traffic Volume Network and the capacity and queue analysis for the southbound right-turn movement from Conant Street to Main Street during the weekday evening peak hour. There are 104 vehicles per the network and 102 per the capacity and queue analysis. This parameter should be corrected.

15.) TEC does concur with the *Highway Capacity Manual 2010* (*HCM 2010*) methodology as presented in the development of the capacity and queue analysis results. The signalized intersection of Main Street / Pine Street / Church Street was reported however using

Synchro percentile queue / percentile delay methodology. The Applicant should correct this methodology although TEC agrees that this will have minimal effect on the result of the capacity and queue analysis.

16.) The comments as noted above may result in modifications to the results of the capacity and queue analysis and therefore TEC has not provided direct comment on the analysis as presented at this time. TEC reserves the right to provide additional comments upon completion of the peer review comment responses.

17.) Overall, TEC concurs that the general impact of the project on the control delay, queue, and level of service along the approaches to the study area intersections is anticipated to be nominal in terms of 'vehicular' traffic.

18.) As driveways are proposed along Highland Street, the Applicant should provide Intersection Sight Distance (ISD) and Stopping Sight Distance (SSD) information for the intersection with Main Street. The Applicant should provide any sight line mitigation as necessary.

19.) In concurrence with recommendations provided in the TIA, the Applicant should commit to remove and consistently maintain vegetation along the site frontage and at the intersection of Main Street / Highland Street, to ensure sight lines remain unobstructed at the site driveways as noted in the TIA. All new vegetation and site signage should be kept low to not impede sight lines to/from the project driveways and Highland Street. See Comment #36 for specific information regarding sight distance observations.

20.) The Applicant should provide a commitment to implement all transportation related recommendations identified in the TIA. Further discussion of these measures may be documented in the following Site Development Plans comment section.

21.) In addition to recommendations outlined in the TIA, the Applicant should consider upgrades to the accessible ramps and existing crossings at the intersections of Main Street / West Street and Main Street / Highland Street. These crossings will provide a direct path of travel for children of future residents to access the Thoreau Elementary School and provide the path of travel for residents to safely access the MBTA Commuter Rail Station and business district of West Concord; further lowering single occupancy vehicle trips.

Site Development Plans

22.) The TIA as provided by the Applicant notes that a school bus waiting area should be provided at an appropriate location in consultation with the Town. The Applicant should meet with the Town of Concord School Department and Department of Public Works to determine this location and provide detail information on the location and associated amenities within the Site Development Plans.

23.) The Applicant should provide turning templates showing the ability of refuse vehicles and Town of Concord fire apparatus to access, circulate, and egress the site through the circulation pattern of the internal private roadway without leaving the paved surface.

24.) The Site Development Plans do not appear to provide sufficient space along the private drive for a Town of Concord fire apparatus to turn around in the vicinity of buildings #27 / #28 and #13 / #14. Upon application of a turning template, should a fire apparatus not be able to complete a full U-turn, the Applicant should consider modifications at these points to further enlarge the roadway hammerheads as shown, and/or provide for a engineered pervious area beyond the asphalt to allow for complete turns.

25.) The Applicant should consider comments from the Concord Fire Department to install guidance / directional signage at the end of the entry driveway to denote the locations of street numbers to assist with resident location for fire safety.

26.) The Applicant should coordinate with the Town of Concord Fire Department for preferred locations of fire lanes (if needed), confirmation of hydrant locations, and sign requirements for fire lanes within the site. TEC does note that the current Site Development Plans as provided include locations for fire hydrants.

27.) The Town of Concord Road and Sidewalk Standard Details provide for a typical roadway cross-section with a minimum 22-foot pavement width. The Site Development Plans as provided depict a minimum roadway width of 22-feet in line with the standard detail. No response required.

28.) The Site Development Plans as provided depict an existing Town catch basin along the northerly side of Main Street in the middle of the proposed egress driveway location to Main Street. This creates the potential for existing stormwater ponding during rain/snow events to exist at the driveway opening. All water to this location is expected to be off-site related based on the stormwater infrastructure laid-out on-site. It is TEC's recommendation that the Applicant should consider a minor shift in the driveway location or provide for the relocation of the catch basin to remove it from the driveway opening. Note that should this be a low-point catch basin as opposed to a by-pass catch basin, the shift in driveway location would be a more feasible alternative.

29.) Section 7.7.2.1 of the Town of Concord Zoning Bylaw notes that minimum parking for a single- and two-family dwelling and planned residential development shall include "two (2) spaces per dwelling unit or one and one-half (1½) spaces per dwelling unit for subsidized low- and moderate-income housing or elderly housing developments." Upon inspection of the Representative Building Elevations and Floor Plans, all dwelling units appear to provide two indoor spaces and space for one outdoor parking stall at a minimum. TEC concurs that this bylaw is satisfied.

30.) The Site Development Plans as provided depict an on-site sidewalk network along one side of each roadway throughout parts of the Planned Residential Development. The Applicant should consider at a minimum the construction of sidewalk along one side of roadway throughout the entire project. This includes the entry and egress driveways, separate from the neighborhood park area, to provide connectivity to Main Street. The Applicant should further consider, if possible, the construction of sidewalk along both sides of each road in the development.

31.) The Applicant shall also provide further detail on the plan to the location and type of accessible ramps within the project and along the existing sidewalk across the driveways along Main Street. In addition, the construction details on Sheet 8 and Sheet 10 do not

provide detail for the several types of accessible ramps that may be needed throughout the site. Details for each ramp configuration type should be added to the Site Development Plans.

32.) The Applicant shall provide details within the plan to the type and material for crosswalk layout across the entry driveway and egress driveway, consistent with Town of Concord Standards and West Concord Master Plan recommendations. The Applicant should also provide similar detail, if different, to the type and material for crosswalk layout within the site.

33.) As the Site Development Plans depict two (2) dwelling units along Highland Street, the Applicant should consider providing sidewalk accommodations from the apex of Highland Street to Main Street along the frontage of the dwelling units. See Comment #21.

34.) It is reasonable to assume that operating speed along the internal private roadway would be 30 miles per hour (mph); however, TEC has assumed an operating speed of 25 mph to assess sight distance along the internal private roadway. The Site Development Plans as provided depict two (2) horizontal curvatures in the internal private roadway where the sight lines along the roadway are impeded and therefore do not attain a full 155-foot distance (25 mph) for at least one direction of travel:

- Horizontal curvature between approximately STA 1+25 and STA 3+50 on the easterly side of the site. Both direction sight lines are obstructed by building #22; and
- Horizontal curvature between approximately STA 2+50 and STA 4+25 on the westerly side of the site. Northbound travel sight lines are obstructed by building #16.

35.) The Site Development Plans as provided depict six (6) separate vertical curves located at PVI STA 0+25, STA 1+00, and STA 3+90 along the entry driveway and points east; as well as PVI STA 0+25, STA 1+50, and STA 4+00 along the egress driveway and points west, which are designed with K-values that are below the AASHTO minimum recommendations for sight distance along 30 mph roadways. Under as assumed 25 mph condition for the roadway, four (4) of these curves still are designed with K-values that are below the AASHTO minimum recommendations. The Applicant should consider an alternative grading design for these areas or the Applicant shall provide justification for each vertical curve location which is in conflict with AASHTO recommendations.

36.) There is currently no landscaping plan provided as part of the Site Development Plans. As these plans were not reviewed, TEC presents the following information:

- The Applicant has not denoted the trimming or removal of vegetation along Main Street at the entry driveway, egress driveway, or Highland Street. Upon field visitations, TEC has noted that the ISD from the proposed exit driveway looking west is approximately 375-feet; which is slightly lower than the 392-feet as reported in the TIA. TEC finds that this may be related to finite locations in the field and considers the difference negligible. Assuming all vegetation is maintained, or removed; all ISD and SSD will be greater than AASHTO minimum recommendations. The Applicant should commit to remove and consistently

maintain vegetation to ensure sight lines remain unobstructed at the site driveways as noted in the TIA. The Applicant should also revise the Site Development Plans to provide sight triangles and measurements at each project intersection adjacent to the entry driveway, egress driveway, or Highland Street. All new vegetation and site signage should be kept low to not impede sight lines to/from the project driveways and Highland Street.

- As no internal landscaping plan is provided, TEC cannot assess whether sight lines along the internal private roadway will be further obstructed as noted in Comment #34. Upon compilation of the landscaping plan, the Applicant should take note of these sensitive horizontal curves along the internal private roadway and ensure that a 155-feet sight line along the roadway is maintained (assumes 25 mph operating speed).

37.) The Site Development Plans as provided do not include information to individual lots within the site and the current lot ownership. With the several horizontal curves along the internal private roadway, many sight lines; although sufficient distance wise, cross over private property, or future private property. The Applicant shall discuss with the developer the potential for sight line easements, if needed, at these locations in order to maintain the sight lines where future vegetation and potential on-lot storage (say parking an RV) can be restricted.

38.) The Applicant shall provide a dedicated plan for all traffic signage and pavement markings to be installed as part of the project. A sign summary shall also be included which depicts the sign legend, sign size, and sign lettering dimensions in compliance with the Manual on Uniform Traffic Control Devices (MUTCD).

39.) The Applicant shall provide a dedicated plan for all snow storage to be designated as part of the project.

Please do not hesitate to contact me directly if you have any questions concerning our peer review at 978-794-1792. Thank you for your consideration.

Sincerely,
TEC, Inc.
*"The **E**ngineering **C**orporation"*

Samuel W. Gregorio, P.E., PTOE
Senior Traffic Engineer

CONCORD PUBLIC WORKS
ENGINEERING DIVISION

133 Keyes Road
Concord, MA 01742

Tel: 978 - 318 - 3210
Fax: 978 - 318 - 3245

DATE: 09/7/2018

MEMORANDUM

TO: **Elizabeth Hughes, Town Planner**
VIA: **Richard Reine, Director of Public Works**
VIA: **Christopher Olbrot, P.E., Town Engineer**
FROM: **Jacob Zwicker, Public Works Engineer**
SUBJECT: **1440 Main Street – Proposed Residential Development**

Engineering Division Comments:

The Engineering Division has reviewed the submitted materials and below is the additional comments/ recommendation to the TIA review for 1440 Main Street provided by TEC.

- Amend comment 15 of the peer review to the following:
  - TEC does concur with the Highway Capacity Manual 2010 (HCM 2010) methodology as presented in the development of the capacity and queue analysis results. The signalized intersection of Main Street / Pine Street / Church Street was reported however using Synchro percentile queue / percentile delay methodology. The Applicant should correct this methodology although TEC agrees that this will have minimal effect on the result of the capacity and queue analysis. CPW recommends that the methodology should be corrected, if the applicant revises the TIA to account for the changes in traffic volumes as a result of the sensitivity analysis recommended in comment #3.
- Amend comment 22 to the following:
  - The TIA as provided by the Applicant notes that a school bus waiting area should be provided at an appropriate location in consultation with the Town. CPW recommends that the Applicant should determine a location for a community bus stop within the PRD site and provide detailed information on the location and associated amenities within the Site Development Plans. The bus stop should be located at an area that will not impact the traffic patterns along Main Street and provide a safe environment for the children.
- In response to comment #28
  - CPW suggests removing the comment since we have no concerns with the catch basin being located within the driveway opening.

Additional Comments:

- CPW recommends that the Applicant shall accommodate the maneuvering and parking of commercial vehicles (e.g. landscape trucks, delivery trucks, etc) within the PRD site in order to prevent negative impacts on the traffic patterns along Main Street. The Site Development Plans shall be revised demonstrating these accommodations.
- CPW recommends that the Applicant provide notes within the site development plans to remove the existing driveway aprons to the site and install granite edging, grass strips, and continue the existing sidewalk.

Printed on 30% post consumer recycled paper

- CPW recommends that the applicant provide details of the driveway openings demonstrating that the proposed driveways are in conformance with the dimensional guidelines outlined in the CPW Driveway Permit Application.

- Following the submission of the storm water peer review for this project from the consultant, CPW may have additional comments pertaining to storm water.

Items Reviewed:

Plan Set entitled "Permit Site Plan: CENTER AND MAIN" prepared by Stamski and McNary, dated July 11, 2018.

Transportation Impact Assessment entitled "Proposed Planned Residential Development, 1450 Mains Street", prepared by Vanasse & Associates, INC, dated July 2018.

Transportation Engineering Peer Review, prepared by The Engineering Corp, dated August 30, 2018.

MANUAL TURNING MOVEMENT COUNT DATA

Accurate Counts

978-664-2565

N/S Street : Conant Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380001
Site Code : 77380001
Start Date : 9/27/2018
Page No : 1

Groups Printed- Cars - Trucks

	Conant St From North		Main St From East		Main St From West		
Start Time	Left	Right	Thru	Right	Left	Thru	Int. Total
07:00 AM	12	9	26	2	16	168	233
07:15 AM	9	17	36	4	22	169	257
07:30 AM	11	9	39	7	25	155	246
07:45 AM	22	13	51	6	20	187	299
Total	54	48	152	19	83	679	1035
08:00 AM	10	19	68	10	24	159	290
08:15 AM	14	18	58	8	27	191	316
08:30 AM	18	25	54	10	24	161	292
08:45 AM	15	17	75	20	41	133	301
Total	57	79	255	48	116	644	1199
Grand Total	111	127	407	67	199	1323	2234
Apprch %	46.6	53.4	85.9	14.1	13.1	86.9	
Total %	5	5.7	18.2	3	8.9	59.2	
Cars	106	123	380	65	198	1301	2173
% Cars	95.5	96.9	93.4	97	99.5	98.3	97.3
Trucks	5	4	27	2	1	22	61
% Trucks	4.5	3.1	6.6	3	0.5	1.7	2.7

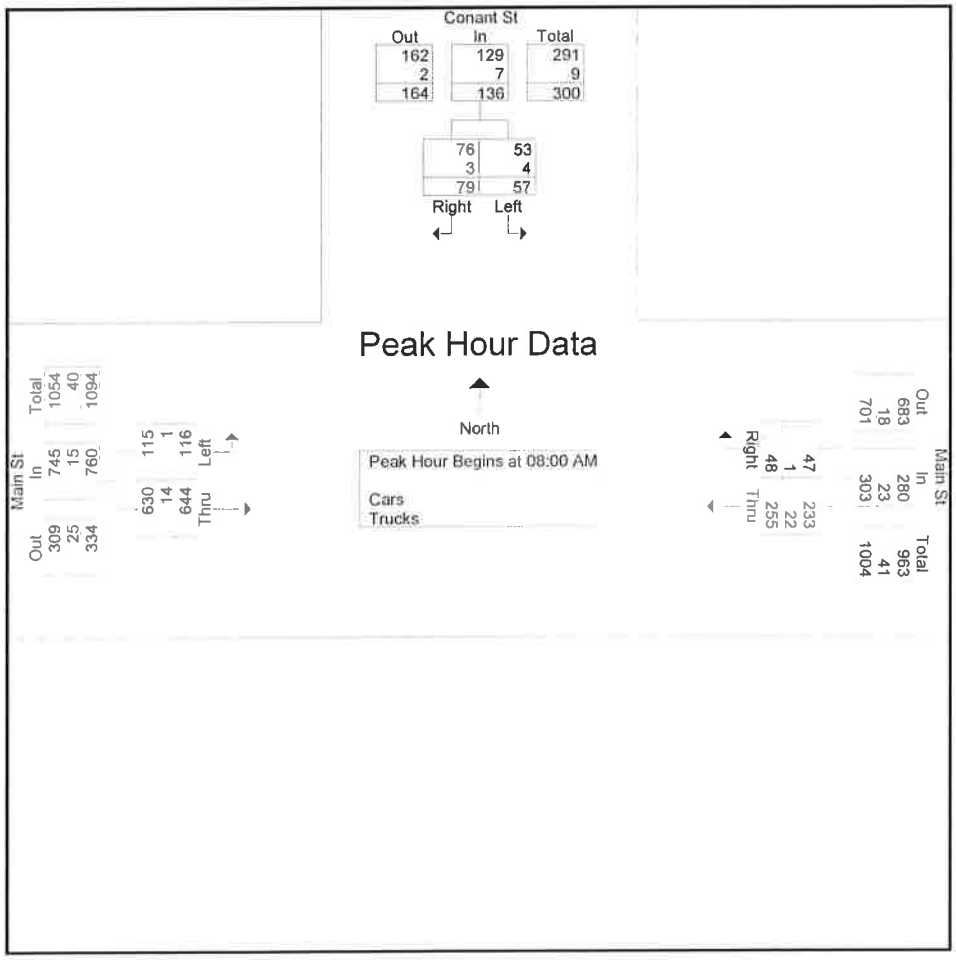
Accurate Counts

978-664-2565

N/S Street : Conant Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380001
Site Code : 77380001
Start Date : 9/27/2018
Page No : 2

	Conant St From North			Main St From East			Main St From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	10	19	29	68	10	78	24	159	183	290
08:15 AM	14	18	32	58	8	66	27	**191**	**218**	**316**
08:30 AM	**18**	**25**	**43**	54	10	64	24	161	185	292
08:45 AM	15	17	32	**75**	**20**	**95**	**41**	133	174	301
Total Volume	57	79	136	255	48	303	116	644	760	1199
% App. Total	41.9	58.1		84.2	15.8		15.3	84.7		
PHF	.792	.790	.791	.850	.600	.797	.707	.843	.872	.949
Cars	53	76	129	233	47	280	115	630	745	1154
% Cars	93.0	96.2	94.9	91.4	97.9	92.4	99.1	97.8	98.0	96.2
Trucks	4	3	7	22	1	23	1	14	15	45
% Trucks	7.0	3.8	5.1	8.6	2.1	7.6	0.9	2.2	2.0	3.8



Accurate Counts

978-664-2565

N/S Street : Conant Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380001
Site Code : 77380001
Start Date : 9/27/2018
Page No : 4

Groups Printed- Cars

	Conant St From North		Main St From East		Main St From West		
Start Time	Left	Right	Thru	Right	Left	Thru	Int. Total
07:00 AM	12	9	26	2	16	167	232
07:15 AM	9	17	34	4	22	166	252
07:30 AM	11	9	36	6	25	154	241
07:45 AM	21	12	51	6	20	184	294
Total	53	47	147	18	83	671	1019
08:00 AM	10	19	64	10	24	157	284
08:15 AM	14	17	50	7	27	187	302
08:30 AM	16	24	53	10	24	154	281
08:45 AM	13	16	66	20	40	132	287
Total	53	76	233	47	115	630	1154
Grand Total	106	123	380	65	198	1301	2173
Apprch %	46.3	53.7	85.4	14.6	13.2	86.8	
Total %	4.9	5.7	17.5	3	9.1	59.9	

Accurate Counts

978-664-2565

N/S Street : Conant Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380001
Site Code : 77380001
Start Date : 9/27/2018
Page No : 7

Groups Printed- Trucks

	Conant St From North		Main St From East		Main St From West		
Start Time	Left	Right	Thru	Right	Left	Thru	Int. Total
07:00 AM	0	0	0	0	0	1	1
07:15 AM	0	0	2	0	0	3	5
07:30 AM	0	0	3	1	0	1	5
07:45 AM	1	1	0	0	0	3	5
Total	1	1	5	1	0	8	16
08:00 AM	0	0	4	0	0	2	6
08:15 AM	0	1	8	1	0	4	14
08:30 AM	2	1	1	0	0	7	11
08:45 AM	2	1	9	0	1	1	14
Total	4	3	22	1	1	14	45
Grand Total	5	4	27	2	1	22	61
Apprch %	55.6	44.4	93.1	6.9	4.3	95.7	
Total %	8.2	6.6	44.3	3.3	1.6	36.1	

Accurate Counts

978-664-2565

N/S Street : Conant Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380001
Site Code : 77380001
Start Date : 9/27/2018
Page No : 10

Groups Printed- Bikes Peds

	Conant St From North			Main St From East			Main St From West					
Start Time	Left	Right	Peds	Thru	Right	Peds	Left	Thru	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	4	0	0	0	0	0	0	4	0	4
07:15 AM	0	0	3	0	0	0	0	2	4	7	2	9
07:30 AM	0	0	1	0	0	0	0	0	1	2	0	2
07:45 AM	0	0	4	0	0	0	0	0	2	6	0	6
Total	0	0	12	0	0	0	0	2	7	19	2	21
08:00 AM	0	0	3	1	0	0	0	0	1	4	1	5
08:15 AM	0	0	1	0	0	0	0	0	0	1	0	1
08:30 AM	0	0	2	0	0	0	0	1	0	2	1	3
08:45 AM	0	0	1	0	1	0	0	2	1	2	3	5
Total	0	0	7	1	1	0	0	3	2	9	5	14
Grand Total	0	0	19	1	1	0	0	5	9	28	7	35
Apprch %	0	0		50	50		0	100				
Total %	0	0		14.3	14.3		0	71.4		80	20	

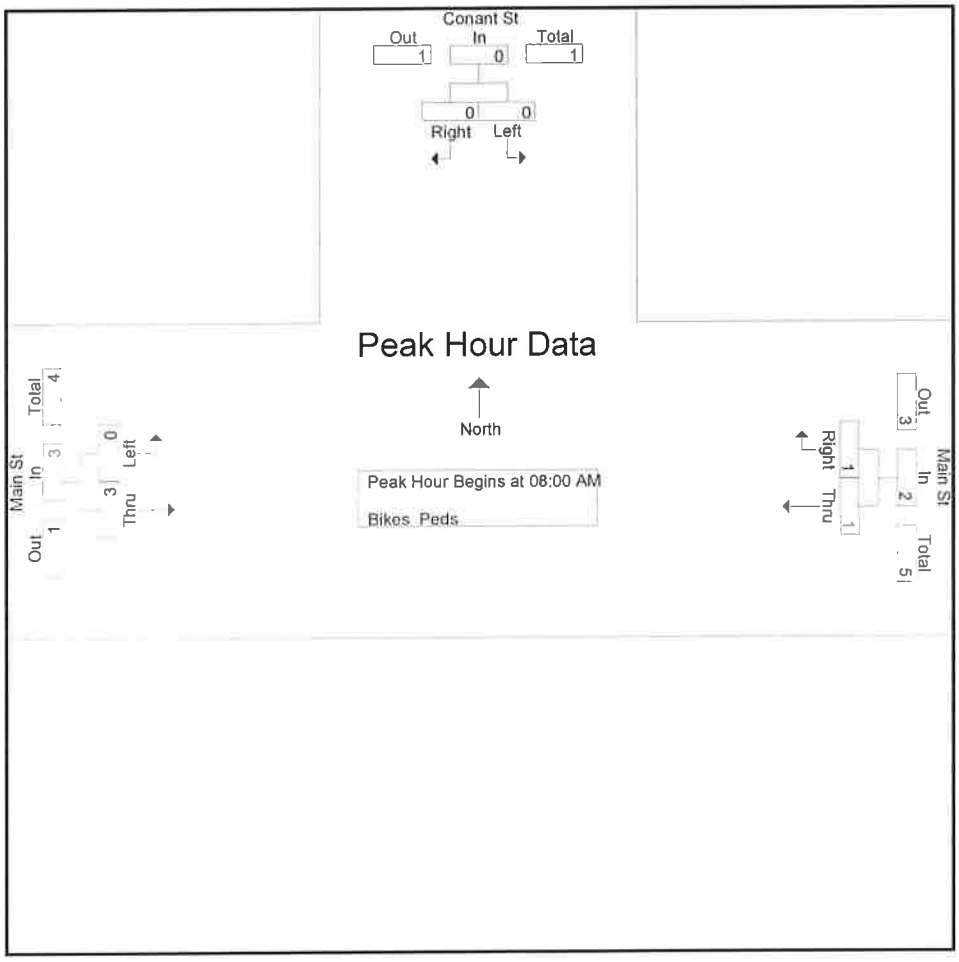
Accurate Counts

978-664-2565

N/S Street : Conant Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380001
Site Code : 77380001
Start Date : 9/27/2018
Page No : 11

	Conant St From North			Main St From East			Main St From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	0	0	0	**1**	0	**1**	0	0	0	1
08:15 AM	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	**1**	**1**	1
08:45 AM	0	0	0	0	**1**	1	0	**2**	**2**	**3**
Total Volume	0	0	0	1	1	2	0	3	3	5
% App. Total	0	0		50	50		0	100		
PHF	.000	.000	.000	.250	.250	.500	.000	.375	.375	.417



Accurate Counts

978-664-2565

N/S Street : Conant Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380001
Site Code : 77380001
Start Date : 9/27/2018
Page No : 1

Groups Printed- Cars - Trucks

	Conant St From North		Main St From East		Main St From West		
Start Time	Left	Right	Thru	Right	Left	Thru	Int. Total
04:00 PM	4	21	146	17	37	60	285
04:15 PM	7	24	137	14	39	85	306
04:30 PM	10	23	145	20	20	91	309
04:45 PM	9	22	121	22	28	75	277
Total	30	90	549	73	124	311	1177
05:00 PM	11	33	139	11	24	78	296
05:15 PM	5	25	149	14	29	65	287
05:30 PM	6	26	121	16	22	71	262
05:45 PM	9	34	149	9	22	73	296
Total	31	118	558	50	97	287	1141
Grand Total	61	208	1107	123	221	598	2318
Apprch %	22.7	77.3	90	10	27	73	
Total %	2.6	9	47.8	5.3	9.5	25.8	
Cars	61	206	1089	122	220	590	2288
% Cars	100	99	98.4	99.2	99.5	98.7	98.7
Trucks	0	2	18	1	1	8	30
% Trucks	0	1	1.6	0.8	0.5	1.3	1.3

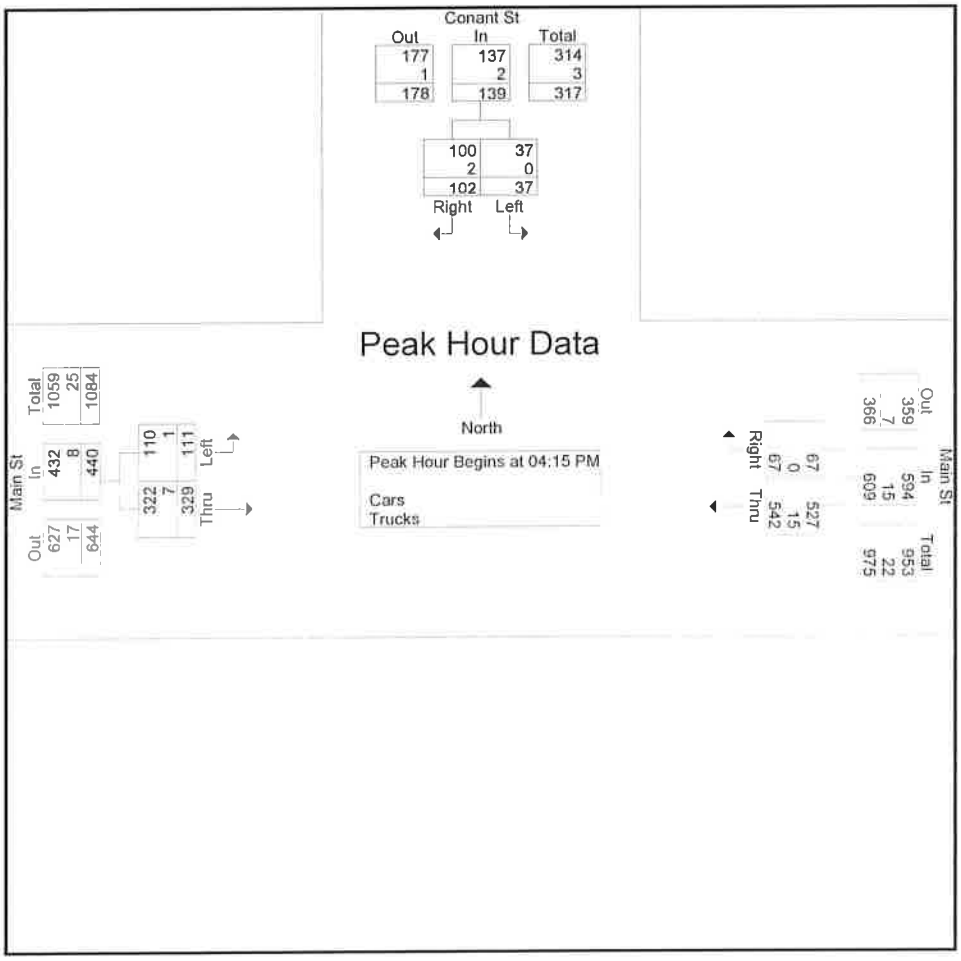
Accurate Counts

978-664-2565

N/S Street : Conant Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380001
Site Code : 77380001
Start Date : 9/27/2018
Page No : 2

	Conant St From North			Main St From East			Main St From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:15 PM										
04:15 PM	7	24	31	137	14	151	**39**	85	**124**	306
04:30 PM	10	23	33	**145**	20	**165**	20	**91**	111	**309**
04:45 PM	9	22	31	121	**22**	143	28	75	103	277
05:00 PM	**11**	**33**	**44**	139	11	150	24	78	102	296
Total Volume	37	102	139	542	67	609	111	329	440	1188
% App. Total	26.6	73.4		89	11		25.2	74.8		
PHF	.841	.773	.790	.934	.761	.923	.712	.904	.887	.961
Cars	37	100	137	527	67	594	110	322	432	1163
% Cars	100	98.0	98.6	97.2	100	97.5	99.1	97.9	98.2	97.9
Trucks	0	2	2	15	0	15	1	7	8	25
% Trucks	0	2.0	1.4	2.8	0	2.5	0.9	2.1	1.8	2.1



Accurate Counts

978-664-2565

N/S Street : Conant Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380001
Site Code : 77380001
Start Date : 9/27/2018
Page No : 4

Groups Printed- Cars

	Conant St From North		Main St From East		Main St From West		
Start Time	Left	Right	Thru	Right	Left	Thru	Int. Total
04:00 PM	4	21	143	17	37	59	281
04:15 PM	7	23	131	14	38	82	295
04:30 PM	10	22	142	20	20	91	305
04:45 PM	9	22	117	22	28	71	269
Total	30	88	533	73	123	303	1150
05:00 PM	11	33	137	11	24	78	294
05:15 PM	5	25	149	14	29	65	287
05:30 PM	6	26	121	16	22	71	262
05:45 PM	9	34	149	8	22	73	295
Total	31	118	556	49	97	287	1138
Grand Total	61	206	1089	122	220	590	2288
Apprch %	22.8	77.2	89.9	10.1	27.2	72.8	
Total %	2.7	9	47.6	5.3	9.6	25.8	

Accurate Counts

978-664-2565

N/S Street : Conant Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380001
Site Code : 77380001
Start Date : 9/27/2018
Page No : 7

Groups Printed- Trucks

	Conant St From North		Main St From East		Main St From West		
Start Time	Left	Right	Thru	Right	Left	Thru	Int. Total
04:00 PM	0	0	3	0	0	1	4
04:15 PM	0	1	6	0	1	3	11
04:30 PM	0	1	3	0	0	0	4
04:45 PM	0	0	4	0	0	4	8
Total	0	2	16	0	1	8	27
05:00 PM	0	0	2	0	0	0	2
05:15 PM	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0
05:45 PM	0	0	0	1	0	0	1
Total	0	0	2	1	0	0	3
Grand Total	0	2	18	1	1	8	30
Apprch %	0	100	94.7	5.3	11.1	88.9	
Total %	0	6.7	60	3.3	3.3	26.7	

Accurate Counts

978-664-2565

N/S Street : Conant Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380001
Site Code : 77380001
Start Date : 9/27/2018
Page No : 10

Groups Printed- Bikes Peds

	Conant St From North			Main St From East			Main St From West					
Start Time	Left	Right	Peds	Thru	Right	Peds	Left	Thru	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	0	0	1	0	0	0	0	0	0	1	1
04:15 PM	0	1	0	0	0	0	0	1	3	3	2	5
04:30 PM	0	0	3	1	0	0	0	0	0	3	1	4
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	3	2	0	0	0	1	3	6	4	10
05:00 PM	0	0	1	0	0	0	0	0	6	7	0	7
05:15 PM	0	0	0	1	0	0	0	2	0	0	3	3
05:30 PM	0	0	4	0	0	0	0	0	1	5	0	5
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	5	1	0	0	0	2	7	12	3	15
Grand Total	0	1	8	3	0	0	0	3	10	18	7	25
Apprch %	0	100		100	0		0	100				
Total %	0	14.3		42.9	0		0	42.9		72	28	

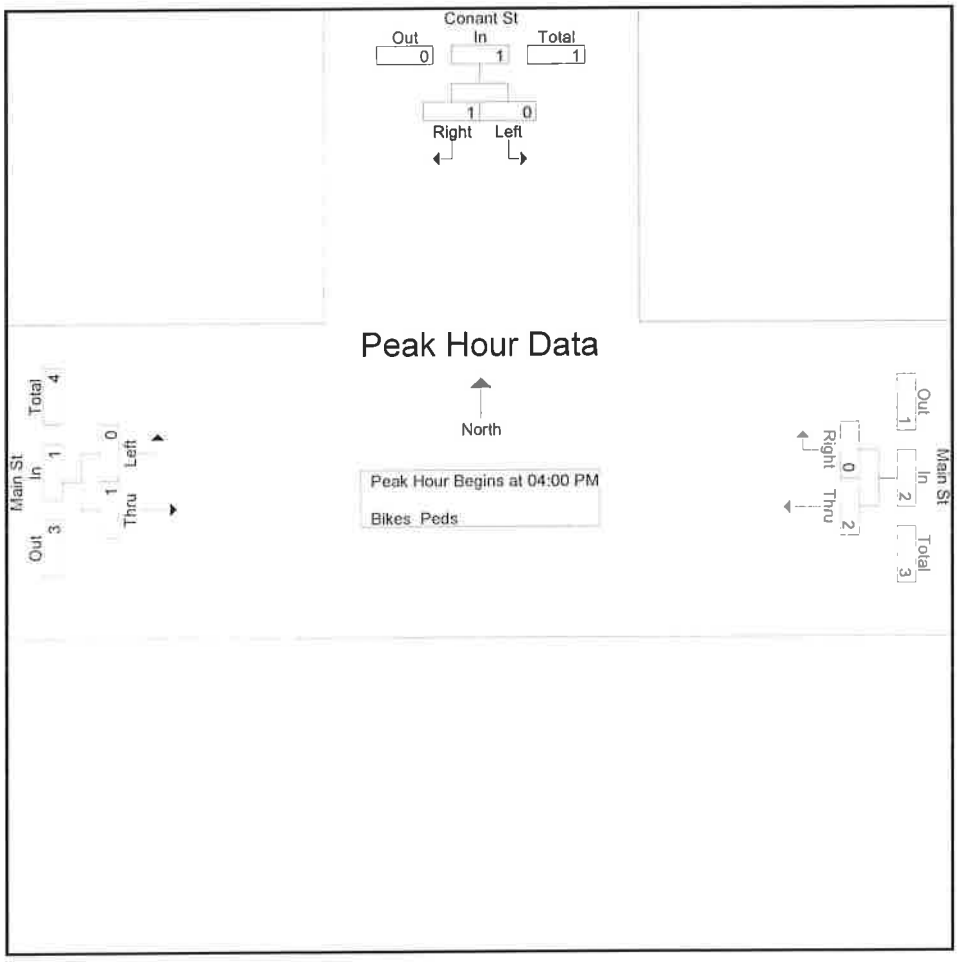
Accurate Counts

978-664-2565

N/S Street : Conant Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380001
Site Code : 77380001
Start Date : 9/27/2018
Page No : 11

	Conant St From North			Main St From East			Main St From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:00 PM										
04:00 PM	0	0	0	1	0	1	0	0	0	1
04:15 PM	0	1	1	0	0	0	0	1	1	2
04:30 PM	0	0	0	1	0	1	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	0	0
Total Volume	0	1	1	2	0	2	0	1	1	4
% App. Total	0	100		100	0		0	100		
PHF	.000	.250	.250	.500	.000	.500	.000	.250	.250	.500



Accurate Counts

978-664-2565

N/S Street : West Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380002
Site Code : 77380002
Start Date : 9/27/2018
Page No : 1

Groups Printed- Cars - Trucks

	Main St From East		West St From South		Main St From West		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
07:00 AM	1	26	0	1	145	28	201
07:15 AM	1	39	1	1	150	19	211
07:30 AM	2	40	2	2	140	28	214
07:45 AM	2	45	5	3	168	35	258
Total	6	150	8	7	603	110	884
08:00 AM	2	68	8	6	143	19	246
08:15 AM	4	56	5	2	178	28	273
08:30 AM	3	57	4	0	140	20	224
08:45 AM	6	76	14	2	120	23	241
Total	15	257	31	10	581	90	984
Grand Total	21	407	39	17	1184	200	1868
Apprch %	4.9	95.1	69.6	30.4	85.5	14.5	
Total %	1.1	21.8	2.1	0.9	63.4	10.7	
Cars	21	386	32	17	1167	197	1820
% Cars	100	94.8	82.1	100	98.6	98.5	97.4
Trucks	0	21	7	0	17	3	48
% Trucks	0	5.2	17.9	0	1.4	1.5	2.6

Accurate Counts

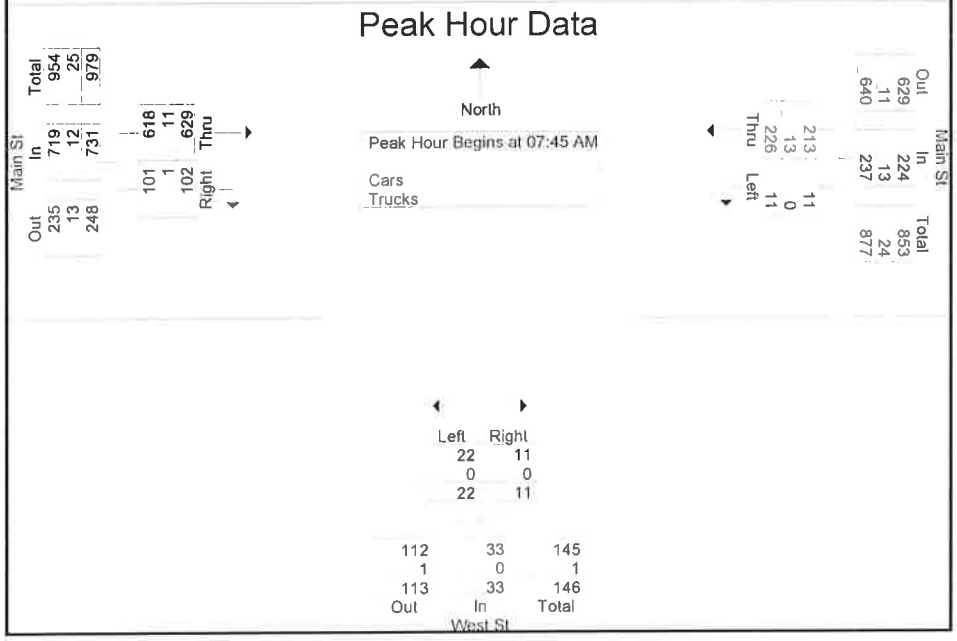
978-664-2565

N/S Street : West Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380002
Site Code : 77380002
Start Date : 9/27/2018
Page No : 2

	Main St From East			West St From South			Main St From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:45 AM										
07:45 AM	2	45	47	5	3	8	168	**35**	203	258
08:00 AM	2	**68**	**70**	**8**	**6**	**14**	143	19	162	246
08:15 AM	**4**	56	60	5	2	7	**178**	28	**206**	**273**
08:30 AM	3	57	60	4	0	4	140	20	160	224
Total Volume	11	226	237	22	11	33	629	102	731	1001
% App. Total	4.6	95.4		66.7	33.3		86	14		
PHF	.688	.831	.846	.688	.458	.589	.883	.729	.887	.917
Cars	11	213	224	22	11	33	618	101	719	976
% Cars	100	94.2	94.5	100	100	100	98.3	99.0	98.4	97.5
Trucks	0	13	13	0	0	0	11	1	12	25
% Trucks	0	5.8	5.5	0	0	0	1.7	1.0	1.6	2.5

Peak Hour Data



Accurate Counts

978-664-2565

N/S Street : West Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380002
Site Code : 77380002
Start Date : 9/27/2018
Page No : 4

Groups Printed- Cars

	Main St From East		West St From South		Main St From West		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
07:00 AM	1	26	0	1	144	28	200
07:15 AM	1	35	1	1	147	19	204
07:30 AM	2	38	2	2	139	28	211
07:45 AM	2	45	5	3	167	34	256
Total	6	144	8	7	597	109	871
08:00 AM	2	63	8	6	141	19	239
08:15 AM	4	49	5	2	175	28	263
08:30 AM	3	56	4	0	135	20	218
08:45 AM	6	74	7	2	119	21	229
Total	15	242	24	10	570	88	949
Grand Total	21	386	32	17	1167	197	1820
Apprch %	5.2	94.8	65.3	34.7	85.6	14.4	
Total %	1.2	21.2	1.8	0.9	64.1	10.8	

Accurate Counts

978-664-2565

N/S Street : West Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380002
Site Code : 77380002
Start Date : 9/27/2018
Page No : 7

Groups Printed- Trucks

	Main St From East		West St From South		Main St From West		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
07:00 AM	0	0	0	0	1	0	1
07:15 AM	0	4	0	0	3	0	7
07:30 AM	0	2	0	0	1	0	3
07:45 AM	0	0	0	0	1	1	2
Total	0	6	0	0	6	1	13
08:00 AM	0	5	0	0	2	0	7
08:15 AM	0	7	0	0	3	0	10
08:30 AM	0	1	0	0	5	0	6
08:45 AM	0	2	7	0	1	2	12
Total	0	15	7	0	11	2	35
Grand Total	0	21	7	0	17	3	48
Apprch %	0	100	100	0	85	15	
Total %	0	43.8	14.6	0	35.4	6.2	

Accurate Counts

978-664-2565

N/S Street : West Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380002
Site Code : 77380002
Start Date : 9/27/2018
Page No : 10

Groups Printed- Bikes Peds

	Main St From East			West St From South			Main St From West					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	3	0	0	1	1	0	0	4	1	5
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	2	0	0	1	0	0	0	3	0	3
Total	0	0	5	0	0	2	1	0	0	7	1	8
08:00 AM	0	1	3	0	0	1	0	0	0	4	1	5
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	13	0	0	4	0	0	0	17	0	17
08:45 AM	0	1	9	0	0	0	1	0	0	9	2	11
Total	0	2	25	0	0	5	1	0	0	30	3	33
Grand Total	0	2	30	0	0	7	2	0	0	37	4	41
Apprch %	0	100		0	0		100	0				
Total %	0	50		0	0		50	0		90.2	9.8	

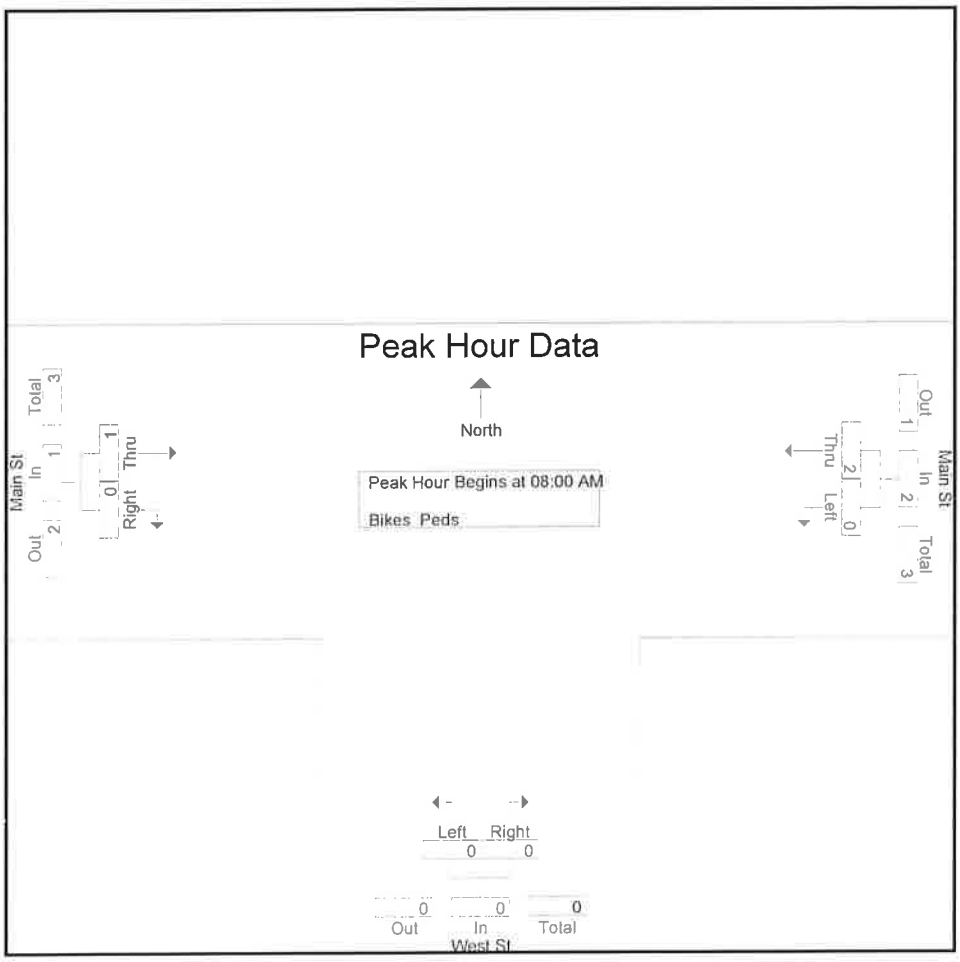
Accurate Counts

978-664-2565

N/S Street : West Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380002
Site Code : 77380002
Start Date : 9/27/2018
Page No : 11

	Main St From East			West St From South			Main St From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	0	1	1	0	0	0	0	0	0	1
08:15 AM	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	1	1	0	0	0	1	0	1	2
Total Volume	0	2	2	0	0	0	1	0	1	3
% App. Total	0	100		0	0		100	0		
PHF	.000	.500	.500	.000	.000	.000	.250	.000	.250	.375



Accurate Counts

978-664-2565

N/S Street : West Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380002
Site Code : 77380002
Start Date : 9/27/2018
Page No : 1

Groups Printed- Cars - Trucks

	Main St From East		West St From South		Main St From West		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
04:00 PM	2	149	9	2	75	2	239
04:15 PM	0	135	15	0	83	9	242
04:30 PM	6	150	15	4	94	3	272
04:45 PM	3	126	14	1	84	4	232
Total	11	560	53	7	336	18	985
05:00 PM	2	138	13	2	82	4	241
05:15 PM	2	151	14	2	67	4	240
05:30 PM	5	126	9	0	72	2	214
05:45 PM	2	145	11	5	79	3	245
Total	11	560	47	9	300	13	940
Grand Total	22	1120	100	16	636	31	1925
Apprch %	1.9	98.1	86.2	13.8	95.4	4.6	
Total %	1.1	58.2	5.2	0.8	33	1.6	
Cars	22	1099	100	16	625	30	1892
% Cars	100	98.1	100	100	98.3	96.8	98.3
Trucks	0	21	0	0	11	1	33
% Trucks	0	1.9	0	0	1.7	3.2	1.7

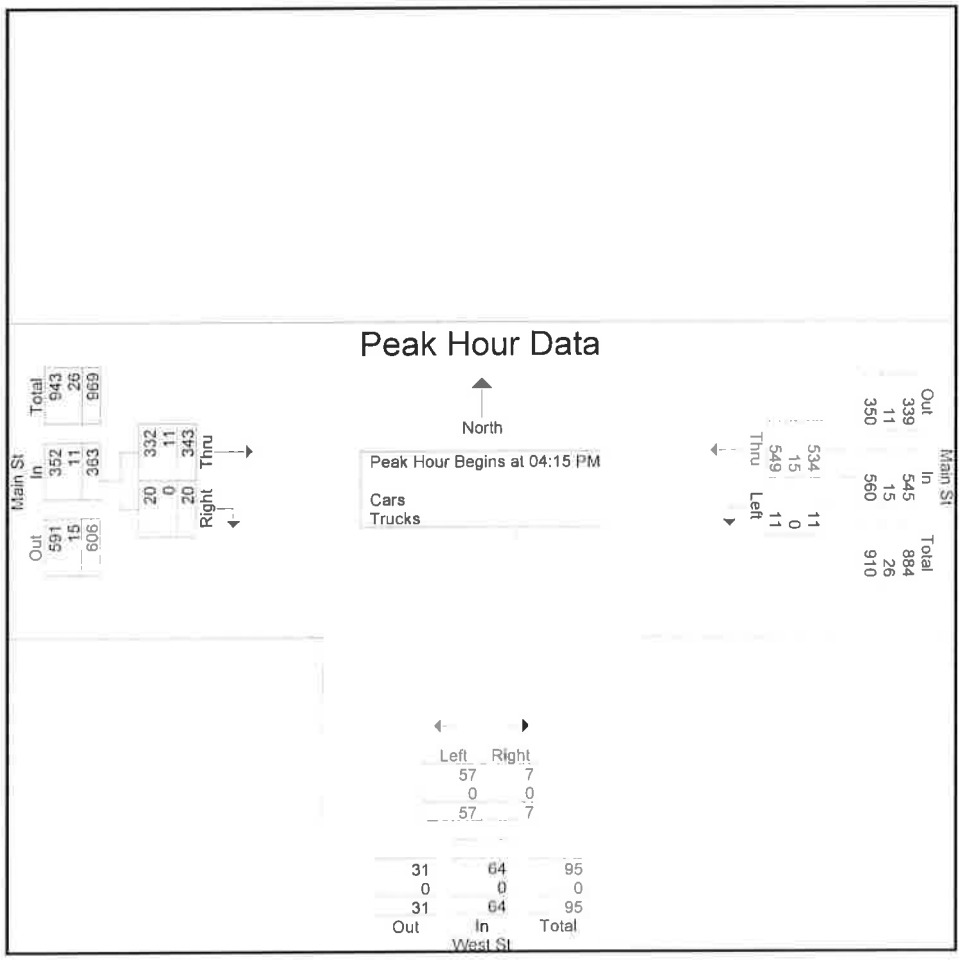
Accurate Counts

978-664-2565

N/S Street : West Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380002
Site Code : 77380002
Start Date : 9/27/2018
Page No : 2

	Main St From East			West St From South			Main St From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:15 PM										
04:15 PM	0	135	135	**15**	0	15	83	**9**	92	242
04:30 PM	**6**	**150**	**156**	15	**4**	**19**	**94**	3	**97**	**272**
04:45 PM	3	126	129	14	1	15	84	4	88	232
05:00 PM	2	138	140	13	2	15	82	4	86	241
Total Volume	11	549	560	57	7	64	343	20	363	987
% App. Total	2	98		89.1	10.9		94.5	5.5		
PHF	.458	.915	.897	.950	.438	.842	.912	.556	.936	.907
Cars	11	534	545	57	7	64	332	20	352	961
% Cars	100	97.3	97.3	100	100	100	96.8	100	97.0	97.4
Trucks	0	15	15	0	0	0	11	0	11	26
% Trucks	0	2.7	2.7	0	0	0	3.2	0	3.0	2.6



Accurate Counts

978-664-2565

N/S Street : West Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380002
Site Code : 77380002
Start Date : 9/27/2018
Page No : 4

Groups Printed- Cars

	Main St From East		West St From South		Main St From West		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
04:00 PM	2	146	9	2	75	1	235
04:15 PM	0	130	15	0	77	9	231
04:30 PM	6	147	15	4	94	3	269
04:45 PM	3	121	14	1	79	4	222
Total	11	544	53	7	325	17	957
05:00 PM	2	136	13	2	82	4	239
05:15 PM	2	150	14	2	67	4	239
05:30 PM	5	125	9	0	72	2	213
05:45 PM	2	144	11	5	79	3	244
Total	11	555	47	9	300	13	935
Grand Total	22	1099	100	16	625	30	1892
Apprch %	2	98	86.2	13.8	95.4	4.6	
Total %	1.2	58.1	5.3	0.8	33	1.6	

Accurate Counts

978-664-2565

N/S Street : West Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380002
Site Code : 77380002
Start Date : 9/27/2018
Page No : 7

Groups Printed- Trucks

	Main St From East		West St From South		Main St From West		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
04:00 PM	0	3	0	0	0	1	4
04:15 PM	0	5	0	0	6	0	11
04:30 PM	0	3	0	0	0	0	3
04:45 PM	0	5	0	0	5	0	10
Total	0	16	0	0	11	1	28
05:00 PM	0	2	0	0	0	0	2
05:15 PM	0	1	0	0	0	0	1
05:30 PM	0	1	0	0	0	0	1
05:45 PM	0	1	0	0	0	0	1
Total	0	5	0	0	0	0	5
Grand Total	0	21	0	0	11	1	33
Apprch %	0	100	0	0	91.7	8.3	
Total %	0	63.6	0	0	33.3	3	

Accurate Counts

978-664-2565

N/S Street : West Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380002
Site Code : 77380002
Start Date : 9/27/2018
Page No : 10

Groups Printed- Bikes Peds

	Main St From East			West St From South			Main St From West					
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	2	1	0	0	2	1	3
04:30 PM	0	1	0	0	0	0	0	0	0	0	1	1
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	2	1	0	0	2	2	4
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	1	0	0	0	0	2	0	0	0	3	3
05:30 PM	0	0	2	0	0	0	0	0	0	2	0	2
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	2	0	0	0	2	0	0	2	3	5
Grand Total	0	2	2	0	0	2	3	0	0	4	5	9
Apprch %	0	100		0	0		100	0				
Total %	0	40		0	0		60	0		44.4	55.6	

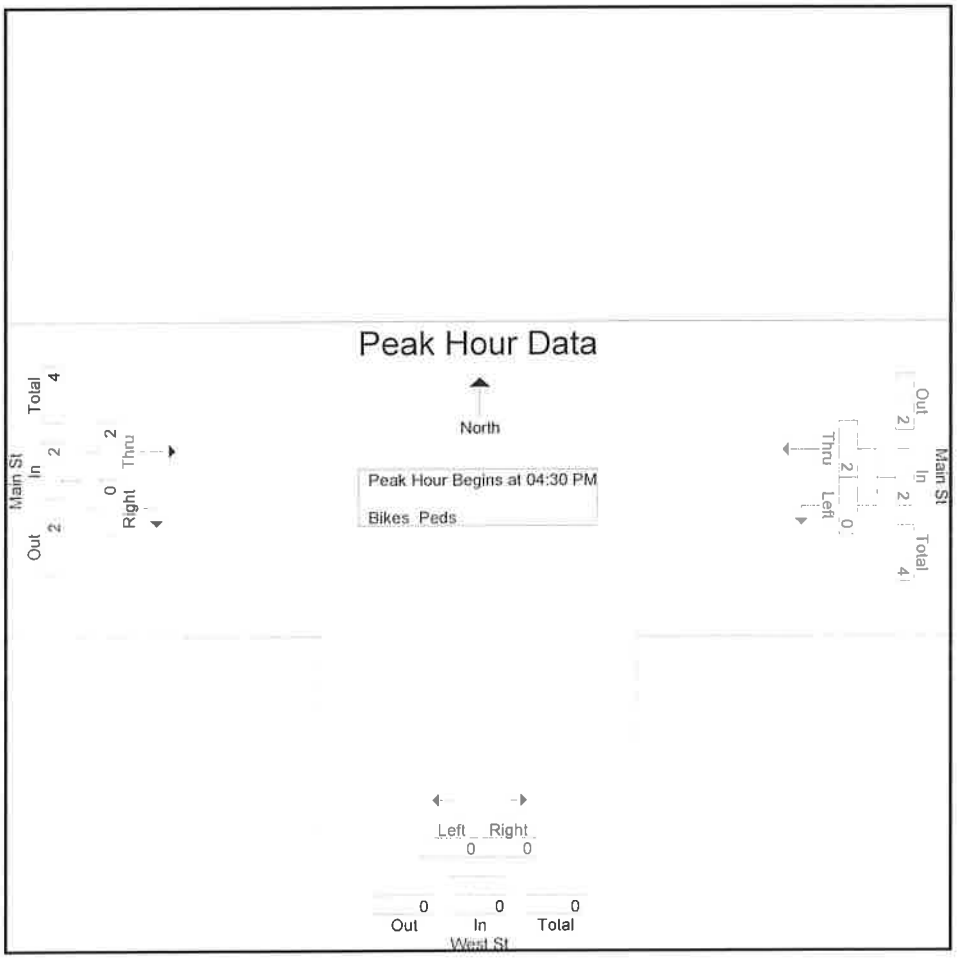
Accurate Counts

978-664-2565

N/S Street : West Street
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380002
Site Code : 77380002
Start Date : 9/27/2018
Page No : 11

	Main St From East			West St From South			Main St From West			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	0	**1**	**1**	0	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	1	1	0	0	0	**2**	0	**2**	**3**
Total Volume	0	2	2	0	0	0	2	0	2	4
% App. Total	0	100		0	0		100	0		
PHF	.000	.500	.500	.000	.000	.000	.250	.000	.250	.333



Accurate Counts

978-664-2565

N/S Street : Church St / Pine St
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380003
Site Code : 77380003
Start Date : 9/27/2018
Page No : 1

Groups Printed- Cars - Trucks

	Church St From North			Main St From East			Pine St From South			Main St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	2	16	1	0	25	5	2	1	0	7	133	24	216
07:15 AM	1	11	4	1	31	1	3	5	1	15	91	20	184
07:30 AM	2	13	2	2	28	1	5	18	0	7	120	10	208
07:45 AM	3	15	1	3	35	0	2	9	1	12	149	12	242
Total	8	55	8	6	119	7	12	33	2	41	493	66	850
08:00 AM	0	14	6	2	56	1	8	28	6	12	118	15	266
08:15 AM	5	26	4	0	55	3	7	13	4	13	138	17	285
08:30 AM	5	25	10	2	47	9	2	9	4	22	116	12	263
08:45 AM	8	21	8	2	57	8	15	21	3	17	114	10	284
Total	18	86	28	6	215	21	32	71	17	64	486	54	1098
Grand Total	26	141	36	12	334	28	44	104	19	105	979	120	1948
Apprch %	12.8	69.5	17.7	3.2	89.3	7.5	26.3	62.3	11.4	8.7	81.3	10	
Total %	1.3	7.2	1.8	0.6	17.1	1.4	2.3	5.3	1	5.4	50.3	6.2	
Cars	25	138	35	12	318	25	43	102	19	104	966	118	1905
% Cars	96.2	97.9	97.2	100	95.2	89.3	97.7	98.1	100	99	98.7	98.3	97.8
Trucks	1	3	1	0	16	3	1	2	0	1	13	2	43
% Trucks	3.8	2.1	2.8	0	4.8	10.7	2.3	1.9	0	1	1.3	1.7	2.2

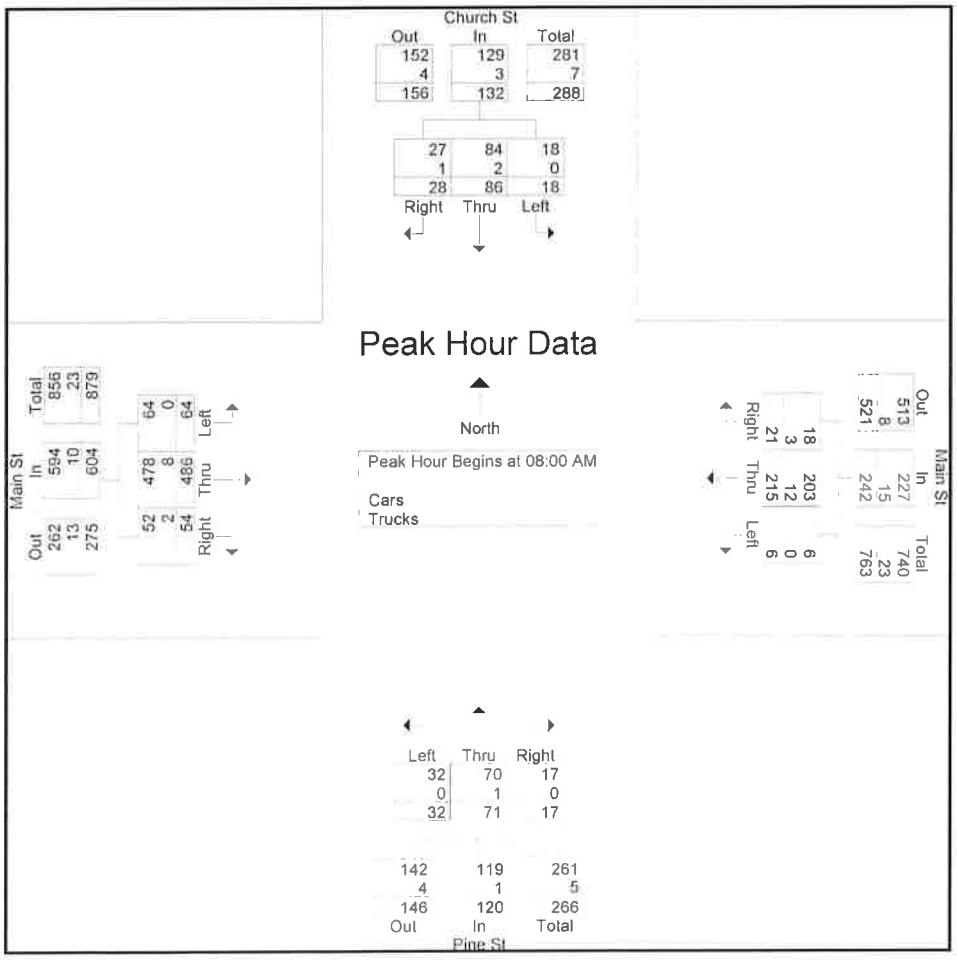
Accurate Counts

978-664-2565

N/S Street : Church St / Pine St
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380003
Site Code : 77380003
Start Date : 9/27/2018
Page No : 2

	Church St From North				Main St From East				Pine St From South				Main St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	14	6	20	**2**	56	1	59	8	**28**	**6**	**42**	12	118	15	145	266
08:15 AM	5	**26**	4	35	0	55	3	58	7	13	4	24	13	**138**	**17**	**168**	**285**
08:30 AM	5	25	**10**	**40**	2	47	**9**	58	2	9	4	15	**22**	116	12	150	263
08:45 AM	**8**	21	8	37	2	**57**	8	**67**	**15**	21	3	39	17	114	10	141	284
Total Volume	18	86	28	132	6	215	21	242	32	71	17	120	64	486	54	604	1098
% App. Total	13.6	65.2	21.2		2.5	88.8	8.7		26.7	59.2	14.2		10.6	80.5	8.9		
PHF	.563	.827	.700	.825	.750	.943	.583	.903	.533	.634	.708	.714	.727	.880	.794	.899	.963
Cars	18	84	27	129	6	203	18	227	32	70	17	119	64	478	52	594	1069
% Cars	100	97.7	96.4	97.7	100	94.4	85.7	93.8	100	98.6	100	99.2	100	98.4	96.3	98.3	97.4
Trucks	0	2	1	3	0	12	3	15	0	1	0	1	0	8	2	10	29
% Trucks	0	2.3	3.6	2.3	0	5.6	14.3	6.2	0	1.4	0	0.8	0	1.6	3.7	1.7	2.6



Accurate Counts

978-664-2565

N/S Street : Church St / Pine St
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380003
Site Code : 77380003
Start Date : 9/27/2018
Page No : 4

Groups Printed- Cars

	Church St From North			Main St From East			Pine St From South			Main St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	2	16	1	0	25	5	2	1	0	6	132	24	214
07:15 AM	1	10	4	1	29	1	2	5	1	15	90	20	179
07:30 AM	1	13	2	2	26	1	5	17	0	7	117	10	201
07:45 AM	3	15	1	3	35	0	2	9	1	12	149	12	242
Total	7	54	8	6	115	7	11	32	2	40	488	66	836
08:00 AM	0	14	5	2	53	1	8	27	6	12	116	15	259
08:15 AM	5	25	4	0	50	3	7	13	4	13	136	17	277
08:30 AM	5	24	10	2	44	8	2	9	4	22	115	10	255
08:45 AM	8	21	8	2	56	6	15	21	3	17	111	10	278
Total	18	84	27	6	203	18	32	70	17	64	478	52	1069
Grand Total	25	138	35	12	318	25	43	102	19	104	966	118	1905
Apprch %	12.6	69.7	17.7	3.4	89.6	7	26.2	62.2	11.6	8.8	81.3	9.9	
Total %	1.3	7.2	1.8	0.6	16.7	1.3	2.3	5.4	1	5.5	50.7	6.2	

Accurate Counts

978-664-2565

N/S Street : Church St / Pine St
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380003
Site Code : 77380003
Start Date : 9/27/2018
Page No : 7

Groups Printed- Trucks

	Church St From North			Main St From East			Pine St From South			Main St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	1	1	0	2
07:15 AM	0	1	0	0	2	0	1	0	0	0	1	0	5
07:30 AM	1	0	0	0	2	0	0	1	0	0	3	0	7
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	1	0	0	4	0	1	1	0	1	5	0	14
08:00 AM	0	0	1	0	3	0	0	1	0	0	2	0	7
08:15 AM	0	1	0	0	5	0	0	0	0	0	2	0	8
08:30 AM	0	1	0	0	3	1	0	0	0	0	1	2	8
08:45 AM	0	0	0	0	1	2	0	0	0	0	3	0	6
Total	0	2	1	0	12	3	0	1	0	0	8	2	29
Grand Total	1	3	1	0	16	3	1	2	0	1	13	2	43
Apprch %	20	60	20	0	84.2	15.8	33.3	66.7	0	6.2	81.2	12.5	
Total %	2.3	7	2.3	0	37.2	7	2.3	4.7	0	2.3	30.2	4.7	

Accurate Counts

978-664-2565

N/S Street : Church St / Pine St
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380003
Site Code : 77380003
Start Date : 9/27/2018
Page No : 10

Groups Printed- Bikes Peds

	Church St From North				Main St From East				Pine St From South				Main St From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
07:15 AM	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	4	7	0	7
07:30 AM	0	1	0	3	0	0	0	2	0	0	0	1	0	1	0	1	7	2	9
07:45 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1
Total	0	1	0	6	0	0	0	4	0	0	0	1	0	1	0	5	16	2	18
08:00 AM	0	0	0	0	0	1	0	5	0	0	0	2	1	0	0	2	9	2	11
08:15 AM	0	0	0	0	0	0	0	4	0	1	0	0	0	0	0	1	5	1	6
08:30 AM	0	0	0	2	0	0	0	14	0	0	0	3	0	0	0	1	20	0	20
08:45 AM	0	0	0	3	0	0	0	1	1	0	0	0	0	2	0	2	6	3	9
Total	0	0	0	5	0	1	0	24	1	1	0	5	1	2	0	6	40	6	46
Grand Total	0	1	0	11	0	1	0	28	1	1	0	6	1	3	0	11	56	8	64
Apprch %	0	100	0		0	100	0		50	50	0		25	75	0				
Total %	0	12.5	0		0	12.5	0		12.5	12.5	0		12.5	37.5	0		87.5	12.5	

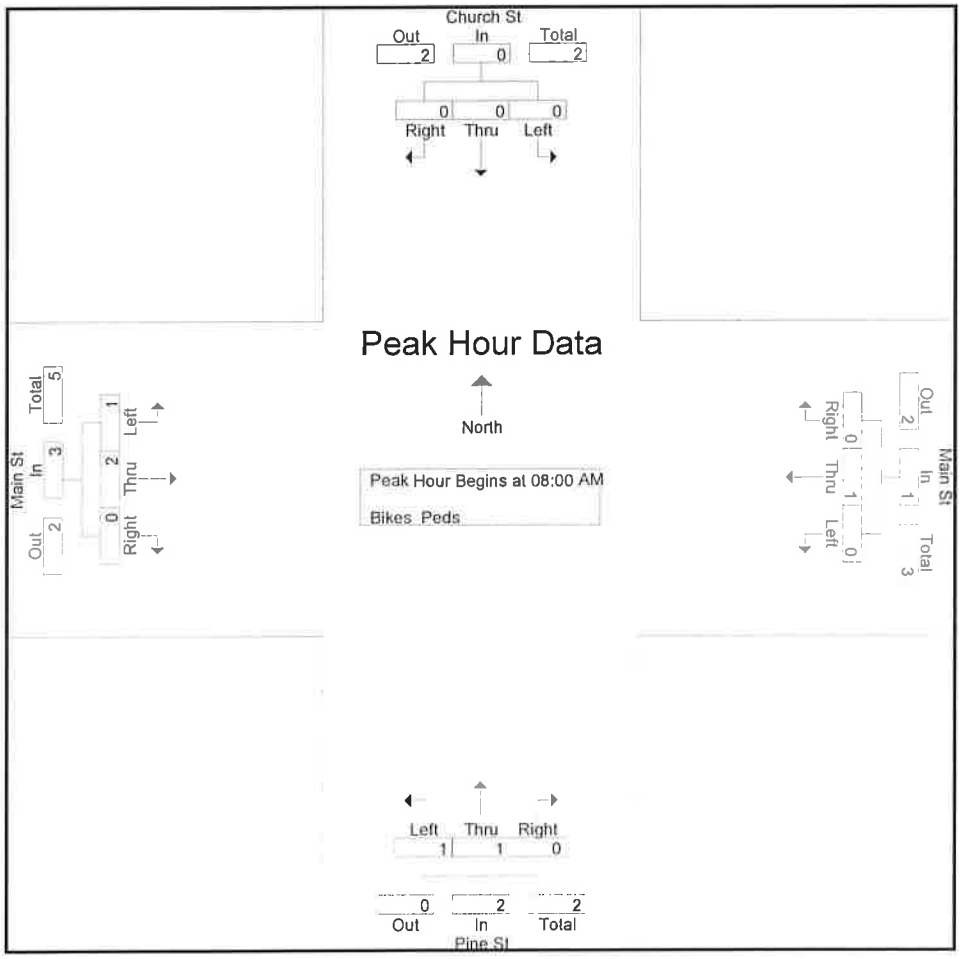
Accurate Counts

978-664-2565

N/S Street : Church St / Pine St
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380003
Site Code : 77380003
Start Date : 9/27/2018
Page No : 11

	Church St From North				Main St From East				Pine St From South				Main St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	1	2
08:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	2	0	2	3
Total Volume	0	0	0	0	0	1	0	1	1	1	0	2	1	2	0	3	6
% App. Total	0	0	0		0	100	0		50	50	0		33.3	66.7	0		
PHF	.000	.000	.000	.000	.000	.250	.000	.250	.250	.250	.000	.500	.250	.250	.000	.375	.500



Accurate Counts

978-664-2565

N/S Street : Church St / Pine St
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380003
Site Code : 77380003
Start Date : 9/27/2018
Page No : 1

Groups Printed- Cars - Trucks

	Church St From North			Main St From East			Pine St From South			Main St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	15	18	20	2	89	10	22	27	3	12	62	3	283
04:15 PM	13	22	15	0	114	6	29	39	2	3	63	2	308
04:30 PM	5	13	10	3	119	7	24	29	5	17	87	2	321
04:45 PM	11	15	7	2	81	6	28	33	1	10	72	2	268
Total	44	68	52	7	403	29	103	128	11	42	284	9	1180
05:00 PM	4	18	13	3	85	11	36	43	3	12	70	3	301
05:15 PM	3	17	12	2	128	5	25	43	2	10	67	4	318
05:30 PM	5	20	20	1	81	2	32	43	1	6	54	5	270
05:45 PM	7	23	12	7	106	6	22	42	1	8	72	4	310
Total	19	78	57	13	400	24	115	171	7	36	263	16	1199
Grand Total	63	146	109	20	803	53	218	299	18	78	547	25	2379
Apprch %	19.8	45.9	34.3	2.3	91.7	6.1	40.7	55.9	3.4	12	84.2	3.8	
Total %	2.6	6.1	4.6	0.8	33.8	2.2	9.2	12.6	0.8	3.3	23	1.1	
Cars	63	146	107	20	788	52	217	299	18	76	542	25	2353
% Cars	100	100	98.2	100	98.1	98.1	99.5	100	100	97.4	99.1	100	98.9
Trucks	0	0	2	0	15	1	1	0	0	2	5	0	26
% Trucks	0	0	1.8	0	1.9	1.9	0.5	0	0	2.6	0.9	0	1.1

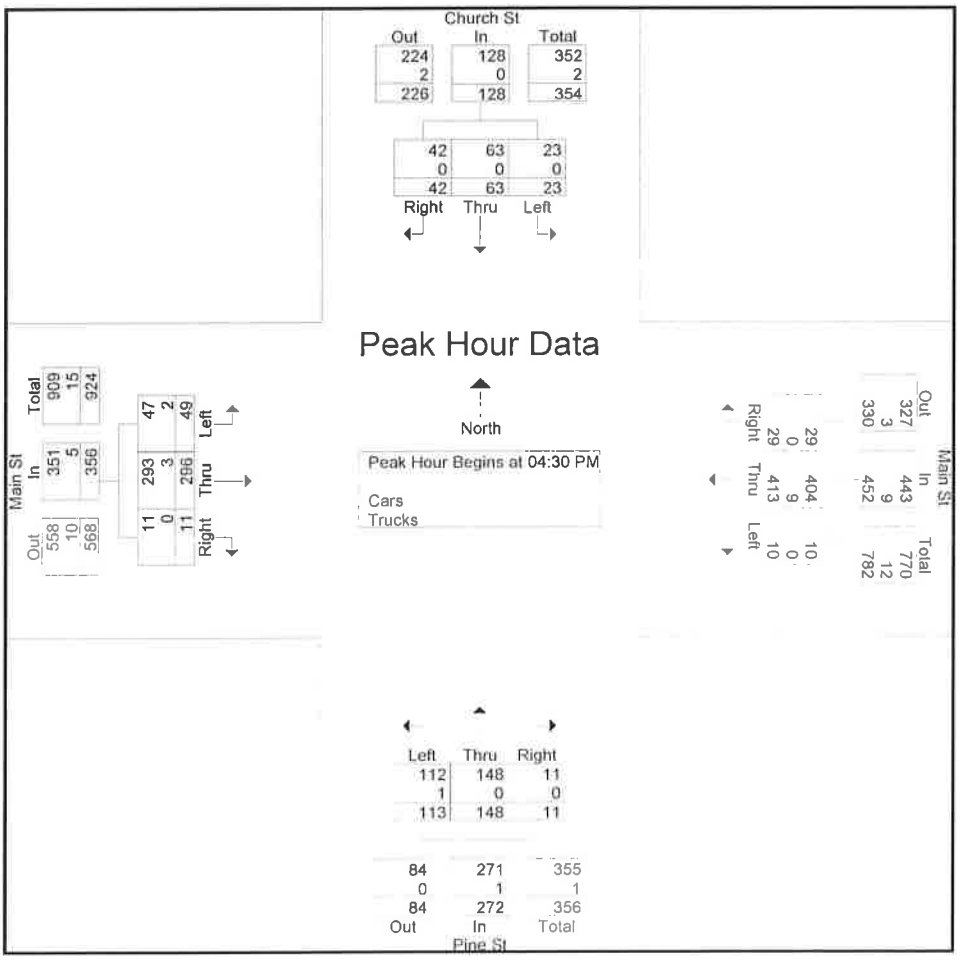
Accurate Counts

978-664-2565

N/S Street : Church St / Pine St
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380003
Site Code : 77380003
Start Date : 9/27/2018
Page No : 2

	Church St From North				Main St From East				Pine St From South				Main St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	5	13	10	28	**3**	119	7	129	24	29	**5**	58	**17**	**87**	2	**106**	**321**
04:45 PM	**11**	15	7	33	2	81	6	89	28	33	1	62	10	72	2	84	268
05:00 PM	4	**18**	**13**	**35**	3	85	**11**	99	**36**	**43**	3	**82**	12	70	3	85	301
05:15 PM	3	17	12	32	2	**128**	5	**135**	25	43	2	70	10	67	**4**	81	318
Total Volume	23	63	42	128	10	413	29	452	113	148	11	272	49	296	11	356	1208
% App. Total	18	49.2	32.8		2.2	91.4	6.4		41.5	54.4	4		13.8	83.1	3.1		
PHF	.523	.875	.808	.914	.833	.807	.659	.837	.785	.860	.550	.829	.721	.851	.688	.840	.941
Cars	23	63	42	128	10	404	29	443	112	148	11	271	47	293	11	351	1193
% Cars	100	100	100	100	100	97.8	100	98.0	99.1	100	100	99.6	95.9	99.0	100	98.6	98.8
Trucks	0	0	0	0	0	9	0	9	1	0	0	1	2	3	0	5	15
% Trucks	0	0	0	0	0	2.2	0	2.0	0.9	0	0	0.4	4.1	1.0	0	1.4	1.2



Accurate Counts

978-664-2565

N/S Street : Church St / Pine St
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380003
Site Code : 77380003
Start Date : 9/27/2018
Page No : 4

Groups Printed- Cars

	Church St From North			Main St From East			Pine St From South			Main St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	15	18	18	2	88	9	22	27	3	12	62	3	279
04:15 PM	13	22	15	0	110	6	29	39	2	3	61	2	302
04:30 PM	5	13	10	3	114	7	24	29	5	17	85	2	314
04:45 PM	11	15	7	2	79	6	28	33	1	10	71	2	265
Total	44	68	50	7	391	28	103	128	11	42	279	9	1160
05:00 PM	4	18	13	3	84	11	36	43	3	10	70	3	298
05:15 PM	3	17	12	2	127	5	24	43	2	10	67	4	316
05:30 PM	5	20	20	1	81	2	32	43	1	6	54	5	270
05:45 PM	7	23	12	7	105	6	22	42	1	8	72	4	309
Total	19	78	57	13	397	24	114	171	7	34	263	16	1193
Grand Total	63	146	107	20	788	52	217	299	18	76	542	25	2353
Apprch %	19.9	46.2	33.9	2.3	91.6	6	40.6	56	3.4	11.8	84.3	3.9	
Total %	2.7	6.2	4.5	0.8	33.5	2.2	9.2	12.7	0.8	3.2	23	1.1	

Accurate Counts

978-664-2565

N/S Street : Church St / Pine St
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380003
Site Code : 77380003
Start Date : 9/27/2018
Page No : 7

Groups Printed- Trucks

	Church St From North			Main St From East			Pine St From South			Main St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	0	0	2	0	1	1	0	0	0	0	0	0	4
04:15 PM	0	0	0	0	4	0	0	0	0	0	2	0	6
04:30 PM	0	0	0	0	5	0	0	0	0	0	2	0	7
04:45 PM	0	0	0	0	2	0	0	0	0	0	1	0	3
Total	0	0	2	0	12	1	0	0	0	0	5	0	20
05:00 PM	0	0	0	0	1	0	0	0	0	2	0	0	3
05:15 PM	0	0	0	0	1	0	1	0	0	0	0	0	2
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
Total	0	0	0	0	3	0	1	0	0	2	0	0	6
Grand Total	0	0	2	0	15	1	1	0	0	2	5	0	26
Apprch %	0	0	100	0	93.8	6.2	100	0	0	28.6	71.4	0	
Total %	0	0	7.7	0	57.7	3.8	3.8	0	0	7.7	19.2	0	

Accurate Counts

978-664-2565

N/S Street : Church St / Pine St
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380003
Site Code : 77380003
Start Date : 9/27/2018
Page No : 10

Groups Printed- Bikes Peds

	Church St From North				Main St From East				Pine St From South				Main St From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu Total	Inclu Total	Int. Total
04:00 PM	0	0	0	5	0	0	0	8	0	0	0	5	0	0	0	3	21	0	21
04:15 PM	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2	2	4
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	2	1	3
04:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3	3	1	4
Total	0	2	0	6	0	1	0	8	0	0	0	7	0	1	0	7	28	4	32
05:00 PM	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	8	10	0	10
05:15 PM	0	0	0	1	0	1	0	1	0	1	0	0	0	1	0	4	6	3	9
05:30 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	4	5	1	6
05:45 PM	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	5	7	1	8
Total	0	1	0	4	0	1	0	3	0	1	0	0	0	2	0	21	28	5	33
Grand Total	0	3	0	10	0	2	0	11	0	1	0	7	0	3	0	28	56	9	65
Apprch %	0	100	0		0	100	0		0	100	0		0	100	0				
Total %	0	33.3	0		0	22.2	0		0	11.1	0		0	33.3	0		86.2	13.8	

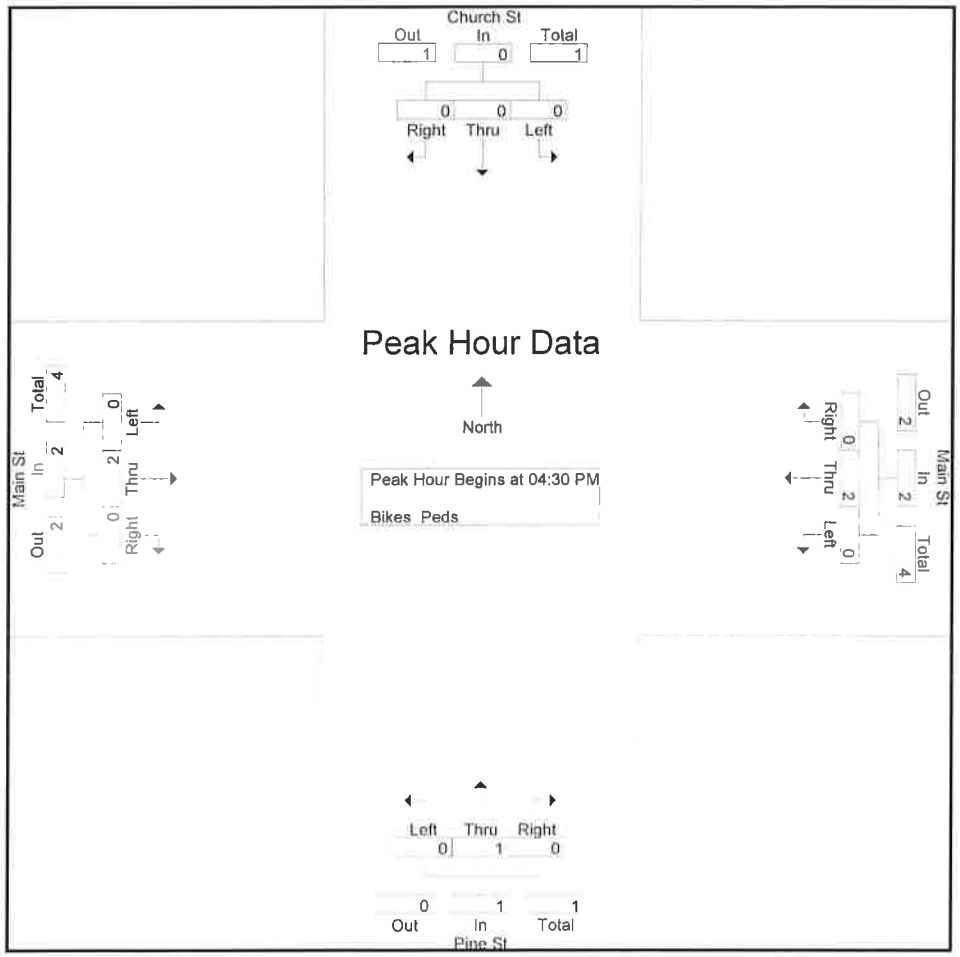
Accurate Counts

978-664-2565

N/S Street : Church St / Pine St
E/W Street: Main Street
City/State : Concord, MA
Weather : Cloudy

File Name : 77380003
Site Code : 77380003
Start Date : 9/27/2018
Page No : 11

	Church St From North				Main St From East				Pine St From South				Main St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	**1**	1
04:45 PM	0	0	0	0	0	**1**	0	**1**	0	0	0	0	0	0	0	0	1
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	1	0	1	0	**1**	0	**1**	0	1	0	1	**3**
Total Volume	0	0	0	0	0	2	0	2	0	1	0	1	0	2	0	2	5
% App. Total	0	0	0		0	100	0		0	100	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.500	.000	.500	.000	.250	.000	.250	.000	.500	.000	.500	.417



SEASONAL ADJUSTMENT DATA

Massachusetts Highway Department
403: Monthly Hourly Volume for September 2017

Location ID:	403	Seasonal Factor Group:	U3
County:	Middlesex	Daily Factor Group:	
Funcationl Class	3	Axle Factor Group:	U3
Location:	ELM STREET	Growth Factor Group:	

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	TOTAL
1	371	164	107	167	442	1694	2765	3150	3245	3005	2891	3035	3467	3452	3552	3330	3375	3296	2737	2101	1593	1189	986	782	50896
2	464	217	136	128	178	429	1030	1569	1875	2417	2740	3162	3147	3186	3074	2796	2693	2574	2199	1943	1586	1198	972	818	40531
3	459	192	139	114	117	223	605	1020	1251	1704	2056	2460	2604	2537	2471	2456	2207	2095	1808	1401	1295	1011	755	488	31468
4	282	123	104	72	158	335	593	811	1078	1561	2052	2435	2616	2502	2710	2619	2564	2332	2035	1827	1432	1075	693	542	32551
5	220	147	87	159	476	1970	3057	3502	3408	3190	2766	2659	2737	2771	3163	3243	3016	3022	3248	2456	1574	1149	798	475	49293
6	297	153	142	153	472	1962	3059	3506	3512	3272	2796	2623	2714	2695	3124	3158	3084	3196	3066	2304	1507	1228	833	625	49481
7	297	145	124	148	466	1923	3093	3444	3649	3321	2776	2695	2867	3066	3448	3190	3127	3261	3229	2558	1772	1129	862	600	51190
8	332	267	195	154	409	1803	3011	3229	3435	3189	2635	2631	2816	2740	3522	3215	3243	3413	3267	2331	1598	1265	1067	867	50634
9	412	240	159	152	233	522	1066	1520	2199	2464	2823	3114	3218	3189	3220	3110	3050	2808	2223	1837	1558	1270	1181	970	42538
10	428	236	156	153	129	318	674	1152	1698	2049	2660	3153	3343	3351	3188	3086	3060	2871	2477	1913	1611	1046	696	396	39844
11	203	115	85	123	485	1887	3065	3287	3585	3153	2667	2598	2607	2733	3069	3186	2965	3159	3049	2434	1502	1122	773	454	48306
12	259	106	86	153	456	2020	3096	3255	3565	3377	2906	2718	2737	2886	3315	3167	3115	3169	3228	2554	1802	1267	904	677	50818
13	325	136	107	164	454	2008	3141	3576	3599	3453	2807	2863	2890	2861	3361	3170	3274	3304	3250	2573	1839	1362	1038	686	52241
14	360	176	116	183	470	1998	3064	3553	3550	3288	3062	2876	2898	2911	3380	3250	3132	3157	3160	2537	1884	1423	997	704	52129
15	406	170	135	183	456	1767	3054	3356	3512	3229	2765	2878	2924	3253	3444	3229	3273	3237	3235	2541	1715	1397	1144	815	52118
16	495	202	142	144	227	546	1079	1580	2045	2460	2930	3044	3324	3312	3203	3101	3065	2912	2399	2042	1741	1416	1069	847	43325
17	443	228	144	135	168	357	706	1065	1744	2181	2890	3210	3589	3350	3120	2931	2872	2837	2467	1997	1631	1147	673	453	40338
18	215	143	101	177	480	2011	2956	3431	3432	3246	2735	2505	2647	2798	3194	3113	3009	3160	3081	2169	1504	1102	717	455	48381
19	242	148	112	173	458	1994	2966	3462	3503	3148	2754	2560	2796	2933	3312	3133	2996	3135	3119	2212	1572	1163	857	509	49257
20	230	134	93	157	463	1881	3010	3373	3461	3211	2749	2535	2838	2837	3230	3090	3193	3282	3196	2420	1580	1362	908	576	49809
21	290	141	123	155	440	1910	2978	3574	3584	3349	3001	2907	2989	3239	3401	3279	3227	3185	3254	2555	1737	1369	1016	592	52295
22	321	162	143	171	396	1811	2982	3428	3501	3179	2867	2903	2971	3187	3462	3388	3174	3359	3364	2382	1637	1247	1116	872	52023
23	500	243	157	173	203	546	1025	1678	2303	2507	3201	3388	3480	3532	3514	3375	3191	3108	2556	2075	1605	1397	1201	944	45902
24	505	273	143	139	182	351	735	1265	1845	2401	2900	3320	3529	3611	3215	2987	3123	3078	2570	2193	1779	1177	714	463	42498
25	235	113	97	165	481	1978	3039	3422	3478	3197	2838	2818	2828	2841	3269	3172	2992	3161	3092	2530	1576	1198	968	674	50162
26	296	152	118	147	484	2006	2958	3496	3497	3295	2742	2618	2767	2790	3261	3188	2939	3202	3260	2609	1653	1242	998	674	50392
27	260	123	131	167	470	1982	3076	3516	3530	3368	2942	2766	2903	2939	3287	3098	3176	3371	3252	2590	1946	1444	1022	775	52134
28	380	157	117	170	514	2030	3014	3536	3515	3284	2917	2959	2908	2988	3439	3386	3296	3148	3119	2773	1902	1528	1059	795	52934
29	458	186	132	189	459	1882	3005	3393	3319	3105	2679	2909	3092	3371	3463	3267	3458	3208	3240	2661	1691	1317	1238	1002	52724
30	526	268	145	151	199	477	874	1308	1950	2403	2861	3096	3159	3063	3035	2887	2929	2792	2419	1923	1537	1394	1069	926	41391

September Average =	47,253
Yearly Average =	46,307
Seasonal Adjustment =	0.98

MASSDOT CRASH RATE WORKSHEETS

Crash Number	Crash Date	Crash Time	City/Town	Crash Severity	Maximum Injury Severity Reported	Number of Vehicles	Manner of Collision	Vehicle Action Prior to Crash	Vehicle Travel Directions	First Harmful Event	First Harmful Event Location	Most Harmful Events	Road Surface	Ambient Light	Weather Condition	Street Number	Roadway	Distance And Direction From Intersection	Near Intersection Roadway	Roadway Intersection Type	Traffic Control Device Type	Linked RI Street Name	Geocoding Method	X	Y
[illegible]	[illegible]	5:43 PM	CONCORD	Non fatal injury	Non fatal injury - Possible	2	Rear end	V1: Slowing or stopped in traffic / V2:Other	V1:S / V2:S	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Dark - lighted roadway	Clear		CHURCH STREET		MAIN STREET	Four way intersection	Traffic control signal	CHURCH STREET	Off intersection	208647.0625	911605.8125
[illegible]	5/11/2011	[illegible]	CONCORD	Property damage only (none injured)	No injury	2	Rear end	V1: Travelling straight ahead / V2 Slowing or stopped in traffic	V1:E / V2:E	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Daylight	Cloudy		MAIN STREET / WEST STREET			T-intersection	No controls	MAIN STREET	At Intersection	208409.8907	911509.5001
[illegible]	[illegible]	[illegible]	CONCORD	Property damage only (none injured)	No injury	2	Head on	V1: Travelling straight ahead / V2 Turning left	V1:W / V2:E	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Daylight	Clear		CHURCH STREET / MAIN STREET			Four way intersection	Traffic control signal	MAIN STREET	At Intersection	208647.0625	911605.8125
[illegible]	[illegible]	5:45 PM	CONCORD	Property damage only (none injured)	No injury	1	Single vehicle crash	V1: Travelling straight ahead	V1:W	Collision with utility pole	Outside roadway	V1 (Collision with utility pole)	Dry	Dusk	Cloudy	[illegible]	MAIN STREET			Not at junction	No controls	MAIN STREET	At Address	[illegible]	911442.125
[illegible]	9/25/2011	[illegible]	CONCORD	Non fatal injury	Non fatal injury - Non-incapacitating	2	Sideswipe, opposite direction	V1: Travelling straight ahead / V2:Travelling straight ahead	V1:W / V2:S	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Dark - lighted roadway	Clear	[illegible]	MAIN STREET			Four way intersection	Traffic control signal	MAIN STREET	At Address	208672.2345	911619.544
[illegible]	5/31/2012	8:03 PM	CONCORD	Non fatal injury	Non fatal injury - Non-incapacitating	2	Rear end	V1: Slowing or stopped in traffic / V2 Travelling straight ahead	V1:E / V2:E	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Daylight	Cloudy		MAIN ST / CONANT ST			T-intersection	No controls	MAIN STREET	At Intersection	207920.5155	911474.3749
[illegible]	7/29/2012	10:43 PM	CONCORD	Non fatal injury	Non fatal injury - Possible	1	Single vehicle crash	V1: Travelling straight ahead	V1:E	Collision with utility pole	Outside roadway	V1 (Collision with utility pole)	Wet	Dark - lighted roadway	Rain	[illegible]	CONANT ST			Not at junction	No controls	CONANT STREET	At Address	207918.2828	911554.0292
[illegible]	3/24/2012	8:10 AM	CONCORD	Non fatal injury	Non fatal injury - Possible	4	Rear end	V1: Travelling straight ahead / V2 Travelling straight ahead / V3 Slowing or stopped in traffic / V4:Travelling straight ahead	V1:E / V2:E / V3:E / V4:E	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic) V3 (Collision with motor vehicle in traffic) V4 (Collision with motor vehicle in traffic)	Wet	Daylight	Rain	[illegible]	MAIN ST			T-intersection	No controls	MAIN STREET	At Address	208441.4834	911519.2445
3243165	10/25/2012	11:44 AM	CONCORD	Non fatal injury	Non fatal injury - Possible	1	Single vehicle crash	V1: Travelling straight ahead	V1:W	Collision with other	Roadway	V1 (Other)	Dry	Daylight	Clear	[illegible]	MAIN STREET			Four way intersection	Traffic control signal	MAIN STREET	At Address	208672.6993	911619.2596
[illegible]	[illegible]	1:34 PM	CONCORD	Property damage only (none injured)	No injury	2	Angle	V1: Travelling straight ahead / V2 Entering traffic lane	V1:E / V2:N	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Dark - lighted roadway	Clear		MAIN ST / HIGHLAND ST			T-intersection	No controls	MAIN STREET	At Intersection	208339.7969	911491.8126
[illegible]	[illegible]	11:24 AM	CONCORD	Property damage only (none injured)	No injury	2	Angle	V1: Travelling straight ahead / V2 Travelling straight ahead	V1:W / V2:S	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Daylight	Clear		MAIN ST / PINE ST			Four way intersection	Traffic control signal	MAIN STREET	At Intersection	208547.0625	911605.8125
[illegible]	[illegible]	12:22 PM	CONCORD	Property damage only (none injured)	No injury	1	Single vehicle crash	V1: Backing	V1:N	Collision with tree	Outside roadway	V1 (Collision with tree)	Dry	Daylight	Clear	1322	MAIN ST		CHURCH STREET	Not at junction	No controls	MAIN STREET	Off intersection	208647.0625	911605.8125
[illegible]	3/29/2013	1:51 PM	CONCORD	Non fatal injury	Non fatal injury - Possible	2	Angle	V1: Travelling straight ahead / V2 Travelling straight ahead	V1:N / V2:E	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Snow	Daylight	Snow		WEST ST / MAIN ST Rte 62 E			T-intersection	[illegible]		At Intersection	208409.8907	911509.5001
[illegible]	[illegible]	2:24 PM	CONCORD	Property damage only (none injured)	No injury	2	Rear end	V1: Travelling straight ahead / V2 Slowing or stopped in traffic	V1:W / V2:W	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Daylight	Clear		MAIN ST Rte 62 W / WEST ST			T-intersection	No controls		At Intersection	208409.8907	911509.5002
[illegible]	[illegible]	6:58 PM	CONCORD	Property damage only (none injured)	No injury	2	Angle	V1: Travelling straight ahead / V2 Travelling straight ahead	V1:N / V2:E	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Dusk	Clear		PINE ST / MAIN ST			Four way intersection	Traffic control signal	MAIN STREET	At Intersection	208647.0625	911605.8125
[illegible]	5/17/2013	11:26 PM	CONCORD	Property damage only (none injured)	No injury	2	Rear end	V1: Travelling straight ahead / V2 Parked	V1:N / V2:N	Collision with parked motor vehicle	Roadway	V1 (Collision with parked motor vehicle) V2 (Collision with parked motor vehicle)	Dry	Dark - lighted roadway	Clear	199	CONANT ST			Not at junction	No controls	CONANT STREET	At Address	207916.209	911555.5179
[illegible]	[illegible]	4:43 PM	CONCORD	Non fatal injury	Non fatal injury - Non-incapacitating	3	Rear end	V1: Travelling straight ahead / V2 Travelling straight ahead / V3 Travelling straight ahead	V1:N / V2:N / V3:N	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic) V3 (Collision with motor vehicle in traffic)	Dry	Daylight	Clear	[illegible]	MAIN ST			Not at junction	No controls	MAIN STREET	At Address	[illegible]	[illegible]
[illegible]	[illegible]	12:15 PM	CONCORD	Property damage only (none injured)	No injury	1	Single vehicle crash	V1: Travelling straight ahead	V1:W	Collision with other	Outside roadway	V1 (Collision with fence)	Dry	Daylight	Clear	1322	MAIN ST			Driveway	No controls	MAIN STREET	At Address	208647.0625	911605.8125
[illegible]	[illegible]	5:25 PM	CONCORD	Non fatal injury	Non fatal injury - Non-incapacitating	1	Single vehicle crash	V1: Backing	V1:E	Collision with tree	Outside roadway	V1 (Collision with tree)	Dry	Daylight	Clear	1510	MAIN ST Rte 62 E			Not at junction	No controls	MAIN STREET	At Address	208066.9193	911850.0174
[illegible]	7/31/2014	9:20 AM	CONCORD	Property damage only (none injured)	No injury	3	Rear end	V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Travelling straight ahead	V1:E / V2:E / V3:E	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic) V3 (Collision with motor vehicle in traffic)	Dry	Daylight	Clear		MAIN ST / HIGHLAND ST			Not at junction	No controls	MAIN STREET	At Intersection	208339.7969	911491.8126
[illegible]	[illegible]	2:37 PM	CONCORD	Property damage only (none injured)	No injury	2	Rear-end	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1:E / V2:E	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Daylight	Clear		MAIN ST / CONANT ST			T-intersection	No controls	MAIN STREET	At Intersection	207920.5155	911474.3749
[illegible]	[illegible]	3:01 PM	CONCORD	Property damage only (none injured)	No injury	2	Angle	V1: Travelling straight ahead / V2 Travelling straight ahead	V1:E / V2:W	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Daylight	Clear		CHURCH STREET		JUNCTION SQUARE	Not at junction	No controls	CHURCH STREET	Operator Designated	208606.4864	911737.6209
[illegible]	[illegible]	9:36 PM	CONCORD	Non fatal injury	Non fatal injury - Non-incapacitating	1	Single vehicle crash	V1: Travelling straight ahead	V1:S	Collision with tree	Outside roadway	V1 (Collision with tree)	Dry	Dark - lighted roadway	Cloudy	[illegible]	CHURCH ST			Not at junction	No controls	CHURCH STREET	At Address	[illegible]	[illegible]
[illegible]	[illegible]	2:10 PM	CONCORD	Property damage only (none injured)	No injury	2	Sideswipe, same direction	V1: Parked / V2:Travelling straight ahead	V1:W / V2:E	Collision with parked motor vehicle	Roadway	V1:(Collision with motor vehicle in traffic) V2 (Collision with parked motor vehicle)	Dry	Daylight	Clear	1362	MAIN STREET			Not at junction	No controls	MAIN STREET	At Address	208510.5469	911547.1643
[illegible]	[illegible]	4:05 PM	CONCORD	Property damage only (none injured)	No injury	2	Rear end	V1: Travelling straight ahead / V2 Slowing or stopped in traffic	V1:E / V2:E	Collision with motor vehicle in traffic	Roadway	V1:(Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Daylight	Clear		MAIN ST / CONANT ST			T-intersection	No controls	MAIN STREET	At Intersection	207920.5155	911474.3749
[illegible]	10/15/2015	6:34 AM	CONCORD	Property damage only (none injured)	No injury	2	Rear end	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1:E / V2 E	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Daylight	Clear	[illegible]	MAIN ST			Not at junction	No controls	MAIN STREET	At Address	208441.4834	911519.2445
[illegible]	10/31/2015	1:31 PM	CONCORD	Non fatal injury	Non fatal injury - Non-incapacitating	2	Rear end	V1: Turning left / V2 Travelling straight ahead	V1:E / V2:E	Collision with motor vehicle in traffic	Roadway	V1:(Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Daylight	Clear		MAIN ST / HIGHLAND ST			T-intersection	No controls	MAIN STREET	At Intersection	208339.7969	911491.8126
[illegible]	3/29/2016	6:50 PM	CONCORD	Property damage only (none injured)	No injury	3	Rear-to-rear	V1: Other / V2 Parked / V3 Parked	V1:W / V2 B / V3 B	Collision with unknown fixed object	Outside roadway	V1 (Collision with parked motor vehicle) V2 (Collision with motor vehicle in traffic) V3 (Collision with motor vehicle in traffic)	Dry	Dark - lighted roadway	Clear	[illegible]	MAIN ST			Not at junction	No controls	MAIN STREET	At Address	208647.1	911605.8
[illegible]	7/18/2016	3:42 PM	CONCORD	Non fatal injury	Non fatal injury - Possible	2	Rear end	V1: Travelling straight ahead / V2 Slowing or stopped in traffic	V1:W / V2 W	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Daylight	Clear		MAIN ST / CONANT ST			T-intersection	No controls	MAIN STREET	At Intersection	207920.5	911474.4
[illegible]	3/12/2016	6:02 AM	CONCORD	Non fatal injury	Non fatal injury - Possible	2	Angle	V1: Travelling straight ahead / V2 Parked	V1:W	Collision with parked motor vehicle	Outside roadway	V1 (Collision with parked motor vehicle) V2 (Collision with parked motor vehicle)	Dry	Daylight	Clear	[illegible]	MAIN ST			T-intersection	No controls	MAIN STREET	At Address	207952	911471.2
[illegible]	4/?/2016	1:48 PM	CONCORD	Property damage only (none injured)	No injury	2	Rear end	V1: Travelling straight ahead / V2 Travelling straight ahead	V1:W / V2:W	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Daylight	Cloudy	[illegible]	MAIN ST			Not at junction	No controls	MAIN STREET	At Address	208441.5	911519.2
[illegible]	11/29/2016	3:17 PM	CONCORD	Property damage only (none injured)	No injury	2	Rear end	V1: Turning left / V2 Travelling straight ahead	V1:E / V2:E	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Wet	Daylight	Rain		MAIN ST / CONANT ST			T-intersection	No controls	MAIN STREET	At Intersection	207920.5	911474.4
[illegible]	12/14/2016	12:14 PM	CONCORD	Property damage only (none injured)	No injury	2	Rear-end	V1: Slowing or stopped in traffic / V2:Travelling straight ahead	V1:E / V2:E	Collision with motor vehicle in traffic	Roadway	V1 (Collision with motor vehicle in traffic) V2 (Collision with motor vehicle in traffic)	Dry	Daylight	Clear		CONANT ST / MAIN ST			T-intersection	No controls	MAIN STREET	At Intersection	207920.5	911474.4

SELECT [Crash Number], [Crash Date], [Crash Time], [Crash Hour], [City/Town], [Locality], [RPA Abbreviation], [MassHighway District], [Crash Severity], [Maximum Injury Severity Reported], [Number of NonFatal Injuries], [Number of Fatal Injuries], [Number of Vehicles], [Manner of Collision], [Vehicle Action Prior to Crash], [Vehicle Travel Directions], [First Harmful Event], [First Harmful Event Location], [Most Harmful Events], [Vehicle Sequence of Events], [Vehicle Configuration], [FMSCA Reportable], [Age of Driver - Youngest Known], [Age of Driver - Oldest Known], [Driver Contributing Codes], [Non Motorist Type], [Non Motorist Action], [Non Motorist Location], [Hit & Run], [Road Surface], [Ambient Light], [Weather Condition], [Street Number], [Roadway], [Distance And Direction From Intersection], [Near Intersection Roadway], [Exit Route], [Distance And Direction From Exit Number], [Exit Number], [Milemarker Route], [Distance And Direction From Milemarker], [Milemarker], [Landmark], [Distance And Direction From Landmark], [Traffic Way], [Speed Limit], [Roadway Intersection Type], [Traffic Control Device Type], [Traffic

This query was also restricted by a map filter.

Moving Massachusetts Forward
massDOT
Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Concord COUNT DATE : Jun-18

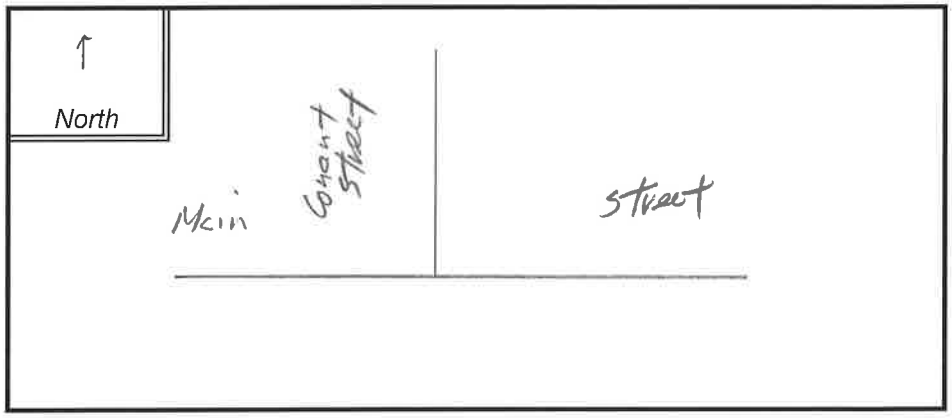
DISTRICT : 4 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Main Street

MINOR STREET(S) : Conant Street

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (PM) :	486	675		126		**1,287**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **14,300**

TOTAL # OF CRASHES : 10 # OF YEARS : 6 AVERAGE # OF CRASHES PER YEAR (**A**) : **1.67**

CRASH RATE CALCULATION : 0.32 RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Below MassDOT District 4 crash rate

Project Title & Date: Proposed Residential development June 2018

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Concord COUNT DATE : Jun-18

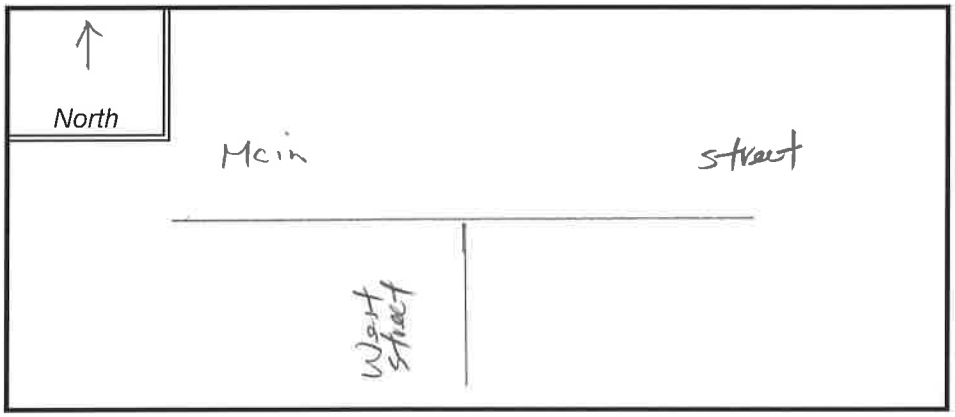
DISTRICT : 4 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Main Street

MINOR STREET(S) : West Street

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (PM) :	384	620	57			1,061

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **11,789**

TOTAL # OF CRASHES : 6 # OF YEARS : 6 AVERAGE # OF CRASHES PER YEAR (**A**) : **1.00**

CRASH RATE CALCULATION : **0.23** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Below MassDOT District 4 crash rate

Project Title & Date: Proposed Residential development June 2018

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Concord COUNT DATE : Jun-18

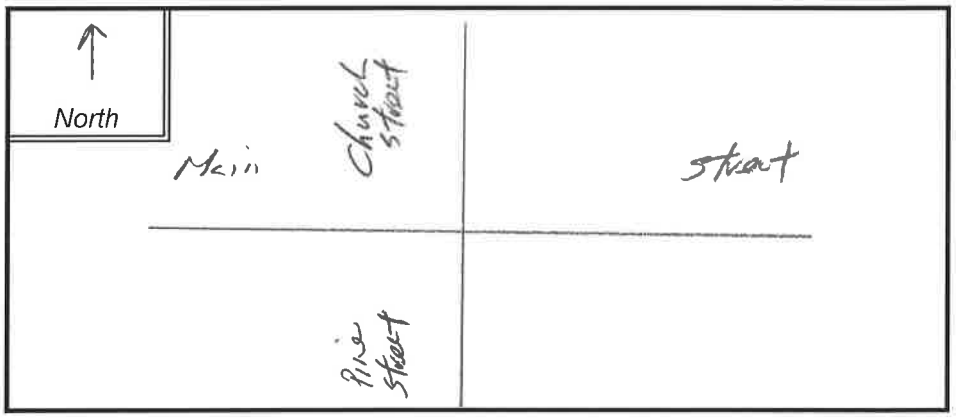
DISTRICT : 4 UNSIGNALIZED : [ ] SIGNALIZED : [X]

~ INTERSECTION DATA ~

MAJOR STREET : Main Street

MINOR STREET(S) : Church Street/Pine Street

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (PM) :	386	500	272	141		**1,299**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **14,433**

TOTAL # OF CRASHES : 8 # OF YEARS : 6 AVERAGE # OF CRASHES PER YEAR (**A**) : **1.33**

CRASH RATE CALCULATION : 0.25 RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

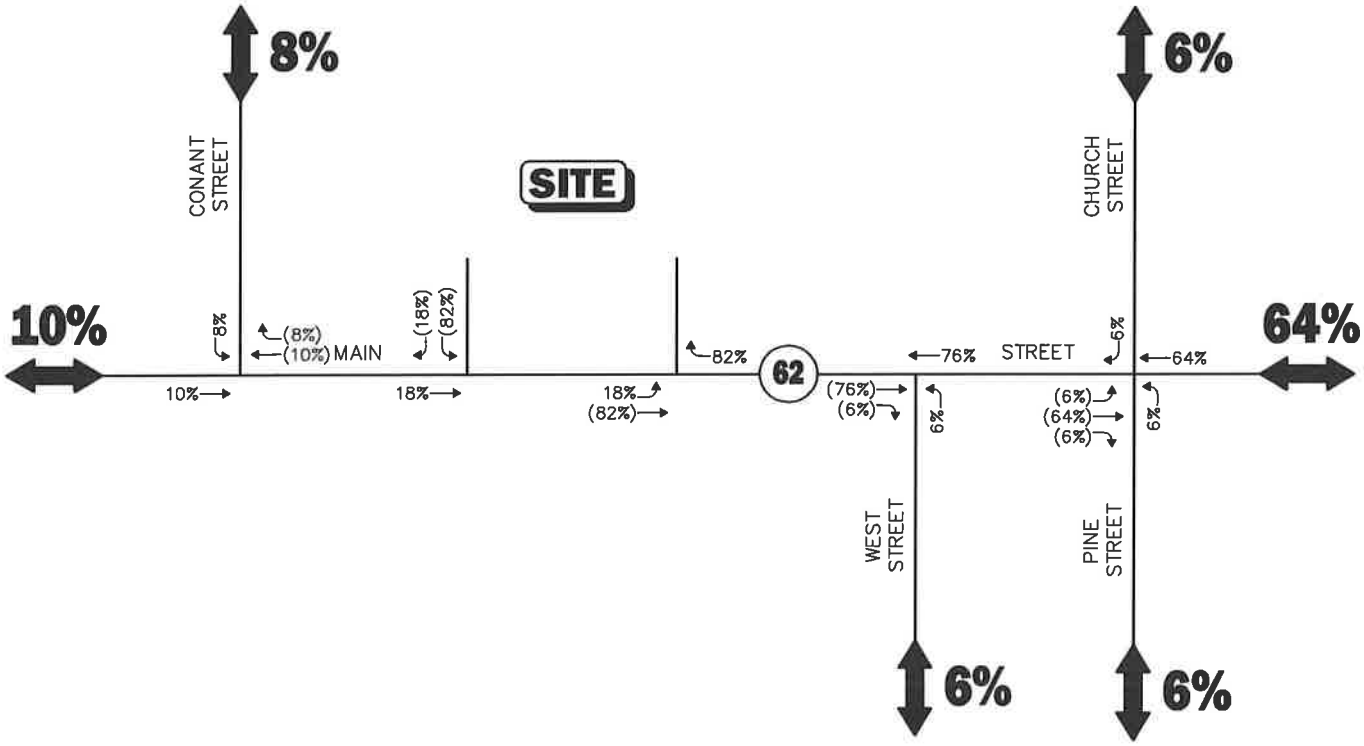
Comments : Below MassDOT District 4 crash rate

Project Title & Date: Proposed Residential development June 2018

REVISED TRAFFIC-VOLUME NETWORKS

Legend:

XX	Entering Trips
(XX)	Exiting Trips



Not To Scale

Figure 5R

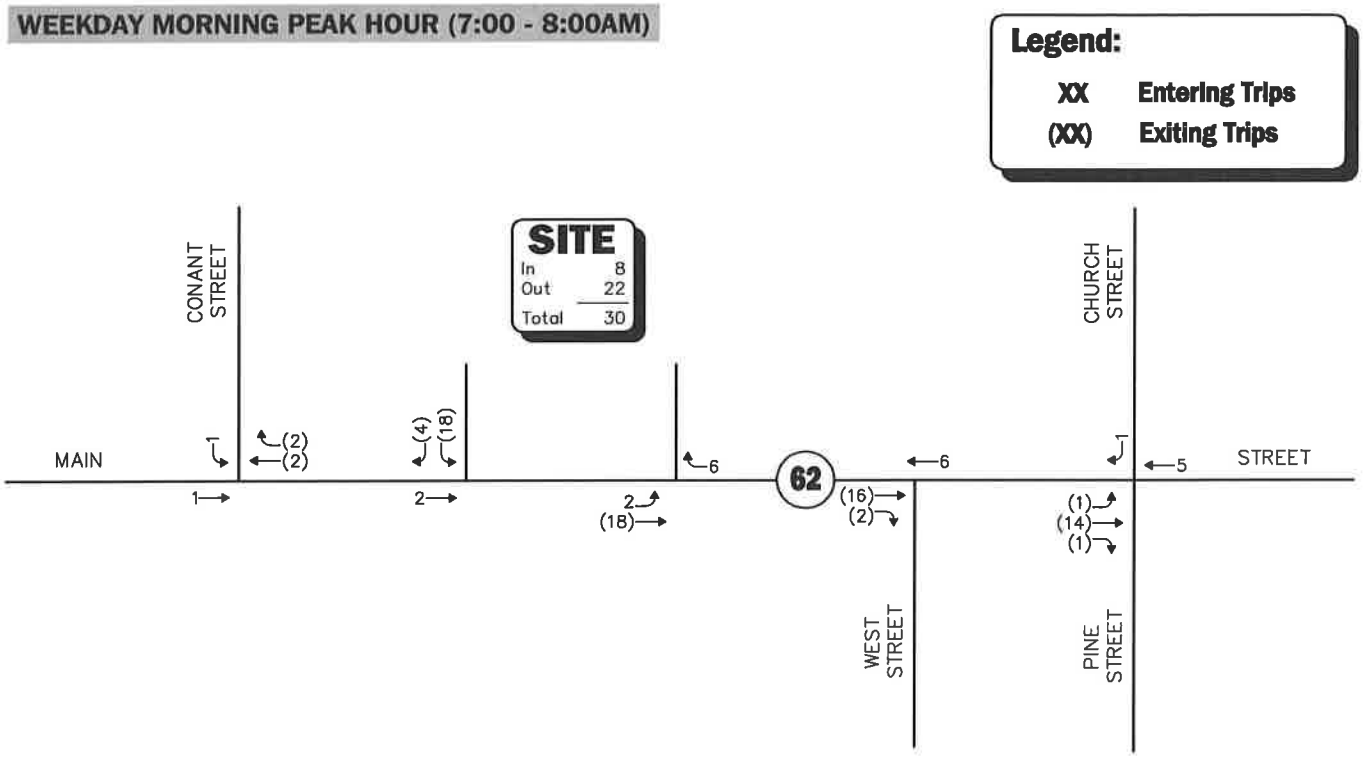
Trip Distribution Map

Vanasse & Associates, Inc.
Transportation Engineers & Planners

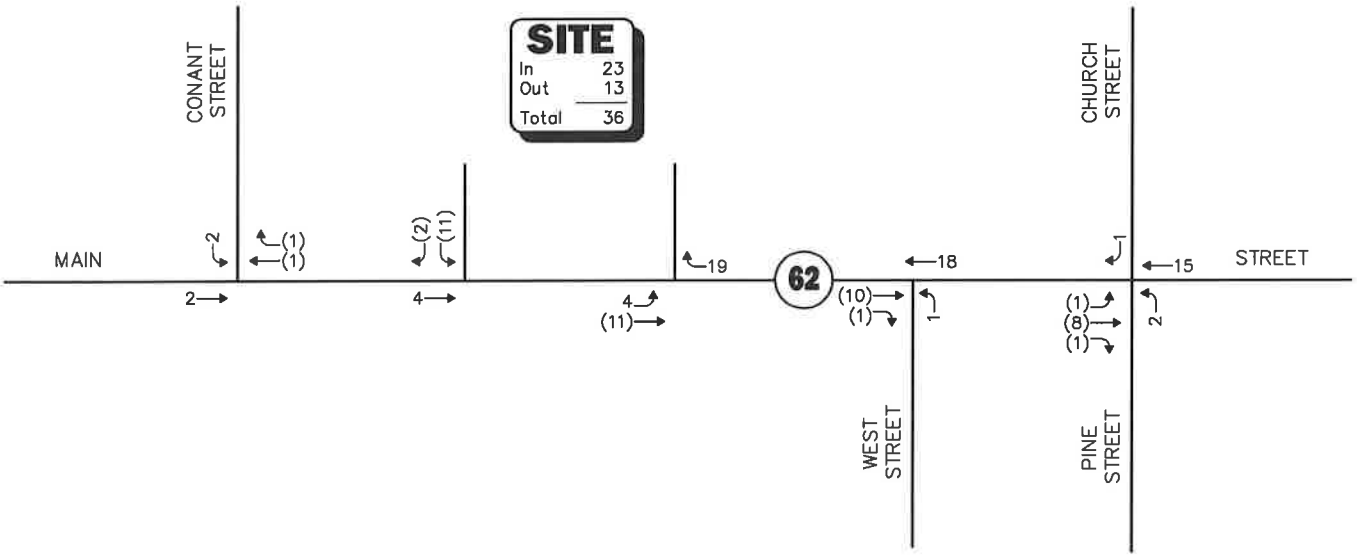
R:\7738\7738nt4.dwg, Tue Oct 2 16:06:48 2018

Copyright © 2018 by VAI. All Rights Reserved.

WEEKDAY MORNING PEAK HOUR (7:00 - 8:00AM)



WEEKDAY EVENING PEAK HOUR (4:45 - 5:45PM)



Not To Scale

Figure 6R

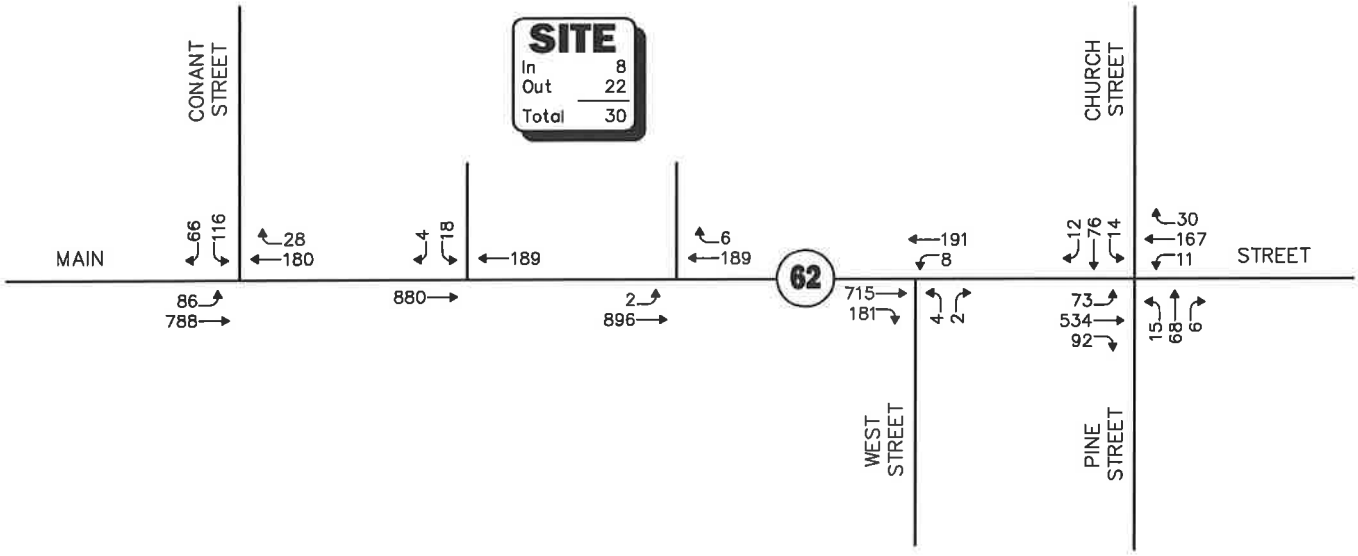
Project-Generated Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners

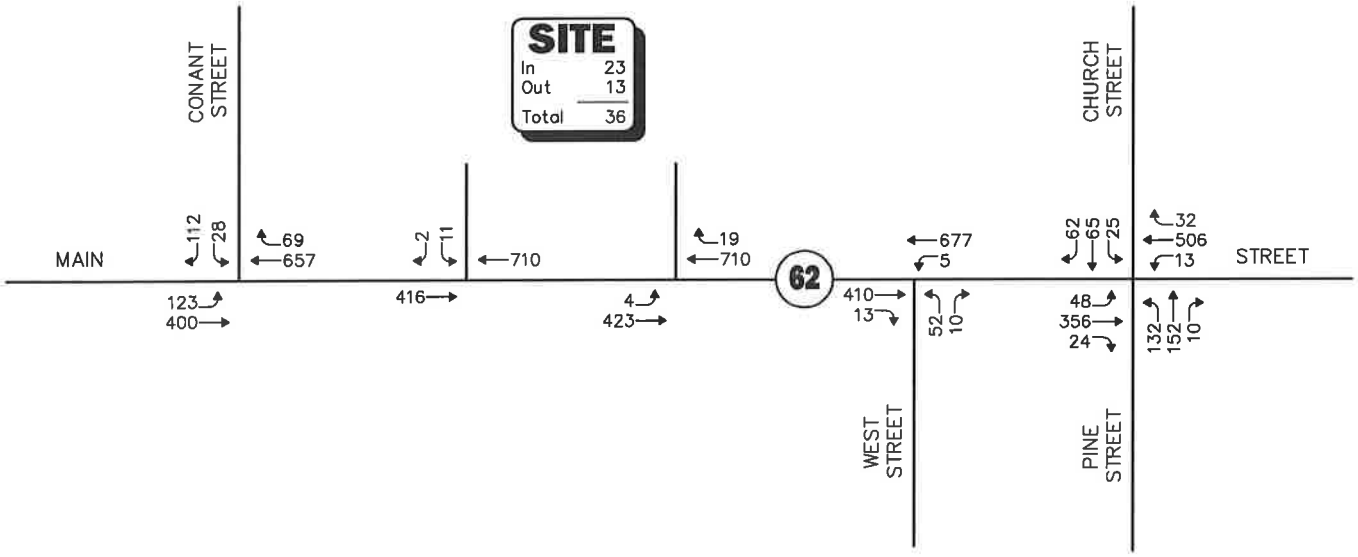
R:\7738\7738nt5.dwg, Tue Oct 2 16:10:24 2018

Copyright © 2014 by VAI. All Rights Reserved.

WEEKDAY MORNING PEAK HOUR (7:00 - 8:00AM)



WEEKDAY EVENING PEAK HOUR (4:45 - 5:45PM)



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 7R

2025 Build
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners

R:\7738\7738n3.dwg, Tue Oct 2 16:21:26 2018

Copyright © 2014 by VAI. All Rights Reserved.

CAPACITY ANALYSIS WORKSHEETS

Main Street at Conant Street
Main Street at Church Street and Pine Street
Main Street at the East Project Site Driveway
Main Street at the West Project Site Driveway

Main Street at Conant Street

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	115	371	612	63	24	104
Future Volume (vph)	115	371	612	63	24	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	13	12
Satd. Flow (prot)	0	1877	1875	0	1734	0
Flt Permitted		0.988			0.991	
Satd. Flow (perm)	0	1877	1875	0	1734	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		350	1540		438	
Travel Time (s)		8.0	35.0		10.0	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	517	718	0	137	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 79.7% ICU Level of Service D
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⋔	
Traffic Vol, veh/h	115	371	612	63	24	104
Future Vol, veh/h	115	371	612	63	24	104
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	122	395	651	67	26	111

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	718	0	-	0	1324	685
Stage 1	-	-	-	-	685	-
Stage 2	-	-	-	-	639	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	892	-	-	-	174	452
Stage 1	-	-	-	-	504	-
Stage 2	-	-	-	-	530	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	892	-	-	-	144	452
Mov Cap-2 Maneuver	-	-	-	-	144	-
Stage 1	-	-	-	-	416	-
Stage 2	-	-	-	-	530	-

Approach	EB	WB	SB
HCM Control Delay, s	2.3	0	24
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	892	-	-	-	323
HCM Lane V/C Ratio	0.137	-	-	-	0.422
HCM Control Delay (s)	9.7	0	-	-	24
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.5	-	-	-	2

Main Street at Church Street and Pine Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	485	85	10	151	28	14	63	6	13	71	10
Future Volume (vph)	67	485	85	10	151	28	14	63	6	13	71	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	10	12	10	11	12	12	11	12	12	15	12
Storage Length (ft)	50		0	90		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1728	1703	0	1685	1750	0	0	1802	0	0	2046	0
Flt Permitted	0.633			0.316				0.945			0.948	
Satd. Flow (perm)	1151	1703	0	560	1750	0	0	1718	0	0	1954	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		634			584			581			554	
Travel Time (s)		14.4			13.3			13.2			12.6	
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 (%)	1%	2%	1%	0%	3%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	74	633	0	11	199	0	0	93	0	0	104	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	21.0	21.0		21.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	40.0	40.0		40.0	40.0		25.0	25.0		25.0	25.0	
Total Split (%)	47.1%	47.1%		47.1%	47.1%		29.4%	29.4%		29.4%	29.4%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0			-1.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Act Effct Green (s)	32.1	32.1		32.1	32.1			9.9			9.9	
Actuated g/C Ratio	0.66	0.66		0.66	0.66			0.20			0.20	
v/c Ratio	0.10	0.56		0.03	0.17			0.27			0.26	
Control Delay	7.5	11.8		8.0	7.3			22.3			21.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.5	11.8		8.0	7.3			22.3			21.8	
LOS	A	B		A	A			C			C	
Approach Delay		11.3			7.3			22.3			21.8	
Approach LOS		B			A			C			C	
Queue Length 50th (ft)	6	78		1	17			19			21	
Queue Length 95th (ft)	43	#431		11	96			81			87	
Internal Link Dist (ft)		554			504			501			474	
Turn Bay Length (ft)	50			90								

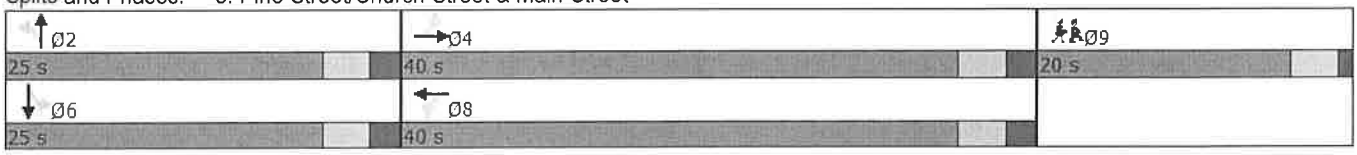
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	20.0
Total Split (s)	20.0
Total Split (%)	24%
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	893	1321		434	1357			810			921	
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	0.08	0.48		0.03	0.15			0.11			0.11	

Intersection Summary

Area Type: Other
Cycle Length: 85
Actuated Cycle Length: 48.5
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.56
Intersection Signal Delay: 12.5 Intersection LOS: B
Intersection Capacity Utilization 50.4% ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Pine Street/Church Street & Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	485	85	10	151	28	14	63	6	13	71	10
Future Volume (vph)	67	485	85	10	151	28	14	63	6	13	71	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	10	12	10	11	12	12	11	12	12	15	12
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.98			0.99			0.99	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1728	1702		1685	1749			1802			2046	
Flt Permitted	0.63	1.00		0.32	1.00			0.94			0.95	
Satd. Flow (perm)	1151	1702		560	1749			1717			1952	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	74	539	94	11	168	31	16	70	7	14	79	11
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	74	633	0	11	199	0	0	93	0	0	104	0
Heavy Vehicles (%)	1%	2%	1%	0%	3%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	29.8	29.8		29.8	29.8			7.0			7.0	
Effective Green, g (s)	30.8	30.8		30.8	30.8			8.0			8.0	
Actuated g/C Ratio	0.58	0.58		0.58	0.58			0.15			0.15	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	672	994		327	1022			260			296	
v/s Ratio Prot		c0.37			0.11							
v/s Ratio Perm	0.06			0.02				c0.05			0.05	
v/c Ratio	0.11	0.64		0.03	0.19			0.36			0.35	
Uniform Delay, d1	4.9	7.2		4.6	5.1			20.0			20.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.1	1.3		0.0	0.1			0.8			0.7	
Delay (s)	4.9	8.6		4.7	5.2			20.9			20.7	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		8.2			5.2			20.9			20.7	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	9.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	52.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	50.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	44	325	21	12	458	30	121	142	9	23	61	57
Future Volume (vph)	44	325	21	12	458	30	121	142	9	23	61	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	10	12	10	11	12	12	11	12	12	15	12
Storage Length (ft)	50		0	90		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1745	1757	0	1685	1820	0	0	1787	0	0	1959	0
Flt Permitted	0.270			0.431				0.821			0.926	
Satd. Flow (perm)	496	1757	0	764	1820	0	0	1500	0	0	1829	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		634			584			581			554	
Travel Time (s)		14.4			13.3			13.2			12.6	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	47	368	0	13	519	0	0	290	0	0	150	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	21.0	21.0		21.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	40.0	40.0		40.0	40.0		25.0	25.0		25.0	25.0	
Total Split (%)	47.1%	47.1%		47.1%	47.1%		29.4%	29.4%		29.4%	29.4%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0			-1.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Act Effct Green (s)	22.0	22.0		22.0	22.0			19.2			19.2	
Actuated g/C Ratio	0.42	0.42		0.42	0.42			0.37			0.37	
v/c Ratio	0.23	0.50		0.04	0.68			0.53			0.22	
Control Delay	15.2	15.1		11.7	18.8			21.8			16.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	15.2	15.1		11.7	18.8			21.8			16.7	
LOS	B	B		B	B			C			B	
Approach Delay		15.1			18.6			21.8			16.7	
Approach LOS		B			B			C			B	
Queue Length 50th (ft)	8	72		2	113			56			26	
Queue Length 95th (ft)	41	214		15	323			#265			117	
Internal Link Dist (ft)		554			504			501			474	
Turn Bay Length (ft)	50			90								

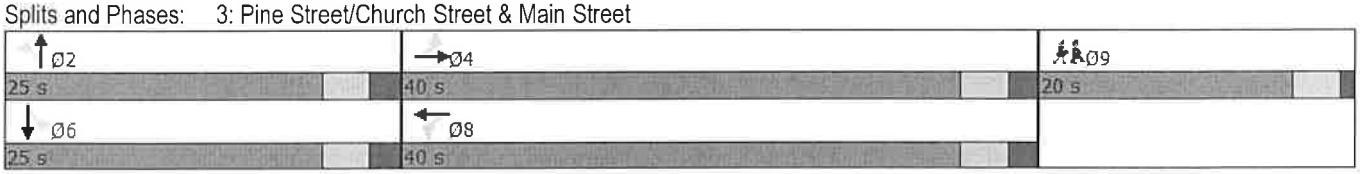
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	20.0
Total Split (s)	20.0
Total Split (%)	24%
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	369	1310		569	1357			657			801	
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	0.13	0.28		0.02	0.38			0.44			0.19	

Intersection Summary

Area Type: Other
Cycle Length: 85
Actuated Cycle Length: 52.3
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 18.1 Intersection LOS: B
Intersection Capacity Utilization 60.6% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Pine Street/Church Street & Main Street



2018 Existing Wkdy PM Peak
3: Pine Street/Church Street & Main Street

10/02/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	44	325	21	12	458	30	121	142	9	23	61	57
Future Volume (vph)	44	325	21	12	458	30	121	142	9	23	61	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	10	12	10	11	12	12	11	12	12	15	12
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.99			1.00			0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.99	
Satd. Flow (prot)	1745	1757		1685	1820			1788			1960	
Flt Permitted	0.27	1.00		0.43	1.00			0.82			0.93	
Satd. Flow (perm)	496	1757		765	1820			1501			1829	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	47	346	22	13	487	32	129	151	10	24	65	61
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	47	368	0	13	519	0	0	290	0	0	150	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	20.9	20.9		20.9	20.9			18.1			18.1	
Effective Green, g (s)	21.9	21.9		21.9	21.9			19.1			19.1	
Actuated g/C Ratio	0.40	0.40		0.40	0.40			0.35			0.35	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	197	700		305	726			522			636	
v/s Ratio Prot		0.21			c0.29							
v/s Ratio Perm	0.09			0.02				c0.19			0.08	
v/c Ratio	0.24	0.53		0.04	0.71			0.56			0.24	
Uniform Delay, d1	11.0	12.5		10.1	13.9			14.5			12.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.6	0.7		0.1	3.4			1.3			0.2	
Delay (s)	11.6	13.3		10.1	17.2			15.8			12.9	
Level of Service	B	B		B	B			B			B	
Approach Delay (s)		13.1			17.1			15.8			12.9	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	54.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	520	91	11	162	30	15	68	6	14	76	11
Future Volume (vph)	72	520	91	11	162	30	15	68	6	14	76	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	10	12	10	11	12	12	11	12	12	15	12
Storage Length (ft)	50		0	90		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1728	1703	0	1685	1750	0	0	1806	0	0	2046	0
Flt Permitted	0.625			0.294				0.948			0.955	
Satd. Flow (perm)	1137	1703	0	521	1750	0	0	1725	0	0	1968	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		634			584			581			554	
Travel Time (s)		14.4			13.3			13.2			12.6	
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 (%)	1%	2%	1%	0%	3%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	679	0	12	213	0	0	100	0	0	112	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	21.0	21.0		21.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	40.0	40.0		40.0	40.0		25.0	25.0		25.0	25.0	
Total Split (%)	47.1%	47.1%		47.1%	47.1%		29.4%	29.4%		29.4%	29.4%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0			-1.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Act Effct Green (s)	35.3	35.3		35.3	35.3			10.0			10.0	
Actuated g/C Ratio	0.68	0.68		0.68	0.68			0.19			0.19	
v/c Ratio	0.10	0.59		0.03	0.18			0.30			0.29	
Control Delay	7.5	12.5		8.1	7.2			23.9			23.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.5	12.5		8.1	7.2			23.9			23.4	
LOS	A	B		A	A			C			C	
Approach Delay		12.0			7.3			23.9			23.4	
Approach LOS		B			A			C			C	
Queue Length 50th (ft)	7	90		1	19			23			26	
Queue Length 95th (ft)	46	#487		12	103			85			92	
Internal Link Dist (ft)		554			504			501			474	
Turn Bay Length (ft)	50			90								

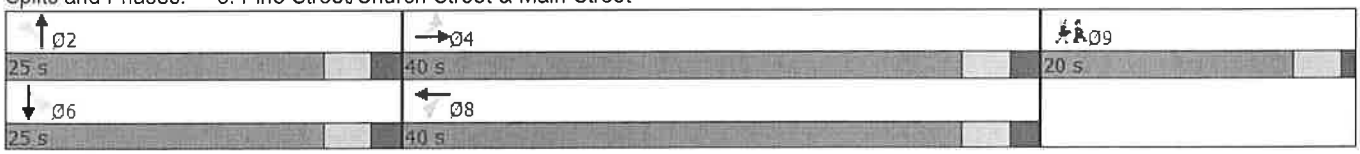
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	20.0
Total Split (s)	20.0
Total Split (%)	24%
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	834	1249		382	1284			745			850	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.10	0.54		0.03	0.17			0.13			0.13	

Intersection Summary

Area Type: Other
Cycle Length: 85
Actuated Cycle Length: 51.9
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.59
Intersection Signal Delay: 13.2 Intersection LOS: B
Intersection Capacity Utilization 53.1% ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Pine Street/Church Street & Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	520	91	11	162	30	15	68	6	14	76	11
Future Volume (vph)	72	520	91	11	162	30	15	68	6	14	76	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	10	12	10	11	12	12	11	12	12	15	12
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.98			0.99			0.99	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1728	1702		1685	1750			1804			2045	
Flt Permitted	0.62	1.00		0.29	1.00			0.95			0.95	
Satd. Flow (perm)	1136	1702		521	1750			1724			1966	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	578	101	12	180	33	17	76	7	16	84	12
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	80	679	0	12	213	0	0	100	0	0	112	0
Heavy Vehicles (%)	1%	2%	1%	0%	3%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	33.0	33.0		33.0	33.0			7.2			7.2	
Effective Green, g (s)	34.0	34.0		34.0	34.0			8.2			8.2	
Actuated g/C Ratio	0.60	0.60		0.60	0.60			0.15			0.15	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	687	1029		315	1058			251			286	
v/s Ratio Prot		c0.40			0.12							
v/s Ratio Perm	0.07			0.02				c0.06			0.06	
v/c Ratio	0.12	0.66		0.04	0.20			0.40			0.39	
Uniform Delay, d1	4.7	7.3		4.5	5.0			21.8			21.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.1	1.5		0.0	0.1			1.0			0.9	
Delay (s)	4.8	8.8		4.5	5.1			22.8			22.6	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		8.4			5.1			22.8			22.6	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	10.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	56.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	53.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	348	23	13	491	32	130	152	10	25	65	61
Future Volume (vph)	47	348	23	13	491	32	130	152	10	25	65	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	10	12	10	11	12	12	11	12	12	15	12
Storage Length (ft)	50		0	90		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1745	1757	0	1685	1820	0	0	1787	0	0	1959	0
Flt Permitted	0.225			0.396				0.814			0.919	
Satd. Flow (perm)	413	1757	0	702	1820	0	0	1488	0	0	1815	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		634			584			581			554	
Travel Time (s)		14.4			13.3			13.2			12.6	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	50	394	0	14	556	0	0	311	0	0	161	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	21.0	21.0		21.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	40.0	40.0		40.0	40.0		25.0	25.0		25.0	25.0	
Total Split (%)	47.1%	47.1%		47.1%	47.1%		29.4%	29.4%		29.4%	29.4%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0			-1.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Act Effct Green (s)	23.2	23.2		23.2	23.2			21.2			21.2	
Actuated g/C Ratio	0.42	0.42		0.42	0.42			0.38			0.38	
v/c Ratio	0.29	0.54		0.05	0.73			0.55			0.23	
Control Delay	17.5	16.1		11.7	21.0			23.0			17.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	17.5	16.1		11.7	21.0			23.0			17.2	
LOS	B	B		B	C			C			B	
Approach Delay		16.2			20.7			23.0			17.2	
Approach LOS		B			C			C			B	
Queue Length 50th (ft)	9	81		2	128			65			29	
Queue Length 95th (ft)	45	232		15	355			#295			125	
Internal Link Dist (ft)		554			504			501			474	
Turn Bay Length (ft)	50			90								

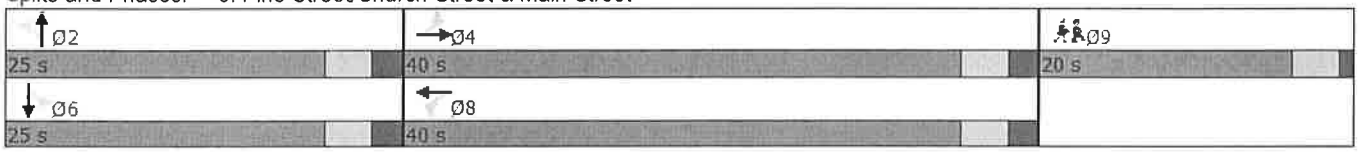
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	20.0
Total Split (s)	20.0
Total Split (%)	24%
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	286	1216		485	1259			601			732	
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	0.17	0.32		0.03	0.44			0.52			0.22	

Intersection Summary

Area Type: Other
Cycle Length: 85
Actuated Cycle Length: 55.4
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 19.5 Intersection LOS: B
Intersection Capacity Utilization 68.8% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Pine Street/Church Street & Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	348	23	13	491	32	130	152	10	25	65	61
Future Volume (vph)	47	348	23	13	491	32	130	152	10	25	65	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	10	12	10	11	12	12	11	12	12	15	12
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.99			1.00			0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.99	
Satd. Flow (prot)	1745	1757		1685	1820			1788			1960	
Flt Permitted	0.23	1.00		0.40	1.00			0.81			0.92	
Satd. Flow (perm)	414	1757		702	1820			1487			1816	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	50	370	24	14	522	34	138	162	11	27	69	65
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	50	394	0	14	556	0	0	311	0	0	161	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	22.1	22.1		22.1	22.1			20.1			20.1	
Effective Green, g (s)	23.1	23.1		23.1	23.1			21.1			21.1	
Actuated g/C Ratio	0.40	0.40		0.40	0.40			0.36			0.36	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	164	697		278	722			539			658	
v/s Ratio Prot		0.22			c0.31							
v/s Ratio Perm	0.12			0.02				c0.21			0.09	
v/c Ratio	0.30	0.57		0.05	0.77			0.58			0.24	
Uniform Delay, d1	12.0	13.6		10.8	15.2			15.0			13.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	1.1	1.1		0.1	5.1			1.5			0.2	
Delay (s)	13.1	14.7		10.9	20.3			16.5			13.2	
Level of Service	B	B		B	C			B			B	
Approach Delay (s)		14.5			20.1			16.5			13.2	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	58.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	68.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	534	92	11	167	30	15	68	6	14	76	12
Future Volume (vph)	73	534	92	11	167	30	15	68	6	14	76	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	10	12	10	11	12	12	11	12	12	15	12
Storage Length (ft)	50		0	90		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1728	1703	0	1685	1750	0	0	1806	0	0	2042	0
Flt Permitted	0.621			0.289				0.946			0.957	
Satd. Flow (perm)	1129	1703	0	512	1750	0	0	1722	0	0	1968	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		634			584			581			554	
Travel Time (s)		14.4			13.3			13.2			12.6	
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 (%)	1%	2%	1%	0%	3%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	81	695	0	12	219	0	0	100	0	0	113	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	21.0	21.0		21.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	40.0	40.0		40.0	40.0		25.0	25.0		25.0	25.0	
Total Split (%)	47.1%	47.1%		47.1%	47.1%		29.4%	29.4%		29.4%	29.4%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0			-1.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Act Effct Green (s)	37.2	37.2		37.2	37.2			9.9			10.0	
Actuated g/C Ratio	0.69	0.69		0.69	0.69			0.18			0.19	
v/c Ratio	0.10	0.59		0.03	0.18			0.32			0.31	
Control Delay	7.4	12.6		8.0	7.1			24.9			24.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.4	12.6		8.0	7.1			24.9			24.4	
LOS	A	B		A	A			C			C	
Approach Delay		12.1			7.2			24.9			24.4	
Approach LOS		B			A			C			C	
Queue Length 50th (ft)	7	93		1	20			25			28	
Queue Length 95th (ft)	47	#505		12	106			85			93	
Internal Link Dist (ft)		554			504			501			474	
Turn Bay Length (ft)	50			90								

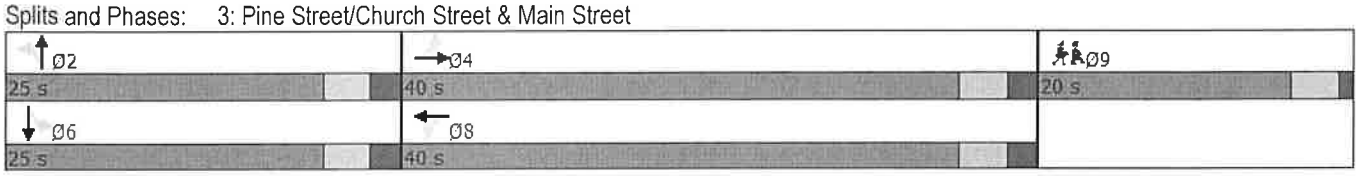
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	20.0
Total Split (s)	20.0
Total Split (%)	24%
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	793	1197		359	1230			706			807	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.10	0.58		0.03	0.18			0.14			0.14	

Intersection Summary

Area Type: Other
Cycle Length: 85
Actuated Cycle Length: 53.9
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.59
Intersection Signal Delay: 13.3 Intersection LOS: B
Intersection Capacity Utilization 54.0% ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Pine Street/Church Street & Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	534	92	11	167	30	15	68	6	14	76	12
Future Volume (vph)	73	534	92	11	167	30	15	68	6	14	76	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	10	12	10	11	12	12	11	12	12	15	12
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.98			0.99			0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1728	1703		1685	1751			1804			2043	
Flt Permitted	0.62	1.00		0.29	1.00			0.95			0.96	
Satd. Flow (perm)	1130	1703		513	1751			1722			1968	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	81	593	102	12	186	33	17	76	7	16	84	13
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	81	695	0	12	219	0	0	100	0	0	113	0
Heavy Vehicles (%)	1%	2%	1%	0%	3%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	35.0	35.0		35.0	35.0			7.2			7.2	
Effective Green, g (s)	36.0	36.0		36.0	36.0			8.2			8.2	
Actuated g/C Ratio	0.62	0.62		0.62	0.62			0.14			0.14	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	697	1051		316	1081			242			276	
v/s Ratio Prot		c0.41			0.13							
v/s Ratio Perm	0.07			0.02				c0.06			0.06	
v/c Ratio	0.12	0.66		0.04	0.20			0.41			0.41	
Uniform Delay, d1	4.6	7.2		4.4	4.9			22.9			22.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.1	1.6		0.0	0.1			1.1			1.0	
Delay (s)	4.7	8.8		4.4	5.0			24.0			23.8	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		8.4			4.9			24.0			23.8	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	58.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	54.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	356	24	13	506	32	132	152	10	25	65	62
Future Volume (vph)	48	356	24	13	506	32	132	152	10	25	65	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	10	12	10	11	12	12	11	12	12	15	12
Storage Length (ft)	50		0	90		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1745	1756	0	1685	1820	0	0	1787	0	0	1959	0
Flt Permitted	0.212			0.385				0.811			0.919	
Satd. Flow (perm)	389	1756	0	683	1820	0	0	1482	0	0	1815	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		634			584			581			554	
Travel Time (s)		14.4			13.3			13.2			12.6	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	51	405	0	14	572	0	0	313	0	0	162	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	21.0	21.0		21.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	40.0	40.0		40.0	40.0		25.0	25.0		25.0	25.0	
Total Split (%)	47.1%	47.1%		47.1%	47.1%		29.4%	29.4%		29.4%	29.4%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0			-1.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Act Effct Green (s)	23.7	23.7		23.7	23.7			21.4			21.4	
Actuated g/C Ratio	0.42	0.42		0.42	0.42			0.38			0.38	
v/c Ratio	0.31	0.55		0.05	0.75			0.55			0.23	
Control Delay	18.5	16.2		11.7	21.5			23.4			17.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	18.5	16.2		11.7	21.5			23.4			17.4	
LOS	B	B		B	C			C			B	
Approach Delay		16.5			21.3			23.4			17.4	
Approach LOS		B			C			C			B	
Queue Length 50th (ft)	9	84		2	133			67			30	
Queue Length 95th (ft)	48	240		15	370			#299			125	
Internal Link Dist (ft)		554			504			501			474	
Turn Bay Length (ft)	50			90								

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	20.0
Total Split (s)	20.0
Total Split (%)	24%
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	264	1193		464	1237			587			719	
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	0.19	0.34		0.03	0.46			0.53			0.23	

Intersection Summary

Area Type: Other
Cycle Length: 85
Actuated Cycle Length: 56.1
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 19.8 Intersection LOS: B
Intersection Capacity Utilization 69.7% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Pine Street/Church Street & Main Street

Ø2	Ø4	Ø9
25 s	40 s	20 s
Ø6	Ø8	
25 s	40 s	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	356	24	13	506	32	132	152	10	25	65	62
Future Volume (vph)	48	356	24	13	506	32	132	152	10	25	65	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	10	12	10	11	12	12	11	12	12	15	12
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.99			1.00			0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.99	
Satd. Flow (prot)	1745	1756		1685	1820			1788			1959	
Flt Permitted	0.21	1.00		0.38	1.00			0.81			0.92	
Satd. Flow (perm)	388	1756		682	1820			1482			1815	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	51	379	26	14	538	34	140	162	11	27	69	66
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	51	405	0	14	572	0	0	313	0	0	162	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	22.6	22.6		22.6	22.6			20.4			20.4	
Effective Green, g (s)	23.6	23.6		23.6	23.6			21.4			21.4	
Actuated g/C Ratio	0.40	0.40		0.40	0.40			0.36			0.36	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	155	702		272	728			537			658	
v/s Ratio Prot		0.23			c0.31							
v/s Ratio Perm	0.13			0.02				c0.21			0.09	
v/c Ratio	0.33	0.58		0.05	0.79			0.58			0.25	
Uniform Delay, d1	12.2	13.8		10.8	15.5			15.2			13.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	1.2	1.2		0.1	5.6			1.6			0.2	
Delay (s)	13.5	15.0		10.9	21.1			16.8			13.4	
Level of Service	B	B		B	C			B			B	
Approach Delay (s)		14.8			20.8			16.8			13.4	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	59.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Main Street at the East Project Site Driveway

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	2	896	189	6	0	0
Future Volume (vph)	2	896	189	6	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1863	1855	0	0	1863
Flt Permitted						
Satd. Flow (perm)	0	1863	1855	0	0	1863
Link Speed (mph)		30	30		30	
Link Distance (ft)		250	350		198	
Travel Time (s)		5.7	8.0		4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	976	212	0	0	0
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 52.1%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱			↱
Traffic Vol, veh/h	2	896	189	6	0	0
Future Vol, veh/h	2	896	189	6	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	974	205	7	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	212	0	-	0	-	209
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.12	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.218	-	-	-	-	3.318
Pot Cap-1 Maneuver	1358	-	-	-	0	831
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1358	-	-	-	-	831
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1358	-	-	-	-
HCM Lane V/C Ratio	0.002	-	-	-	-
HCM Control Delay (s)	7.7	0	-	-	0
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	4	423	710	19	0	0
Future Volume (vph)	4	423	710	19	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1863	1855	0	0	1863
Flt Permitted						
Satd. Flow (perm)	0	1863	1855	0	0	1863
Link Speed (mph)		30	30		30	
Link Distance (ft)		270	390		227	
Travel Time (s)		6.1	8.9		5.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	464	793	0	0	0
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 41.9%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱			↱
Traffic Vol, veh/h	4	423	710	19	0	0
Future Vol, veh/h	4	423	710	19	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	460	772	21	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	793	0	-	0	-	783
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.12	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.218	-	-	-	-	3.318
Pot Cap-1 Maneuver	828	-	-	-	0	394
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	828	-	-	-	-	394
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	828	-	-	-	-
HCM Lane V/C Ratio	0.005	-	-	-	-
HCM Control Delay (s)	9.4	0	-	-	0
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Main Street at the West Project Site Driveway

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		Y	
Traffic Volume (vph)	0	880	189	0	18	4
Future Volume (vph)	0	880	189	0	18	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1863	1863	0	1747	0
Flt Permitted					0.960	
Satd. Flow (perm)	0	1863	1863	0	1747	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		940	250		192	
Travel Time (s)		21.4	5.7		4.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	957	205	0	24	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 56.3% ICU Level of Service B
Analysis Period (min) 15

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		⋔	
Traffic Vol, veh/h	0	880	189	0	18	4
Future Vol, veh/h	0	880	189	0	18	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	957	205	0	20	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	1162	205
Stage 1	-	-	-	-	205	-
Stage 2	-	-	-	-	957	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	0	-	-	0	216	836
Stage 1	0	-	-	0	829	-
Stage 2	0	-	-	0	373	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	216	836
Mov Cap-2 Maneuver	-	-	-	-	216	-
Stage 1	-	-	-	-	829	-
Stage 2	-	-	-	-	373	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	20.9
HCM LOS			C

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	250
HCM Lane V/C Ratio	-	-	0.096
HCM Control Delay (s)	-	-	20.9
HCM Lane LOS	-	-	C
HCM 95th %tile Q(veh)	-	-	0.3

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		⋎	
Traffic Volume (vph)	0	416	710	0	11	2
Future Volume (vph)	0	416	710	0	11	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1863	1863	0	1752	0
Flt Permitted					0.959	
Satd. Flow (perm)	0	1863	1863	0	1752	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		880	270		217	
Travel Time (s)		20.0	6.1		4.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	452	772	0	14	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 47.4%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↱	
Traffic Vol, veh/h	0	416	710	0	11	2
Future Vol, veh/h	0	416	710	0	11	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	452	772	0	12	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	1224	772
Stage 1	-	-	-	-	772	-
Stage 2	-	-	-	-	452	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	0	-	-	0	198	400
Stage 1	0	-	-	0	456	-
Stage 2	0	-	-	0	641	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	198	400
Mov Cap-2 Maneuver	-	-	-	-	198	-
Stage 1	-	-	-	-	456	-
Stage 2	-	-	-	-	641	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	22.9
HCM LOS			C

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	215
HCM Lane V/C Ratio	-	-	0.066
HCM Control Delay (s)	-	-	22.9
HCM Lane LOS	-	-	C
HCM 95th %tile Q(veh)	-	-	0.2