
Traffic Impact, Access, and Parking Study

TEC Project File No. T1199.01

Cell Signaling Technologies at the Old Quarry

8 Atwater Avenue – Manchester By-the-Sea, Massachusetts

Prepared for: **Town of Manchester By-the-Sea, Massachusetts**
10 Central Street
Manchester-by-the-Sea, Massachusetts 01944



Massachusetts Department of Transportation (MassDOT)
Highway Division – District 4
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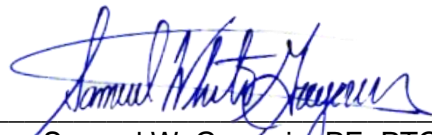
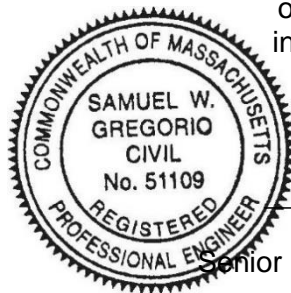
On Behalf of: **Cell Signaling Technologies**
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As the engineer in responsible charge, I have reviewed this document as it relates to the proposed planning of traffic operations and safety and concur that it is in conformity with accepted engineering standards.



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I. INTRODUCTION

PURPOSE OF STUDY

TEC, Inc. (TEC) has been retained by Cell Signaling Technologies (the “Applicant”) to prepare a Traffic Impact, Access, and Parking Study (TIAPS) for a proposed life science and research laboratory (the “Project”) to be located at #8 Atwater Avenue in Manchester By-the-Sea, Massachusetts. The existing site currently consists of an active earth removal quarry. The Applicant proposes to remove the earth removal operation and construct a 263,000 square foot (SF) research & development (R&D) facility with 550 employees and 535 off-street parking spaces (56 surface parking spaces and 479 garage spaces).

The life science and research laboratory, as well as both the surface and garage parking, will be constructed over two sequentially constructed phases. Phase 1 will include the construction of 127,000 SF of R&D space with 40 surface parking spaces and 227 garage parking spaces. Phase 2 will consist of the remaining 136,000 SF of R&D space with 16 surface parking spaces and 252 garage parking spaces. For the purposes of this TIAPS, the project in its entirety has been evaluated together for traffic operations and safety. Although the analyses are presented as a whole, some project-specific off-site mitigation has been identified to be implemented prior to the occupancy of distinct phases.

Access/egress to the site will be provided via two (2) full access/egress driveways, one at the end of Atwater Avenue adjacent to the Manchester Athletic Club and one along Beaver Dam Road approximately 175-feet east of Atwater Avenue. Both driveways are located at the existing driveway locations for the earth removal operation. Atwater Avenue provides the only public inlet/outlet location to the greater transportation network and therefore all traffic generated by the site will access/egress along the 2,000-foot Atwater Avenue to its terminus at its intersection with School Street, approximately 1,250 feet north of the Route 128 SB Ramps for Interchange 50.

The project directly abuts Massachusetts Department of Transportation (MassDOT) State Highway Layout (SHLO) along Route 128 and will require an indirect Permit to Access State Highway from the MassDOT’s District 4 office. The TIAPS for the project is subject to the review of the Massachusetts Environmental Policy Act (MEPA) as part of an Environmental Notification Form (ENF) as a requirement outlined under the following MEPA Review Thresholds:

- 301 CMR 11.03(6)(b)(13) – Generation of 2,000 or more New ADT on roadways providing access to a single location.
- 301 CMR 11.03(6)(b)(14) – Generation of 1,000 or more New ADT on roadways providing access to a single location and construction of 150 or more New parking spaces at a single location.

- 301 CMR 11.03(6)(b)(15) – Construction of 300 or more New parking spaces at a single location.

Coordination with MassDOT and MEPA

The Applicant facilitated a virtual meeting with MassDOT District 4 staff: including representations from the District's Projects, Traffic, Utilities and Constructability, Economic Development, and Planning Sections on Thursday, March 23, 2023. The project scope was introduced to MassDOT as well as the No-Build and Build traffic operating conditions. The meeting also permitted the Applicant to provide initial recommendations for project-specific off-site mitigation along MassDOT's infrastructure at the Route 128 Northbound (NB) Ramps. The questions and comments discussed during this virtual meeting will be reflected in the recommendations and conclusions outlined in this TIAPS. TEC issued a Transportation Scoping Letter to MassDOT on April 25, 2023 outlining the scope of the TIAPS. MassDOT's Public/Private Development Unit (PPDU) issued a memorandum intended to provide commentary on the methodology of the TIAPS required for the Project on May 31, 2023. The memorandum generally approved of the TIAPS methodology and offered information on items that should be included in addition to the general scope. Each of these items has been included in the TIAPS or has been specifically superseded by other study parameters.

Massachusetts Environmental Policy Act Review

The project received a Certificate of the Secretary of Energy and Environmental Affairs on the ENF, with the original version of this TIAS included, on July 24, 2023 identifying the Secretary's determination that the project does not require an Environmental Impact Report (EIR). As part of the Certificate, MassDOT's attached comments identified the following pertaining to SHLO:

"The Proponent should work with the MassDOT's District 4 office during the permitting of Phase 1 to discuss the proposed redesign for this intersection [School Street / Route 128 NB Ramps / Mill Street]. This may include an alternatives analysis to select the preferred alternative for improvements at this intersection."

The Applicant has submitted, in conjunction with the ENF, an Intersection Control Evaluation (ICE) Stage 1 form for the intersection of School Street / Route 128 NB Ramps / Mill Street identifying the existing two-way stop-control, potential all-way stop-control, and potential traffic signal control strategies / alternatives as viable traffic control strategies at the intersection. No action was taken on the ICE Stage 1 submittal by MassDOT, and this process will continue as part of the future MassDOT Permit to Access State Highway process to finalize a preferred alternative, as applicable. This process will recommence following occupancy of Phase 1 based on evaluating the need for any further traffic control improvements which can be tied directly to Phase 2 permitting and occupancy needs.

"As documented in this study, Project-related traffic can be safely and efficiently accommodated within the study area corridors and intersections upon implementation of off-site mitigation. The Proponent has committed to work with MassDOT and the Town of Manchester-by-the-Sea to implement the phased transportation mitigation program."

Given the limited Project impacts based on the anticipated new trip generation, MassDOT recommends no further environmental review based on transportation

issues. The Proponent should coordinate with MassDOT District 4 to obtain the necessary access permit for the Project site.”

MassDOT Permits to Access State Highway Process

Whereas the Town has recently submitted materials to MassDOT for a Permit to Access State Highway in conjunction with the Applicant for the utility related aspects of the project in May 2024 (Permit 4-2024-0205), the Applicant will be submitting a separate Permit to Access State Highway based on the location of the project adjacent to SHLO and will not identify any specific roadway improvement related to off-site mitigation at this time. This permit application will include a copy of this TIAPS, a copy of the aforementioned MEPA Certificate, and a copy of the up-to-date site plans with an overall request for no further action. This Permit to Access State Highway will be one (1) of potentially two (2) permits submitted by the Applicant to MassDOT. Any and all improvements related to potential traffic control at the intersection of School Street / Route 128 NB Ramps / Mill Street, as previously noted, will be part of a second and future MassDOT Permit to Access State Highway following occupancy of Phase 1. There is a possibility that bicycle lane improvements, as noted in this TIAPS, may slightly overlap SHLO by a few feet to tie-into the recently installed buffered bicycle lanes by MassDOT in 2023. Should this be the case, this will be identified in the near-term Permit to Access State Highway prior to occupancy of Phase 1.

METHODOLOGY

TEC has evaluated the traffic operations for the study area under existing and future conditions consistent with the *Transportation Impact Assessment (TIA) Guidelines* issued by the MassDOT¹ and the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports. The future planning horizon examines traffic operations under existing conditions (2023), as well as a 10-year planning horizon (2033) for traffic-volume projections, which includes an evaluation of the No-Build conditions (without the proposed project), Build conditions (with the proposed project), and Build with Mitigation conditions (with the proposed project and any proposed mitigation).

Further evaluation of the 20-year design horizon (2043) will be evaluated as part of any Project Framework Document (PFD) and/or Interchange Modification Report (IMR) that may be filed with Federal Highway Administration (FHWA) should off-site mitigation at the Route 128 NB Ramps be implemented. These subsequent documents will be provided to MassDOT during the Permit to Access State Highway process following the completion of MEPA.

¹ *Transportation Impact Assessment (TIA) Guidelines*; Massachusetts Department of Transportation; March 13, 2014.

II. EXISTING CONDITIONS

TRAFFIC STUDY AREA

A comprehensive field inventory of existing traffic conditions on the study area corridors and intersections was conducted during various site visits by TEC staff from February 2023 through March 2023. The field investigations consisted of existing roadway geometrics, operating characteristics, study area safety concerns, and multi-modal accommodations.

Study Area Intersections

The study area was selected to contain the major roadways providing local access/egress to/from the project site. This includes an evaluation of intersections in which the site-generated trips increase the peak hour traffic volume by more than 5 percent and/or by more than 100 vehicles per hour per MassDOT's *TIA Guidelines* (Section 3.I.C). The following intersections were therefore evaluated as part of the study area:

1. School Street / Atwater Avenue
2. School Street / Route 128 Southbound Ramps
3. School Street / Route 128 Northbound On-Ramps / Mill Street
4. School Street / Route 128 Northbound Ramps
5. School Street / Pleasant Street
6. School Street / Lincoln Street

Locations #3 and #4 above are traditionally considered to be one intersection location; however, the offset between the Route 128 NB Ramps and Mill Street is at such distance that they operate independently from one another. All traffic operational analysis presented in this TIAPS assumes that these locations are two independent locations. The study area intersections and project limits are shown graphically in Figure 1.

GEOMETRY

The field inventory included collection of existing roadway geometrics, pedestrian and bicycle accommodation, traffic volumes, sight distances, and safety data for the existing study area. A description of the existing roadway and intersection inventory is provided within this section.



1" = 800'

Study Area Intersections:

1. School Street / Atwater Avenue
2. School Street / RTE 128 Southbound
3. School Street / RTE 128 Northbound
4. School Street / Pleasant Street
5. School Street / Lincoln Street



Figure 1

**Project Location Map &
Study Area Intersections**



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Roadways

Atwater Avenue

Atwater Avenue is a 2,000-foot east-west local roadway under the jurisdiction of the Town of Manchester By-the-Sea. The roadway, which starts at School Street to the west, has no other inlet/outlet and serves as the driveway collection roadway for the Manchester Athletic Club and other minor parcels and short non-outlet roadways such as Beaver Dam Road. Atwater Avenue is 25-feet wide within a 30-foot Right-of-Way (ROW) consisting of one travel lane in each direction with directional flow unmarked. The posted speed along the roadway is 20 miles per hour (mph); however, there is no Special Speed Regulation on file for the roadway with MassDOT. There is no formal pedestrian or bicycle accommodation along Atwater Avenue.

School Street

School Street is a two-lane, north-south urban minor arterial roadway under the jurisdiction of the Town of Manchester By-the-Sea. A segment of School Street, from Route 128 SB Ramps to Route 128 NB Ramps, is under the jurisdiction of MassDOT. School Street varies in width with a narrow 28 to 30-foot section to the south entering the Manchester Business District, increasing to 40-feet in the vicinity of Route 128, and narrowing again to approximately 28-feet in the vicinity of Atwater Avenue. The roadway provides one travel lane in each direction with directional flow separated by a marked centerline. The posted speed limit north of Route 128 NB ramps is 35 mph while south of the ramps it is 25 mph. Within the study area, sidewalks are provided along the easterly side of School Street south of Route 128 SB Ramps and along the westerly side of School Street south of Windemere Park. There is no formal bicycle accommodation along School Street although shoulders from the Route 128 NB Ramps to the #195 School Street Driveway (labeled as Kit Glass Drive, a private way) are generally wide enough to support bicycle travel. Land uses along School Street north of Route 128 are generally limited to a small amount of light commercial and recreational uses. South of Route 128, the land uses in the study area are primarily residential in nature.

A section of the School Street corridor is under minor reconstruction in early 2023 as part of MassDOT Project 609102. The work along School Street includes reconstruction of asphalt sidewalks and concrete curb ramps along the easterly side of School Street between the southerly limit of SHLO and the Route 128 bridge. The work will also include resurfacing School Street within the SHLO limits both north and south of the Route 128 bridge. Pavement markings being applied to the resurface roadway will include variable width buffered bicycle lanes (3-foot buffer) in both directions of travel within the limits of SHLO.

Existing Intersections

School Street / Atwater Avenue

Atwater Avenue intersects School Street from the east to create a three-legged, unsignalized intersection. The Atwater Avenue westbound approach is under stop-control while the School Street northbound and southbound approaches are free flowing. All three intersection approaches consist of a single general-purpose travel lane. Directional flow along School Street is separated by a marked centerline while flow along Atwater Avenue is unmarked. There is no formal pedestrian or bicycle accommodation along School Street or Atwater Avenue at the intersection.

School Street / Route 128 Southbound Ramps

The Route 128 SB Ramps intersect School Street from the east to create a three-legged, unsignalized intersection. The Route 128 SB Off Ramp westbound approach is under stop-control while the School Street northbound and southbound approaches are free flowing. The Route 128 SB Off Ramp westbound approach consists of an exclusive left-turn lane and a channelized right-turn lane with directional flow separated by a raised landscaped median. The School Street northbound approach consists of a through lane and a channelized right-turn lane with directional flow separated by a marked centerline. The School Street southbound approach consists of a shared left-turn / through lane with directional flow separated by a marked centerline. Sidewalks are provided along the easterly side of School Street south of the intersection. There is no formal bicycle accommodation at the intersection.

Components of this intersection were reconstructed in early 2023 as part of ongoing MassDOT Project 609102. The work at this intersection included the resurfacing of the pavement between the Route 128 bridge and the edge of SHLO to the north. New pavement markings being applied to the resurface roadway will include variable width buffered bicycle lanes (3-foot buffer) in both directions of travel through the intersection.

School Street / Route 128 Northbound Ramps / Mill Street

Mill Street and the Route 128 NB Ramps intersect to form a four-legged, offset, unsignalized intersection. The Mill Street westbound and Route 128 NB Ramps eastbound approaches are offset by approximately 120-feet with Mill Street opposing only the channelized freeway on-ramp from School Street southbound. Both the Mill Street westbound and Route 128 NB Ramps eastbound approaches are under stop-control while the School Street northbound and southbound approaches are free flowing. The Route 128 NB Ramp eastbound approach consists of an exclusive left-turn lane and a channelized right-turn lane with directional flow separated by a raised landscaped median. The Mill Street westbound approach consists of a single general-purpose travel lane with directional flow separated by a marked centerline. The School Street northbound approach consists of a single general-purpose travel lane with directional flow separated by a marked centerline. The School Street southbound approach consists of a shared left-turn / through lane and a channelized right-turn lane with directional flow separated by a marked centerline. Sidewalks are provided along the easterly side of School Street through the intersection with no marked crossing across the Mill Street approach. There is no formal bicycle accommodation at the intersection.

Components of this intersection were reconstructed in early 2023 as part of ongoing MassDOT Project 609102. The work at this intersection included the reconstruction of the sidewalk and pedestrian curb ramps along the easterly side of School Street, as well as a resurfacing of the pavement between the Route 128 bridge and the edge of SHLO to the south. New pavement markings being applied to the resurface roadway will include variable width buffered bicycle lanes (3-foot buffer) in both directions of travel through the intersection.

School Street / Pleasant Street

Pleasant Street intersects School Street to create a four-legged, all-way stop controlled intersection. Pleasant Street east of the intersection enters School Street with one-way flow. The Pleasant Street eastbound approach consists of a single general-purpose travel lane with directional flow separated by a marked centerline. The Pleasant Street westbound approach

consists of a shared left-turn / through lane and an exclusive right turn lane. The School Street northbound and southbound approaches each consist of single general-purpose travel lanes with directional flow separated by a marked centerline. Sidewalks are provided along both sides of all four intersection approaches with crosswalks marked across each approach. There is no formal bicycle accommodation at the intersection.

Components of this intersection were reconstructed in early 2023 as part of ongoing Town of Manchester By-the-Sea annual maintenance work. The reconstruction work at this intersection included the reconstruction of the sidewalk and pedestrian curb ramps along each corner of the intersection.

School Street / Lincoln Street / Lincoln Avenue

Lincoln Street intersects School Street to create a four-legged, unsignalized intersection. Lincoln Street east of the intersection exits School Street with one-way flow. Both the Lincoln Street eastbound and westbound approaches are slightly offset. The Lincoln Street eastbound approach, a cul-de-sac roadway, consists of a single general-purpose travel lane with directional flow unmarked. The School Street northbound and southbound approaches each consist of single general-purpose travel lanes with directional flow separated by a marked centerline. Sidewalks are provided along both sides of all four intersection approaches with crosswalks marked across all approaches except the Lincoln Street eastbound approach. Although no crosswalk is provided, the sidewalk opens into pedestrian ramps to cross. There is no formal bicycle accommodation at the intersection.

Components of this intersection were reconstructed in early 2023 as part of ongoing Town of Manchester By-the-Sea annual maintenance work. The reconstruction work at this intersection included the reconstruction of the sidewalk and pedestrian curb ramps along the westerly side of School Street. Sidewalks and ramps along the easterly side of the roadway were retained as they had been more recently reconstructed.

PUBLIC TRANSPORTATION

The proposed project site is not located near existing public transportation bus or rail services. The closest Massachusetts Bay Transportation Authority (MBTA) commuter rail station for the Newbury/Rockport Line is approximately 2.2-miles from the site on Beach Street in the Manchester By-the-Sea Business District. Schedule information for the MBTA commuter rail is provided in Attachment A.

EXISTING TRAFFIC VOLUMES

Traffic volume data for this report was obtained from Manual Turning Movement Counts (TMCs) and supplemented with Automatic Traffic Recorder (ATR) counts conducted at the study area intersections. The details of the data collection effort for this project are described below.

Turning Movement Counts

To establish existing traffic volume conditions at the study area intersections, manual TMCs were conducted during the typical weekday (7:00 AM to 7:00 PM) at the School Street intersections with Atwater Avenue, Route 128 SB Ramps, and Route 128 NB Ramps / Mill Street. Additional TMCs were conducted during the weekday morning (7:00 AM – 9:00 AM) and weekday evening

(3:00 PM – 6:00 PM) peak periods at the School Street intersections with Pleasant Street and Lincoln Street. All TMCs were conducted on Wednesday, January 11, 2023 while area schools were in general session. A detailed summary of the turning movement counts, partitioned into 15-minute intervals, is provided within Attachment B.

Automatic Traffic Recorder Counts

ATR counts were conducted along School Street, south of the Atwater Avenue, from Wednesday January 11, 2023 through Thursday, January 12, 2023 concurrently with the TMCs to gather daily traffic volume data, vehicle speeds, and vehicle classifications during a continuous 48-hour time period. A summary of the Weekday ATR traffic data is presented in Table 1. A detailed summary of the ATR data, partitioned into 15-minute intervals, is provided within Attachment C.

Table 1 – Existing Weekday Traffic Volume Summary

Location	Weekday Traffic Volume ^(a)	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
		Traffic Volume ^(b)	K Factor ^(c)	Directional Distribution ^(d)	Traffic Volume	K Factor	Directional Distribution
School Street, South of Atwater Avenue	6,131	580	9.5	50.1% SB	563	9.2	56.5% NB

^a Daily traffic expressed in vehicles per day

^b Hourly traffic expressed in vehicles per hour

^c Percent of daily traffic volumes which occurs during the peak hour

^d Percent of peak-hour volume in the predominant direction of travel

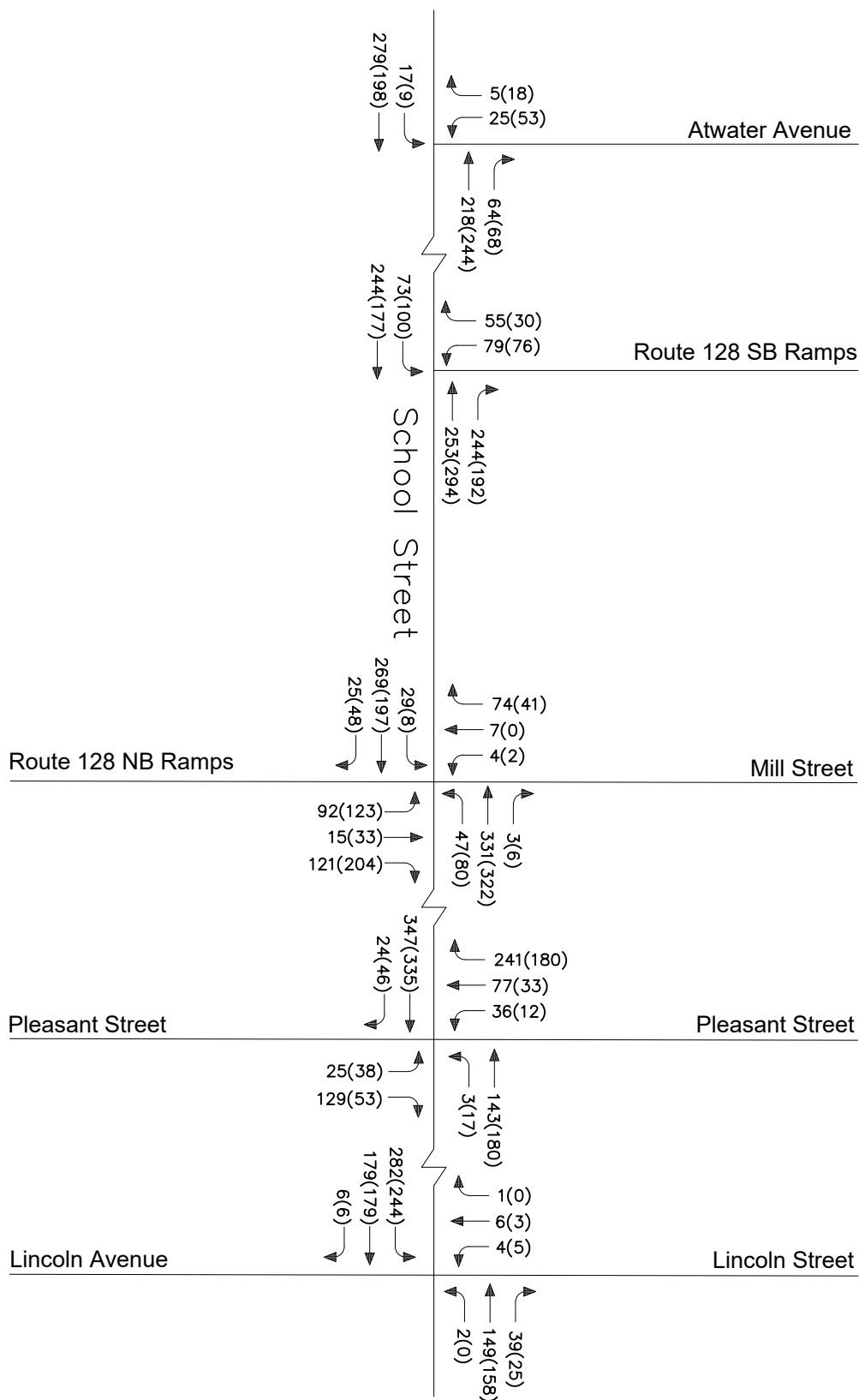
School Street carries approximately 6,130 vehicles per day (vpd) on an average weekday. Directional distribution along the roadway is generally balanced northbound and southbound during the weekday morning and evening peak hour which a slight weight towards northbound, away from Route 128, during the weekday evening peak hour. Speed data indicates that the average speed and 85th percentile speed along School Street is 34 mph and 40 mph in the northbound direction, respectively, and 31 mph and 37 mph in the southbound direction, respectively.

Seasonal Adjustments

In accordance with MassDOT standards, traffic volumes are typically adjusted to average-month conditions. Within the vicinity of the project, there is currently no MassDOT permanent count station with month-to-month continuous data available to provide a precise overview of month-to-month fluctuations in traffic volumes. To account for seasonal adjustment, TEC utilized MassDOT's weekday seasonal and axle correction factors as published in 2019 (most recent publication). The factors provide a month-to-month overview of traffic volumes statewide by roadway functional classification and land (urban vs. rural) type. For minor arterial roadways within an urban setting, traffic volumes in the month of January are 6 percent lower than the average-month. Therefore, the January 2023 traffic volumes were upwardly adjusted by 6 percent to reflect a conservative condition. The compiled seasonal adjustment data is provided in Attachment D. The resulting 2023 Existing Condition weekday morning and weekday evening peak hour traffic volumes are shown graphically in Figure 2.



Not to Scale



XXX(XXX) = Weekday Morning(Weekday Evening)



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Figure 2

2023 Existing Conditions
Weekday Morning and Weekday Evening
Peak Hour Traffic Volumes

SAFETY ANALYSIS AND REVIEW

A comprehensive traffic safety analysis was conducted for the study area intersections. The traffic safety analysis included the compilation and examination of study intersection crash data, a general safety review with consideration given to items on the MassDOT Safety Review Prompt List, and sight distance measurements. Details of each step in the traffic safety analysis are described in the following section.

Crash History Analysis

Crash data for the study area intersections were compiled and analyzed for the most recent consecutive five-year period (2017-2021) of data on file with the MassDOT Interactive Mapping Portal for Analysis and Crash Tracking (IMPACT) online website. This includes the most recent three-years of complete data (2017 through 2019). The motor vehicle crash data was reviewed to determine if any crash trends exist within the study area. Summaries of the vehicle crash data and intersection crash rates are provided in Table 2.

Crash Rate Worksheets

In addition to examining the number of crashes at the study area intersections, a crash rate was calculated to compare the occurrence of crashes to the volume of traffic passing through the intersection. The crash rate per million entering vehicles (MEV) was calculated using the evening peak hour volumes from the TMCs and a calculated K-factor obtained from the ATR counts to establish a daily intersection traffic volume. The crash rates at each of the study area intersections were compared to the statewide and district-wide averages published by MassDOT in June 2018 to determine the significance of the crash occurrence. The statewide average for unsignalized intersections is 0.57, and the District 4 average for unsignalized intersections is 0.57. A compilation of the MEV rate calculation worksheets and detailed crash data are provided in Attachment E.

Crash Data Summary

There is a limited history of crashes at the study area intersections based on an evaluation of MassDOT's IMPACT database. All intersections included within the study experienced less than three (3) crashes per year on average with crash rates at each intersection below the statewide and District-wide averages for unsignalized intersections. No locations within the study area were designated as high crash locations. The data indicated no noticeable crash trends within the study area.

Table 2 – Intersection Crash History Summary

Parameter		School Street / Atwater Avenue	School Street / Route 128 Southbound	School Street / Mill Street / Route 128 Northbound	School Street / Pleasant Street	School Street / Lincoln Street
Year	2017	1	1	4	1	0
	2018	0	0	2	0	0
	2019	0	2	1	2	0
	2020	1	1	1	1	0
	2021	1	1	0	2	0
	TOTAL	3	5	8	6	0
Average Annual Crashes*		0.33	1.00	2.33	1.00	0.00
Rate per MEV/MVMT*		0.14	0.29	0.55	0.28	0.00
Manner of Collision	Angle	1	4	1	2	0
	Rear-end	0	0	0	3	0
	Sideswipe	1	0	1	1	0
	Single Vehicle	1	1	3	0	0
	Head-On	0	0	0	0	0
	Ped / Bike	0	0	0	0	0
	Not Reported	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
	TOTAL	3	5	8	6	0
Road Surface Conditions	Dry	2	5	4	6	0
	Wet	1	0	1	0	0
	Snow / Ice	0	0	0	0	0
	Other / Unk	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
	TOTAL	3	5	8	6	0
Injury Status (Crash Severity)	Prop Damage	1	3	3	5	0
	Non-Fatal Injury	1	2	1	1	0
	Fatal Injury	0	0	0	0	0
	Not Reported	<u>1</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>
	TOTAL	3	5	8	6	0
Day of Week	Monday-Friday	6	4	8	3	0
	Sat-Sun	<u>1</u>	<u>1</u>	<u>0</u>	<u>3</u>	<u>0</u>
	TOTAL	3	5	8	6	0
Time of Day	6:00AM-9:00AM	0	0	0	0	0
	9:00AM-3:00PM	1	3	2	3	0
	3:00PM-6:00PM	2	2	3	3	0
	6:00PM-6:00AM	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
	TOTAL	3	5	8	6	0

*Rate based on completed crash years (2017-2019). MassDOT has indicated that 2020, although complete, should not be included in rate calculations.

Sight Distance Measurements

TEC measured the available sight distances at the intersection of School Street / Atwater Avenue as the intersection serves as the sole inlet/outlet to the project location. The available sight lines were compared to minimum requirements established by the American Association of State Highway and Transportation Officials (AASHTO).

Sight distance represents the length of roadway that is visible to a driver traveling within the roadway. Two types of sight distance are typically evaluated for driveways and intersections: stopping sight distance (SSD) and intersection sight distance (ISD). SSD is the minimum distance required for a driver traveling along a roadway to perceive an object in the roadway and stop safely in advance of the object when traveling on a wet pavement surface. SSD is measured from an eye height of 3.5-feet to an object height of 2-feet above the ground, which is equivalent to a driver viewing the taillight of a vehicle ahead. SSD is measured along the centerline of the travel lane approaching the driveway or intersection.

ISD represents the length of the roadway visible to a driver waiting to exit a driveway or minor street. Minimum ISD requirements are based on the distance required for a driver to exit a minor street onto a major street without requiring an approaching vehicle to reduce its speed from the design speed to less than 70 percent of the design speed. ISD is measured from an eye height of 3.5-feet to an object height of 3.5-feet and is measured from a distance 14.5-feet beyond the edge of the travel-way of the major roadway to represent a driver waiting to exit a driveway or minor roadway.

SSD is typically considered the critical sight distance, as it represents the minimum distance required for safe stopping, while ISD represents an acceptable speed reduction for approaching vehicles. The ISD, however, must be at least equal to the minimum required SSD in order to prevent a driver from entering the roadway when an approaching vehicle is too close to safely stop. The guidance provided by AASHTO states:

“If the available sight distance for an entering or crossing vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to anticipate and avoid collisions. However, in some cases, this may require a major-road vehicle to stop or slow to accommodate the maneuver by a minor-road vehicle. To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road.”

Tables 3 and 4 provide a summary of the available SSD and ISD at the intersection of School Street / Atwater Avenue, respectively.

Table 3 – Existing Stopping Sight Distance Measurements

Approach / Direction	Operating Speed ^a	AASHTO Recommended Minimum	Measured Stopping Sight Distance
School Street at Atwater Avenue:			
School Street northbound	40 MPH	305 FT	> 500 FT
School Street southbound	37 MPH	270 FT	> 500 FT

^a Operating speeds calculated as 85th percentile speed from ATR counts on January 11th and 12th, 2023

Table 4 – Existing Intersection Sight Distance Measurements

Approach / Direction	Operating Speed ^a	AASHTO Desired Minimum ^b	AASHTO Recommended Minimum	Measured Intersection Sight Distance
School Street at Atwater Avenue:				
<i>North of Atwater Avenue</i>	37 MPH	410 FT	270 FT	430 FT
<i>South of Atwater Avenue</i>	40 MPH	445 FT	305 FT	> 500 FT

^a Operating speeds calculated as 85th percentile speed from ATR counts on January 11th and 12th, 2023

^b ISD calculated using time gap (t_g) at design speed of 6.5 seconds for passenger car left-turn

As shown in Tables 3 and 4, the ISD and SSD at the intersection of School Street / Atwater Avenue are well in excess of AASHTO minimum recommendations and desired minimums.

III. FUTURE CONDITIONS

Traffic volumes in the study area were projected to the year 2033, which reflects a 10-year planning horizon in accordance with MassDOT standards for TIA. The traffic conditions for the year 2033 under No-Build conditions, were developed to document the operating conditions independent of the proposed project, including all existing traffic, new traffic from background growth, and traffic from other specific developments in the site area. Anticipated site-generated traffic volumes for the proposed school were superimposed upon the No-Build traffic networks to reflect the Build conditions with the proposed project.

BACKGROUND TRAFFIC GROWTH

Traffic growth is a function of the expected land development in the immediate area and the surrounding region. Several methods can be used to estimate this growth. Traffic engineers frequently employ an annual percentage increase in traffic growth, which is applied to all traffic volumes under study. The drawback to such a procedure is that some turning volumes may actually grow at either a greater or a lesser rate at particular intersections.

An alternative procedure identifies the location and type of planned development, estimates the traffic to be generated, and assigns it to the area roadway network. This procedure produces a more realistic estimate of growth for local traffic; however, the potential growth in population and development external to the study area are not accounted for in the traffic projections.

To provide a conservative analysis framework, both procedures were considered.

General Background Growth

To project traffic to a future planning horizon year, TEC utilized MassDOT published year-by-year annual growth data between 2016 and 2019 (pre-COVID growth). The data indicates that for urban minor arterials, traffic volumes between 2016 and 2017 grew 1.7 percent, between 2017 and 2018 growing 0.3 percent, and between 2018 and 2019 decreasing 0.4 percent. This equates to an annual growth rate of approximately 0.53 percent per year on average between 2016 and 2019. To provide a consistent analysis scenario, a 1.0 percent per year compounded annual background traffic growth rate was used to account for potential future traffic growth external to the study area and any presently unforeseen development. This growth rate aligned with recent traffic studies completed in the Town of Manchester By-the-Sea. MassDOT historic count station data have been included in Attachment F.

Specific Developments by Others

TEC coordinated with the Town of Manchester By-The-Sea to identify nearby private / public development projects in the vicinity of the study area that are either in the planning process or

were recently approved but not yet occupied. Based on these discussions there are two (2) private development projects in the vicinity, including the following:

- #156 School Street - The Town of Manchester By-The-Sea indicated that a new residential development is currently within the planning / zoning process and located north of Atwater Avenue along the west side of School Street. This development is anticipated to include 157 multifamily units as part of the 40B regulations. To assess the impact of additional traffic from the site that would not be represented in the January 2023 traffic counts, TEC included site generated traffic and distribution for the proposed residential development based on a previous Transportation Impact Assessment (TIA) prepared by Vanasse & Associates Inc. (VAI) in December 2021.
- #183-#193 School Street – The Town of Manchester By-The-Sea indicated the Cornerstone Church would be relocated to a new parish building along School Street near Mill Street with access/egress provided along Mill Street immediately east of School Street. This development will occupy approximately 9,745 SF directly opposing the Route 128 NB Ramps along School Street. To assess the impact of additional traffic from the site that would not be represented in the January 2023 traffic counts, TEC included site generated traffic for the church based on a previous TIA prepared by VAI in September 2021. The estimated trips for the weekday morning and evening peak hour were less than five (5) trips, having insignificant impact to traffic in the area. The additional traffic to/from the site has been assumed to be part of general background growth.

Trip generation and trip distribution calculations related to these specific developments by others are provided in Attachment G.

Infrastructure Improvement Projects by Others

There are two (2) specific projects currently underway within the study area that directly affect the transportation infrastructure. These projects include:

- MassDOT Project 609102 – This project includes the reconstruction along School Street within the limits of SHLO adjacent to Route 128. The project includes reconstruction of asphalt sidewalks and concrete curb ramps along the easterly side of School Street between the southerly limit of SHLO and the Route 128 bridge. The work will also include resurfacing School Street within the SHLO limits both north and south of the Route 128 bridge. Pavement markings being applied to the resurface roadway will include variable width buffered bicycle lanes (3-foot buffer) in both directions of travel within the limits of SHLO. This work is expected to be completed by early summer 2023.
- Municipal Pedestrian Improvements – The Town of Manchester By-the-Sea is currently reconstructing pedestrian infrastructure, such as sidewalk and pedestrian curb ramps, along School Street at the intersections with Pleasant Street and Lincoln Street. This work is expected to be completed by early summer 2023.

The infrastructure improvement projects by others are not anticipated to result in a noticeable change in traffic volumes at the various study area intersections.

2033 NO-BUILD TRAFFIC VOLUMES

The 2033 No-Build weekday morning and weekday evening peak-hour traffic-volume networks were developed by applying the 1.0 percent per year compounded annual background traffic growth rate on the 2023 Existing Condition peak hour traffic volumes over the 10-year planning horizon and adding the projected traffic generated by the specific development by others. The resulting 2033 No-Build weekday morning and weekday evening peak hour traffic volume networks are illustrated in Figure 3.

SITE GENERATED TRAFFIC

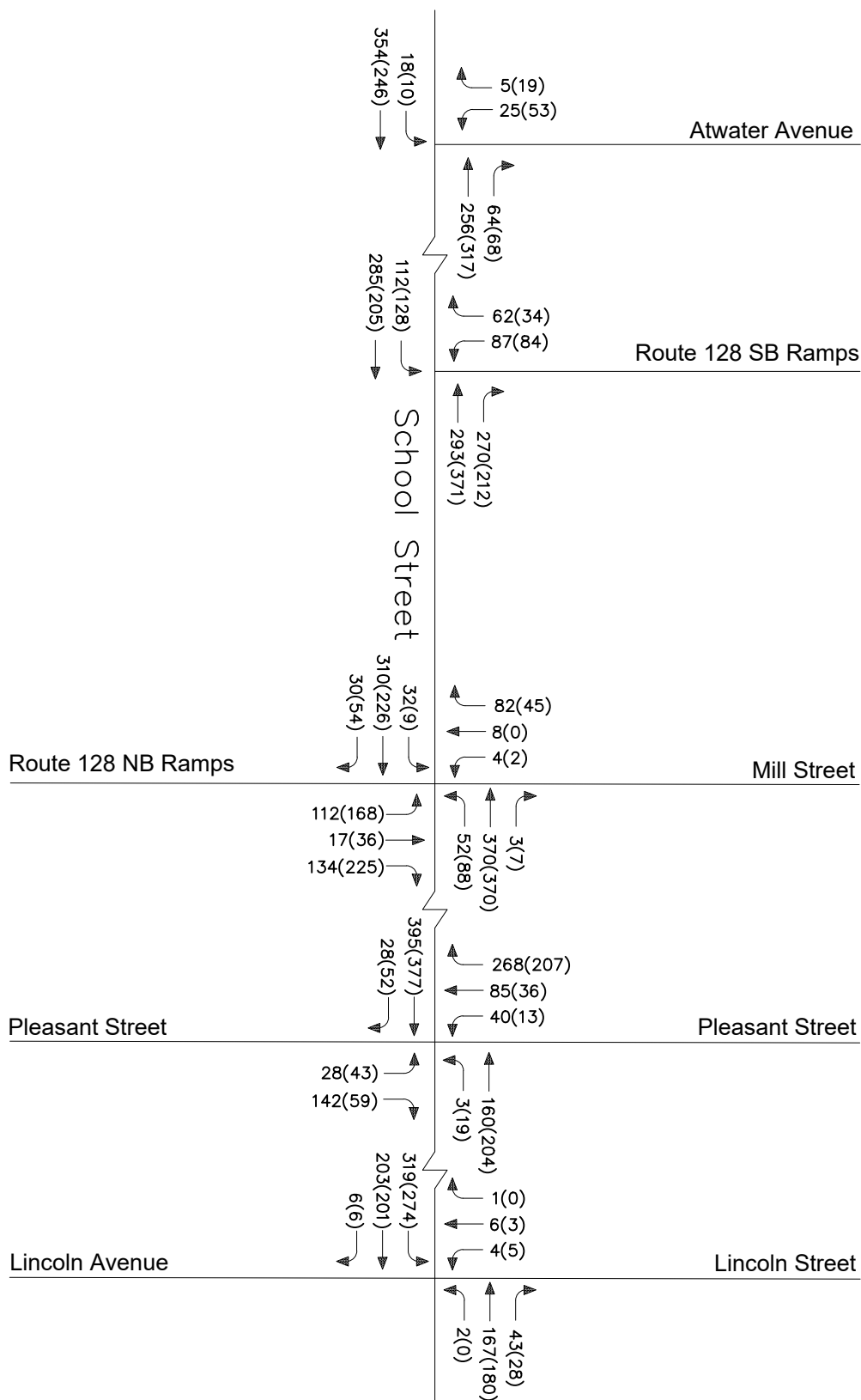
Trip Generation Calculations

The Applicant proposes to transform the existing earth removal operation and construct a 263,000 SF R&D facility with 550 employees. The project proposes to be developed in two phases. Phase 1 will be the construction of 127,000 SF of R&D space and an approximate 200 employees with Phase 2 consisting of the remaining 136,000 SF of R&D space. The Phase 1 and full build-out size and scope of the project has been evaluated for the purpose of this TIAPS. TEC estimated the site-generated traffic based on industry standard trip rates published in the Institute of Transportation Engineers (ITE) publication, *Trip Generation*, 11th Edition for Land Use Code (LUC) 760 – Research and Development Center.

The ITE Publication assesses this land use by two separate independent variables: gross floor area and number of employees. The TIAPS reviews both independent variables. Table 5 provides a summary of the resulting trip generation estimate as calculated for both independent variables under the Phase 1 condition and Table 6 provides a summary of the resulting trip generation estimate as calculated for both independent variables under the Full Build-Out condition. The detailed trip generation calculation worksheets are provided in Attachment H.

Table 5 –Trip Generation Summary for Phase 1

Time Period	LUC 760 (127,000 SF)	LUC 760 (200 Employees)
<i>Weekday Daily</i>		
IN	740	337
OUT	740	337
TOTAL	1,480	674
<i>Weekday Morning</i>		
IN	113	66
OUT	25	14
TOTAL	138	80
<i>Weekday Evening</i>		
IN	21	12
OUT	111	64
TOTAL	132	76



XXX(XXX) = Weekday Morning(Weekday Evening)

Figure 3

2033 No-Build Conditions
Weekday Morning and Weekday Evening
Peak Hour Traffic Volumes



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Table 6 –Trip Generation Summary for Full Build-Out

Time Period	LUC 760 (263,000 SF)	LUC 760 (550 Employees)
<i>Weekday Daily</i>		
IN	1,400	948
OUT	<u>1,400</u>	<u>948</u>
TOTAL	2,800	1,896
<i>Weekday Morning</i>		
IN	212	193
OUT	<u>47</u>	<u>34</u>
TOTAL	259	227
<i>Weekday Evening</i>		
IN	39	26
OUT	<u>207</u>	<u>190</u>
TOTAL	246	216

As shown in Table 5, the Phase 1 component of the development is anticipated to generate 1,480 new vehicle trips during the average weekday, with 80 new vehicle trips (66 entering and 14 exiting) during the weekday morning peak hour and 76 new vehicle trips (12 entering and 64 exiting) during the weekday evening peak hour. For the full build-out and as shown in Table 6, the proposed development assessed by square footage is anticipated to generate 2,800 new vehicle trips during the average weekday, with 259 new vehicle trips (212 entering and 47 exiting) during the weekday morning peak hour and 246 new vehicle trips (39 entering and 207 exiting) during the weekday evening peak hour. If assessed by employee count, the number of trips generated by the site would be less.

Employee Count vs. Square Footage

Although the overall daily trip generation is significantly less when utilizing the employee count by independent variable, the trip generation during the weekday morning and weekday evening commuter peak hours higher but comparable. For the purposes of traffic operational analysis, the TIAPS will present the conservative trip generation as calculated by the gross floor area. The opportunity for less trip generation based on the employee count, which the Applicant believes is more in line with what will occur based on the existing CST Danvers, MA headquarters campus, has influenced the opportunity for off-site mitigation programming. It is not expected that the overall daily trips will be at or near 2,800 vehicles per day but closer to 1,900 trips per day as ITE projects by the employee count.

Regardless of which independent variable is utilized, the project is subject to an Environmental Notification Form (ENF) with the MEPA office as the project either a) generates more than 2,000 new motor vehicle ADT on roadways providing access to the site, or b) generates more than 1,000 new motor vehicle ADT on roadways providing access to the site in conjunction with more than 150 new parking spaces.

Mode Split

There is substantially limited non-vehicle infrastructure connectivity in the vicinity of the site. In addition, there is no significant amount of potential origins / destination for trips to/from the site as conservation land and the Sawmill Brook resource area limits opportunities for other development.

For the purposes of the TIAPS, it is assumed that all site related traffic is projected as motor vehicle trips. The Applicant recognized that very minimal traffic to/from the site will be generated as pedestrian and/or bicycle traffic based on the project's location.

SITE TRIP DISTRIBUTION

The distribution of research & development space site-generated traffic volumes will be based on gravity models using 2017-2019 U.S. Census Bureau Journey-to-Work data for the Town of Manchester By-the-Sea. The R&D space distribution models the commutes of workers to Manchester By-the-Sea from the top seventeen (17) residential contributing cities and towns, which represent approximately 78 percent of total Manchester By-the-Sea workforce. The top 78 percent of resident communities generally allow for an approximation of overall distribution of traffic.

This distribution results in 13 percent of site traffic traveling to/from the site along School Street to the north of Atwater Avenue, 44 percent of site traffic traveling to/from the site along Route 128 west of the School Street interchange, 21 percent of site traffic traveling to/from the site along Route 128 east of the School Street interchange, 1percent of site traffic traveling to/from Mill Street opposite the Route 128 NB Ramps, and 21 percent of site traffic traveling to/from the site along School Street to the south of the project.

The resulting primary trip distributions are shown in Table 7. The Net Site-Generated Trip Assignment peak hour traffic-volume networks are Phase 1 and the Full Build-Out are graphically depicted in Figures 4 and 5, respectively. Trip distribution gravity model information is provided in Attachment I.

Table 7 – Trip Distribution Summary

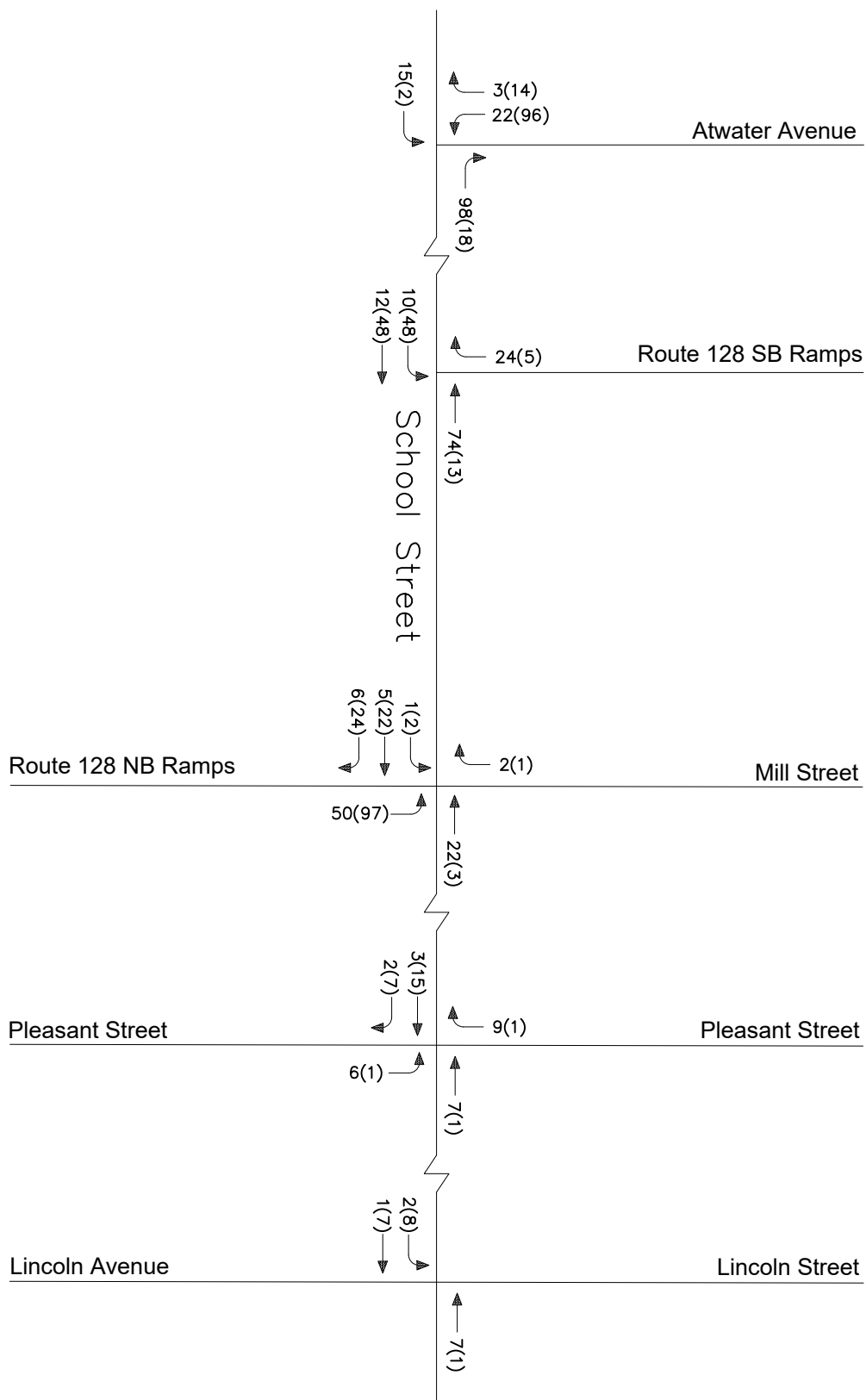
Direction	Percentage
School Street to/from north	13%
Route 128 to/from west	44%
Route 128 to/from east	21%
Mill Street to/from east	1%
Pleasant Street to/from west	6%
Pleasant Street / Lincoln Street to/from east	8%
<u>School Street to/from south</u>	<u>7%</u>
Total	100%

2033 BUILD TRAFFIC VOLUMES

The 2033 Build Condition traffic-volume networks consist of the 2033 No-Build traffic volumes with the addition of the site-generated traffic for the proposed development. The resulting 2033 Build Condition peak-hour traffic-volume networks for Phase 1 and the Full Build-Out are presented in Figure 6 and 7, respectively.



Not to Scale



XXX(XXX) = Weekday Morning(Weekday Evening)



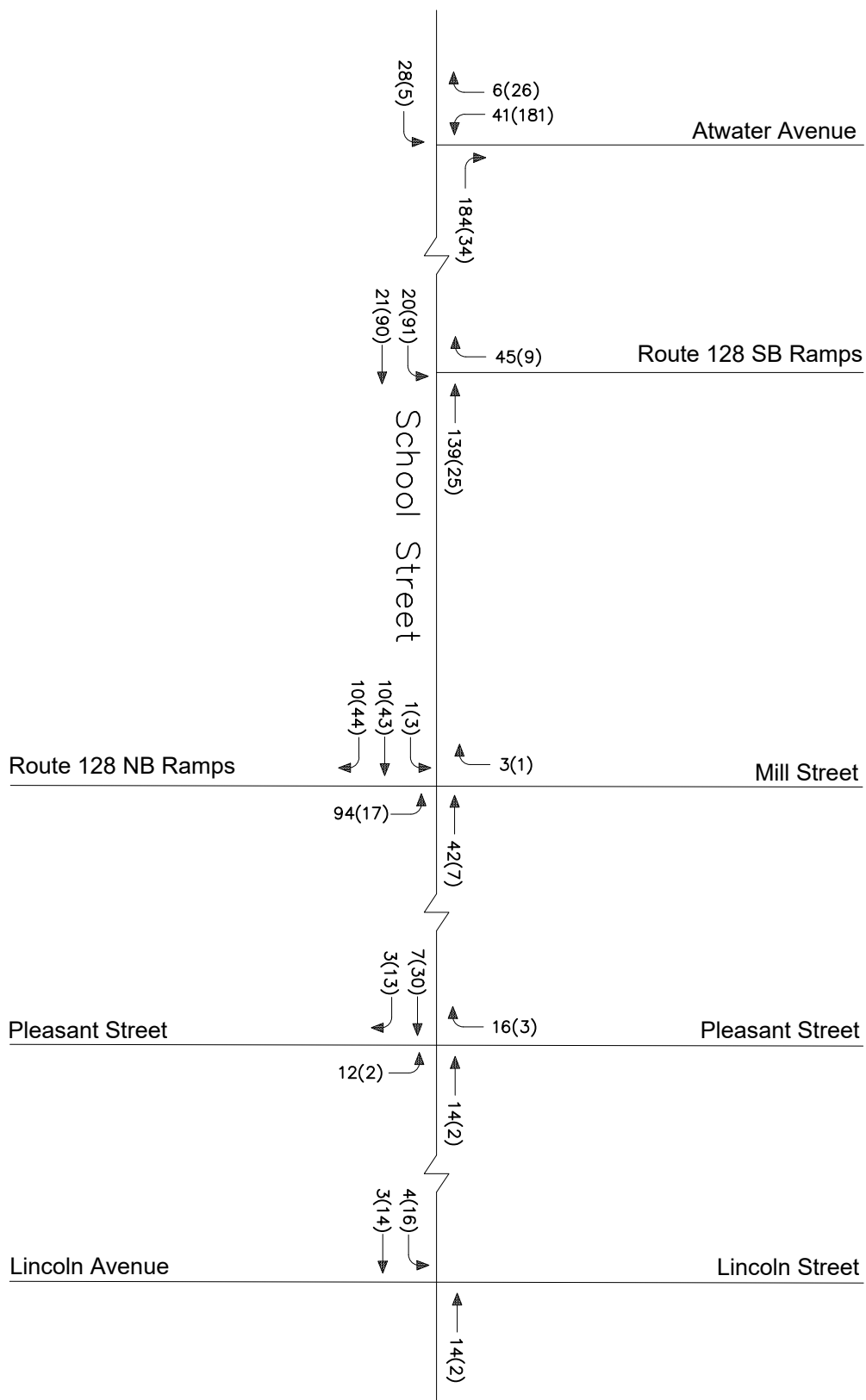
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Figure 4

Site Trip Generation - Phase 1
Weekday Morning and Weekday Evening
Peak Hour Traffic Volumes



Not to Scale



XXX(XXX) = Weekday Morning(Weekday Evening)



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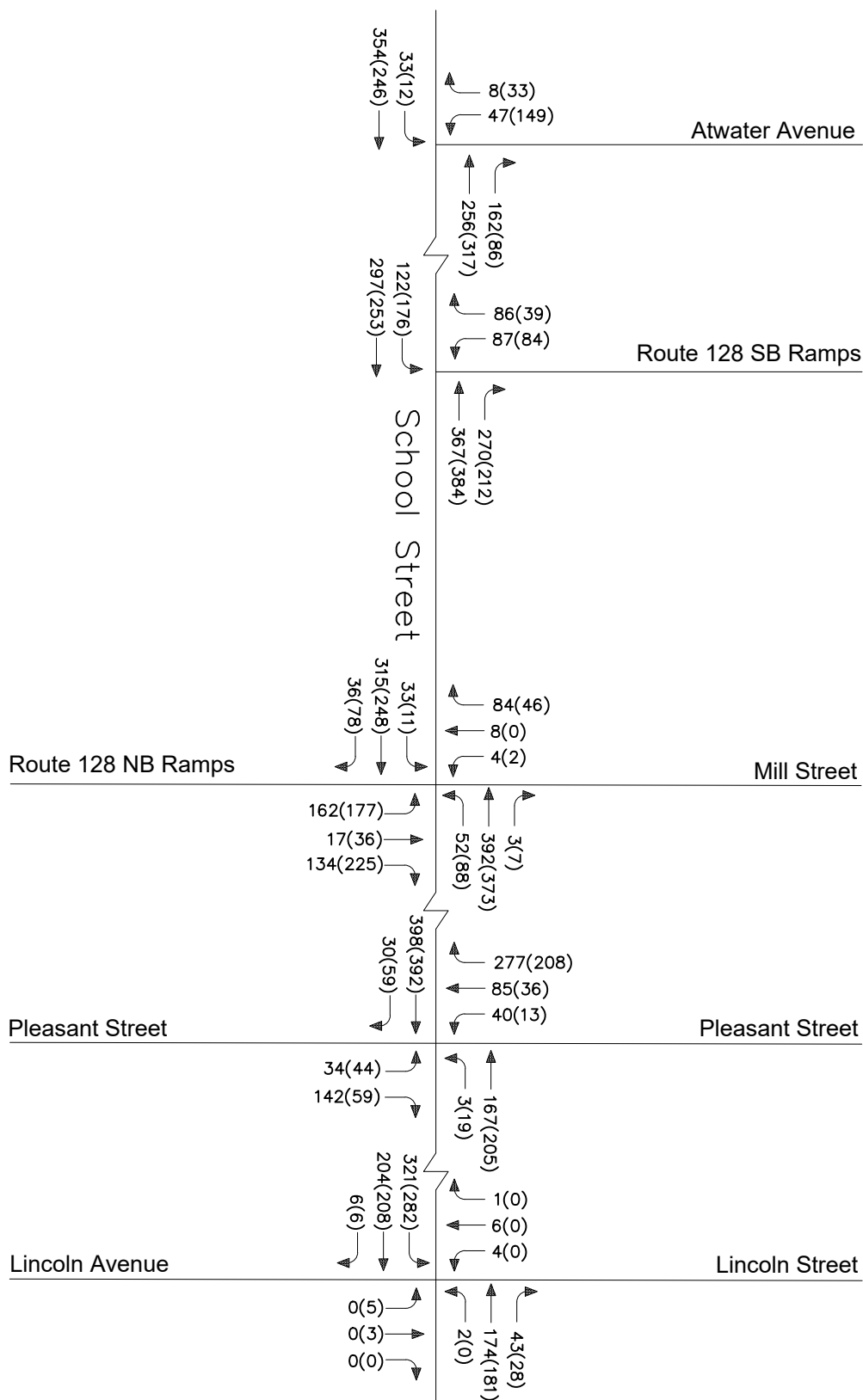
Figure 5

Site Trip Generation - Full Build-Out
Weekday Morning and Weekday Evening
Peak Hour Traffic Volumes

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Not to Scale



XXX(XXX) = Weekday Morning(Weekday Evening)

Figure 6

2033 Build Conditions - Phase 1
Weekday Morning and Weekday Evening
Peak Hour Traffic Volumes



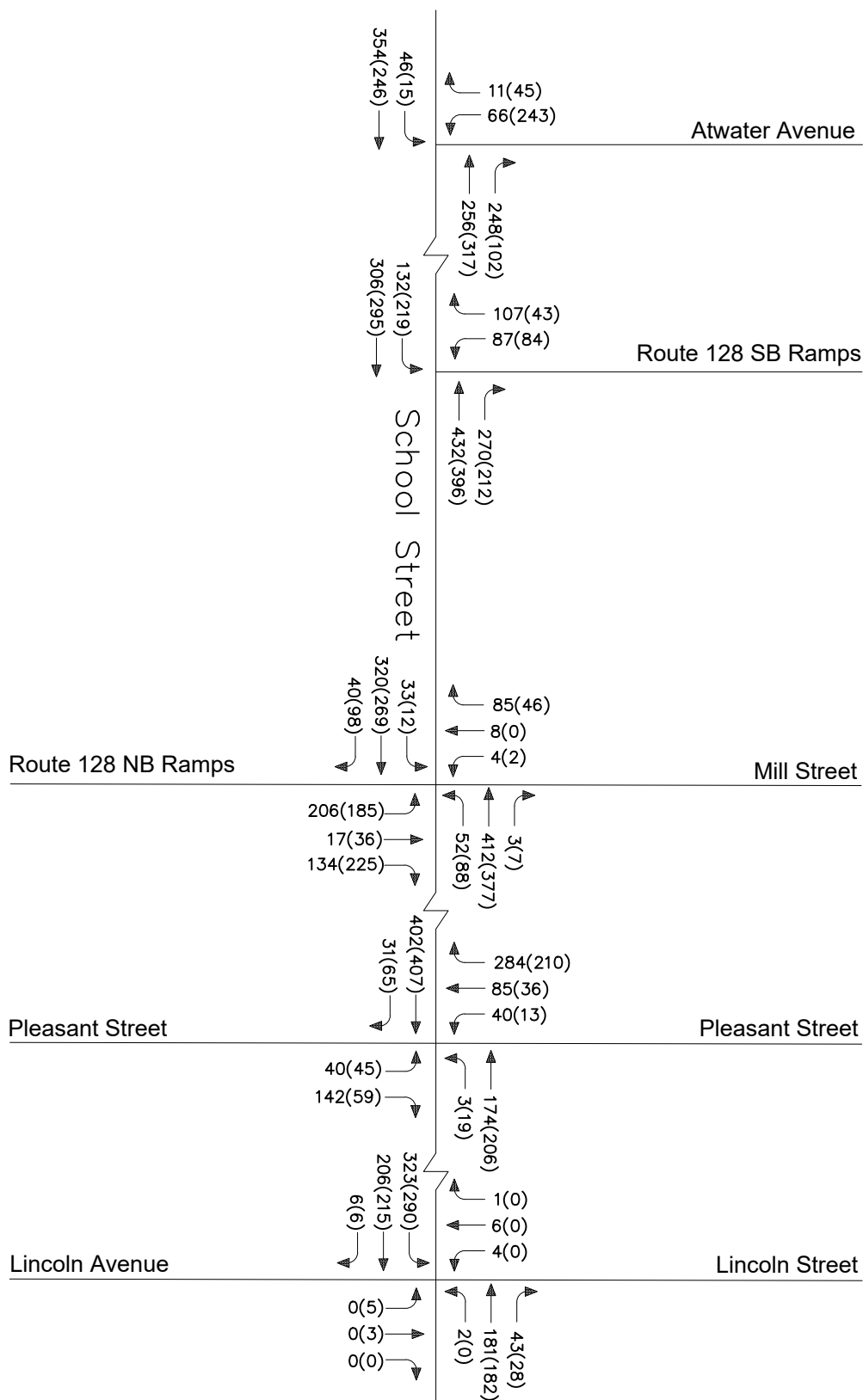
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Not to Scale

CST by the Quarry - Manchester By-the-Sea, Massachusetts

Traffic Impact, Access, and Parking Study



XXX(XXX) = Weekday Morning(Weekday Evening)



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Figure 7

2033 Build Conditions - Full Build-Out
Weekday Morning and Weekday Evening
Peak Hour Traffic Volumes

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IV. WARRANTS

MULTI-WAY STOP CONTROL WARRANTS

A multi-way stop control signal warrant analysis was conducted for the intersection of School Street / Route 128 NB Ramps / Mill Street to document the warranting condition should an all-way stop be recommended as project-specific mitigation. TEC performed the all-way stop warrant analyses based on criteria contained within the *2009 Manual on Uniform Traffic Control Devices (MUTCD)*². Multi-way stop control is a useful safety measure at unsignalized intersections if certain traffic conditions exist. Multi-way stop control can be used where the volume of traffic on the intersecting road approaches is approximately equal. Installation of multi-way stop-control, “all-way stop control” in the case of the subject intersection, is based upon Section 2B.07(04) of the MUTCD, which outlines the guidance and options, as noted below:

Warrant Checklist

- *MUTCD Section 2B.07(04)A – “Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.”*

Result: POTENTIALLY MET – Multi-way stop control may be implemented in advance of traffic signal control if a traffic signal is programmed for this location. Although potentially met under this circumstance, multi-way stop control may not be outright warranted.

- *MUTCD Section 2B.07(04)B – “Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.”*

Result: NOT MET – The intersection did not experience the minimum five or more crashes in a 12-month period

- *MUTCD Section 2B.07(04)C(1&2) – “1) The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and the combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour.”*

² *Manual on Uniform Traffic Control Devices (MUTCD)* – Federal Highway Administration / U.S. DOT – 2009 Edition. Newer MUTCD edition from 2023 is not excepted by MassDOT to date.

Result: NOT MET - The major street approach averages more than 300 vehicles per hour over a consecutive 8-hour period; however, the minor street approaches only average less than 200 vehicles over the same consecutive 8-hour period. The minor-street delay is reported at more than 30 seconds per vehicle during the highest hour.

- *MUTCD Section 2B.07(04)C(3) – “If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.”*

Result: MET - Speed data indicates that the 85th percentile speed along School Street exceeds 40 mph during free flow conditions.

- *MUTCD Section 2B.07(04)C(3) – “Where no single criterion is satisfied, but where Criteria B, C.1 and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.*

Result: NOT MET – 80% of Criterion B not met.

Under Sections 2B.07(04) of the *MUTCD*, a multi-way stop-control is warranted to improve the operations of the intersection. Detailed all-way stop warrant analysis calculations are provided in Attachment J.

TRAFFIC SIGNAL WARRANTS

A traffic signal warrant analysis was conducted for the intersections of School Street with Atwater Avenue, Route 128 SB Ramps, and Route 128 NB Ramps / Mill Street to document the warranting condition should a traffic signal be recommended as project-specific off-site mitigation for the project. TEC performed the traffic signal warrant analyses based on criteria contained within the *MUTCD*³. The *MUTCD* contains eight warrants for evaluating the need for installation of a traffic signal. The two multi-hour volume-related warrants were evaluated to determine whether a traffic signal is warranted at the four intersections described above. These warrants include:

- Warrant 1: Eight-Hour Vehicular Volume
- Warrant 2: Four-Hour Vehicular Volume

For the purposes of this analysis, TEC utilized TMCs and 12-hour ATRs conducted at the subject intersections to assess the warranting conditions over a typical weekday. Site-generated traffic volumes and the hour-by-hour breakdown of site generated traffic to be utilized in the traffic signal warrant analyses were assessed based on trip generation rates obtained in the ITE publication, *Trip Generation*, 11th Edition.

No traffic signal warrants were assessed for the intersections of School Street with both Pleasant Street and Lincoln Street as a cursory review of the January 2023 traffic volumes would indicate that traffic signal warrants will not be met.

³ *Manual on Uniform Traffic Control Devices (MUTCD)* – Federal Highway Administration / U.S. DOT – 2009 Edition.

Warrant Adjustments – School Street / Atwater Avenue

85th Percentile Speed greater than 40 MPH - As noted in the ATR counts collected in January 2023, vehicle speeds along School Street northbound and southbound entering the intersection at Atwater Avenue were measured with an 85th percentile speed at or greater than 40 mph during free flow conditions. Therefore, the *MUTCD* notes that traffic volumes reductions in the 70% and 56% columns of Table 4C.1 of the *MUTCD* shall govern for use in the traffic signal warrant.

Right-Turn Side-Street Traffic Volumes - The Atwater Avenue westbound approach consists of a single general-purpose travel lane. For this approach geometry, the *MUTCD* states:

“The study should consider the effects of the right-turn vehicles from the minor-street approaches. Engineering judgment should be used to determine what, if any, portion of the right-turn traffic is subtracted from the minor-street traffic count when evaluating the count against the signal warrants.” (MUTCD - Sect 4C.01 ¶08)

Right-turns exiting the minor-street can generally be discounted at a traffic signal due to the lesser conflict seen between right-turns on minor-streets and major-street traffic. At the intersection of School Street / Atwater Avenue, a 100 percent reduction for right-turns was applied to the Atwater Avenue westbound approach based on the potential for a lesser vehicle conflict for right-turning vehicles.

Warrant Adjustments – School Street / Route 128 SB Ramps

85th Percentile Speed greater than 40 MPH - As noted in the ATR counts collected in January 2023, vehicle speeds along School Street northbound and southbound near the intersection at Route 128 SB Ramps were measured with an 85th percentile speed at or greater than 40 mph during free-flow conditions. Therefore, the *MUTCD* notes that traffic volumes reductions in the 70% and 56% columns of Table 4C.1 of the *MUTCD* shall govern for use in the traffic signal warrant.

Right-Turn Side-Street Traffic Volumes - The Route 128 SB Ramp westbound approach consists of an exclusive left-turn lane and an exclusive right-turn lane. For this approach geometry, the *MUTCD* states:

“...engineering judgment and rationale should be applied to a street approach with one through/left-turn lane plus a right-turn lane. In this case, the degree of conflict of minor-street right-turn traffic with traffic on the major street should be considered. Thus, right-turn traffic should not be included in the minor-street volume if the movement enters the major street with minimal conflict. The approach should be evaluated as a one-lane approach with only the traffic volume in the through/left-turn lane considered.” (MUTCD - Sect 4C.01 ¶10)

Right-turns exiting the minor-street can generally be discounted at a traffic signal due to the lesser conflict seen between right-turns on minor-streets and major-street traffic. At the intersection of School Street / Route 128 SB Ramps, a 100 percent reduction for right-turns was applied to the Route 128 SB Ramps westbound approach based on the potential for a lesser vehicle conflict for right-turning vehicles and the presence of an exclusive right-turn lane.

Warrant Adjustments – School Street / Route 128 NB Ramps / Mill Street

85th Percentile Speed greater than 40 MPH - As noted in the ATR counts collected in January 2023, vehicle speeds along School Street northbound and southbound near the intersection at Route 128 NB Ramps and Mill Street were measured with an 85th percentile speed at or greater than 40 mph during free-flow conditions. Therefore, the *MUTCD* notes that traffic volumes reductions in the 70% and 56% columns of Table 4C.1 of the *MUTCD* shall govern for use in the traffic signal warrant.

Right-Turn Side-Street Traffic Volumes - The Route 128 NB Ramp eastbound approach consists of an exclusive left-turn lane and an exclusive right-turn lane. For this approach geometry, the *MUTCD* states:

“...engineering judgment and rationale should be applied to a street approach with one through/left-turn lane plus a right-turn lane. In this case, the degree of conflict of minor-street right-turn traffic with traffic on the major street should be considered. Thus, right-turn traffic should not be included in the minor-street volume if the movement enters the major street with minimal conflict. The approach should be evaluated as a one-lane approach with only the traffic volume in the through/left-turn lane considered.” (MUTCD - Sect 4C.01 ¶10)

Right-turns exiting the minor-street can generally be discounted at a traffic signal due to the lesser conflict seen between right-turns on minor-streets and major-street traffic. At the intersection of School Street / Route 128 NB Ramps / Mill Street, a 100 percent reduction for right-turns was applied to the Route 128 NB Ramps westbound approach based on the potential for a lesser vehicle conflict for right-turning vehicles and the presence of an exclusive right-turn lane. Right-turns were retained along the Mill Street approach; however, the limited volume along Mill Street did not assess the approach to be the controlling minor-street approach as part of the analysis.

Warrant Results

Based on the existing traffic volumes, the intersection of School Street / Route 128 NB Ramps / Mill Street meets the criteria for Warrant and Warrant 2. With the addition of site generated traffic volumes, the following intersections meet the criteria for Warrant 1 and Warrant 2:

- School Street / Atwater Avenue
- School Street / Route 128 Southbound Ramps
- School Street / Route 128 Northbound Ramps / Mill Street

Although traffic signals are warranted at these locations based on the parameters set forth in the *MUTCD*, the traffic operations at the intersections do not specifically warrant the installation of traffic signal. Both Chapter V – Traffic Operations and Chapter VI – Off-Site Mitigation review the operations in relation to the traffic signal warrants as to whether a traffic signal could be an alternative for traffic control modifications at each of the intersections. The signal warrant analysis worksheets are included in Attachment K.

Warrant Sensitivity

Although the threshold is nominally met for an 85th percentile speed at or greater than 40 mph during free flow conditions along School Street, the 85th percentile speed during these periods is reported as typically 41 to 42 mph, immediately over the warrant adjustment threshold. Where the traffic volumes at these locations would increase from both general background growth and the site generated traffic, it is reasonable to assume the 85th percentile speed may decrease as the free flow conditions realize both an increase in traffic volumes and more side-friction in the form of the MassDOT installed buffered bicycle lanes (constructed in 2023) and other off-site mitigation measures. A drop in the 85th percentile speed at these locations would eliminate the traffic signal warranting condition following construction of the project at each study area intersection noted.

Chapter V – Traffic Operations and Chapter VI – Off-Site Mitigation of this TIAPS identify traffic signal control as the preferred alternative for off-site mitigation at the intersection of School Street / Route 128 NB Ramps / Mill Street. If approved by MassDOT, the Applicant has committed to install this traffic signal prior to occupancy of Phase 2 of site construction. Prior to the installation of a traffic signal at this location and in conjunction with the Traffic Monitoring Program (TMP) committed to by the Applicant, overall traffic signal warrants including vehicle speed analysis will be reconducted as the Applicant and MassDOT both recognize a traffic signal may no longer be warranted at that time. Note that under a Phase 1 condition only, a traffic signal is warranted for either Warrant 1 or 2; but only if the 85th percentile speed is measured at above 40 mph.

V. TRAFFIC OPERATIONS

Measuring existing and future traffic volumes quantifies traffic flow within the study area. To assess quality of flow, roadway capacity and vehicle queue analyses were conducted under Existing, No-Build, Build, and Build with Mitigation traffic-volume conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed upon them, with vehicle queue analyses providing a secondary measure of the operational characteristics of an intersection or section of roadway under study.

METHODOLOGY

Levels of Service

A primary result of capacity analyses is the assignment of level-of-service to traffic facilities under various traffic-flow conditions.⁴ The concept of level-of-service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

Six levels of service are defined for each type of facility. They are given letter designations from A to F, with level-of-service (LOS) A representing the best operating conditions and LOS F representing the worst. Since the level of service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year.

Queue Length Analysis

Vehicle queue analyses are a direct measurement of an intersection's ability to process vehicles under various traffic control and volume scenarios and lane use arrangements. The vehicle queue analysis was performed using the Synchro 11.0TM intersection capacity analysis software which is also based upon the methodology and procedures presented in the *HCM 6th Edition*. Synchro reports the 95th percentile queues for unsignalized intersections and both the 50th (average) and 95th percentile vehicle queues for signalized intersections, which are based on the number of vehicles that experience a delay of six (6) seconds or more at an intersection and is a function of the traffic signal timing; vehicle arrival patterns during the analysis period; and the saturation flow rate. The 50th percentile or average vehicle queue is the average number of vehicles that are projected to be delayed by six seconds or more at the intersection under study during the analysis period. The 95th percentile vehicle queue is the vehicle queue length that will

⁴ The capacity analysis methodology is based on the concepts and procedures presented in the *Highway Capacity Manual 6th Edition*; Transportation Research Board; Washington, DC; 2016

be exceeded only five (5) percent of the time; or approximately three (3) minutes out of 60 minutes during the peak one hour of the day. During the remaining 57 minutes, the vehicle queue length will be less than the 95th percentile queue length.

PARAMETERS FOR TRAFFIC IMPACT ANALYSIS

Unsignalized Intersections

The levels of service of two-way stop-controlled unsignalized intersections are determined by application of a procedure described in the *HCM 6th Edition*. Level of service is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and stop signs. Control delay includes the effects of initial deceleration delay approaching a stop sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for level of service at unsignalized intersections are also given in the *HCM 6th Edition*. Table 8 summarizes the relationship between level of service and average control delay.

Table 8 – Level-of-Service Criteria for Unsignalized Intersections ^(a)

Level of Service (v/c ≤ 1.0)	Level of Service (v/c > 1.0)	Average Control Delay (seconds per vehicle)	Description
A	F	≤10.0	LOS A represents a condition with little or no control delay to minor street traffic.
B	F	10.1 to 15.0	LOS B represents a condition with short control delays to minor street traffic.
C	F	15.1 to 25.0	LOS C represents a condition with average control delays to minor street traffic.
D	F	25.1 to 35.0	LOS D represents a condition with long control delays to minor street traffic.
E	F	35.1 to 50.0	LOS E represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
F	F	>50.0	LOS F represents a condition where minor street demand volume exceeds capacity of an approach lane, with excessive control delays resulting.

^a Source: *Highway Capacity Manual 6th Edition*; Transportation Research Board; Washington D.C.; 2016

Signalized Intersections

LOS for signalized intersections is calculated using the operational analysis methodology of the *HCM 6th Edition*. This method assesses the effects of signal type, timing, phasing, progression; vehicle mix; and geometrics on delay. LOS designations are based on the criterion of control or signal delay per vehicle. Control or signal delay can be related to driver discomfort, frustration, and fuel consumption, and includes initial deceleration delay approaching the traffic signal, queue move-up time, stopped delay and final acceleration delay.

Table 9 summarizes the relationship between LOS and control delay. The tabulated control delay criterion may be applied in assigning LOS designations to individual lane groups, to individual intersection approaches, or to entire intersections.

Table 9 – Level-of-Service Criteria for Signalized Intersections^(a)

Level of Service (v/c ≤ 1.0)	Level of Service (v/c > 1.0)	Average Control Delay (seconds per vehicle)	Description
A	F	≤10.0	LOS A describes operations with very low control delay; most vehicles do not stop at all.
B	F	10.1 to 20.0	LOS B describes operations with relatively low control delay. However, more vehicles stop than LOS A.
C	F	20.1 to 35.0	LOS C describes operations with higher control delays. Individual cycle failures may begin to appear. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
D	F	35.1 to 55.0	LOS D describes operations with control delay in the range where the influence of congestion becomes more noticeable. Many vehicles stop and individual cycle failures are noticeable, whereby motorists are not able to get through the signal on one cycle.
E	F	55.1 to 80.0	LOS E describes operations with high control delay values. Individual cycle failures are frequent occurrences.
F	F	>80.0	LOS F describes operations with high control delay values that often occur with over-saturation. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

^a Source: *Highway Capacity Manual 6th Edition*; Transportation Research Board; Washington D.C.; 2016

TRAFFIC IMPACT ANALYSIS RESULTS

Level-of-service analyses were conducted for the 2023 Existing, 2033 No-Build, 2033 Build, and 2033 Build with Mitigation Conditions for the study area intersections. The results of the intersection capacity analysis are summarized in Table 10. The capacity analysis worksheets are provided in Attachment L.

School Street / Atwater Avenue

With the addition of site generated traffic, the Atwater Avenue westbound approach is anticipated to operate at an elevated LOS E during the weekday evening peak hour. This elevated level of service is not expected to be experienced during any other period of the day. Although the LOS E is present, the volume-to-capacity (v/c) ratio for the approach is still well below 1.00 indicating that adequate capacity is present along Atwater Avenue to accommodate the additional demand created by the site. Project-specific mitigation at this location is not expected to change the results of the traffic operational analysis.

School Street / Route 128 SB Ramps

With the addition of site generated traffic at the intersection, the Route 128 SB Ramps westbound left-turn movement is anticipated to operate at an elevated LOS F during both the weekday morning and weekday evening peak hour. Note that no site generated trips are expected on the critical left-turn ramp movement. Although the LOS F is present, the v/c ratio for the approach is still well below 1.00 indicating that adequate capacity is present along the Route 128 SB Ramp left-turn movement to accommodate the additional demand along School Street created by the site. In addition, the queues along the approach are not expected to extend to more than four (4) vehicles, which is not unreasonable for a stop-controlled freeway off-ramp along an arterial corridor. These elevated levels of service are only expected during the peak hours when the

remainder of the typical weekday will operate with significantly better levels of service. Where significant reserve capacity is still available on the ramp and the project does not add traffic to the ramp's critical movement, no project-specific mitigation to alter traffic operations is proposed at this location.

School Street / Route 128 NB Ramps / Mill Street

The intersection of School Street / Route 128 NB Ramps / Mill Street is evaluated separately from the primary Route 128 NB Ramp intersection to the south as the intersections generally operate independently as a result of the side-street approach offsets. With the addition of site generated traffic, all movements at the intersection are anticipated to operate at acceptable levels of service (LOS C or better) during each analysis scenario. Similar to the intersection along School Street to the north, the v/c ratio for each of the movements is well below 1.00 indicating that adequate capacity is present along each movement to accommodate the additional demand created by the site.

The Route 128 NB Ramps eastbound approach at the primary intersection of School Street / Route 128 NB Ramps is anticipated to operate at elevated levels of service (LOS F) during both the weekday morning and weekday evening peak periods during both the No-Build and Build conditions. The addition of site generated traffic following Phase 2 occupancy will result in significantly more degraded conditions during thoughts peak periods. This includes extending the potential queue during the weekday morning peak hour to up to sixteen (16) vehicles along the ramp. This level of impact is only anticipated during the peak periods where much of the rest of the day will operate at acceptable levels of service. The operations at this intersection may warrant off-site mitigation based on the level of site generated traffic utilizing the intersection and key movement. The level of impact is also significantly different based on the traffic following Phase 1 occupancy and full build-out. The potential for off-site mitigation and resulting traffic operations is outlined in Chapter VI.

School Street / Pleasant Street

Both the Pleasant Street westbound right-turn movement and the School Street southbound approach are anticipated to operate at elevated levels of service (LOS F) for both the No-Build and Build conditions during the weekday morning peak hour. Although the level of service is elevated for these movements, the traffic added to the intersection as a result of the project is does not significantly change the operating conditions at the intersection and queues along the noted movements would not increase by more than three (3) vehicles. All movements at the intersection are anticipated to operate at acceptable levels of service (LOS D or better) during the weekday evening peak hour. There are no practical means to mitigate project related impacts at the intersection based on the short period of elevated levels-of-service.

School Street / Lincoln Street

The Lincoln Street westbound approach is anticipated to operate at an elevated level of service (LOS F) during the weekday morning peak hour under both No-Build and Build conditions. This condition is experienced by only eleven vehicles exiting the cul-de-sac during that hour. Although the LOS F is present, the v/c ratio for the approach is still well below 1.00 indicating that adequate capacity is present along Lincoln Street to accommodate the additional demand created by the site along School Street. Maximum queuing along the approach is not expected to exceed one (1) vehicle during the time block. All movements at the intersection are anticipated to operate at

acceptable levels of service (LOS D or better) during the weekday evening peak hour. There are no practical means to mitigate the level of service along the approach independent of the project based on the minimal traffic volume.

Table 10 – Intersection Capacity and Queue Analysis Summary

Intersection / Lane Group	2023 Existing Conditions				2023 No-Build Conditions				2023 Build Conditions			
	V/C ^(a)	Delay ^(b)	LOS ^(c)	Queue ^(d)	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue
School Street / Atwater Avenue												
<i>Weekday Morning Peak Period</i>												
Atwater Avenue WB	0.09	14.5	B	<25	0.11	16.7	C	<25	0.37	27.7	D	40
School Street SBL	0.02	8.0	A	<25	0.02	8.1	A	<25	0.06	8.9	A	<25
<i>Weekday Evening Peak Period</i>												
Atwater Avenue WB	0.17	13.2	B	<25	0.20	15.2	C	<25	0.86	48.8	E	208
School Street SBL	0.01	8.0	A	<25	0.01	8.3	A	<25	0.02	8.4	A	<25
School Street / RTE 128 SB Ramps												
<i>Weekday Morning Peak Period</i>												
RTE 128 SB Ramps WBL	0.26	19.9	C	25	0.39	29.8	D	43	0.60	58.6	F	80
RTE 128 SB Ramps WBR	0.08	10.6	B	<25	0.10	11.1	B	<25	0.22	14.1	B	<25
School Street SBL	0.07	8.2	A	<25	0.11	8.5	A	<25	0.16	9.3	A	<25
<i>Weekday Evening Peak Period</i>												
RTE 128 SB Ramps WBL	0.28	19.6	C	28	0.41	28.5	D	48	0.76	85.9	F	113
RTE 128 SB Ramps WBR	0.05	10.4	B	<25	0.07	11.1	B	<25	0.09	11.5	B	<25
School Street SBL	0.09	8.2	A	<25	0.13	8.5	A	<25	0.22	9.1	A	<25
School Street / Mill Street / RTE 128 NB Ramps												
<i>Weekday Morning Peak Period</i>												
Mill Street WB	0.27	15.2	C	28	0.33	17.4	C	35	0.44	23.8	C	55
School Street SBL	0.04	9.0	A	<25	0.05	9.3	A	<25	0.06	10.1	B	<25
<i>Weekday Evening Peak Period</i>												
Mill Street WB	0.12	12.4	B	<25	0.16	13.8	B	<25	0.16	14.3	B	<25
School Street SBL	0.01	8.5	A	<25	0.01	8.8	A	<25	0.01	8.9	A	<25
School Street / RTE NB Ramps												
<i>Weekday Morning Peak Period</i>												
RTE 128 NB Ramps EBL	0.49	30.8	D	63	0.71	53.1	F	115	1.35	233.0	F	383
RTE 128 NB Ramps EBR	0.22	11.8	B	<25	0.26	12.7	B	25	0.26	12.9	B	25
School Street NBL	0.05	8.2	A	<25	0.06	8.3	A	<25	0.06	8.4	A	<25
<i>Weekday Evening Peak Period</i>												
RTE 128 NB Ramps EBL	0.56	27.3	D	83	0.86	59.5	F	190	1.00	93.7	F	258
RTE 128 NB Ramps EBR	0.32	11.3	B	35	0.36	12.0	B	43	0.38	12.7	B	45
School Street NBL	0.06	7.8	A	<25	0.07	7.9	A	<25	0.07	8.0	A	<25

^a Volume-to-capacity ratio

^b Delay expressed in seconds per vehicle (average)

^c Level of service

^d 95th Percentile Queue (feet)

Table 10 - Intersection Capacity and Queue Analysis Summary (cont.)

Intersection / Lane Group	2023 Existing Conditions				2023 No-Build Conditions				2023 Build Conditions			
	V/C ^(a)	Delay ^(b)	LOS ^(c)	Queue ^(d)	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue
School Street / Pleasant Street												
<i>Weekday Morning Peak Period</i>												
Pleasant Street EB	0.64	22.6	C	108	0.78	31.9	D	150	0.88	41.3	E	188
Pleasant Street WBLT	0.43	16.7	C	53	0.52	20.0	C	68	0.55	21.2	C	70
Pleasant Street WBR	0.82	34.7	D	200	1.01	61.8	F	295	1.11	86.6	F	363
School Street NB	0.43	17.6	C	53	0.54	21.7	C	70	0.61	25.1	D	85
School Street SB	0.90	48.4	E	260	1.11	103.7	F	430	1.19	123.9	F	473
<i>Weekday Evening Peak Period</i>												
Pleasant Street EBT	0.20	10.9	B	<25	0.25	12.1	B	<25	0.26	12.7	B	25
Pleasant Street WBLT	0.10	10.2	B	<25	0.11	10.9	B	<25	0.12	11.1	B	<25
Pleasant Street WBR	0.34	11.7	B	38	0.42	13.8	B	53	0.44	14.5	B	55
School Street NB	0.40	12.6	B	48	0.49	15.1	C	68	0.51	16.0	C	73
School Street SB	0.64	17.5	C	115	0.77	26.2	D	185	0.86	34.7	D	243
School Street / Lincoln Street												
<i>Weekday Morning Peak Period</i>												
Lincoln Street WB	0.10	39.9	E	<25	0.14	55.5	F	<25	0.17	61.9	F	<25
School Street NBL	0.01	7.8	A	<25	0.01	7.9	A	<25	0.01	7.9	A	<25
School Street SBL	0.30	8.9	A	33	0.35	9.2	A	40	0.36	9.4	A	40
<i>Weekday Evening Peak Period</i>												
Lincoln Street WB	0.06	22.6	C	<25	0.07	26.9	D	<25	0.08	29.3	D	<25
School Street NBL	0.00	0.0	A	<25	0.00	0.0	A	<25	0.00	0.0	A	<25
School Street SBL	0.19	8.2	A	<25	0.21	8.4	A	<25	0.23	8.5	A	<25

^a Volume-to-capacity ratio

^b Delay expressed in seconds per vehicle (average)

^c Level of service

^d 95th Percentile Queue (feet)

VI. OFF-SITE MITIGATION

After evaluating the operations and safety of the study area roadways and intersections, the next step is to identify measures to improve the roadways and intersections based on existing and future deficiencies. The Project has modest impacts in the area immediately adjacent to the site and may require mitigation. The following section provides a summary of measures that are recommended to improve the existing and future operations and safety of the study area intersections. These recommended measures were noted in the previous capacity and queue analysis.

TRAFFIC CONTROL ALTERNATIVES AT ROUTE 128 NB RAMPS

Traffic control improvements at the intersection of School Street / Route 128 NB Ramps / Mill Street are subject to MassDOT's ICE procedure to determine the most viable traffic control solution. The criterion to complete this procedure is met for the intersection as a result of the intersection being owned and maintained by MassDOT and if MassDOT determines that a traffic control change is needed as all other individual criterion described in the procedure are not met. The Applicant has projected a potential need for this traffic control modification based on the projected LOS F experienced following the occupancy of Phase 2. The following section evaluates traffic operations throughout the day following Phase 1 occupancy and Phase 2 (full build-out) occupancy and outlines the results of inputs and outputs of the MassDOT ICE procedure.

Intersection Control Evaluation

The ICE Stage 1 procedure provides a clearinghouse of traffic control strategies that are to be deemed viable or non-viable based on several criterion and the overall conditions experienced in the field for the given location. Several of the traffic control strategies are not applicable to the given location; however, there are four (4) potentially potential traffic control strategies, including:

- Two-way stop-control (existing condition)
- All-way stop control
- Traffic signal control
- Roundabout control

Although potentially applicable, not all traffic control strategies are viable solutions to a given location. The intersection of School Street / Route 128 NB Ramps / Mill Street has characteristics that limit the potential traffic control to only two (2) alternatives. The following section describes each of the applicable alternatives and their viability.

Two-Way Stop Control

This traffic control alternative maintains the existing traffic control condition as both the Route 128 NB Ramps and Mill Street consist of stop control today. Existing traffic safety conditions are expected to be retained where the intersection currently operates with less than three (3) crashes per year and a crash rate less than the statewide and District-wide averages. Traffic operating conditions for this alternative are equivalent to the 2033 Build Conditions listed in Table 9 of the previous Chapter. The Applicant believes that two-way stop control is a viable traffic control strategy even though the level of service would be elevated during the commuter peak hours along the Route 128 NB Ramp.

All-Way Stop Control

All-way stop control is warranted at this location based on warrants established in the *MUTCD* Section 2B.07. All-way stop control is a viable traffic control alternative for this location; however, the installation of stop signs along a higher speed segment of the arterial corridor would violate driver expectancy. The closest stop signs along the corridor are at the corridor terminus in Essex three-miles to the north and 2,300-feet to the south at Pleasant Street which is the gateway intersection to the Manchester Business District. TEC and the Applicant do not believe an all-way stop control intersection is a viable traffic control alternative for this location based on the violation of driver expectancy and the inability for emergency services to pre-empt the control in a reasonable fashion.

Traffic Signal Control

The construction of a traffic signal as project-specific off-site mitigation for the project is considered a viable solution as intersection traffic control. The implementation of a traffic signal at this location can incorporate the Mill Street approach and the Route 128 NB Ramps, even being offset, with a single controller operating each 'separate' intersection's side-street approach with split signal phasing to avoid potential conflicts. The construction of a traffic signal at this location would have no impacts to private property and therefore is feasible as an off-site mitigation alternative for the Applicant. This alternative also provides the greatest flexibility for MassDOT's to introduce queue pre-emption on the off-ramp and for emergency services to pre-empt the control along School Street to respond to emergencies north of Route 128.

The results of a capacity and queue analysis incorporating traffic signal control as an off-site mitigation measure are shown in Table 11. Results of the capacity and queue analysis are presented in *HCM 2000* format as the more recent *HCM 6th Edition* cannot analyze 'cluster' intersection locations such as this proposed location. Traffic signal control at this intersection would result in all intersection approaches operating at acceptable levels of service (LOS D or better) during each peak hour scenario. The capacity analysis worksheets are provided in Attachment L.

Table 11 – 2033 Build with Mitigation Traffic Operations Summary

Intersection / Lane Group	2033 Build Conditions – Existing TWSC Traffic Control ^a				2033 Build Conditions – Traffic Signal Control			
	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue
School Street / Mill Street / RTE 128 NB Ramps								
<i>Weekday Morning Peak Period</i>								
Mill Street WB	0.44	23.8	C	55	0.26	33.2	C	<25/26
School Street NB	-	-	-	-	0.75	6.4	A	91/96
School Street SBL	0.06	10.1	B	<25	-	-	-	-
School Street SBLT	-	-	-	-	0.79	24.2	C	123/151
School Street SBR	-	-	-	-	0.03	14.4	B	<25/<25
Intersection	-	-	-	-	0.79	14.7	B	-
<i>Weekday Evening Peak Period</i>								
Mill Street WB	0.16	14.3	B	<25	0.05	26.3	C	<25/<25
School Street NB	-	-	-	-	0.64	6.1	A	<25/96
School Street SBL	0.01	8.9	A	<25	-	-	-	-
School Street SBLT	-	-	-	-	0.40	13.8	B	63/109
School Street SBR	-	-	-	-	0.06	15.7	B	<25/<25
Intersection	-	-	-	-	0.64	10.3	B	-
School Street / RTE NB Ramps								
<i>Weekday Morning Peak Period</i>								
RTE 128 NB Ramps EBL	1.35	233.0	F	383	0.86	49.8	D	122/215
RTE 128 NB Ramps EBR	0.26	12.9	B	25	0.09	26.4	C	<25/39
School Street NBL	0.06	8.4	A	<25	-	-	-	-
School Street NB	-	-	-	-	0.83	25.2	C	195/214
School Street SB	-	-	-	-	0.51	5.8	A	63/63
Intersection	-	-	-	-	0.81	24.1	C	-
<i>Weekday Evening Peak Period</i>								
RTE 128 NB Ramps EBL	1.00	93.7	F	258	0.84	40.1	D	101/171
RTE 128 NB Ramps EBR	0.38	12.7	B	45	0.16	21.5	C	<25/34
School Street NBL	0.07	8.0	A	<25	-	-	-	-
School Street NB	-	-	-	-	0.80	23.2	C	128/274
School Street SB	-	-	-	-	0.42	8.9	A	66/66
Intersection	-	-	-	-	0.77	23.4	C	-

^a From Table 9

Roundabout Control

The implementation of a roundabout at this location will result in two distinct challenges for viability as a traffic control alternative at the intersection of School Street / Route 128 NB Ramps / Mill Street:

- The centerline of Mill Street and the Route 128 NB Ramps are offset by 120-feet. It can reasonably be assumed that Mill Street's alignment precludes it from being included in the standard roundabout if constructed. As such, the proximity of Mill Street along the School Street southbound roundabout entry area to any roundabout may require left turns to be restricted from the Mill Street approach. The ability to relocate Mill Street is limited by private ROW on its southerly side where the Cornerstone Church is about to reconstruct the property for its new location (plans approved by Town). The feasibility of the Applicant to acquire private property for off-site mitigation is unreasonable.
- The installation of a roundabout at this location will greatly shorten the Route 128 NB On-Ramp to between 500 and 600-feet from its current 720-foot length. This distance, as well as the existing condition, is well below the minimum ramp length

as defined by MassDOT's Engineering Directive E-20-001 regarding the FHWA Controlling Criteria and Design Justification Process. This directive states when major reconstruction occurs on a ramp the minimum length of off- and on-ramps from the mainline of the freeway shall be 1,000-feet from the connecting roadway to physical gore. The Applicant is aware that this condition is not met for the Sohier Road Interchange along Route 128 six miles to the west; however, the construction of the Sohier Road interchange was designed and constructed prior to the issuance of the revised FHWA Controlling Criteria and the MassDOT Engineering Directive.

As the private property line located adjacent to Mill Street and the inability to extend the off-ramp length to 1,000-feet, the Applicant considers there is no feasible way to install a roundabout at this location.

ICE Stage 1 Submittal

The Applicant has submitted, in conjunction with the ENF, an ICE Stage 1 form to MassDOT identifying the existing two-way stop-control, potential all-way stop-control, and potential traffic signal control strategies / alternatives as viable traffic control strategies at the intersection. No action was taken on the ICE Stage 1 submittal by MassDOT, and this process will continue as part of the future MassDOT Permit to Access State Highway process to finalize a preferred alternative, as applicable. This process will recommence following occupancy of Phase 1 based to evaluate the need of any further traffic control improvements which can be tied directly to Phase 2 permitting and occupancy needs.

Phase 1 vs. Phase 2 Traffic Operations

If warranted, and if directed by MassDOT, the Applicant is committed to implement traffic signal control modifications at the intersection of School Street / Route 128 NB Ramps / Mill Street. Changing the traffic control from two-way stop control (TWSC) to a more elaborate traffic control will require a substantial monetary commitment from the Applicant. Because of the substantial monetary commitment, the Applicant considers modifications to traffic control at the location unwarranted following occupancy of Phase 1. Following the occupancy of Phase 1, the Route 128 NB Ramps eastbound left-turn movement will continue operating at LOS F similar to the No-Build condition, albeit with slightly increased delay and queuing. The vehicle delay and queueing projected shown in Table 12 are generally conservative as Phase 1 will be occupied with Phase 2 construction underway well before the 10-year planning horizon.

Table 12 – School Street / Route 128 NB Ramps / Mill Street Traffic Operations for Phase 1 vs. Phase 2

Intersection / Lane Group	2033 Build Conditions – Phase 1				2033 Build Conditions – Full Build ^a			
	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue
School Street / RTE NB Ramps								
<i>Weekday Morning Peak Period</i>								
RTE 128 NB Ramps EBL	1.03	119.1	F	235	1.35	233.0	F	383
RTE 128 NB Ramps EBR	0.26	12.8	B	25	0.26	12.9	B	25
School Street NBL	0.06	8.4	A	<25	0.06	8.4	A	<25
<i>Weekday Evening Peak Period</i>								
RTE 128 NB Ramps EBL	0.93	75.4	F	225	1.00	93.7	F	258
RTE 128 NB Ramps EBR	0.37	12.4	B	43	0.38	12.7	B	45
School Street NBL	0.07	8.0	A	<25	0.07	8.0	A	<25

^a From Table 9

The deferral of a traffic control modification to Phase 2 will allow for a reevaluation of site trip generation projections and traffic operations at the intersection utilizing the project's Traffic Monitoring Program (TMP) identified subsequently in this Chapter. Therefore, the Applicant and MassDOT can collaborate at this time whether changes to the traffic control are still necessary to support the project.

OFF-SITE COMMITMENTS

Intersection Improvements

School Street / Atwater Avenue

The Applicant has committed to the following improvements at the intersection of School Street / Atwater Avenue:

- Apply a high-visibility double-yellow centerline along Atwater Avenue for approximately 200-feet to/from School Street to define the two-way directional traffic flow along the approach adjacent to the projected 95th percentile queue distance.
- Replace the faded stop-sign and the stop line (high-visibility) along the Atwater Avenue westbound approach.

School Street / Route 128 NB Ramps / Mill Street

To address the project's future full build-out conditions, the Applicant will provide traffic control improvements in the form of a traffic signal at the intersection in accordance with MassDOT's ICE procedure. The Applicant has committed to the following overall improvements at the intersection of School Street / Route 128 NB Ramps / Mill Street:

- Construct a fully actuated traffic signal with new demand-based vehicular and bicycle detection, accommodations for emergency-vehicle pre-emption, and a protected/exclusive pedestrian crossing. The traffic signal will be constructed to include the Mill Street approach in the traffic signal control. Those approaches will operate in a split-phased sequence.

- Refresh *MUTCD* compliant pavement markings and traffic signage, as applicable, at the intersection based on the new traffic signal and other improvements at the intersection.

These improvements will be implemented in accordance with the following project-based schedule:

- Prior to Phase 1 occupancy, the Applicant will prepare intersection improvement design plans to a 25% Design level for full build-out of a traffic signal, the preferred alternative for off-site mitigation.
- Prior to Phase 2 occupancy, and if requested and approved by MassDOT, the Applicant will install traffic signal infrastructure at this intersection. Signalization of the intersection will be coordinated with MassDOT and reflect the current traffic operating conditions, the current traffic signal warranting conditions, and the actual site's trip generation projections based on Phase 1 occupancy. Whereas the opportunity exists for more limited trip generation than as noted in this TIAPS, a traffic signal may not be sought by MassDOT following Phase 1 occupancy data observations.

Prior to the installation of a traffic signal at this location and in conjunction with the subsequently described TMP committed to by the Applicant, overall traffic signal warrants including vehicle speed analysis will be conducted prior to traffic signal installation as the Applicant and MassDOT both recognize a traffic signal may no longer be warranted at that time based on changes in the 85th percentile speed along School Street.

Should MassDOT provide a direct request for installation of a separate traffic control alternative as this intersection, the Applicant is committed to provide a financial contribution to MassDOT for its design and/or construction equivalent to the installation of the traffic signal alternative as part of a fair share provision to the overall cost. Any additional cost bore be a request for this alternative is unfeasible for the Applicant based on the size and scope of the proposed development.

This intersection is under the jurisdiction of MassDOT and will require the Applicant to prepare and submit PS&E plans to MassDOT for review and approval prior to construction of any improvements.

Pedestrian Accommodations

Recent MassDOT & Town Improvements

Parts of the School Street corridor in the study area are under minor reconstruction in early 2023 as part of both MassDOT Project 609102 and general Town maintenance work. This includes significant pedestrian upgrades to existing pedestrian facilities. The following pedestrian work includes:

- MassDOT Project 609102 – This project includes the reconstruction along School Street within the limits of SHLO adjacent to Route 128. The project includes reconstruction of asphalt sidewalks and concrete curb ramps along the easterly side of School Street between the southerly limit of SHLO and the Route 128 bridge. The work does not reconstruct the existing sidewalk and ramps on the

northerly side of the Route 128 bridge. This work is expected to be completed by early summer 2023.

- *Municipal Pedestrian Improvements* – The Town of Manchester By-the-Sea is currently reconstructing pedestrian infrastructure, such as sidewalk and pedestrian curb ramps, along School Street at the intersections with Pleasant Street and Lincoln Street. This work is expected to be completed by early summer 2023.

Potential for Walkability

The roadways near the project are not defined as an area of high potential for walkability by MassDOT in its 2022 update to the Walkability Maps within the State Pedestrian and State Bicycle Plans. The nearest location defined for any walkability is the School Street Bridge over Route 128 which is designated as LOW potential for walkability. There is substantially limited non-vehicle infrastructure in the vicinity of the site as a result of the rural nature of the region (understanding that the area is designated as an urban zone by the MassDOT Urban Map). No pedestrian accommodation exists along Atwater Avenue and accommodations along School Street, in the form of asphalt sidewalks to the south towards Manchester's Business District, terminate at the Route 28 SB Ramps.

There is no significant number of potential origins / destination for walkable trips to/from the proposed project site as conservation land and the Sawmill Brook resource area limits opportunities for other development. The nearest existing residence to the proposed development is 1-mile away by public roadway to the south with only four (4) non-residence developments within that same 1-mile (small farm stand, small medical office building, Manchester Athletic Club, and a small multi-tenant industrial site).

Challenges to Pedestrian Infrastructure Construction

In addition to the limited origins / destinations in the vicinity, the existing physical geometry and environmental resources constrain the ability to extend pedestrian accommodations from their current terminus along the easterly side of School Street at the Route 128 SB Ramps. School Street from the Route 128 Bridge to the #195 School Street Driveway (labeled as Kit Glass Drive, a private way) has a very steep slope along the easterly side of the road and would provide a gap in the connectivity of any extended sidewalk. Sidewalks could be provided along sections of the westerly side of pavement; however, this will require pedestrians to cross back and forth across a widened School Street cross-section where there are no existing origin / destinations along the westerly side of the roadway.

Atwater Avenue, a local roadway, currently has no pedestrian accommodation. The minimum pedestrian traffic that utilizes this roadway, mostly in the form of higher-end runners to/from the Manchester Athletic Club, currently walks within the minimally travelled roadway. The challenges to install sidewalks along Atwater Avenue are directly related to the topography and water resource areas. Atwater Avenue between School Street and the Sawmill Brook crossing directly abuts a significant elevation drop-off to the adjacent wetlands along the northerly side of pavement. In addition, wetlands line the southerly side of Atwater Avenue for a large portion of this same length. The wetland directly associated with the Sawmill Brook switches to the southerly wide of Atwater Avenue following the crossing and continues along the edge of pavement to the proposed site driveway.

The Applicant's site team had also performed an initial assessment of a cross-country shared-use path between the project site and the intersection of School Street / Route 128 SB Ramps. However, the project team determined that this route was not feasible due to aggressive topography, wetland and stream crossings, and significant ledge outcrops along the north side of the Route 128 SB ramps.

Extent of Pedestrian Accommodation

Due to the limited origin / destinations, the impact to water resource areas, and physical topography of the area, the Applicant has no feasible ability to extend formal street-side pedestrian accommodations from their current terminus along School Street at the Route 128 SB Ramps. Overall, full extension of sidewalk over this distance would be approximately 3,500-feet in length.

The Applicant is however constructing the site to provide formal trailhead connections to the Monoliths recreation area as part of the Trustees of Reservations. Surface parking for these trailheads will be provided on-site.

Bicycle Accommodations

Recent MassDOT Improvements

Parts of the School Street corridor in the study area are under minor reconstruction in early 2023 as part of both MassDOT Project 609102 and general Town maintenance work. This includes significant bicycle upgrades where no formal bicycle accommodation exists. The following bicycle work includes:

- MassDOT Project 609102 – This project includes the reconstruction along School Street within the limits of SHLO adjacent to Route 128. Pavement markings being applied to the resurface roadway will include variable width buffered bicycle lanes (3-foot buffer) in both directions of travel within the limits of SHLO. This work is expected to be completed by early summer 2023.

Potential for Everyday Biking

The area near the project is not defined as an area of high potential for everyday biking by MassDOT in its 2022 update to the Everyday Biking Maps within the State Bicycle Plans. The nearest location defined for any everyday biking is the School Street Bridge over Route 128 which is designated as MEDIUM potential for everyday biking. There is substantially limited non-vehicle infrastructure in the vicinity of the site. No bicycle accommodation exists along Atwater Avenue and accommodations along School Street, in the form of bikeable shoulders, terminate at the #195 School Street Driveway (Kit Glass Drive private way).

There is no significant number of potential origins / destination for bikeable trips to/from the proposed project site as conservation land and the Sawmill Brook resource area limits opportunities for other development. The nearest existing residence to the proposed development is 1-mile away by public roadway to the south with only four (4) non-residence developments within that same 1-mile (small farm stand, small medical office building, Manchester Athletic Club, and a small multi-tenant industrial site).

Extent of Bicycle Accommodation

The Applicant has committed to provide new bicycle infrastructure off-site within the study area as mitigation for the project. The Applicant has committed to the following limited bicycle improvements:

- Provide secure, weather protected, long-term bicycle parking for employees at designated locations within the proposed parking structure.
- Restripe the existing roadway shoulder along School Street from the northerly limit of SHLO, north of the Route 128 NB Ramps, to Atwater Avenue to include a minimum 5-foot buffered bicycle lane with associated signage. This work will provide connectivity to the recently installed buffered bicycle lanes by MassDOT within SHLO at Route 128. The width and extent of the buffer will be coordinated with MassDOT as part of the Permit to Access State Highway process following MEPA review. Continuation of the bicycle accommodation north of the #195 School Street Driveway (labeled as Kit Glass Drive, a private way) will require box widening of the pavement.
- Install shared-use lane markings (“sharrows”) and associated signage along all 2,000-feet of Atwater Avenue, a local roadway.

Atwater Avenue, a local roadway, currently has no bicycle accommodation. Provisions for formal bicycle accommodations are traditionally not included on local roadways; however, the Applicant will provide shared-use lane markings and associated signage along the roadway. Further expansion of the pavement to provide more substantial bicycle accommodations are subject to the same environmental and topographic constraints noted under the pedestrian accommodations section.

TRANSPORTATION DEMAND MANAGEMENT

North Shore Transportation Management Association

North Shore Transportation Management Association (TMA) currently does not operate within Manchester By-the-Sea; however, the adjacent community of Beverly does participate. In addition, the Applicant (Cell Signaling Technologies) is a participating member in the North Shore TMA for its Danvers and Beverly locations. The Applicant will continue to work with North Shore TMA to export its services to the new Manchester By-the-Sea location as part of the project.

Transportation Demand Management Measures

The Applicant has a commitment to research and provide a dynamic TDM program in order to reduce SOV trips to/from the site. At this time, the Applicant is committed to provide the following TDM measures:

Parking Measures

- Preferential Parking - Provide preferential parking for rideshare, carpool, and hybrid vehicles at locations throughout the site’s parking areas in close proximity to major entranceways. The designated spaces will be monitored to ensure that the license plates of those employees parking in the spots each day match the

registrations of participants. Employees will only be allowed to use these spaces on the days that they are carpooling. Information about these services will be posted in a central location or otherwise made available to employees.

- Electric Vehicle Stations – Provide electric vehicle (EV) charging stations at locations throughout the site's parking areas in close proximity to the building entrances.

Reduced Parking Supply – The Applicant is committed to reducing the parking supply by providing minimal number of parking spaces below Town of Manchester By-the-Sea Zoning requirements to a level of the demand need only. The current parking layout provides a parking supply that is both below Town of Manchester By-the-Sea Zoning and comparable to ITE parking demand estimates.

Bicycle and Pedestrian Measures

- Pedestrian Signal Equipment – Install new pedestrian signal equipment at the intersection of School Street / Route 128 NB Ramps / Mill Street as part of a modification to traffic control as specified in this TIAPS.
- On-Site Pedestrian Accommodations – Sidewalk and accessible curb ramps will be provided on-site providing connection to various site structures and components.
- Bicycle Accommodations - Provide striping improvements for buffered bicycle lanes along School Street with complementary bike signs.
- Bicycle Racks - Provide secure, weather protected, long-term bicycle parking for employees at designated locations within the proposed parking structure.
- Employee Shower Facilities - Coordinate with tenants to provide showers for employees who commute by walking or biking.
- Walking Trails – The site will include trailhead connection locations for several walking trails as part of the 146-acre Monoliths recreation area as part of the Trustees of Reservations. Surface parking for these trailheads will be provided on-site.

Public Transportation Measures

- Maps / Schedules - Public transportation schedules with transit maps for the MBTA Commuter Rail, as well as for all nearby routes will be provided to each employee on their start date. Schedules and maps will also be provided in the lobby and lunchroom in each on-site building.
- Transit and Rideshare Subsidies - The Proponent commits to no less than a 25% subsidy for employee Commuter Rail passes and rideshare fees between the Manchester MBTA Station and the project site.

Other Measures

- Employee Transportation Coordinator (ETC) – An ETC will be provided on-site to oversee, implement, monitor, and evaluate TDM measures, employed or funded

by the Applicant. The ETC will be responsible for managing rideshare and carpool programs, as well as distributing information to employees to encourage alternative means of transportation. The ETC will be responsible for posting and distributing announcements, holding promotional events to encourage rideshare, bicycling, and walking.

- Marketing of Transportation Options and Benefits - A welcome packet for all employees will be distributed which includes information for all transportation related benefits, promotions, and local transportation options; including location of MBTA stops, transit schedules, EV and carpool parking locations, and any other emerging new mobility locations.
- Rideshare - The ETC, in consultation with the North Shore TMA, will develop an employee rideshare program to encourage employees to seek alternatives to driving to work alone.
- Vanpool and Carpool – The Applicant, and the ETC, will encourage vanpooling participation through marketing, events, and vanpool formation meetings. The ETC will implement a ride-matching program to assist employees in finding appropriate carpool matches. The ETC will contact employees to determine if they receive their match-lists, review the lists with them and see if they have contacted anyone on the list or would like assistance in contacting people.
- Guaranteed Ride Home Program – The ETC will be responsible for providing all employees who carpool, bicycle, or walk to work with an emergency ride home. This program eliminates the fear of being stranded on days that the employees are ridesharing or having to walk or bicycle in inclement weather conditions.
- Flex Hours - Provide flexible hours to employees.
- Direct Deposit for Employees - Encourage employees to adopt direct deposit to reduce employee trips to/from the site.
- Promotional Events and Activities – The ETC will be responsible for organizing promotional events and activities to encourage rideshare and alternative transportation means. In addition, the ETC will distribute brochures to all new employees and post posters and bulletins on various subjects from carpooling to the Guaranteed Ride Home program throughout the site.
- Transportation Monitoring Program – The Applicant is committed to implement a TMP, which is intended to monitor traffic operations and parking occupancy throughout the construction and for a period following completion of the Project. The scope of the TMP will be developed in coordination with MassDOT, and will include providing traffic and speed counts, TDM compliance, and parking information to the MassDOT District 4 office and the Town of Manchester By-the-Sea.

Transportation Monitoring Program

The Applicant is committed to implementing a TMP, which is intended to monitor traffic operations, parking occupancy, public transportation utilization, and pedestrian / bicycle use for a period following completion of the Project. The TMP will include providing traffic count information to the MassDOT District 4 office and the Town of Manchester By-the-Sea for use of tracking site-

generated trips. The intent of the monitoring program is to ensure that the Project impacts are consistent with those predicted in the Project's permitting process, evaluate the effectiveness of the TDM measures in meeting the mode share targets, and assess the need for additional off-site improvements or TDM measures.

The MassDOT / Manchester By-the-Sea monitoring program will include evaluation of the following:

- Traffic operations at the intersections of:
 - School Street / Atwater Avenue
 - School Street / Route 128 SB Ramps
 - School Street / Route 128 NB Ramps / Mill Street
 - School Street / Pleasant Street
 - School Street Lincoln Street
- Adequacy of the constructed parking supply.
- Safety evaluations based on available crash data, and
- Effectiveness of TDM measures

As part of the monitoring program, the Applicant will complete the following tasks annually for five years following occupancy of the proposed mixed-use development:

- Collect manual Turning Movement Counts (TMCs) during the weekday morning (7:00 AM to 9:00 AM) and weekday evening (4:00 to 6:00 PM), peak periods at the following intersections.
- Traffic operations at the intersections of:
 - School Street / Atwater Avenue
 - School Street / Route 128 SB Ramps
 - School Street / Route 128 NB Ramps / Mill Street
 - School Street / Pleasant Street
 - School Street Lincoln Street
- Collect ATR data for a continuous 7-day week-long period along Atwater Avenue, School Street, and at the end of each site driveway.
- Collect parking demand counts for the specific land use from 5:00 AM to 9:00 PM.
- Collect motor vehicle crash reports from the Town of Manchester By-the-Sea Police Department for the most recent one-year period to ascertain changes in crash frequency, crash trends, and severity at the monitored locations.
- Complete an employee travel survey to gauge employee travel patterns and mode share. This includes transit ridership for those who utilize the MBTA Commuter Rail. This will be administered by the ETC.

- Compare the TMCs collected above with those projected within the TIAPS for the Project to determine whether the total vehicles entering each intersection exceeds the volumes projected.
- Perform a capacity and queuing analysis using Synchro analysis software to evaluate the traffic operations at each of the intersections listed above and compare to the operations projected in the TIAPS prepared for the Project.
- Assess whether additional mitigation is necessary at any of the study intersections and identify measures to improve operations and/or reduce vehicular traffic volumes. The need or evaluation for further mitigation will be conditioned upon:
 - The measured site generated traffic volumes for the Project exceed the projected site generated traffic volumes established in this TIAPS, or subsequent revisions as presented to the Town of Manchester By-the-Sea, by more than 10 percent (i.e., 110 percent of the projected site generated traffic volumes).
 - There is a pronounced increase in the frequency of occurrence of motor vehicle crashes at a monitored location and the calculated motor vehicle crash rate exceeds the MassDOT average crash rate for similar locations.

Corrective actions to reduce the unmitigated impact of the Project should be proposed and implemented based on the thresholds listed above. The corrective actions should be documented in the TMP, approved and coordinated with the Town and/or MassDOT if desired by the agencies, and be undertaken by the Applicant subject to receipt of all necessary rights, permits, and approvals.

- Assess whether the constructed parking supply is adequate for the parking demand as observed.
- Prepare a memorandum summarizing the results of the TMCs, ATRs, parking demand counts, traffic impact analysis for submission to MassDOT District 4 and the Town of Manchester By-the-Sea.

The monitoring program will occur on an annual basis beginning six months after issuance of the first occupancy permit and continuing for five years following full occupancy of the project. The monitoring program may be suspended at any time upon agreement with MassDOT and the Town of Manchester By-the-Sea that the Project has sufficiently provided evidence that the upper limits of vehicle delay and trip projection would not be feasibly satisfied. The annual nature of the monitoring program may be postponed in consultation with the Town and MassDOT based on lack of need circumstances if no new development has occurred during full build-out. The monitoring program may also be suspended if five years have passed since the issuance of an occupancy permit for the project and will recommence should an additional occupancy permit be issued.

VII. PARKING

A parking garage is being constructed on-site to reduce the impact of impervious areas within the property. The life science and research laboratory, as well as both the surface and garage parking, will be constructed over two sequentially constructed phases. Phase 1 will include the construction of 127,000 SF of R&D space with 40 surface parking spaces and 227 garage parking spaces. Phase 2 will consist of the remaining 136,000 SF of laboratory space with 16 surface parking spaces and 252 garage parking spaces. Overall, the project will include 535 off-street parking spaces (56 surface parking spaces and 479 garage spaces).

PROJECTING PARKING SUPPLY NEEDS

Town of Manchester Zoning Bylaws

The Town of Manchester By-the-Sea Zoning By-Laws contains minimal off-street parking supply requirements for various land uses. Although the R&D land use is allowed within the Limited Commercial District, no specific parking requirements for this land use is documented within the Bylaw. Under this scenario, the parking requirement is to be determined by the Building Inspector with the advice of the Planning Board (Section 6.1.1).

Institute of Transportation Engineers Parking Demand Estimates

Projections from the industry standard ITE publication *Parking Generation, 5th Edition* for LUC 760 - Research and Development Center denote an 85th percentile peak parking demand of 826 spaces based on square footage and 539 based on employee count. Based on a parking supply of 535 spaces throughout the site, the proposed parking supply on-site will be comparable to the ITE peak parking demand estimates for the overall employee count. Detailed parking demand generation worksheets are included in Attachment M.

PARKING SUPPLY

The Applicant has sought to provide a parking supply that is generally in-line with ITE demand calculations which is to be conveyed to the Manchester Planning Board and Building Inspector. Generally, the ratio of parking spaces versus the number of employees will be comparable to the CST headquarter campus in Danvers, MA.

VIII. CONCLUSION

TEC has examined the potential traffic impacts associated with the proposed CST at the Quarry development in Manchester By-the-Sea, Massachusetts on the study area roadways and intersections. The following is a summary of the results and conclusions of this effort:

- The existing site currently consists of an earth removal quarry. The Applicant proposes to remove the earth removal operation and construct a 263,000 SF R&D facility with 550 employees and 535 off-street parking spaces (56 surface parking spaces and 479 garage spaces).
- The life science and research laboratory, as well as both the surface and garage parking, will be constructed over two sequentially constructed phases. Phase 1 will include the construction of 127,000 SF of R&D space with 40 surface parking spaces and 227 garage parking spaces. Phase 2 will consist of the remaining 136,000 SF of R&D space with 16 surface parking spaces and 252 garage parking spaces.
- Access/egress to the site will be provided via two (2) full access/egress driveways, one at the end of Atwater Avenue adjacent to the Manchester Athletic Club and one along Beaver Dam Road approximately 175-feet east of Atwater Avenue. All traffic generated by the site will access/egress along the 2,000-foot Atwater Avenue to its terminus at its intersection with School Street, approximately 1,250 feet north of the Route 128 SB Ramps for Interchange 50.
- The intersection sight distance and stopping sight distance at the intersection of School Street / Atwater Avenue are well in excess of AASHTO minimum recommendations.
- The proposed full build-out development assessed by square footage is anticipated to generate 2,800 new vehicle trips during the average weekday, with 259 new vehicle trips (212 entering and 47 exiting) during the weekday morning peak hour and 246 new vehicle trips (39 entering and 207 exiting) during the weekday evening peak hour. If assessed by employee count, the number of trips generated by the site would be less. The opportunity for less trip generation based on the employee count is believed to be more in line with what will occur based on its existing CST Danvers, MA headquarters campus.
- With the addition of site generated traffic, the Atwater Avenue westbound approach to School Street is anticipated to operate at an elevated LOS E during the weekday evening peak hour. This elevated level of service is not expected to be experienced during any other period of the day. Although the LOS E is present, the v/c ratio for the approach is still well below 1.00 indicating that adequate capacity is present along Atwater Avenue to accommodate the additional demand created by the site.

- With the addition of site generated traffic at the intersection, the Route 128 SB Ramps westbound left-turn movement to School Street is anticipated to operate at an elevated LOS F during both the weekday morning and weekday evening peak hour. Although the LOS F is present, the v/c ratio for the approach is still well below 1.00 indicating that adequate capacity is present along the Route 128 SB Ramp left-turn movement to accommodate the additional demand along School Street created by the site. In addition, the queues along the approach are not expected to extend to more than four (4) vehicles. Where significant reserve capacity is still available on the ramp and the project does not add traffic to the ramp's critical movement, no project-specific mitigation to alter traffic operations is proposed at this location.
- The Route 128 NB Ramps eastbound approach to School Street is anticipated to operate at elevated levels of service (LOS F) during both the weekday morning and weekday evening peak periods during both the No-Build and Build conditions. The addition of site generated traffic following Phase 2 occupancy will result in significantly more degraded conditions during each commuter peak periods. This includes extending the potential queue during the weekday morning peak hour to up to sixteen (16) vehicles along the ramp. This level of impact is only anticipated during the peak periods where much of the rest of the day will operate at acceptable levels of service. The Applicant is committed to work with MassDOT on potential traffic control changes to this location prior to occupancy of Phase 2.
- Both the Pleasant Street westbound right-turn movement and the School Street southbound approach are anticipated to operate at elevated levels of service (LOS F) for both the No-Build and Build conditions during the weekday morning peak hour. Although the level of service is elevated for these movements, the traffic added to the intersection as a result of the project does not significantly change the operating conditions at the intersection. There are no practical means to mitigate project related impacts at the intersection based on the short period of elevated levels-of-service.
- The Lincoln Street westbound approach is anticipated to operate at an elevated level of service (LOS F) during the weekday morning peak hour under both No-Build and Build conditions. This condition is experienced by only eleven (11) vehicles exiting the cul-de-sac during that hour. There are no practical means to mitigate the level of service along the approach independent of the project based on the minimal traffic volume.
- The Applicant has sought to provide a parking supply that is generally in-line with ITE demand calculations. Generally, the ratio of parking spaces versus the number of employees will be comparable to the CST headquarter campus in Danvers, MA.
- The Applicant seeks to provide the following off-site mitigation measures:
 - Limited pavement marking and traffic signage improvements at the intersection of School Street / Atwater Avenue.
 - Construction of a traffic control signal at the intersection of School Street / Route 128 NB Ramps / Mill Street prior to occupancy of Phase 2 and in coordination with MassDOT and the Town.

- Significantly improve accommodations for bicycles along School Street with application of buffered bicycle lanes and along Atwater Avenue with shared use lane markings.
- The Applicant has commitment to research and provide a dynamic and extensive TDM program in order to reduce SOV trips to/from the site and promote multi-modal travel. A full compilation of TDM measures have been identified and include provisions to reduce on-site parking, increase pedestrian and bicycle travel, promote transit use to/from the site, and decrease the impacts of vehicle emissions.
- The Applicant has committed to implement a traffic monitoring program that will evaluate the site's traffic and impacts following occupancy. The program will be key in potential off-site mitigation at the intersection of School Street / Route 128 NB Ramps / Mill Street upon evaluation of Phase 1 conditions as compared to the projected impacts identified in this TIAPS.

In conclusion, with implementation of the proposed improvements, the anticipated traffic generated by the CST at the Quarry project can be safely and efficiently accommodated within the study area corridors and intersections upon implementation of modest off-site mitigation. The Applicant has committed to work cooperatively with MassDOT and the Town of Manchester By-the-Sea to implement the robust transportation mitigation program.

Attachment A

Public Transportation Maps & Schedules

NEWBURYPORT/ROCKPORT LINE

SPRING/SUMMER SCHEDULE
Effective May 22, 2023

Monday to Friday			AM															PM												
Inbound to Boston																														
Train No.			140	100	142	102	144	104	146	106	148	108	150	192	110	152	112	154	114	156	198	116	158	118	160	120	162	122	124	164
ZONE	STATION	Bikes Allowed																												
8	Rockport		-	5:08	-	6:13	-	7:13	-	8:13	-	9:13	-	-	10:43	-	12:13	-	1:43	-	-	3:13	-	4:37	-	5:46	-	7:46	8:50	-
7	Gloucester		-	5:15	-	6:20	-	7:20	-	8:20	-	9:20	-	-	10:50	-	12:20	-	1:50	-	-	3:20	-	4:44	-	5:53	-	7:53	8:57	-
7	West Gloucester		-	5:21	-	6:26	-	7:26	-	8:26	-	f 9:26	-	-	f 10:56	-	f 12:26	-	f 1:56	-	-	f 3:26	-	4:50	-	5:59	-	7:59	9:03	-
6	Manchester		-	5:28	-	6:33	-	7:33	-	8:33	-	9:33	-	-	11:03	-	12:33	-	2:03	-	-	3:33	-	4:57	-	6:06	-	8:06	9:10	-
5	Beverly Farms		-	5:34	-	6:39	-	7:39	-	8:39	-	f 9:39	-	-	f 11:09	-	f 12:39	-	f 2:09	-	-	f 3:39	-	5:03	-	6:12	-	8:12	9:16	-
4	Montserrat		-	5:40	-	6:45	-	7:45	-	8:45	-	f 9:45	-	-	f 11:15	-	f 12:45	-	f 2:15	-	-	f 3:45	-	5:09	-	6:18	-	8:18	9:22	-
8	Newburyport		4:49	-	5:54	-	6:54	-	7:54	-	8:54	-	9:54	-	-	11:24	-	12:54	-	2:24	-	-	3:54	-	5:07	-	6:57	-	-	9:39
7	Rowley		4:54	-	5:59	-	6:59	-	7:59	-	8:59	-	f 9:59	-	-	f 11:29	-	f 12:59	-	f 2:29	-	-	f 3:59	-	5:12	-	7:02	-	-	9:44
6	Ipswich		5:00	-	6:05	-	7:05	-	8:05	-	9:05	-	10:05	-	-	11:35	-	1:05	-	2:35	-	-	4:05	-	5:18	-	7:08	-	-	9:50
5	Hamilton/Wenham		5:06	-	6:11	-	7:11	-	8:11	-	9:11	-	f 10:11	-	-	f 11:41	-	f 1:11	-	f 2:41	-	-	f 4:11	-	5:31	-	7:14	-	-	9:56
5	North Beverly		5:10	-	6:15	-	7:15	-	8:15	-	9:15	-	f 10:15	-	-	f 11:45	-	f 1:15	-	f 2:45	-	-	f 4:15	-	5:35	-	7:18	-	-	10:00
4	Beverly		5:15	5:45	6:20	6:50	7:20	7:50	8:20	8:50	9:20	9:50	10:20	10:50	11:20	11:50	12:50	1:20	2:20	2:50	3:20	3:50	4:20	5:14	5:42	6:23	7:23	8:23	9:27	10:05
3	Salem		5:19	5:49	6:24	6:54	7:24	7:54	8:24	8:54	9:24	9:54	10:24	10:54	11:24	11:54	12:54	1:24	2:24	2:54	3:24	3:54	4:24	5:18	5:46	6:27	7:27	8:27	9:31	10:09
3	Swampscott		5:26	5:56	6:31	7:01	7:31	8:01	8:31	9:01	9:31	10:01	10:31	11:01	11:31	12:01	1:01	1:31	2:31	3:01	3:31	4:01	4:31	5:25	5:53	6:34	7:34	8:34	9:38	10:16
2	River Works		f 5:32	f 6:02	f 6:37	f 7:07	-	f 8:07	f 8:37	-	-	-	-	-	-	-	-	-	f 2:37	f 3:07	f 3:37	f 4:07	f 4:37	f 5:31	f 5:59	f 6:40	f 7:40	-	-	f 10:22
1A	Chelsea		5:39	6:09	6:45	7:15	7:44	8:15	8:45	9:14	9:43	10:13	10:43	11:13	11:43	12:13	1:13	1:43	2:44	3:14	3:44	4:14	4:44	5:38	6:06	6:47	7:47	8:46	9:50	10:29
1A	North Station		5:56	6:27	7:03	7:34	8:02	8:34	9:03	9:32	10:01	10:31	11:00	11:29	12:01	12:30	1:31	2:00	3:02	3:31	4:00	4:32	5:01	5:56	6:24	7:05	8:03	9:04	10:08	10:46

Monday to Friday		AM															PM														
Outbound from Boston																															
Train No.		141	101	143	103	145	105	191	147	107	149		109	151	111	197	153	113	155	115	157	117	159	119	161	121	163	123	165	125	167
ZONE	STATION																														
1A	North Station		5:35	6:35	7:35	7:47	8:35	9:05	9:35	10:05	10:35	11:35	12:05	1:05	1:35	2:05	2:35	3:05	3:35	4:05	4:35	5:05	5:35	6:05	6:40	7:20	8:05	8:50	9:35	11:00	<div>Board Rockport Train 125 and change trains at Salem for a Newburyport connection</div>
1A	Chelsea		5:46	6:46	7:46	-	8:46	9:16	9:46	10:16	10:46	11:46	12:16	1:16	1:46	2:16	2:46	3:16	3:46	4:16	4:46	5:16	5:46	6:16	6:51	7:31	8:16	9:01	9:46	11:11	
2	River Works		f 5:53	f 6:53	f 7:53	-	-	-	-	-	-	-	-	-	f 1:54	-	f 2:54	f 3:24	f 3:54	f 4:24	-	f 5:24	f 5:54	-	f 6:59	f 7:39	-	-	-	f 11:19	
3	Swampscott		5:59	6:59	7:59	-	8:58	9:28	9:58	10:28	10:58	11:58	12:28	1:28	1:59	2:28	2:59	3:29	3:59	4:29	4:58	5:29	5:59	6:28	7:04	7:44	8:28	9:13	9:58	11:24	
3	Salem		6:06	7:06	8:06	8:13	9:05	9:35	10:05	10:35	11:05	12:05	12:35	1:35	2:06	2:35	3:06	3:36	4:06	4:36	5:05	5:36	6:06	6:35	7:11	7:51	8:35	9:20	10:05	11:31	
4	Beverly		6:10	7:10	8:10	8:17	9:09	9:39	10:12	10:39	11:09	12:09	12:39	1:39	2:10	2:42	3:10	3:40	4:10	4:40	5:09	5:40	6:10	6:39	7:15	7:55	8:39	9:24	10:09	11:35	
5	North Beverly		f 6:14	-	f 8:14	-	f 9:13	-	-	f 10:43	-	f 12:13	-	1:43	-	-	3:14	-	4:14	-	5:13	-	6:14	-	7:19	-	8:43	-	10:13	-	11:48
5	Hamilton/Wenham		f 6:18	-	f 8:18	-	f 9:17	-	-	f 10:47	-	f 12:17	-	1:47	-	-	3:18	-	4:19	-	5:18	-	6:19	-	7:24	-	8:47	-	10:17	-	11:52
6	Ipswich		6:24	-	8:24	-	9:23	-	-	10:53	-	12:23	-	1:53	-	-	3:24	-	4:25	-	5:25	-	6:26	-	7:30	-	8:53	-	10:23	-	11:58
7	Rowley		f 6:30	-	f 8:30	-	f 9:29	-	-	f 10:59	-	f 12:29	-	1:59	-	-	3:30	-	4:31	-	5:31	-	6:32	-	7:36	-	8:59	-	10:29	-	12:04
8	Newburyport		6:41	-	8:41	-	9:41	-	-	11:11	-	12:41	-	2:11	-	-	3:41	-	4:43	-	5:43	-	6:44	-	7:48	-	9:11	-	10:41	-	12:16
4	Montserrat		-	f 7:14	-	f 8:21	-	f 9:43	-	-	f 11:13	-	f 12:43	-	2:14	-	-	3:44	-	4:44	-	5:44	-	6:43	-	7:59	-	9:28	-	11:39	-
5	Beverly Farms		-	f 7:20	-	f 8:27	-	f 9:49	-	-	f 11:19	-	f 12:49	-	2:20	-	-	3:50	-	4:51	-	5:51	-	6:50	-	8:05	-	9:34	-	11:45	-
6	Manchester		-	7:26	-	8:33	-	9:55	-	-	11:25	-	12:55	-	2:26	-	-	3:56	-	4:57	-	5:57	-	6:56	-	8:11	-	9:40	-	11:51	-
7	West Gloucester		-	f 7:32	-	f 8:39	-	f 10:01	-	-	f 11:31	-	f 1:01	-	2:32	-	-	4:02	-	5:03	-	6:03	-	7:02	-	8:17	-	9:46	-	11:57	-
7	Gloucester		-	7:38	-	8:45	-	10:08	-	-	11:38	-	1:08	-	2:39	-	-	4:09	-	5:11	-	6:11	-	7:10	-	8:24	-	9:53	-	12:04	-
8	Rockport		-	7:50	-	8:57	-	10:21	-	-	11:51	-	1:21	-	2:52	-	-	4:22	-	5:24	-	6:24	-	7:26	-	8:37	-	10:05	-	12:16	-

Weekend																				
Inbound to Boston		AM							PM											
Saturday Train No.		1150	1100	1152	1102	1154	1104	1156	1106	1158	1108	1160	1110	1162	1112	1164	1114	1166	1116	
Sunday Train No.		2150	2100	2152	2102	2154	2104	2156	2106	2158	2108	2160	2110	2162	2112	2164	2114	2166	2116	
ZONE	STATION																			
8	Rockport		-	6:00	-	8:00	-	10:00	-	12:00	-	2:00	-	4:00	-	6:00	-	8:00	-	10:00
7	Gloucester		-	6:07	-	8:07	-	10:07	-	12:07	-	2:07	-	4:07	-	6:07	-	8:07	-	10:07
7	West Gloucester		-	6:13	-	8:13	-	10:13	-	12:13	-	2:13	-	4:13	-	6:13	-	8:13	-	10:13
6	Manchester		-	6:20	-	8:20	-	10:20	-	12:20	-	2:20	-	4:20	-	6:20	-	8:20	-	10:20
5	Beverly Farms		-	6:26	-	8:26	-	10:26	-	12:26	-	2:26	-	4:26	-	6:26	-	8:26	-	10:26
4	Montserrat		-	6:32	-	8:32	-	10:32	-	12:32	-	2:32	-	4:32	-	6:32	-	8:32	-	10:32
8	Newburyport		5:10	-	7:10	-	9:10	-	11:10	-	1:10	-	3:10	-	5:10	-	7:10	-	9:10	-
7	Rowley		5:15	-	7:15	-	9:15	-	11:15	-	1:15	-	3:15	-	5:15	-	7:15	-	9:15	-
6	Ipswich		5:21	-	7:21	-	9:21	-	11:21	-	1:21	-	3:21	-	5:21	-	7:21	-	9:21	-
5	Hamilton/Wenham		5:27	-	7:27	-	9:27	-	11:27	-	1:27	-	3:27	-	5:27	-	7:27	-	9:27	-
5	North Beverly		5:31	-	7:31	-	9:31	-	11:31	-	1:31	-	3:31	-	5:31	-	7:31	-	9:31	-
4	Beverly		5:37	6:37	7:37	8:37	9:37	10:37	11:37	12:37	1:37	2:37	3:37	4:37	5:37	6:37	7:37	8:37	9:37	10:37
3	Salem		5:41	6:41	7:41	8:41	9:41	10:41	11:41	12:41	1:41	2:41	3:41	4:41	5:41	6:41	7:41	8:41	9:41	10:41
3	Swampscott		5:48	6:48	7:48	8:48	9:48	10:48	11:48	12:48	1:48	2:48	3:48	4:48	5:48	6:48	7:48	8:48	9:48	10:48
1A	Chelsea		6:00	7:00	8:00	9:00	10:00	11:00	12:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00
1A	North Station		6:17	7:18	8:17	9:18	10:17	11:18	12:17	1:18	2:17	3:18	4:17	5:18	6:17	7:18	8:17	9:18	10:17	11:18

Attachment B

Turning Movement Counts (TMCs)

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 1

Groups Printed- Cars - Trucks

	School St From North		Atwater Ave From East		School St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
07:00 AM	1	45	11	2	18	8	85
07:15 AM	3	81	6	0	38	11	139
07:30 AM	2	91	6	3	64	17	183
07:45 AM	7	62	8	1	57	13	148
Total	13	279	31	6	177	49	555
08:00 AM	3	54	4	1	34	9	105
08:15 AM	5	56	7	0	51	25	144
08:30 AM	3	39	10	1	44	10	107
08:45 AM	6	54	7	0	39	45	151
Total	17	203	28	2	168	89	507
09:00 AM	9	46	19	6	40	24	144
09:15 AM	2	36	7	3	27	10	85
09:30 AM	0	38	9	2	25	3	77
09:45 AM	1	42	12	4	39	20	118
Total	12	162	47	15	131	57	424
10:00 AM	0	26	27	2	22	7	84
10:15 AM	5	27	19	7	42	17	117
10:30 AM	4	27	15	2	35	23	106
10:45 AM	1	41	13	3	29	10	97
Total	10	121	74	14	128	57	404
11:00 AM	2	36	9	3	35	11	96
11:15 AM	0	40	14	2	34	4	94
11:30 AM	0	40	11	3	40	3	97
11:45 AM	2	31	21	3	31	16	104
Total	4	147	55	11	140	34	391
12:00 PM	0	46	24	5	43	6	124
12:15 PM	2	39	12	4	33	8	98
12:30 PM	0	34	6	1	49	5	95
12:45 PM	2	39	5	1	31	7	85
Total	4	158	47	11	156	26	402
01:00 PM	3	28	9	2	33	11	86
01:15 PM	2	28	8	1	36	5	80
01:30 PM	0	42	17	2	28	7	96
01:45 PM	1	46	2	1	38	6	94
Total	6	144	36	6	135	29	356
02:00 PM	0	36	9	3	42	7	97
02:15 PM	2	40	11	1	70	11	135
02:30 PM	3	42	9	1	52	6	113
02:45 PM	1	42	11	1	50	17	122
Total	6	160	40	6	214	41	467
03:00 PM	2	47	2	2	52	11	116
03:15 PM	4	42	8	1	62	22	139
03:30 PM	3	52	16	4	57	15	147
03:45 PM	2	41	16	6	47	17	129
Total	11	182	42	13	218	65	531
04:00 PM	2	43	10	4	58	17	134
04:15 PM	2	51	11	4	68	19	155
04:30 PM	2	45	21	2	52	13	135
04:45 PM	4	42	15	3	50	11	125
Total	10	181	57	13	228	60	549
05:00 PM	1	43	10	1	69	18	142
05:15 PM	5	34	12	3	39	20	113
05:30 PM	0	31	19	2	52	7	111

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 2

Groups Printed- Cars - Trucks

	School St From North		Atwater Ave From East		School St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
05:45 PM	3	22	5	2	47	6	85
Total	9	130	46	8	207	51	451
06:00 PM	1	25	19	0	38	6	89
06:15 PM	0	27	5	2	32	9	75
06:30 PM	2	21	15	4	37	7	86
06:45 PM	7	23	16	1	24	21	92
Total	10	96	55	7	131	43	342
Grand Total	112	1963	558	112	2033	601	5379
Apprch %	5.4	94.6	83.3	16.7	77.2	22.8	
Total %	2.1	36.5	10.4	2.1	37.8	11.2	
Cars	110	1912	548	112	1990	590	5262
% Cars	98.2	97.4	98.2	100	97.9	98.2	97.8
Trucks	2	51	10	0	43	11	117
% Trucks	1.8	2.6	1.8	0	2.1	1.8	2.2

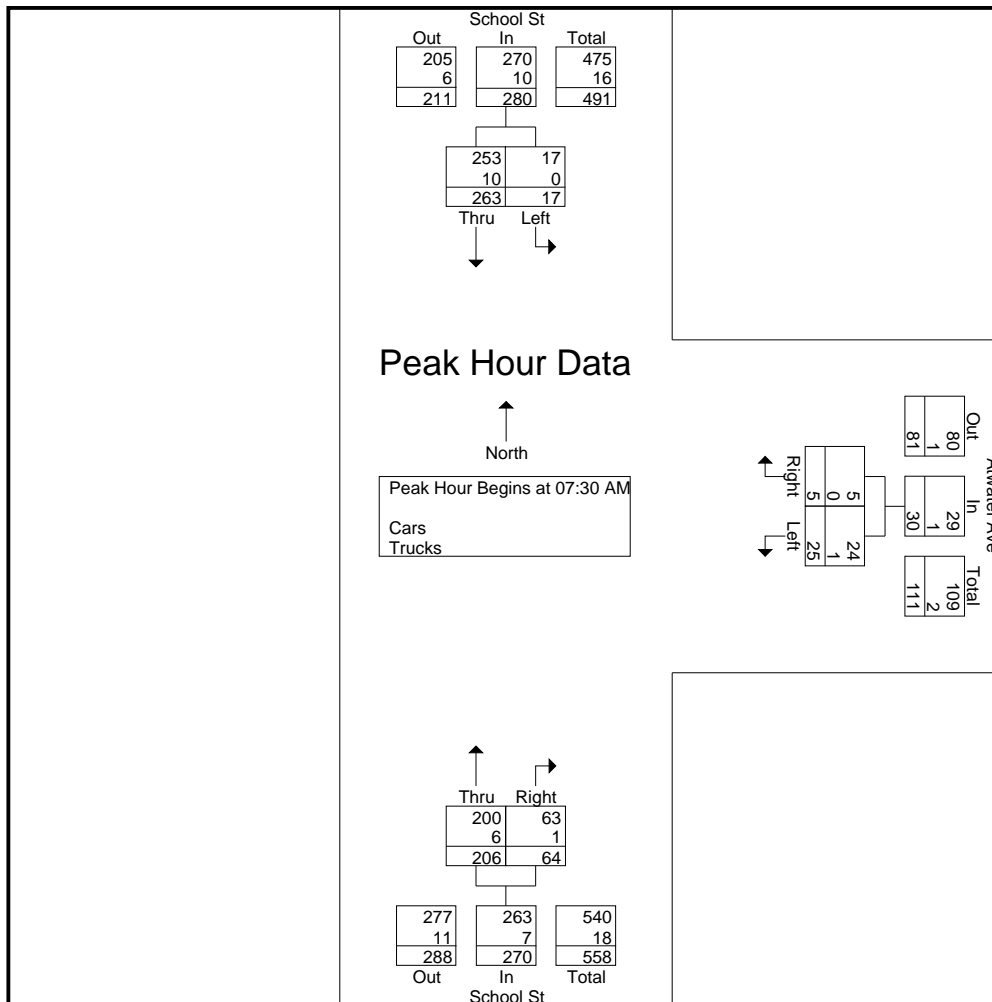
	School St From North			Atwater Ave From East			School St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:30 AM										
07:30 AM	2	91	93	6	3	9	64	17	81	183
07:45 AM	7	62	69	8	1	9	57	13	70	148
08:00 AM	3	54	57	4	1	5	34	9	43	105
08:15 AM	5	56	61	7	0	7	51	25	76	144
Total Volume	17	263	280	25	5	30	206	64	270	580
% App. Total	6.1	93.9		83.3	16.7		76.3	23.7		
PHF	.607	.723	.753	.781	.417	.833	.805	.640	.833	.792
Cars	17	253	270	24	5	29	200	63	263	562
% Cars	100	96.2	96.4	96.0	100	96.7	97.1	98.4	97.4	96.9
Trucks	0	10	10	1	0	1	6	1	7	18
% Trucks	0	3.8	3.6	4.0	0	3.3	2.9	1.6	2.6	3.1

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 3



Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

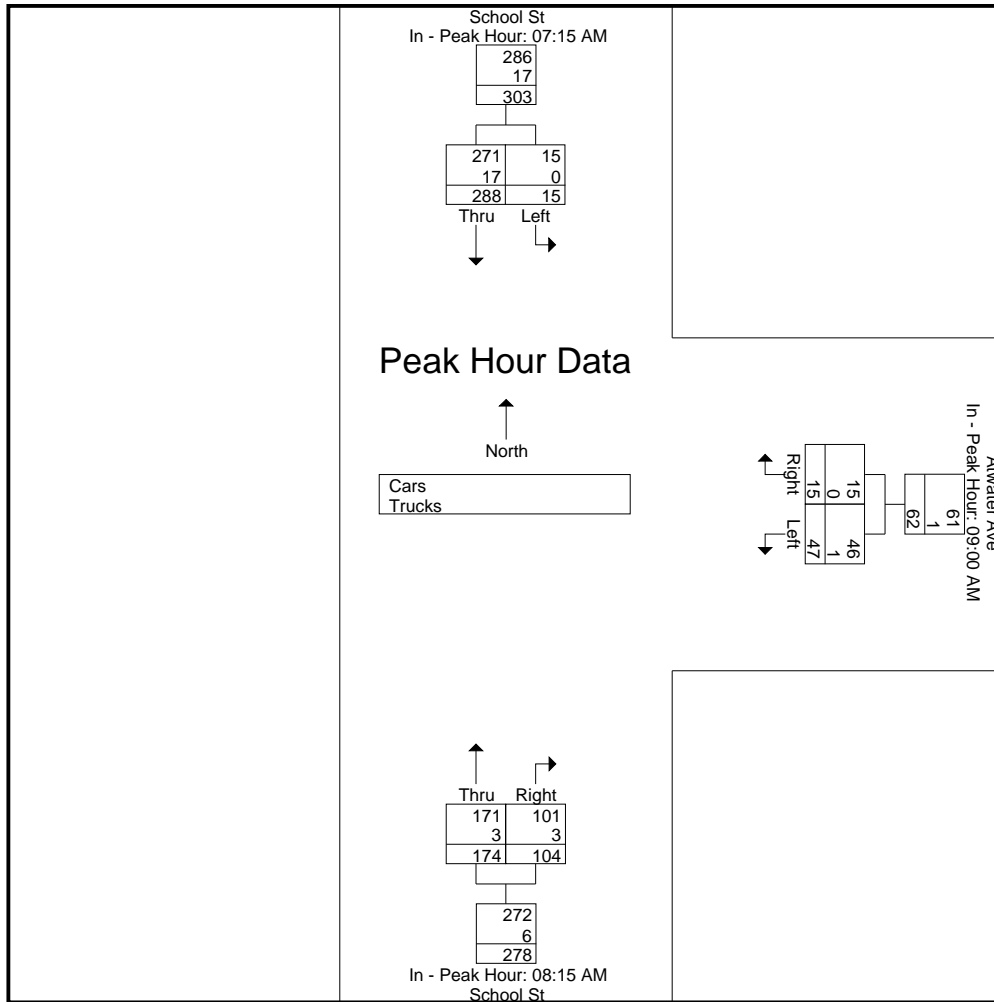
	07:15 AM			09:00 AM			08:15 AM		
+0 mins.	3	81	84	19	6	25	51	25	76
+15 mins.	2	91	93	7	3	10	44	10	54
+30 mins.	7	62	69	9	2	11	39	45	84
+45 mins.	3	54	57	12	4	16	40	24	64
Total Volume	15	288	303	47	15	62	174	104	278
% App. Total	5	95		75.8	24.2		62.6	37.4	
PHF	.536	.791	.815	.618	.625	.620	.853	.578	.827
Cars	15	271	286	46	15	61	171	101	272
% Cars	100	94.1	94.4	97.9	100	98.4	98.3	97.1	97.8
Trucks	0	17	17	1	0	1	3	3	6
% Trucks	0	5.9	5.6	2.1	0	1.6	1.7	2.9	2.2

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 4



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 11:30 AM

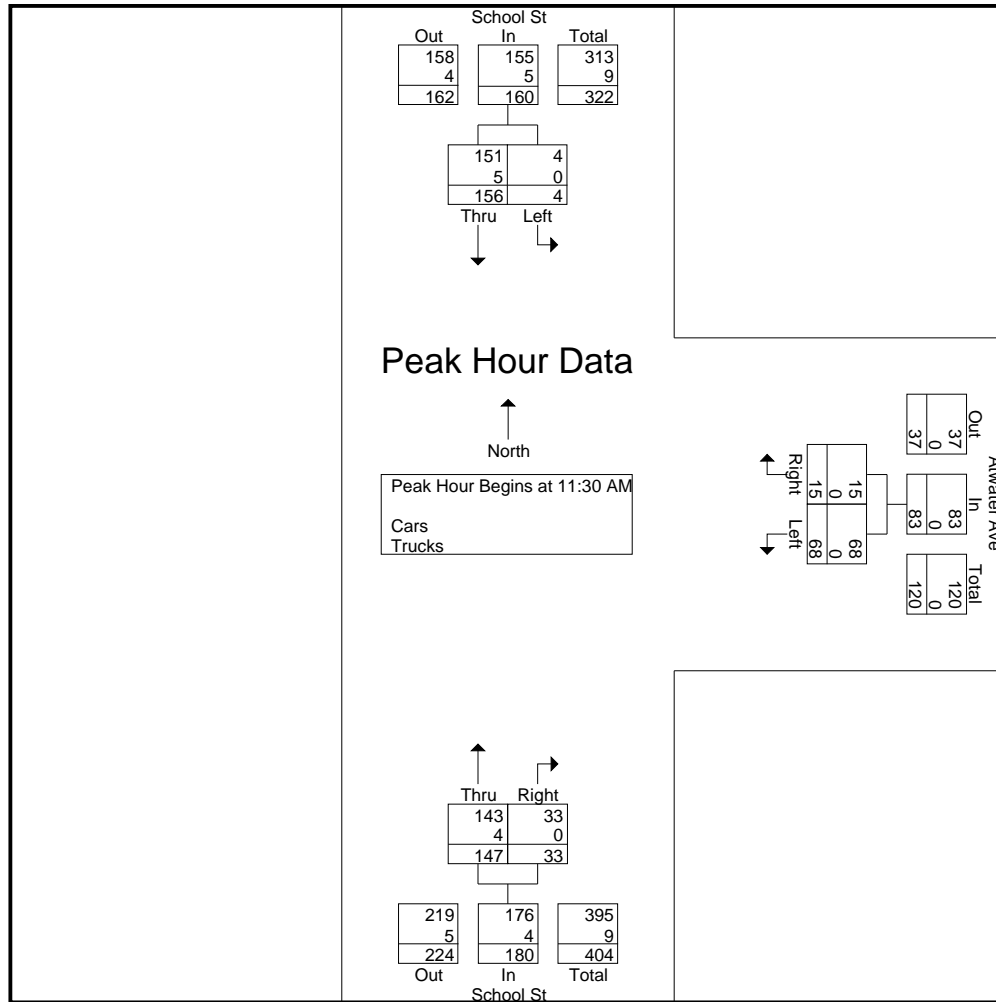
11:30 AM	0	40	40	11	3	14	40	3	43	97
11:45 AM	2	31	33	21	3	24	31	16	47	104
12:00 PM	0	46	46	24	5	29	43	6	49	124
12:15 PM	2	39	41	12	4	16	33	8	41	98
Total Volume	4	156	160	68	15	83	147	33	180	423
% App. Total	2.5	97.5		81.9	18.1		81.7	18.3		
PHF	.500	.848	.870	.708	.750	.716	.855	.516	.918	.853
Cars	4	151	155	68	15	83	143	33	176	414
% Cars	100	96.8	96.9	100	100	100	97.3	100	97.8	97.9
Trucks	0	5	5	0	0	0	4	0	4	9
% Trucks	0	3.2	3.1	0	0	0	2.7	0	2.2	2.1

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 5



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

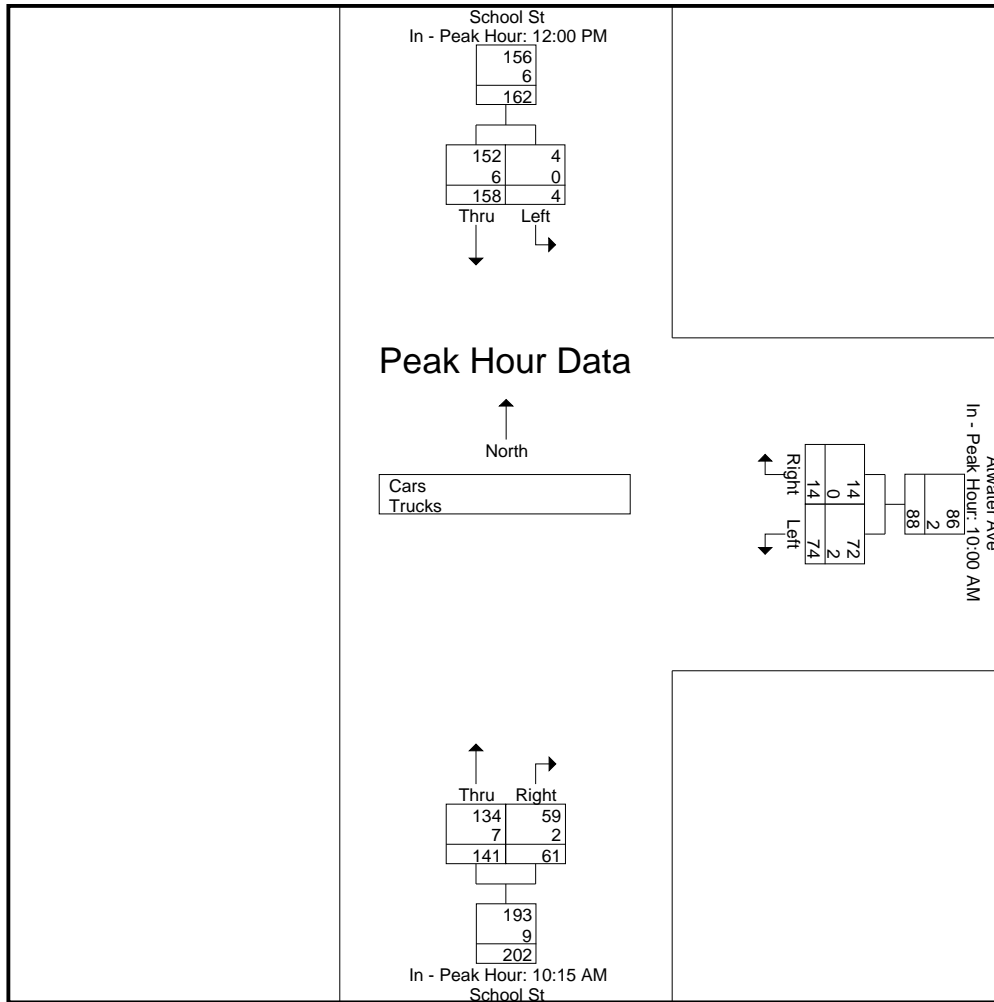
	12:00 PM			10:00 AM			10:15 AM		
+0 mins.	0	46	46	27	2	29	42	17	59
+15 mins.	2	39	41	19	7	26	35	23	58
+30 mins.	0	34	34	15	2	17	29	10	39
+45 mins.	2	39	41	13	3	16	35	11	46
Total Volume	4	158	162	74	14	88	141	61	202
% App. Total	2.5	97.5		84.1	15.9		69.8	30.2	
PHF	.500	.859	.880	.685	.500	.759	.839	.663	.856
Cars	4	152	156	72	14	86	134	59	193
% Cars	100	96.2	96.3	97.3	100	97.7	95	96.7	95.5
Trucks	0	6	6	2	0	2	7	2	9
% Trucks	0	3.8	3.7	2.7	0	2.3	5	3.3	4.5

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 6



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 03:30 PM

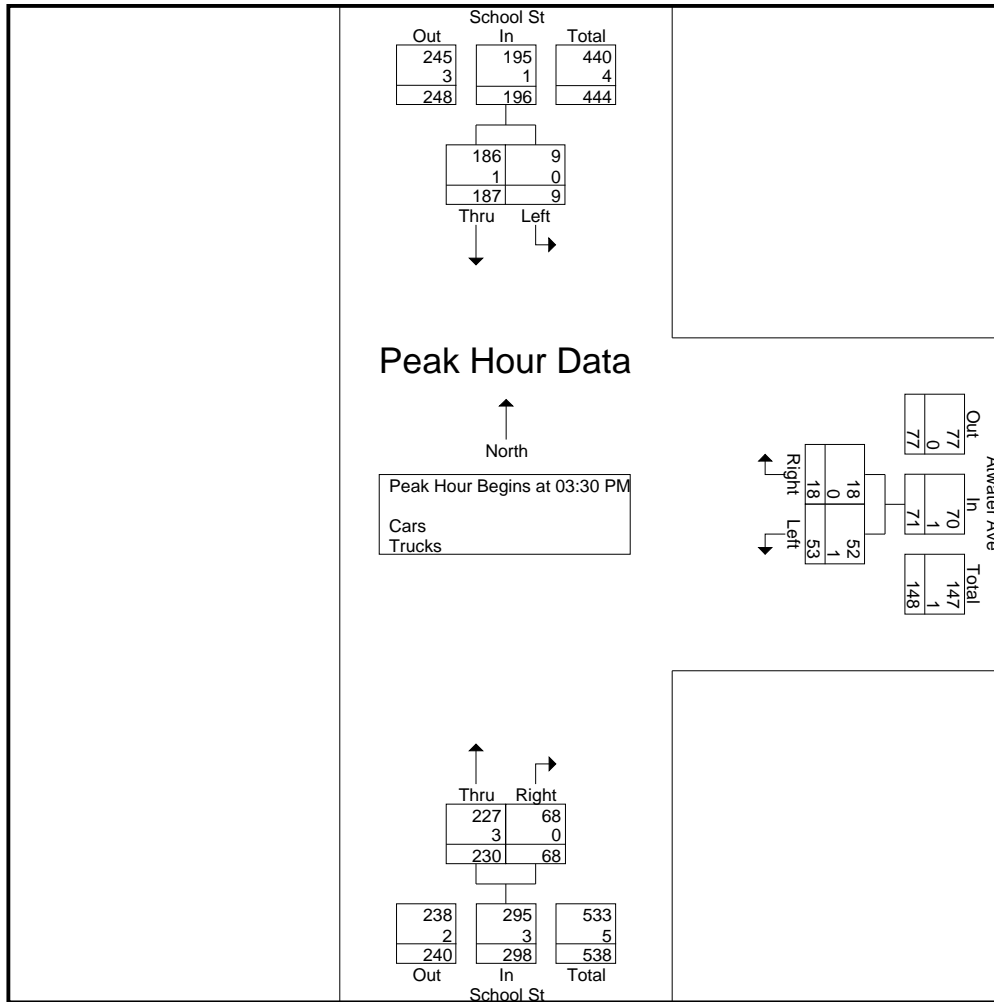
03:30 PM	3	52	55	16	4	20	57	15	72	147
03:45 PM	2	41	43	16	6	22	47	17	64	129
04:00 PM	2	43	45	10	4	14	58	17	75	134
04:15 PM	2	51	53	11	4	15	68	19	87	155
Total Volume	9	187	196	53	18	71	230	68	298	565
% App. Total	4.6	95.4		74.6	25.4		77.2	22.8		
PHF	.750	.899	.891	.828	.750	.807	.846	.895	.856	.911
Cars	9	186	195	52	18	70	227	68	295	560
% Cars	100	99.5	99.5	98.1	100	98.6	98.7	100	99.0	99.1
Trucks	0	1	1	1	0	1	3	0	3	5
% Trucks	0	0.5	0.5	1.9	0	1.4	1.3	0	1.0	0.9

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 7



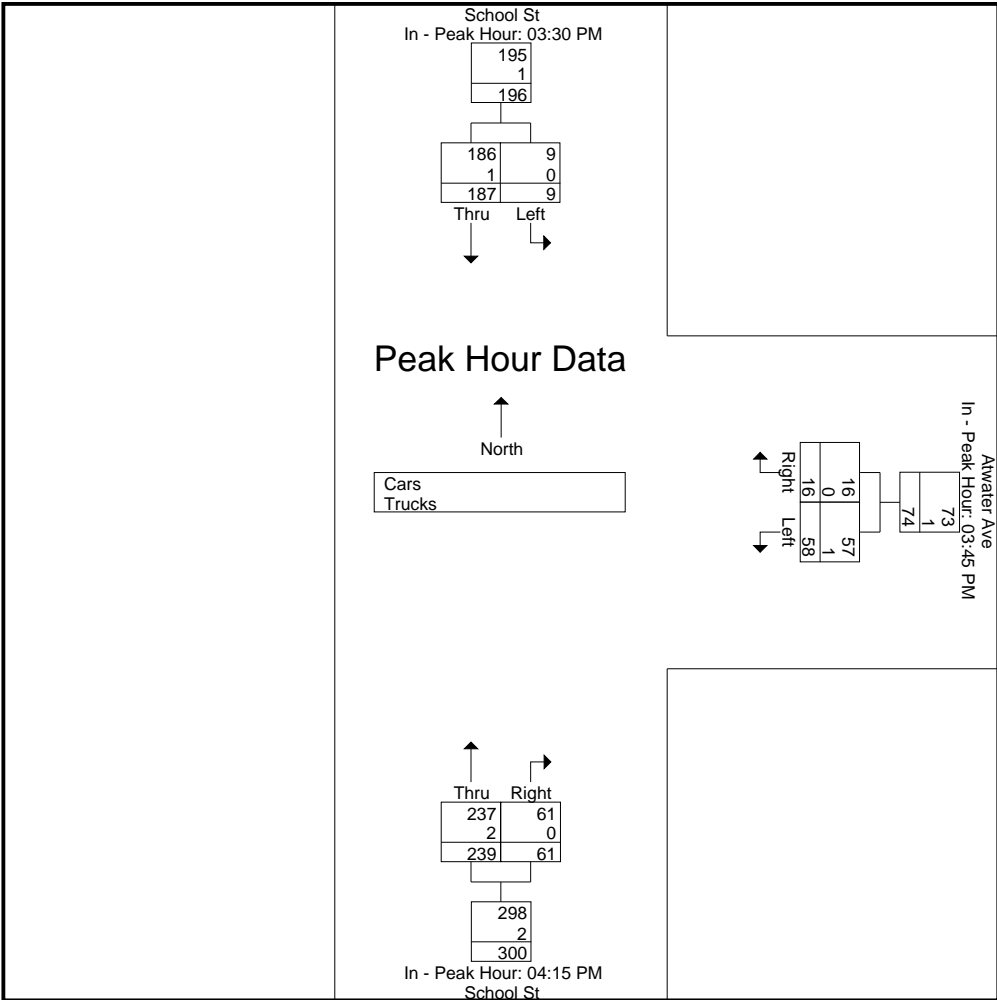
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	03:30 PM			03:45 PM			04:15 PM		
+0 mins.	3	52	55	16	6	22	68	19	87
+15 mins.	2	41	43	10	4	14	52	13	65
+30 mins.	2	43	45	11	4	15	50	11	61
+45 mins.	2	51	53	21	2	23	69	18	87
Total Volume	9	187	196	58	16	74	239	61	300
% App. Total	4.6	95.4		78.4	21.6		79.7	20.3	
PHF	.750	.899	.891	.690	.667	.804	.866	.803	.862
Cars	9	186	195	57	16	73	237	61	298
% Cars	100	99.5	99.5	98.3	100	98.6	99.2	100	99.3
Trucks	0	1	1	1	0	1	2	0	2
% Trucks	0	0.5	0.5	1.7	0	1.4	0.8	0	0.7

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 8



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 9

Groups Printed- Cars

	School St From North		Atwater Ave From East		School St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
07:00 AM	1	42	11	2	18	8	82
07:15 AM	3	74	5	0	36	11	129
07:30 AM	2	82	6	3	62	17	172
07:45 AM	7	61	7	1	56	13	145
Total	13	259	29	6	172	49	528
08:00 AM	3	54	4	1	32	9	103
08:15 AM	5	56	7	0	50	24	142
08:30 AM	3	38	9	1	43	10	104
08:45 AM	6	51	6	0	38	43	144
Total	17	199	26	2	163	86	493
09:00 AM	9	45	19	6	40	24	143
09:15 AM	2	36	7	3	27	10	85
09:30 AM	0	36	9	2	24	2	73
09:45 AM	1	41	11	4	39	20	116
Total	12	158	46	15	130	56	417
10:00 AM	0	26	27	2	22	6	83
10:15 AM	5	27	18	7	42	17	116
10:30 AM	4	26	14	2	33	23	102
10:45 AM	1	38	13	3	27	9	91
Total	10	117	72	14	124	55	392
11:00 AM	2	35	9	3	32	10	91
11:15 AM	0	40	14	2	33	4	93
11:30 AM	0	40	11	3	39	3	96
11:45 AM	2	31	21	3	29	16	102
Total	4	146	55	11	133	33	382
12:00 PM	0	43	24	5	43	6	121
12:15 PM	2	37	12	4	32	8	95
12:30 PM	0	34	6	1	46	5	92
12:45 PM	2	38	4	1	30	6	81
Total	4	152	46	11	151	25	389
01:00 PM	3	27	9	2	32	11	84
01:15 PM	2	28	8	1	36	5	80
01:30 PM	0	40	17	2	28	7	94
01:45 PM	1	44	2	1	37	6	91
Total	6	139	36	6	133	29	349
02:00 PM	0	34	9	3	40	7	93
02:15 PM	2	40	11	1	67	11	132
02:30 PM	3	42	9	1	52	6	113
02:45 PM	1	42	11	1	48	17	120
Total	6	158	40	6	207	41	458
03:00 PM	1	46	2	2	52	10	113
03:15 PM	3	41	8	1	60	20	133
03:30 PM	3	52	16	4	56	15	146
03:45 PM	2	41	16	6	46	17	128
Total	9	180	42	13	214	62	520
04:00 PM	2	43	10	4	57	17	133
04:15 PM	2	50	10	4	68	19	153
04:30 PM	2	45	21	2	52	13	135
04:45 PM	4	42	15	3	49	11	124
Total	10	180	56	13	226	60	545
05:00 PM	1	41	9	1	68	18	138
05:15 PM	5	34	12	3	39	20	113
05:30 PM	0	31	19	2	52	7	111
05:45 PM	3	22	5	2	47	6	85
Total	9	128	45	8	206	51	447

Accurate Counts

978-664-2565

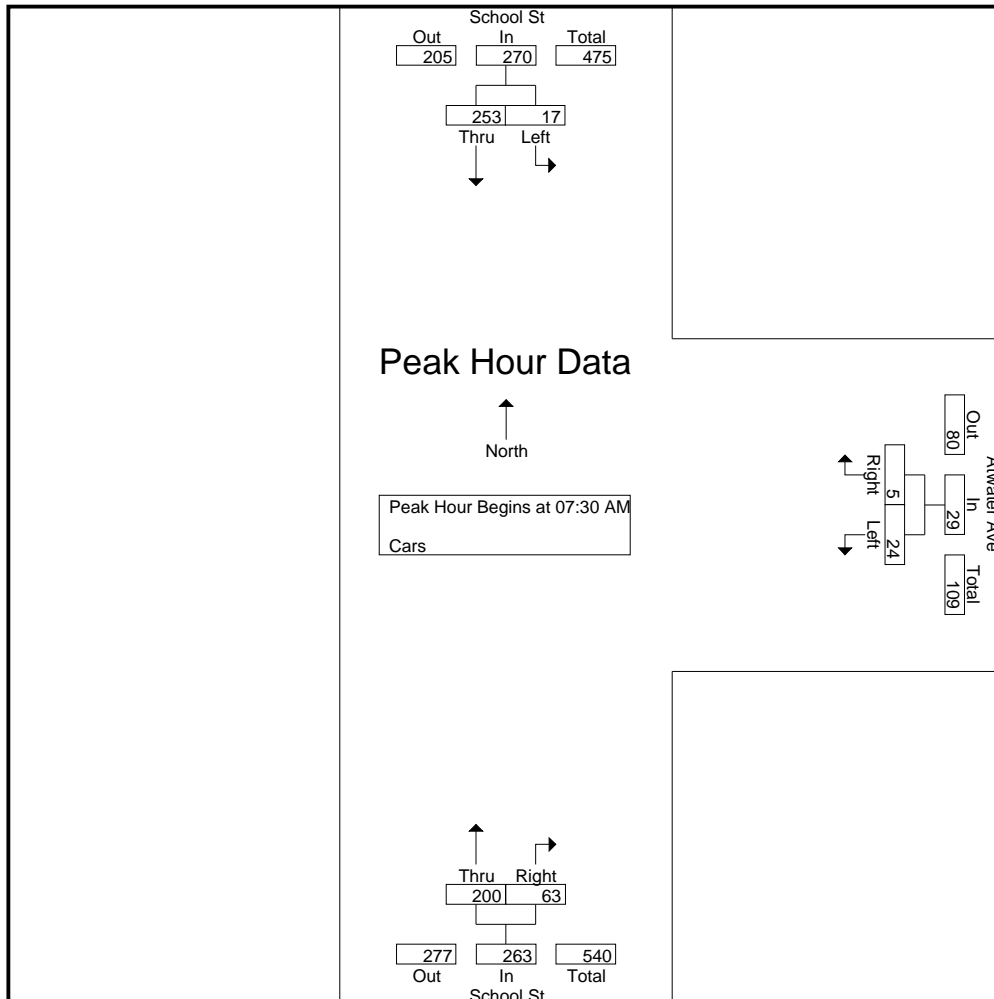
N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 10

Groups Printed- Cars

	School St From North		Atwater Ave From East		School St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
06:00 PM	1	25	19	0	38	6	89
06:15 PM	0	27	5	2	32	9	75
06:30 PM	2	21	15	4	37	7	86
06:45 PM	7	23	16	1	24	21	92
Total	10	96	55	7	131	43	342
Grand Total	110	1912	548	112	1990	590	5262
Apprch %	5.4	94.6	83	17	77.1	22.9	
Total %	2.1	36.3	10.4	2.1	37.8	11.2	

	School St From North			Atwater Ave From East			School St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:30 AM										
07:30 AM	2	82	84	6	3	9	62	17	79	172
07:45 AM	7	61	68	7	1	8	56	13	69	145
08:00 AM	3	54	57	4	1	5	32	9	41	103
08:15 AM	5	56	61	7	0	7	50	24	74	142
Total Volume	17	253	270	24	5	29	200	63	263	562
% App. Total	6.3	93.7		82.8	17.2		76	24		
PHF	.607	.771	.804	.857	.417	.806	.806	.656	.832	.817



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

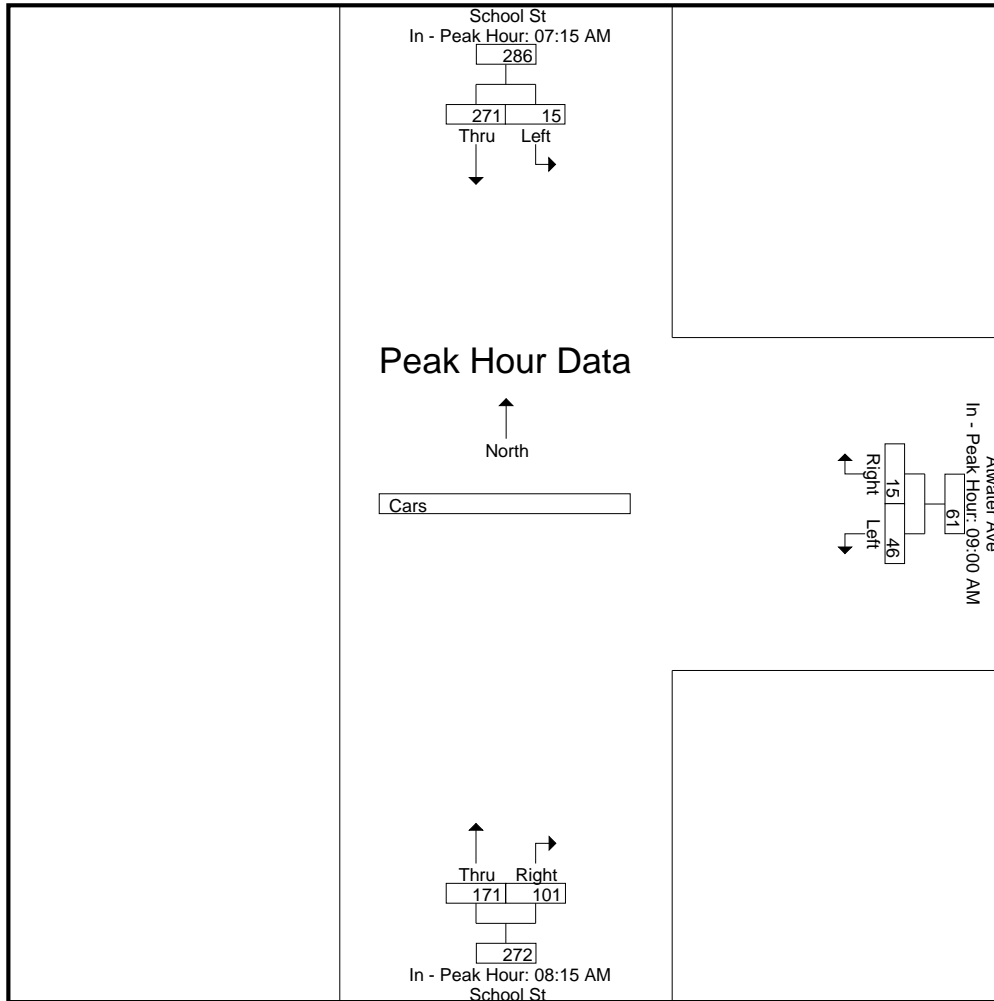
File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 11

	School St From North			Atwater Ave From East			School St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total

Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:15 AM			09:00 AM			08:15 AM		
+0 mins.	3	74	77	19	6	25	50	24	74
+15 mins.	2	82	84	7	3	10	43	10	53
+30 mins.	7	61	68	9	2	11	38	43	81
+45 mins.	3	54	57	11	4	15	40	24	64
Total Volume	15	271	286	46	15	61	171	101	272
% App. Total	5.2	94.8		75.4	24.6		62.9	37.1	
PHF	.536	.826	.851	.605	.625	.610	.855	.587	.840



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 11:30 AM

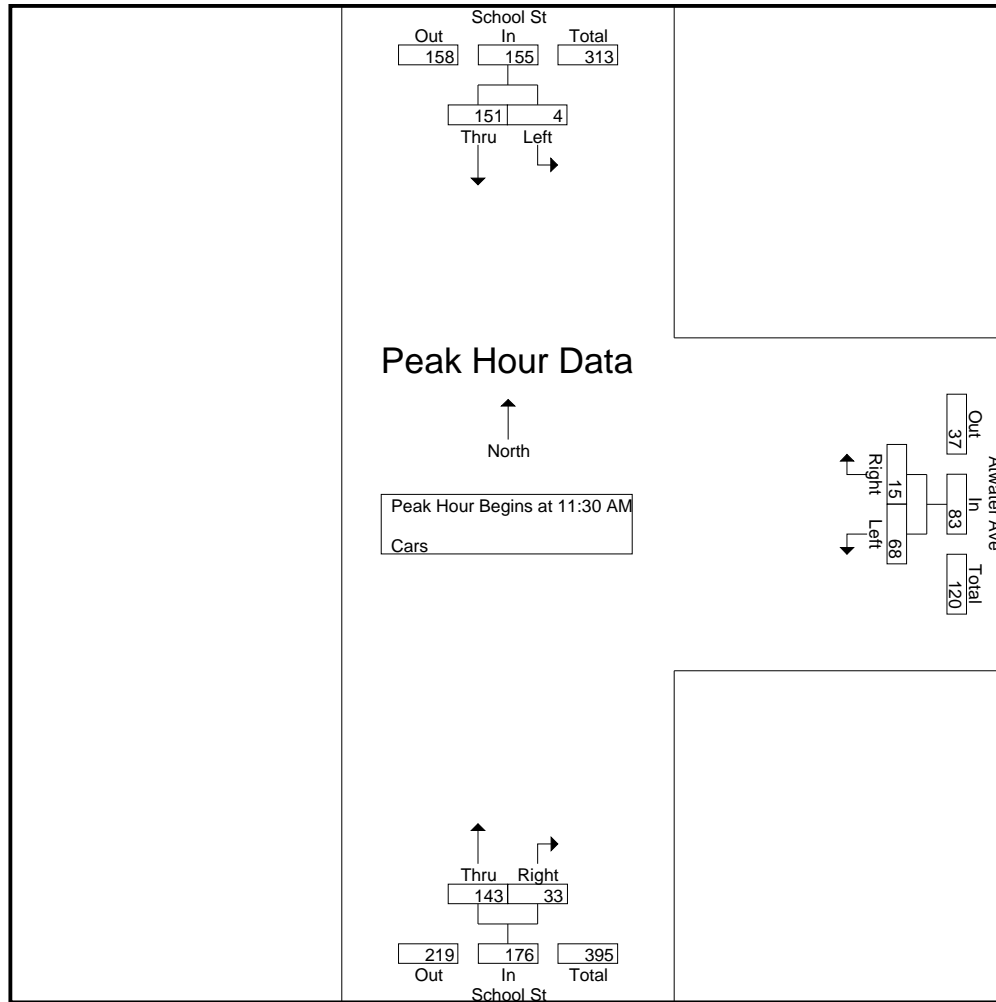
11:30 AM	0	40	40	11	3	14	39	3	42	96
11:45 AM	2	31	33	21	3	24	29	16	45	102
12:00 PM	0	43	43	24	5	29	43	6	49	121
12:15 PM	2	37	39	12	4	16	32	8	40	95
Total Volume	4	151	155	68	15	83	143	33	176	414
% App. Total	2.6	97.4		81.9	18.1		81.2	18.8		
PHF	.500	.878	.901	.708	.750	.716	.831	.516	.898	.855

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 12



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

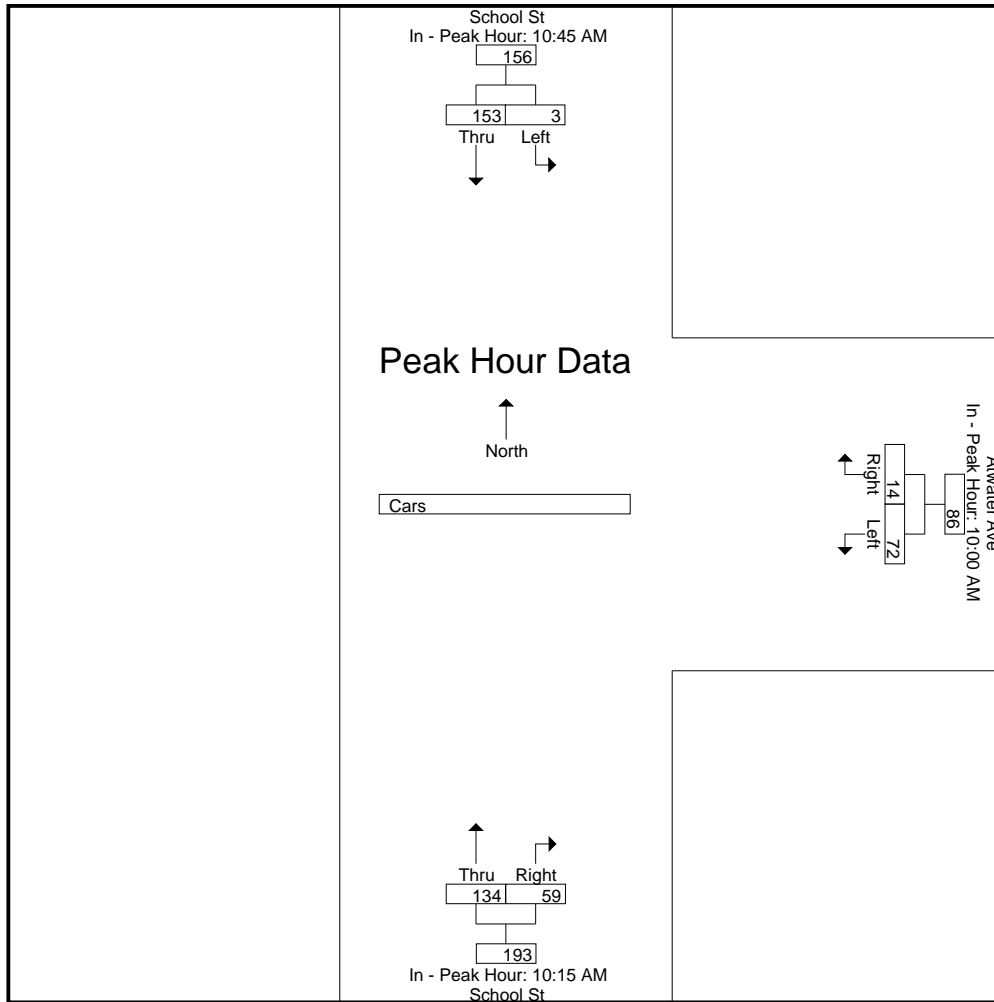
	10:45 AM			10:00 AM			10:15 AM		
+0 mins.	1	38	39	27	2	29	42	17	59
+15 mins.	2	35	37	18	7	25	33	23	56
+30 mins.	0	40	40	14	2	16	27	9	36
+45 mins.	0	40	40	13	3	16	32	10	42
Total Volume	3	153	156	72	14	86	134	59	193
% App. Total	1.9	98.1		83.7	16.3		69.4	30.6	
PHF	.375	.956	.975	.667	.500	.741	.798	.641	.818

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 13



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 03:30 PM

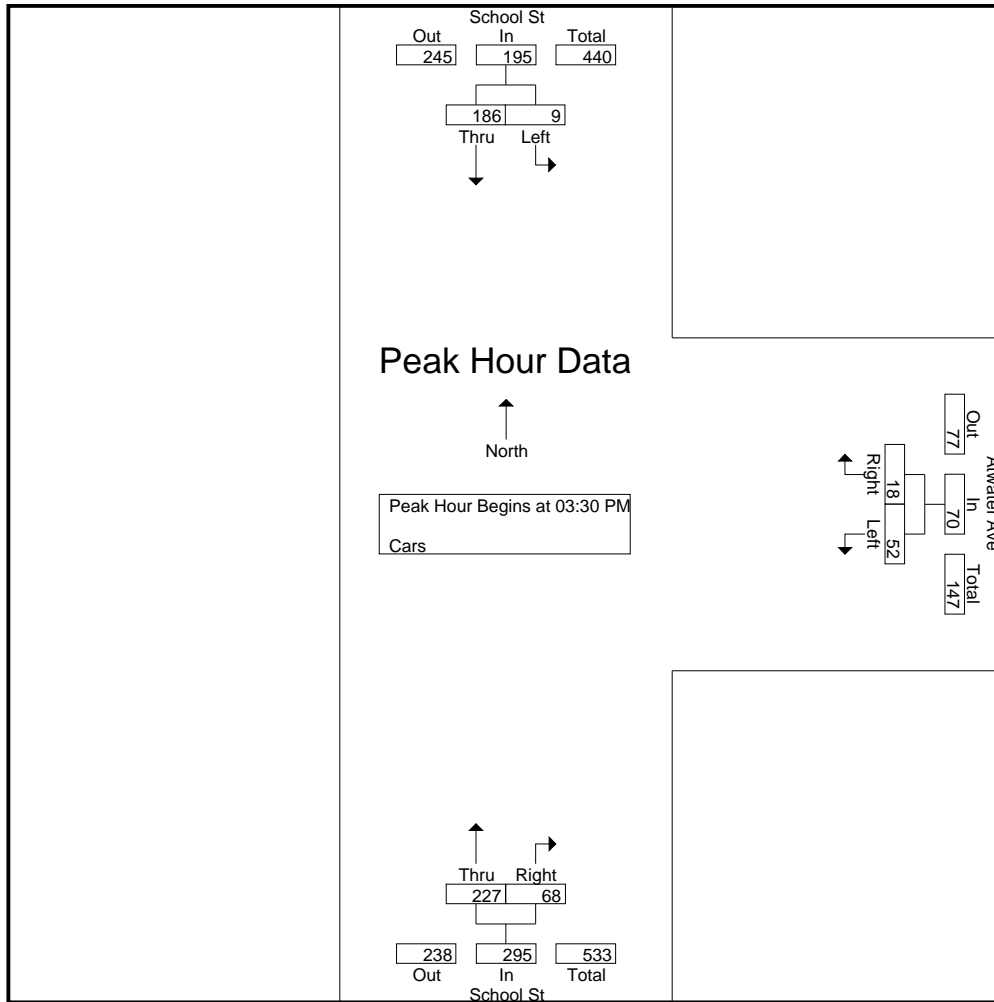
03:30 PM	3	52	55	16	4	20	56	15	71	146
03:45 PM	2	41	43	16	6	22	46	17	63	128
04:00 PM	2	43	45	10	4	14	57	17	74	133
04:15 PM	2	50	52	10	4	14	68	19	87	153
Total Volume	9	186	195	52	18	70	227	68	295	560
% App. Total	4.6	95.4		74.3	25.7		76.9	23.1		
PHF	.750	.894	.886	.813	.750	.795	.835	.895	.848	.915

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 14



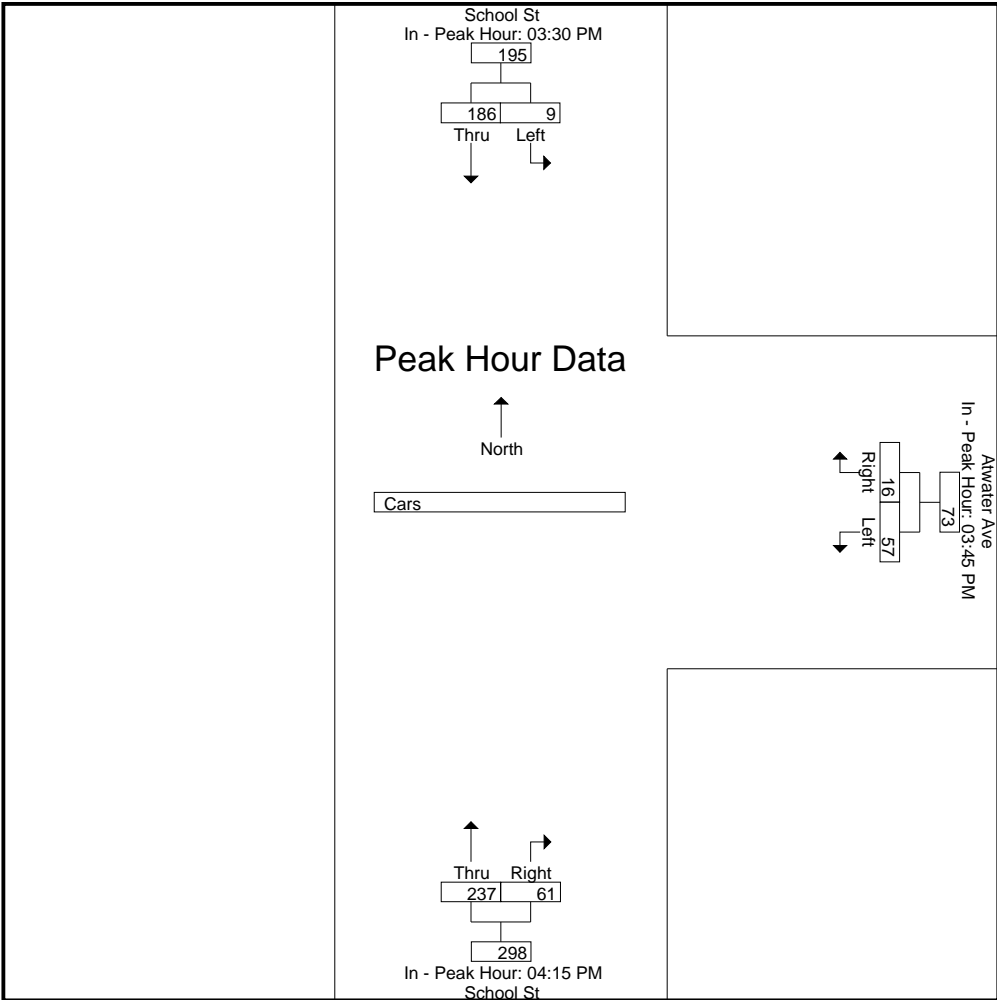
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	03:30 PM			03:45 PM			04:15 PM		
+0 mins.	3	52	55	16	6	22	68	19	87
+15 mins.	2	41	43	10	4	14	52	13	65
+30 mins.	2	43	45	10	4	14	49	11	60
+45 mins.	2	50	52	21	2	23	68	18	86
Total Volume	9	186	195	57	16	73	237	61	298
% App. Total	4.6	95.4		78.1	21.9		79.5	20.5	
PHF	.750	.894	.886	.679	.667	.793	.871	.803	.856

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 15



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 16

Groups Printed- Trucks

	School St From North		Atwater Ave From East		School St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
07:00 AM	0	3	0	0	0	0	3
07:15 AM	0	7	1	0	2	0	10
07:30 AM	0	9	0	0	2	0	11
07:45 AM	0	1	1	0	1	0	3
Total	0	20	2	0	5	0	27
08:00 AM	0	0	0	0	2	0	2
08:15 AM	0	0	0	0	1	1	2
08:30 AM	0	1	1	0	1	0	3
08:45 AM	0	3	1	0	1	2	7
Total	0	4	2	0	5	3	14
09:00 AM	0	1	0	0	0	0	1
09:15 AM	0	0	0	0	0	0	0
09:30 AM	0	2	0	0	1	1	4
09:45 AM	0	1	1	0	0	0	2
Total	0	4	1	0	1	1	7
10:00 AM	0	0	0	0	0	1	1
10:15 AM	0	0	1	0	0	0	1
10:30 AM	0	1	1	0	2	0	4
10:45 AM	0	3	0	0	2	1	6
Total	0	4	2	0	4	2	12
11:00 AM	0	1	0	0	3	1	5
11:15 AM	0	0	0	0	1	0	1
11:30 AM	0	0	0	0	1	0	1
11:45 AM	0	0	0	0	2	0	2
Total	0	1	0	0	7	1	9
12:00 PM	0	3	0	0	0	0	3
12:15 PM	0	2	0	0	1	0	3
12:30 PM	0	0	0	0	3	0	3
12:45 PM	0	1	1	0	1	1	4
Total	0	6	1	0	5	1	13
01:00 PM	0	1	0	0	1	0	2
01:15 PM	0	0	0	0	0	0	0
01:30 PM	0	2	0	0	0	0	2
01:45 PM	0	2	0	0	1	0	3
Total	0	5	0	0	2	0	7
02:00 PM	0	2	0	0	2	0	4
02:15 PM	0	0	0	0	3	0	3
02:30 PM	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	2	0	2
Total	0	2	0	0	7	0	9
03:00 PM	1	1	0	0	0	1	3
03:15 PM	1	1	0	0	2	2	6
03:30 PM	0	0	0	0	1	0	1
03:45 PM	0	0	0	0	1	0	1
Total	2	2	0	0	4	3	11
04:00 PM	0	0	0	0	1	0	1
04:15 PM	0	1	1	0	0	0	2
04:30 PM	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	1	0	1
Total	0	1	1	0	2	0	4
05:00 PM	0	2	1	0	1	0	4
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	0	0	0	0
Total	0	2	1	0	1	0	4

Accurate Counts

978-664-2565

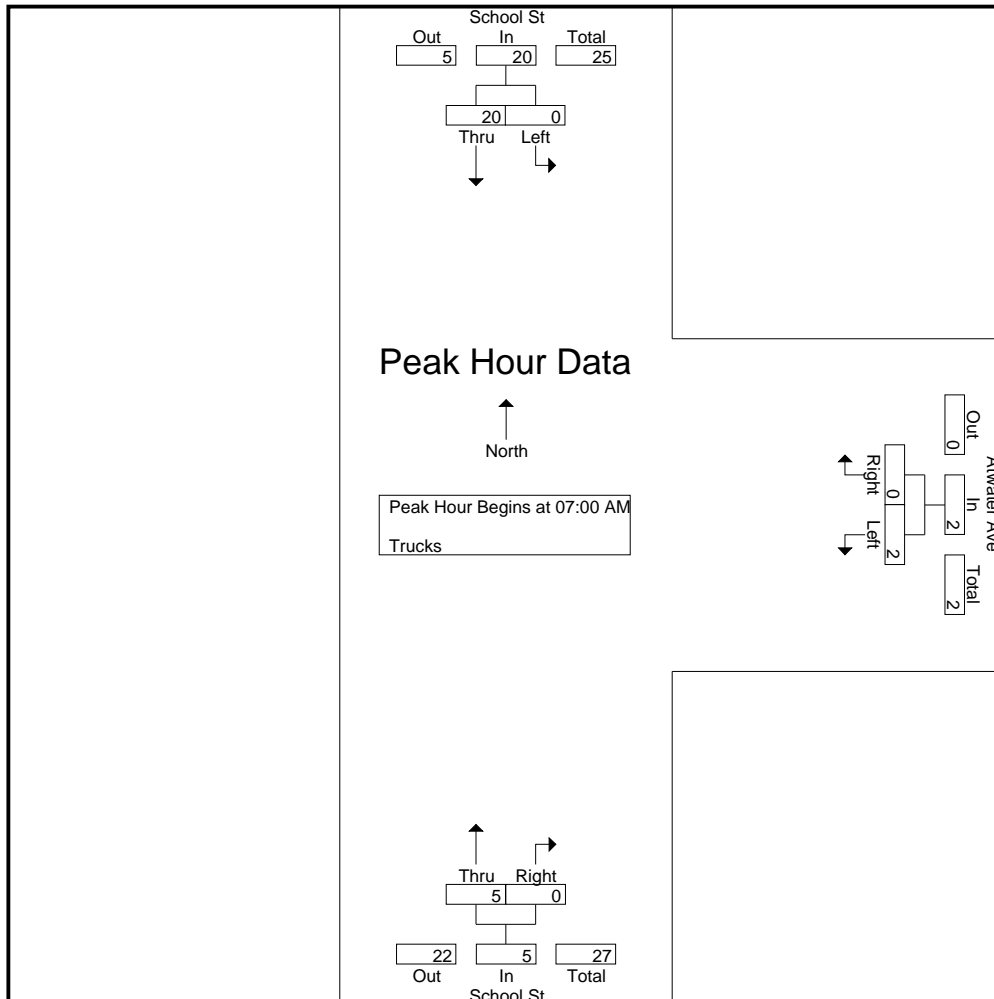
N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 17

Groups Printed- Trucks

	School St From North		Atwater Ave From East		School St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
06:00 PM	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0
06:30 PM	0	0	0	0	0	0	0
06:45 PM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
Grand Total	2	51	10	0	43	11	117
Apprch %	3.8	96.2	100	0	79.6	20.4	
Total %	1.7	43.6	8.5	0	36.8	9.4	

	School St From North			Atwater Ave From East			School St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	0	3	3	0	0	0	0	0	0	3
07:15 AM	0	7	7	1	0	1	2	0	2	10
07:30 AM	0	9	9	0	0	0	2	0	2	11
07:45 AM	0	1	1	1	0	1	1	0	1	3
Total Volume	0	20	20	2	0	2	5	0	5	27
% App. Total	0	100		100	0		100	0		
PHF	.000	.556	.556	.500	.000	.500	.625	.000	.625	.614



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

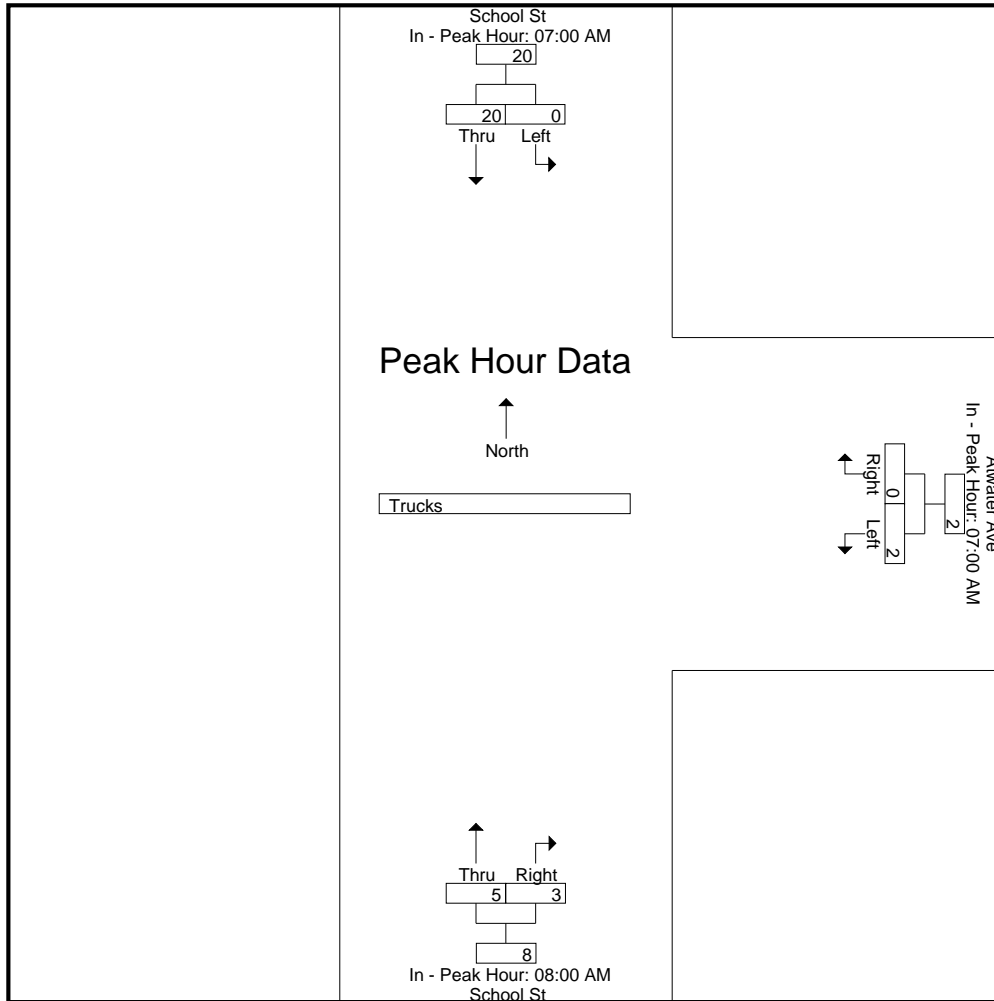
File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 18

	School St From North			Atwater Ave From East			School St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total

Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:00 AM			07:00 AM			08:00 AM			
+0 mins.	0	3	3	0	0	0	2	0	2	
+15 mins.	0	7	7	1	0	1	1	1	2	
+30 mins.	0	9	9	0	0	0	1	0	1	
+45 mins.	0	1	1	1	0	1	1	2	3	
Total Volume	0	20	20	2	0	2	5	3	8	
% App. Total	0	100		100	0		62.5	37.5		
PHF	.000	.556	.556	.500	.000	.500	.625	.375	.667	



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 10:15 AM

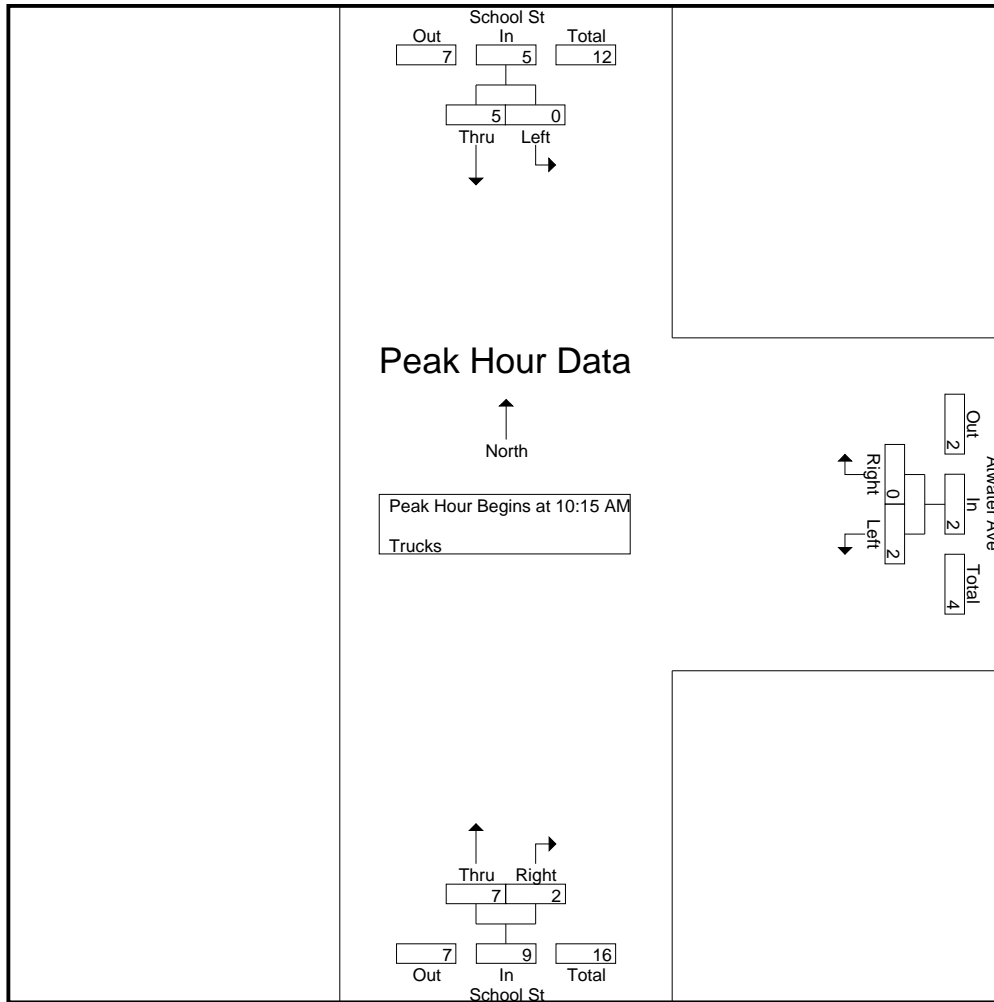
10:15 AM	0	0	0	1	0	1	0	0	0	1
10:30 AM	0	1	1	1	0	1	2	0	2	4
10:45 AM	0	3	3	0	0	0	2	1	3	6
11:00 AM	0	1	1	0	0	0	3	1	4	5
Total Volume	0	5	5	2	0	2	7	2	9	16
% App. Total	0	100		100	0		77.8	22.2		
PHF	.000	.417	.417	.500	.000	.500	.583	.500	.563	.667

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 19



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

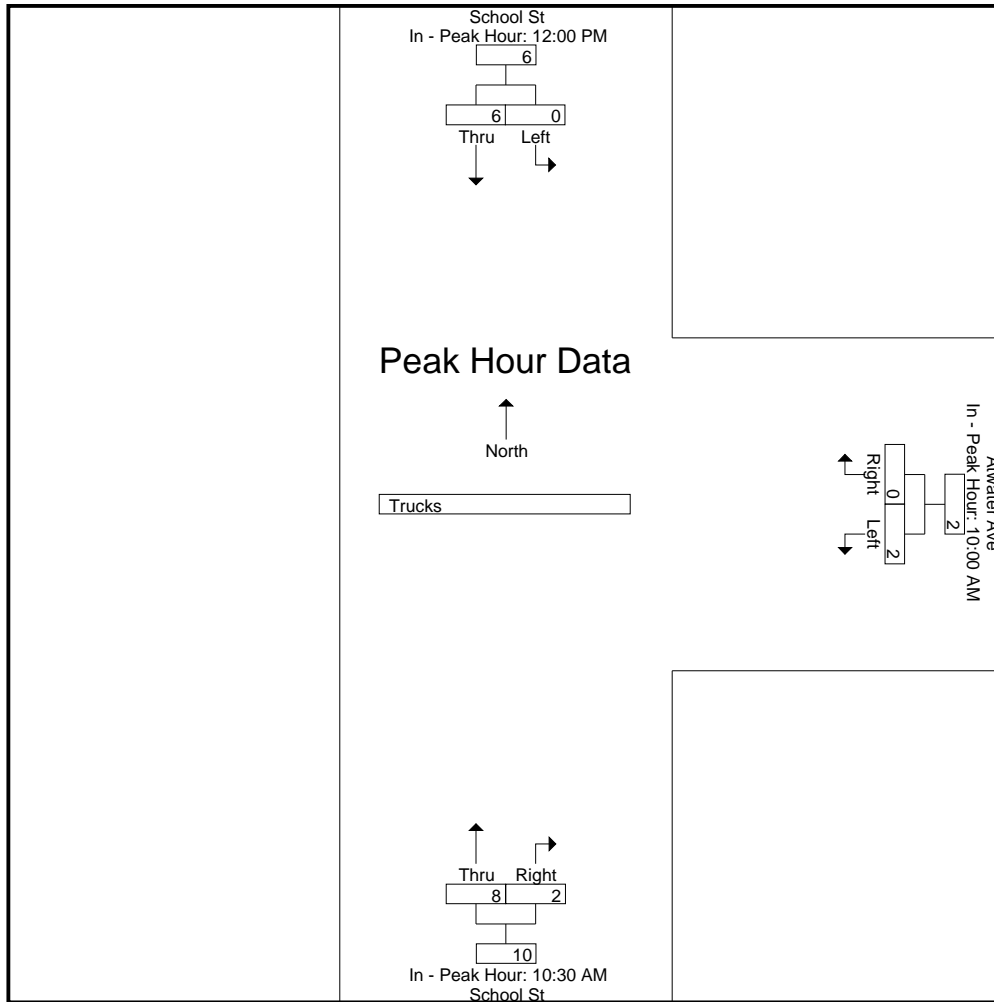
	12:00 PM			10:00 AM			10:30 AM		
+0 mins.	0	3	3	0	0	0	2	0	2
+15 mins.	0	2	2	1	0	1	2	1	3
+30 mins.	0	0	0	1	0	1	3	1	4
+45 mins.	0	1	1	0	0	0	1	0	1
Total Volume	0	6	6	2	0	2	8	2	10
% App. Total	0	100		100	0		80	20	
PHF	.000	.500	.500	.500	.000	.500	.667	.500	.625

Accurate Counts

978-664-2565

N/S Street : School Street
 E/W Street : Atwater Avenue
 City/State : Manchester By The Sea, MA
 Weather : Cloudy

File Name : 11990001
 Site Code : 11990001
 Start Date : 1/11/2023
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Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 02:45 PM

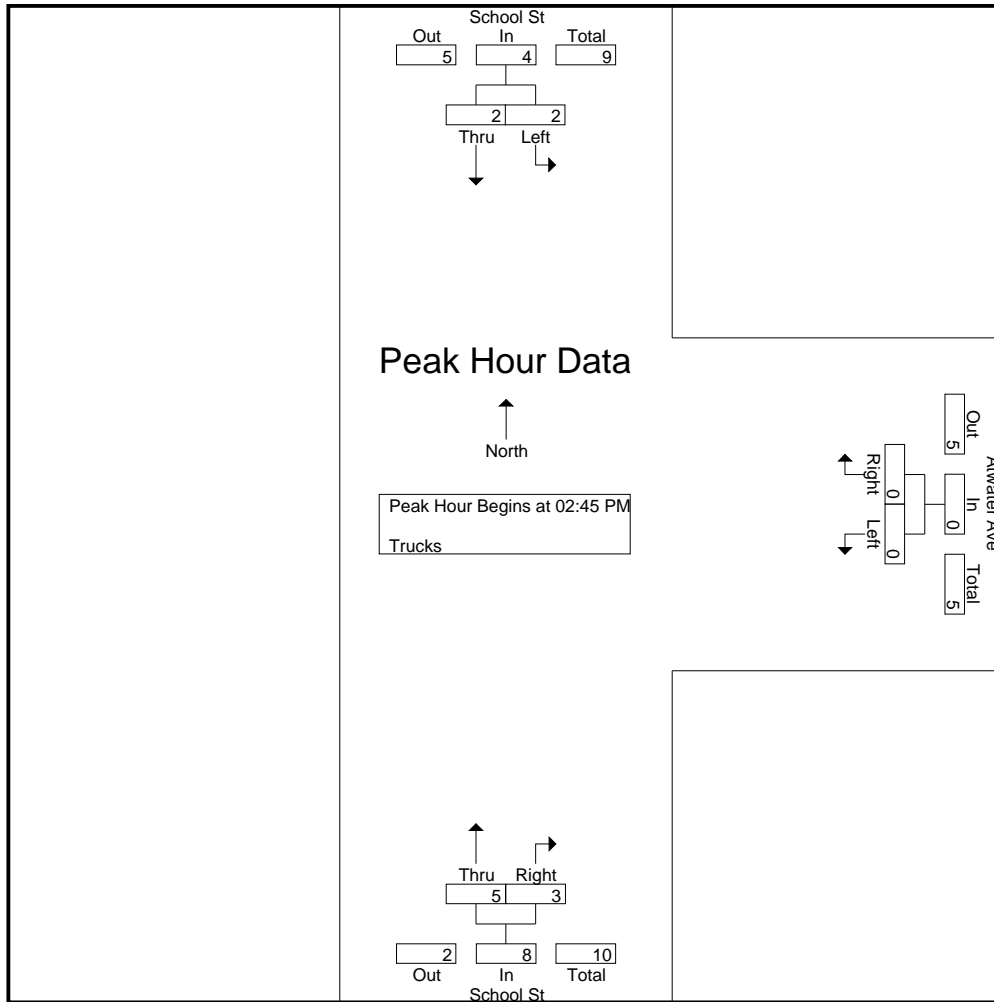
02:45 PM	0	0	0	0	0	0	2	0	2	2
03:00 PM	1	1	2	0	0	0	0	1	1	3
03:15 PM	1	1	2	0	0	0	2	2	4	6
03:30 PM	0	0	0	0	0	0	1	0	1	1
Total Volume	2	2	4	0	0	0	5	3	8	12
% App. Total	50	50		0	0		62.5	37.5		
PHF	.500	.500	.500	.000	.000	.000	.625	.375	.500	.500

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 21



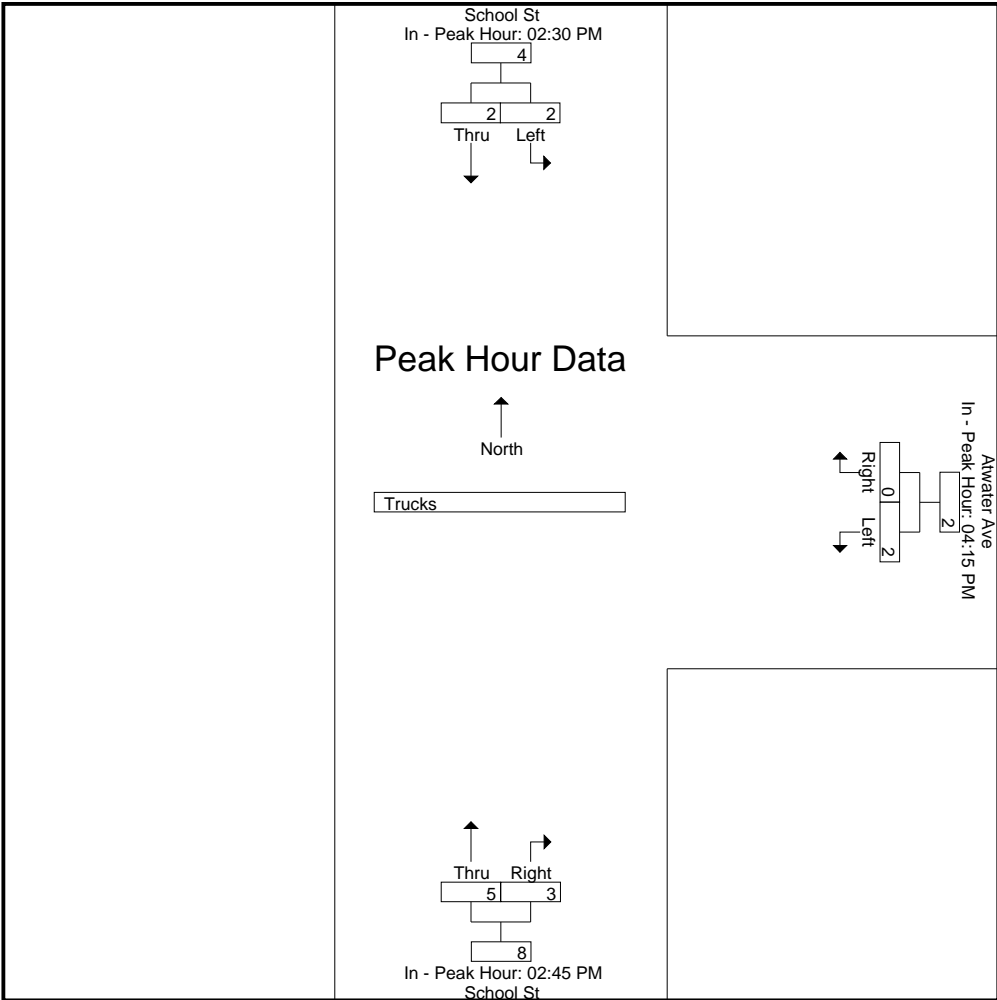
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	02:30 PM			04:15 PM			02:45 PM		
+0 mins.	0	0	0	1	0	1	2	0	2
+15 mins.	0	0	0	0	0	0	0	1	1
+30 mins.	1	1	2	0	0	0	2	2	4
+45 mins.	1	1	2	1	0	1	1	0	1
Total Volume	2	2	4	2	0	2	5	3	8
% App. Total	50	50		100	0		62.5	37.5	
PHF	.500	.500	.500	.500	.000	.500	.625	.375	.500

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 22



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 23

Groups Printed- Bikes Peds

Start Time	School St From North			Atwater Ave From East			School St From South			Exclu. Total	Inclu. Total	Int. Total
	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds			
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	1	0	0	0	1	1
09:45 AM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	0	1	1
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	1	0	0	0	1	1
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	0	1	1
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
02:00 PM	0	1	0	0	0	0	0	0	0	0	1	1
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	0	0	0	0	1	1
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	1	0	0	0	0	0	0	0	0	1	1
Total	0	1	0	0	0	0	0	0	0	0	1	1
04:00 PM	0	1	0	0	0	0	0	0	0	0	1	1
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	0	0	0	0	1	1
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	1	0	0	0	1	1
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	0	1	1

Accurate Counts

978-664-2565

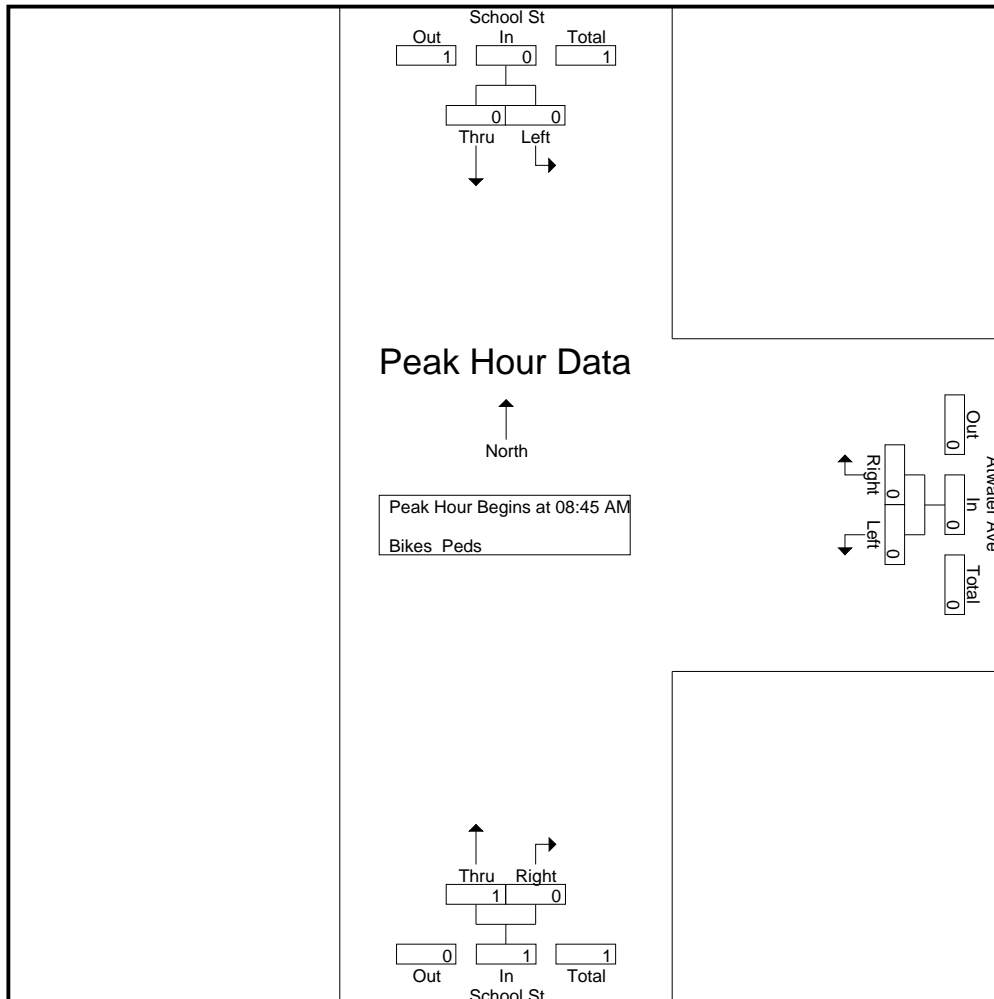
N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 24

Groups Printed- Bikes Peds

	School St From North			Atwater Ave From East			School St From South			Exclu. Total	Inclu. Total	Int. Total
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds			
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
06:30 PM	0	0	0	0	0	0	0	0	0	0	0	0
06:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	3	0	0	0	0	3	0	0	0	6	6
Apprch %	0	100		0	0		100	0				
Total %	0	50		0	0		50	0		0	100	

	School St From North			Atwater Ave From East			School St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:45 AM										
08:45 AM	0	0	0	0	0	0	0	0	0	0
09:00 AM	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	1	0	1	1
Total Volume	0	0	0	0	0	0	1	0	1	1
% App. Total	0	0		0	0		100	0		
PHF	.000	.000	.000	.000	.000	.000	.250	.000	.250	.250



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

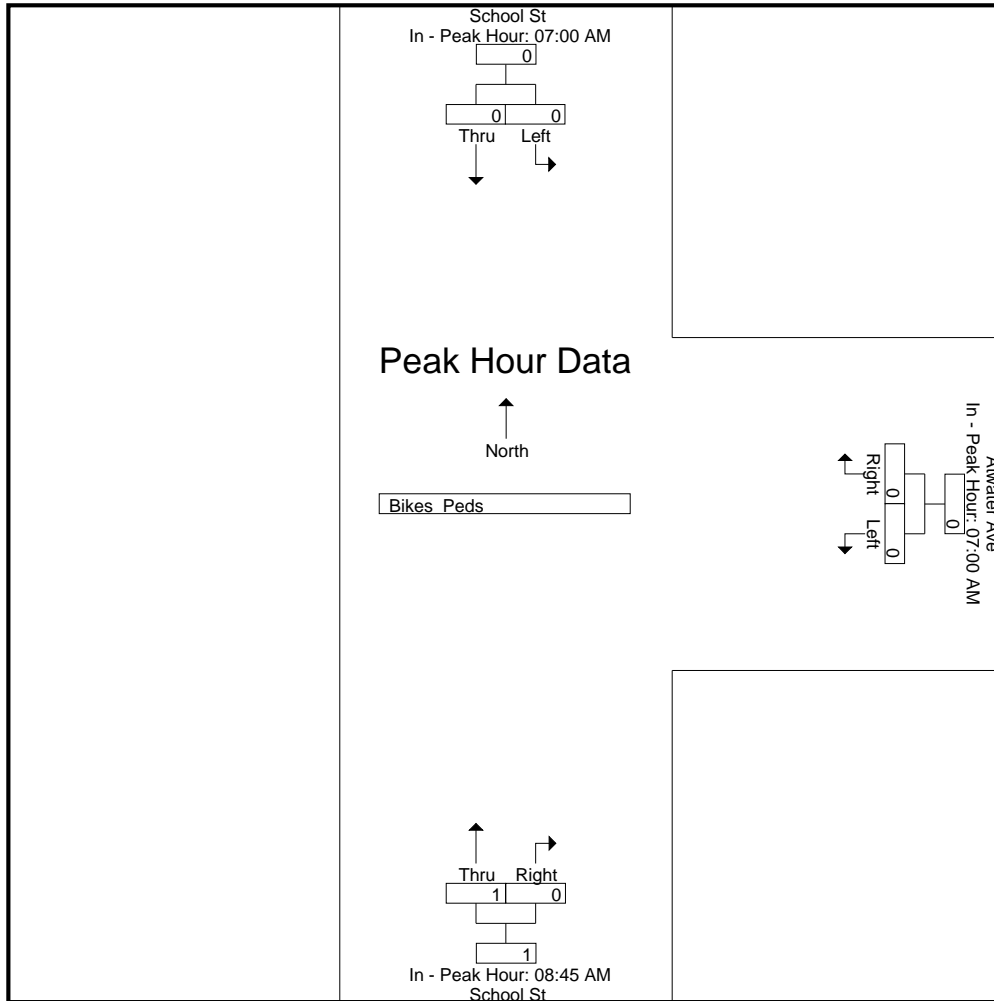
File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 25

	School St From North			Atwater Ave From East			School St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total

Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:00 AM			07:00 AM			08:45 AM		
+0 mins.	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0
+30 mins.	0	0	0	0	0	0	0	0	0
+45 mins.	0	0	0	0	0	0	1	0	1
Total Volume	0	0	0	0	0	0	1	0	1
% App. Total	0	0		0	0		100	0	
PHF	.000	.000	.000	.000	.000	.000	.250	.000	.250



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 10:15 AM

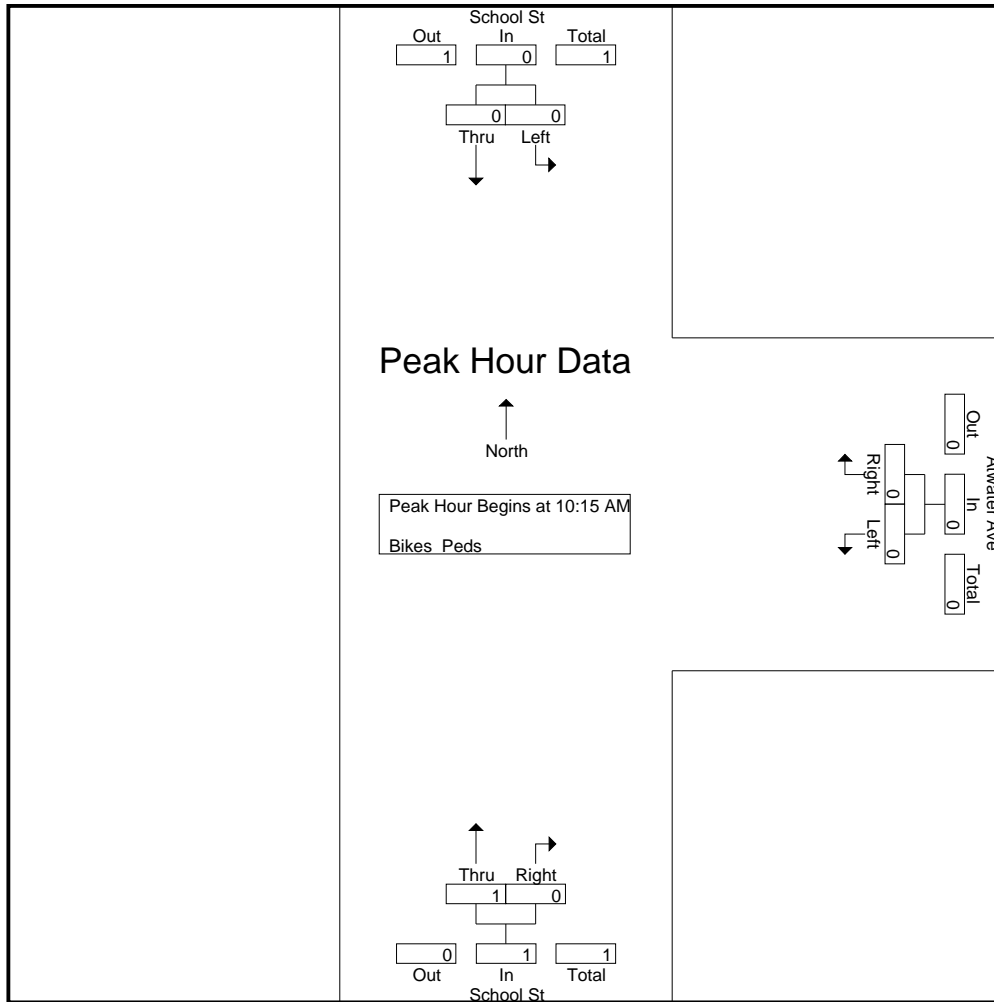
10:15 AM	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	1	0	1	1
Total Volume	0	0	0	0	0	0	1	0	1	1
% App. Total	0	0		0	0		100	0		
PHF	.000	.000	.000	.000	.000	.000	.250	.000	.250	.250

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 26



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

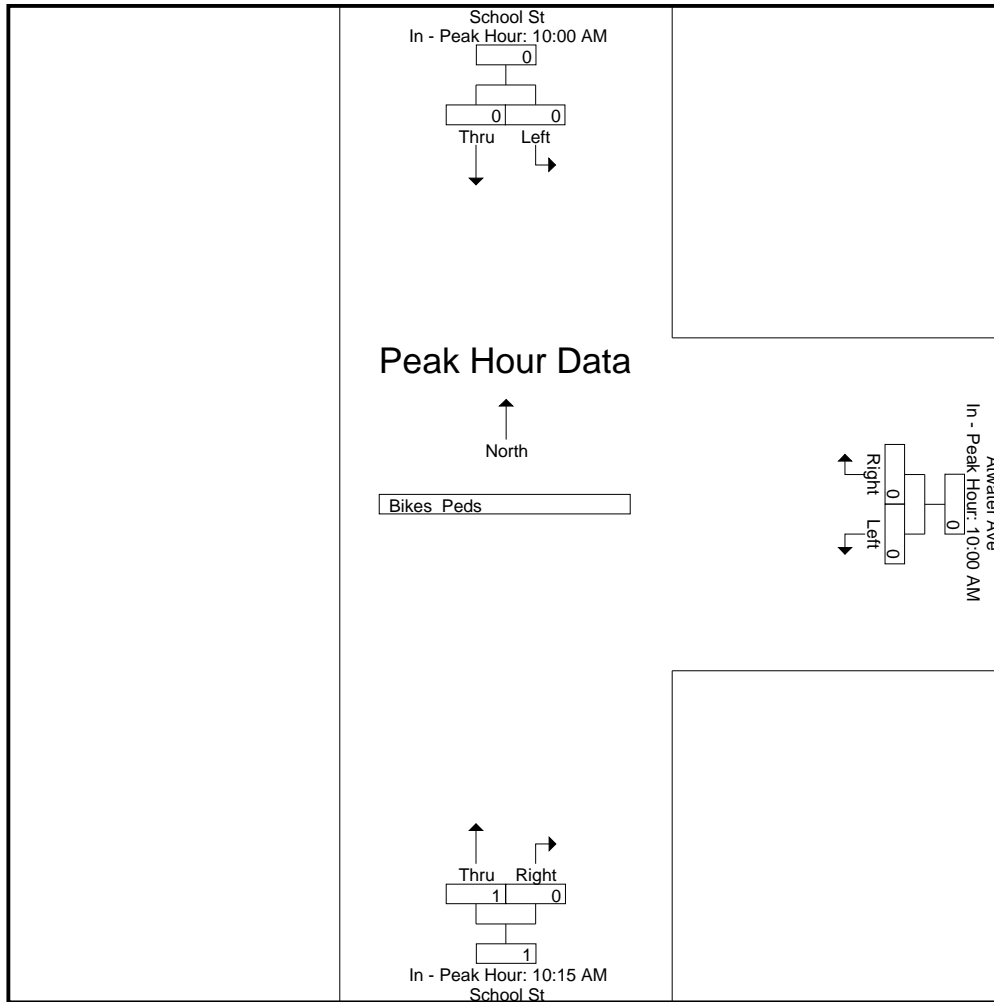
	10:00 AM			10:00 AM			10:15 AM		
+0 mins.	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0
+30 mins.	0	0	0	0	0	0	0	0	0
+45 mins.	0	0	0	0	0	0	1	0	1
Total Volume	0	0	0	0	0	0	1	0	1
% App. Total	0	0		0	0		100	0	
PHF	.000	.000	.000	.000	.000	.000	.250	.000	.250

978-664-2565

978-664-2565

N/S Street : School Street
E/W Street: Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 27



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 03:15 PM

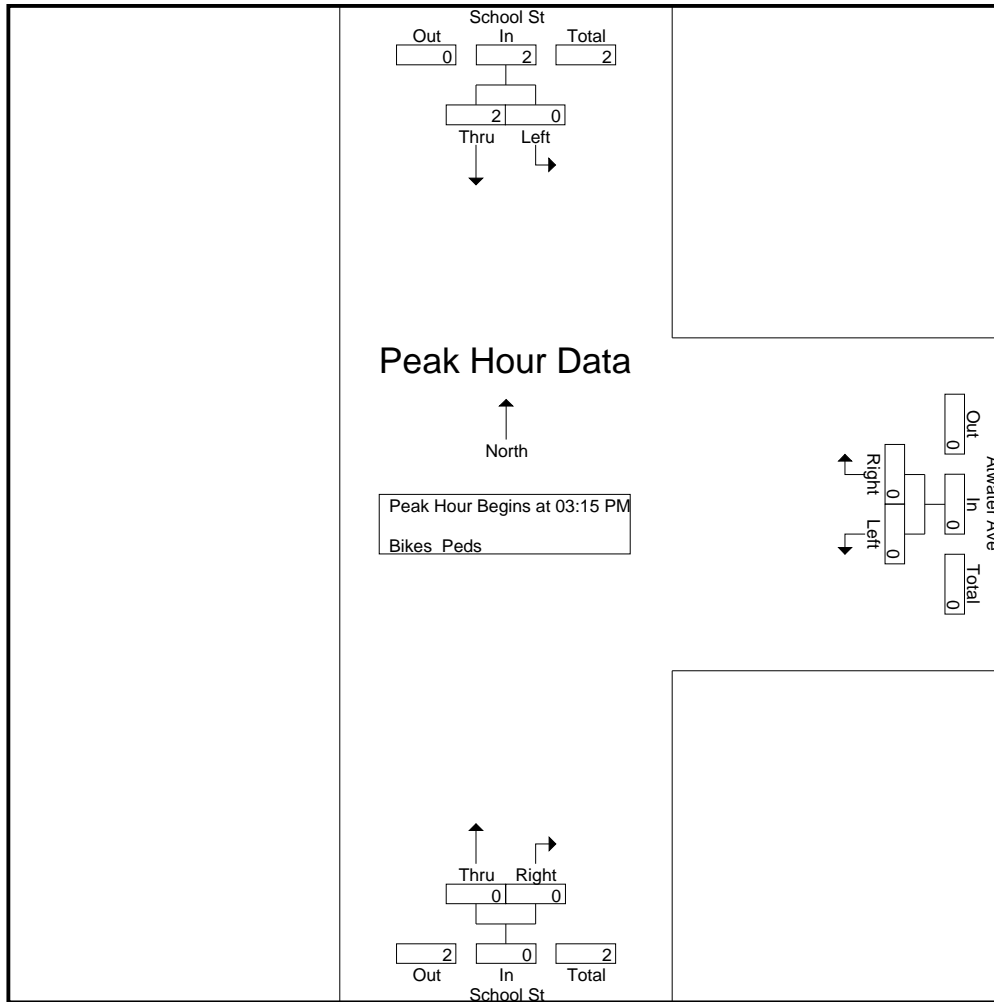
03:15 PM	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0
03:45 PM	0	1	1	0	0	0	0	0	1
04:00 PM	0	1	1	0	0	0	0	0	1
Total Volume	0	2	2	0	0	0	0	0	2
% App. Total	0	100		0	0		0	0	
PHF	.000	.500	.500	.000	.000	.000	.000	.000	.500

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 28



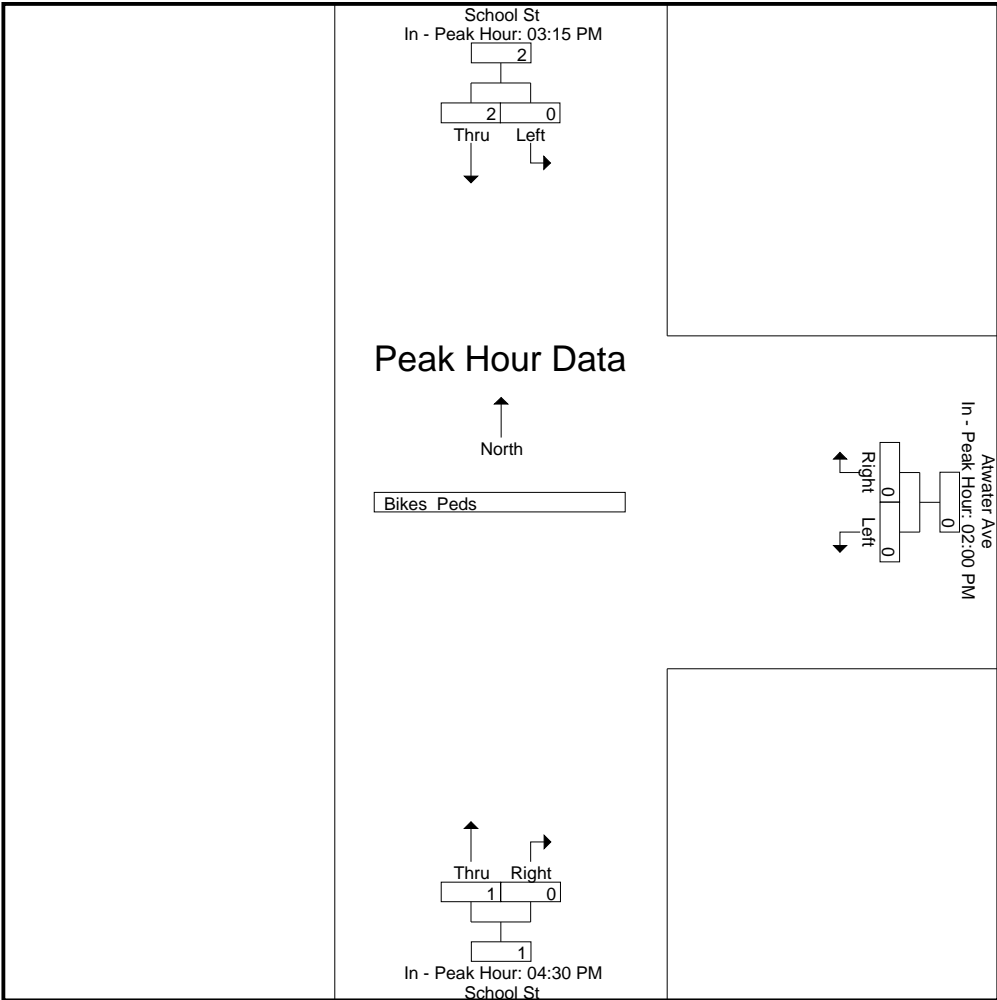
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	03:15 PM			02:00 PM			04:30 PM		
+0 mins.	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0
+30 mins.	0	1	1	0	0	0	0	0	0
+45 mins.	0	1	1	0	0	0	1	0	1
Total Volume	0	2	2	0	0	0	1	0	1
% App. Total	0	100		0	0		100	0	
PHF	.000	.500	.500	.000	.000	.000	.250	.000	.250

N/S Street : School Street
E/W Street : Atwater Avenue
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990001
Site Code : 11990001
Start Date : 1/11/2023
Page No : 29



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 1

Groups Printed- Cars - Trucks

	School St From North		Route 128 SB Ramp From East		School St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
07:00 AM	23	34	12	5	22	41	137
07:15 AM	10	77	24	7	46	40	204
07:30 AM	26	62	18	12	77	81	276
07:45 AM	20	49	16	17	74	63	239
Total	79	222	70	41	219	225	856
08:00 AM	13	41	16	16	41	45	172
08:15 AM	19	45	18	13	72	43	210
08:30 AM	23	33	16	11	59	45	187
08:45 AM	21	40	15	20	72	39	207
Total	76	159	65	60	244	172	776
09:00 AM	27	43	11	17	49	42	189
09:15 AM	31	16	9	9	33	28	126
09:30 AM	23	28	9	4	32	48	144
09:45 AM	22	41	11	13	58	37	182
Total	103	128	40	43	172	155	641
10:00 AM	19	39	8	3	32	34	135
10:15 AM	18	33	18	11	53	34	167
10:30 AM	19	30	15	11	51	31	157
10:45 AM	27	36	11	11	33	30	148
Total	83	138	52	36	169	129	607
11:00 AM	20	34	13	11	42	26	146
11:15 AM	19	38	14	5	32	29	137
11:30 AM	17	40	12	9	39	33	150
11:45 AM	16	42	15	4	47	46	170
Total	72	154	54	29	160	134	603
12:00 PM	22	60	15	6	48	36	187
12:15 PM	14	42	10	10	36	42	154
12:30 PM	17	32	9	1	57	36	152
12:45 PM	21	27	17	5	40	31	141
Total	74	161	51	22	181	145	634
01:00 PM	10	26	20	9	44	30	139
01:15 PM	14	21	18	6	40	29	128
01:30 PM	23	43	19	7	30	33	155
01:45 PM	18	37	22	6	43	28	154
Total	65	127	79	28	157	120	576
02:00 PM	23	52	6	21	52	24	178
02:15 PM	18	39	15	7	83	45	207
02:30 PM	26	29	18	2	66	45	186
02:45 PM	19	38	17	4	63	55	196
Total	86	158	56	34	264	169	767
03:00 PM	19	29	10	6	63	56	183
03:15 PM	22	37	26	7	78	51	221
03:30 PM	28	46	12	6	70	45	207
03:45 PM	24	41	20	4	57	47	193
Total	93	153	68	23	268	199	804
04:00 PM	20	43	14	11	72	38	198
04:15 PM	24	50	19	15	70	45	223
04:30 PM	28	48	23	5	61	35	200
04:45 PM	19	48	14	4	64	34	183
Total	91	189	70	35	267	152	804
05:00 PM	18	44	13	9	77	32	193
05:15 PM	15	38	16	5	58	28	160
05:30 PM	17	40	14	1	61	36	169

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 2

Groups Printed- Cars - Trucks

	School St From North		Route 128 SB Ramp From East		School St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
05:45 PM	10	23	10	4	49	30	126
Total	60	145	53	19	245	126	648
06:00 PM	15	28	13	2	43	19	120
06:15 PM	7	28	9	5	37	16	102
06:30 PM	14	24	5	0	42	18	103
06:45 PM	11	33	6	6	36	14	106
Total	47	113	33	13	158	67	431
Grand Total	929	1847	691	383	2504	1793	8147
Apprch %	33.5	66.5	64.3	35.7	58.3	41.7	
Total %	11.4	22.7	8.5	4.7	30.7	22	
Cars	909	1801	679	369	2450	1766	7974
% Cars	97.8	97.5	98.3	96.3	97.8	98.5	97.9
Trucks	20	46	12	14	54	27	173
% Trucks	2.2	2.5	1.7	3.7	2.2	1.5	2.1

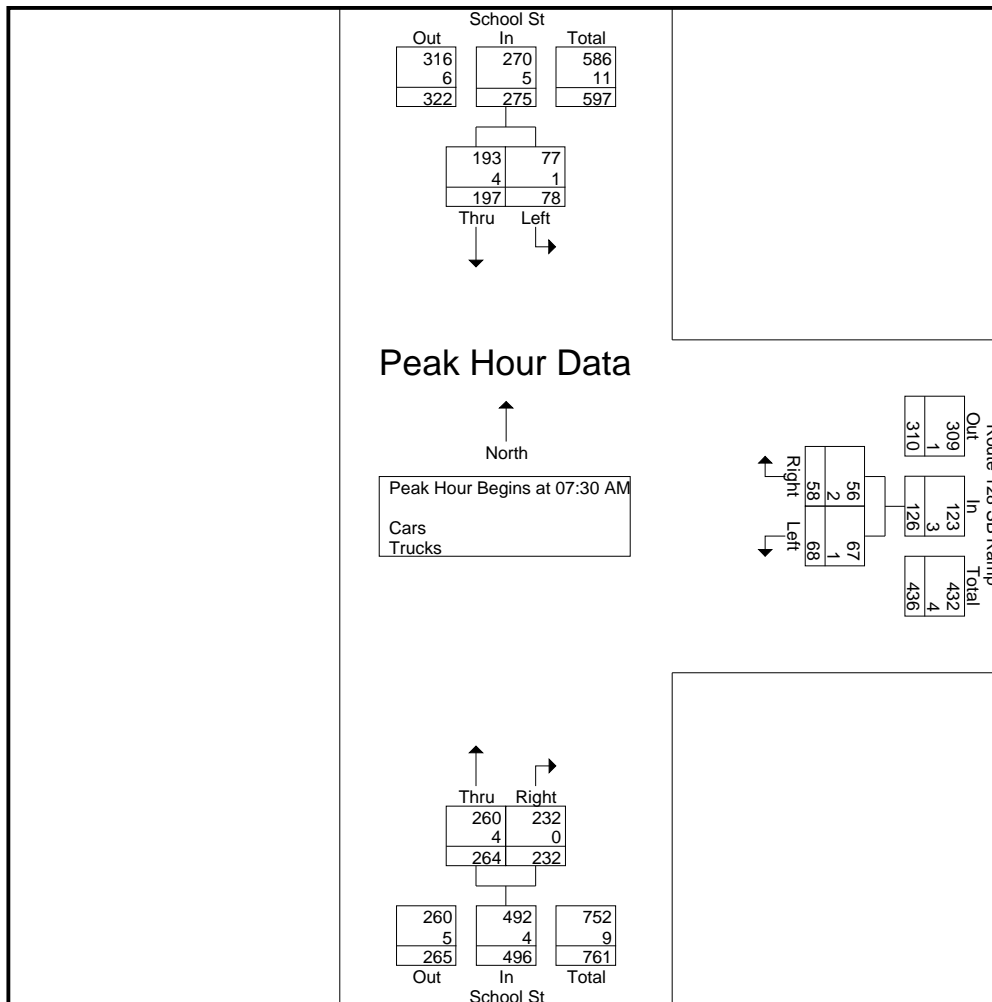
	School St From North			Route 128 SB Ramp From East			School St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:30 AM										
07:30 AM	26	62	88	18	12	30	77	81	158	276
07:45 AM	20	49	69	16	17	33	74	63	137	239
08:00 AM	13	41	54	16	16	32	41	45	86	172
08:15 AM	19	45	64	18	13	31	72	43	115	210
Total Volume	78	197	275	68	58	126	264	232	496	897
% App. Total	28.4	71.6		54	46		53.2	46.8		
PHF	.750	.794	.781	.944	.853	.955	.857	.716	.785	.813
Cars	77	193	270	67	56	123	260	232	492	885
% Cars	98.7	98.0	98.2	98.5	96.6	97.6	98.5	100	99.2	98.7
Trucks	1	4	5	1	2	3	4	0	4	12
% Trucks	1.3	2.0	1.8	1.5	3.4	2.4	1.5	0	0.8	1.3

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 3



Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

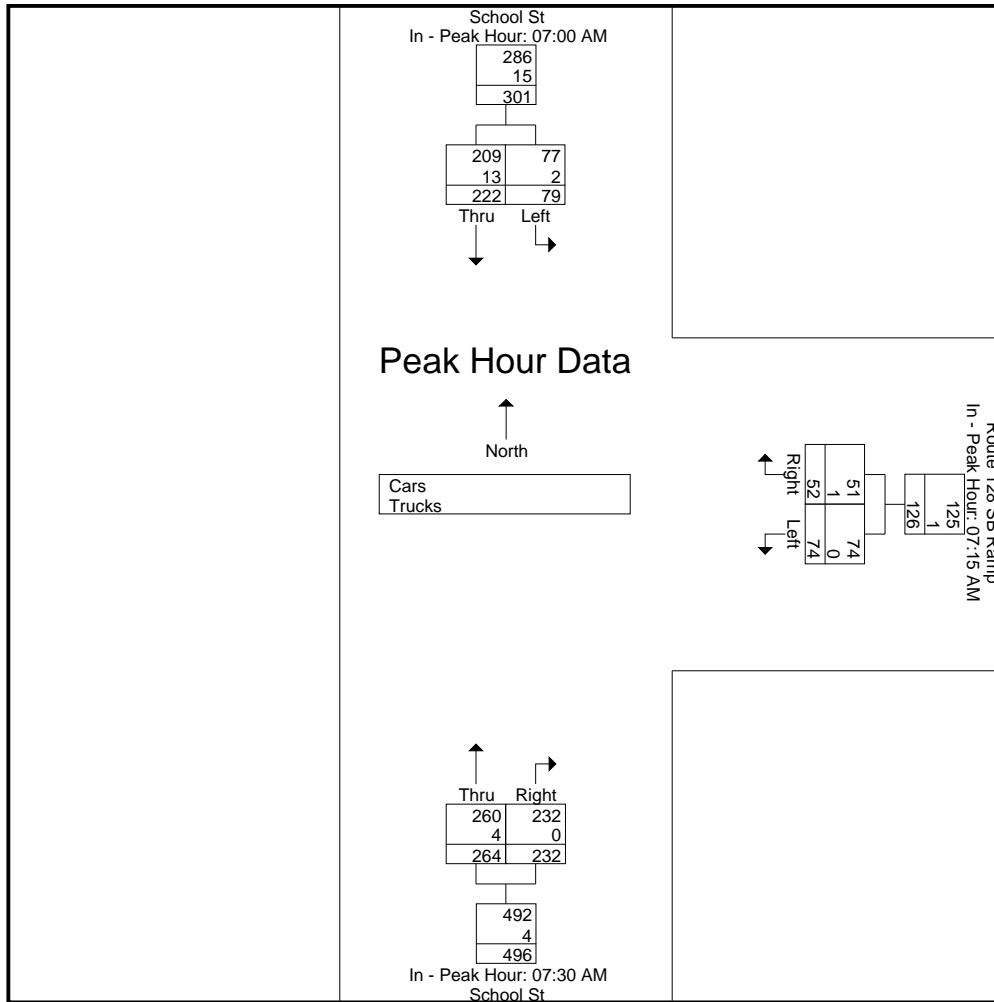
	07:00 AM			07:15 AM			07:30 AM		
+0 mins.	23	34	57	24	7	31	77	81	158
+15 mins.	10	77	87	18	12	30	74	63	137
+30 mins.	26	62	88	16	17	33	41	45	86
+45 mins.	20	49	69	16	16	32	72	43	115
Total Volume	79	222	301	74	52	126	264	232	496
% App. Total	26.2	73.8		58.7	41.3		53.2	46.8	
PHF	.760	.721	.855	.771	.765	.955	.857	.716	.785
Cars	77	209	286	74	51	125	260	232	492
% Cars	97.5	94.1	95	100	98.1	99.2	98.5	100	99.2
Trucks	2	13	15	0	1	1	4	0	4
% Trucks	2.5	5.9	5	0	1.9	0.8	1.5	0	0.8

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 4



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 11:45 AM

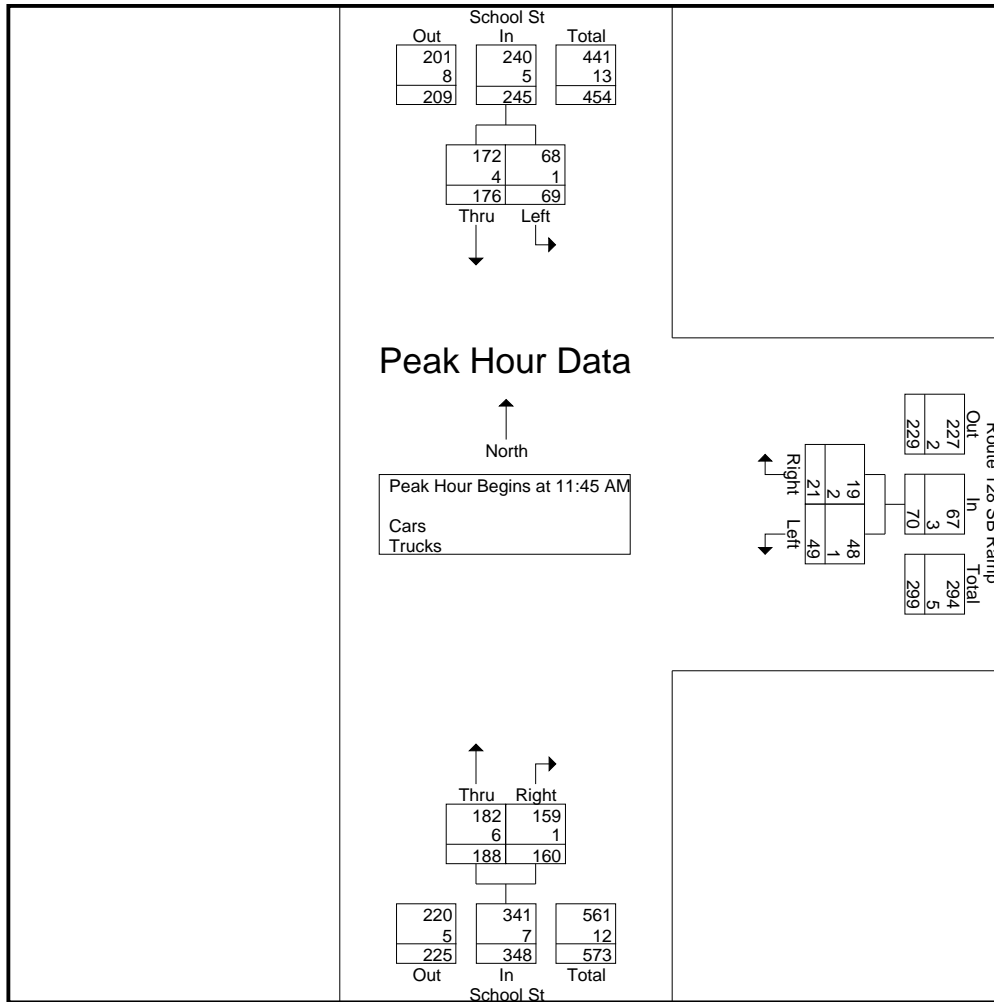
11:45 AM	16	42	58	15	4	19	47	46	93	170
12:00 PM	22	60	82	15	6	21	48	36	84	187
12:15 PM	14	42	56	10	10	20	36	42	78	154
12:30 PM	17	32	49	9	1	10	57	36	93	152
Total Volume	69	176	245	49	21	70	188	160	348	663
% App. Total	28.2	71.8		70	30		54	46		
PHF	.784	.733	.747	.817	.525	.833	.825	.870	.935	.886
Cars	68	172	240	48	19	67	182	159	341	648
% Cars	98.6	97.7	98.0	98.0	90.5	95.7	96.8	99.4	98.0	97.7
Trucks	1	4	5	1	2	3	6	1	7	15
% Trucks	1.4	2.3	2.0	2.0	9.5	4.3	3.2	0.6	2.0	2.3

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 5



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

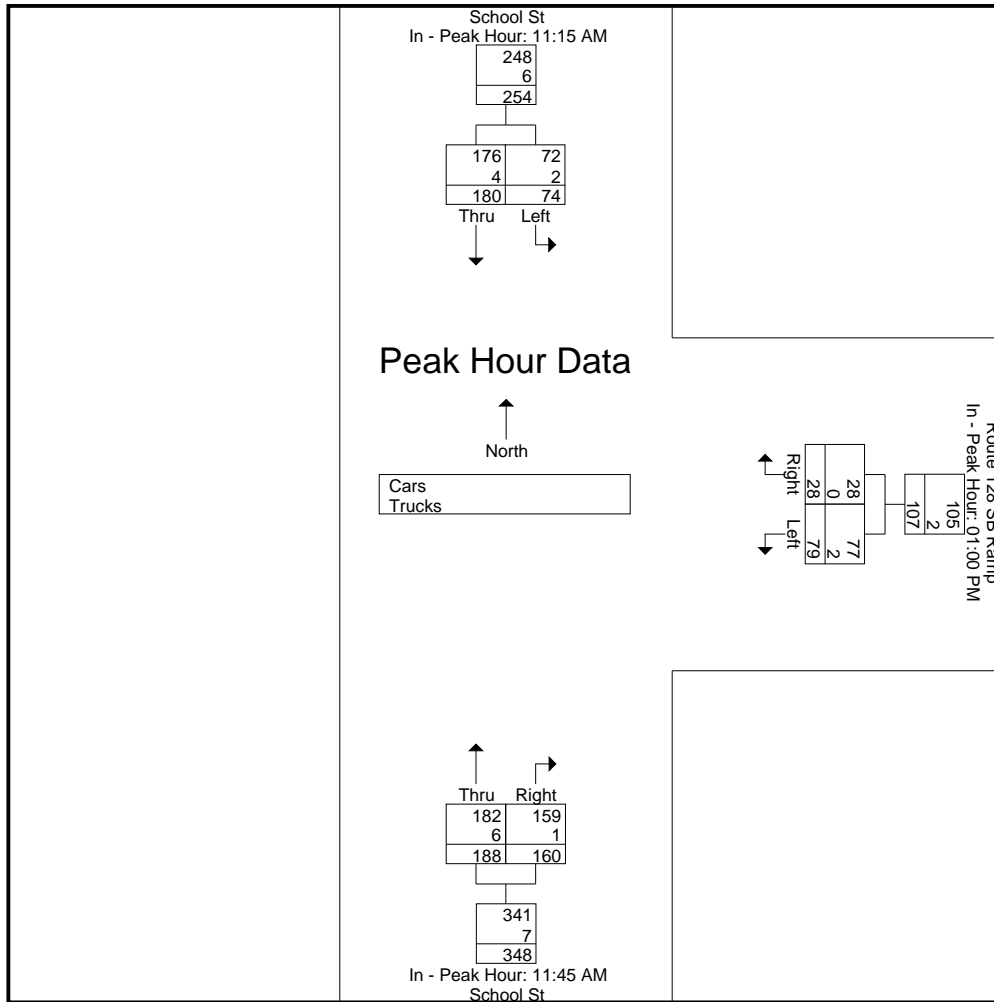
	11:15 AM			01:00 PM			11:45 AM		
+0 mins.	19	38	57	20	9	29	47	46	93
+15 mins.	17	40	57	18	6	24	48	36	84
+30 mins.	16	42	58	19	7	26	36	42	78
+45 mins.	22	60	82	22	6	28	57	36	93
Total Volume	74	180	254	79	28	107	188	160	348
% App. Total	29.1	70.9		73.8	26.2		54	46	
PHF	.841	.750	.774	.898	.778	.922	.825	.870	.935
Cars	72	176	248	77	28	105	182	159	341
% Cars	97.3	97.8	97.6	97.5	100	98.1	96.8	99.4	98
Trucks	2	4	6	2	0	2	6	1	7
% Trucks	2.7	2.2	2.4	2.5	0	1.9	3.2	0.6	2

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 6



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 03:30 PM

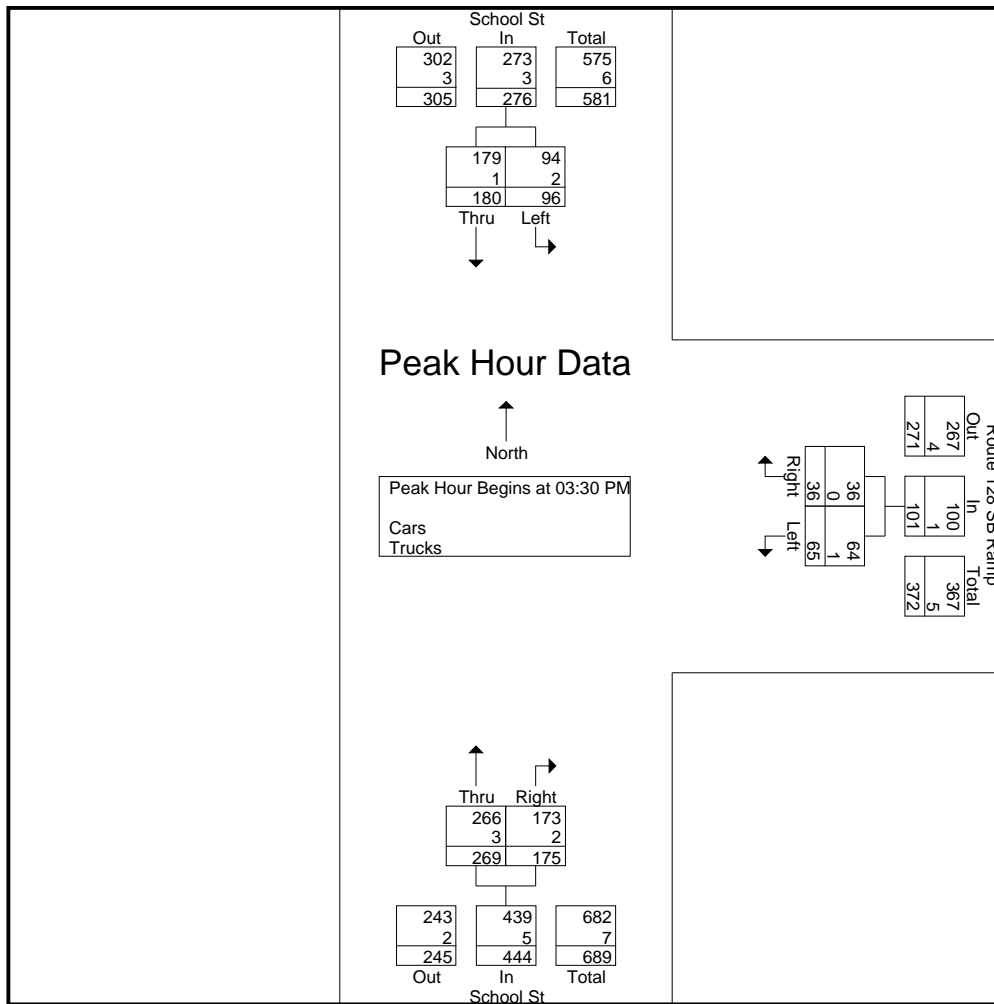
03:30 PM	28	46	74	12	6	18	70	45	115	207
03:45 PM	24	41	65	20	4	24	57	47	104	193
04:00 PM	20	43	63	14	11	25	72	38	110	198
04:15 PM	24	50	74	19	15	34	70	45	115	223
Total Volume	96	180	276	65	36	101	269	175	444	821
% App. Total	34.8	65.2		64.4	35.6		60.6	39.4		
PHF	.857	.900	.932	.813	.600	.743	.934	.931	.965	.920
Cars	94	179	273	64	36	100	266	173	439	812
% Cars	97.9	99.4	98.9	98.5	100	99.0	98.9	98.9	98.9	98.9
Trucks	2	1	3	1	0	1	3	2	5	9
% Trucks	2.1	0.6	1.1	1.5	0	1.0	1.1	1.1	1.1	1.1

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
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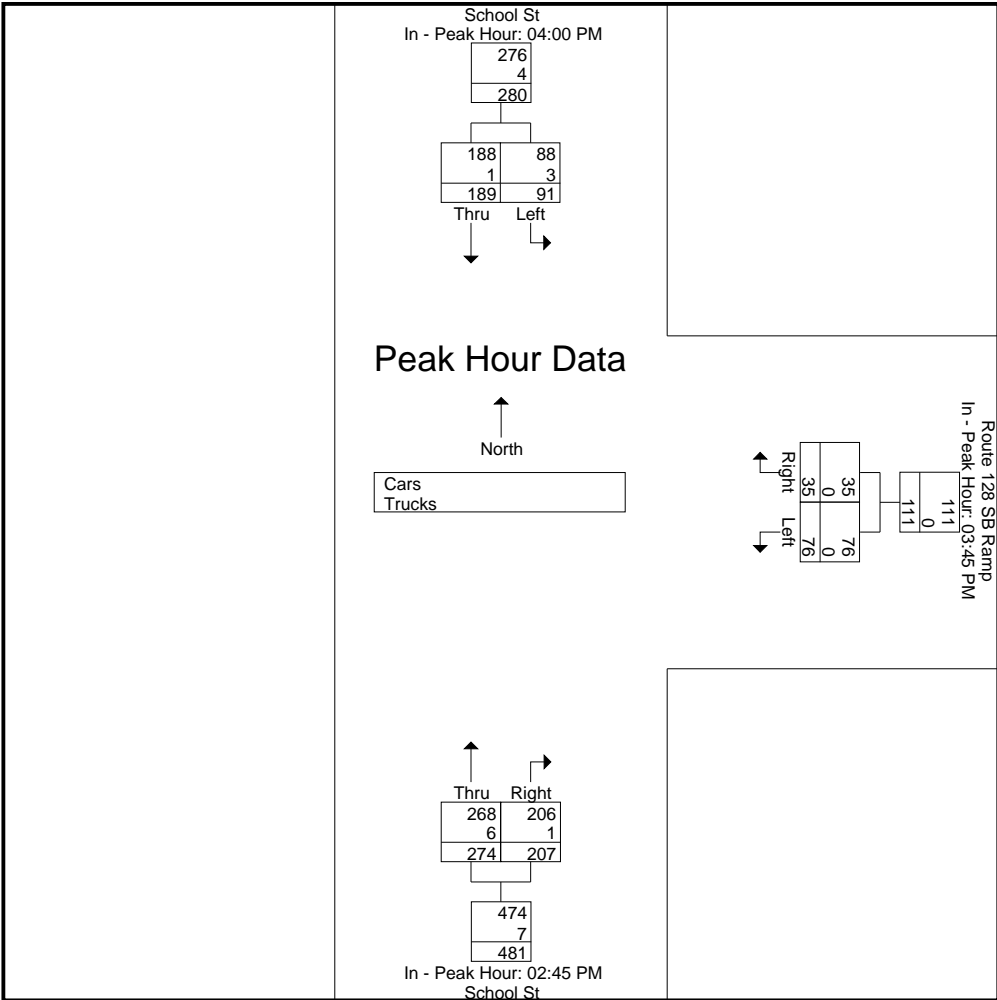
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	04:00 PM			03:45 PM			02:45 PM		
+0 mins.	20	43	63	20	4	24	63	55	118
+15 mins.	24	50	74	14	11	25	63	56	119
+30 mins.	28	48	76	19	15	34	78	51	129
+45 mins.	19	48	67	23	5	28	70	45	115
Total Volume	91	189	280	76	35	111	274	207	481
% App. Total	32.5	67.5		68.5	31.5		57	43	
PHF	.813	.945	.921	.826	.583	.816	.878	.924	.932
Cars	88	188	276	76	35	111	268	206	474
% Cars	96.7	99.5	98.6	100	100	100	97.8	99.5	98.5
Trucks	3	1	4	0	0	0	6	1	7
% Trucks	3.3	0.5	1.4	0	0	0	2.2	0.5	1.5

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 8



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 9

Groups Printed- Cars

	School St From North		Route 128 SB Ramp From East		School St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
07:00 AM	22	32	12	5	22	40	133
07:15 AM	10	69	24	7	43	39	192
07:30 AM	25	61	18	12	76	81	273
07:45 AM	20	47	16	16	74	63	236
Total	77	209	70	40	215	223	834
08:00 AM	13	41	16	16	39	45	170
08:15 AM	19	44	17	12	71	43	206
08:30 AM	23	31	16	11	58	45	184
08:45 AM	19	38	15	19	70	38	199
Total	74	154	64	58	238	171	759
09:00 AM	26	42	11	17	49	41	186
09:15 AM	31	16	9	9	33	25	123
09:30 AM	21	28	9	3	31	47	139
09:45 AM	21	39	11	13	57	35	176
Total	99	125	40	42	170	148	624
10:00 AM	19	39	7	3	31	33	132
10:15 AM	18	32	16	11	52	34	163
10:30 AM	17	30	14	10	50	31	152
10:45 AM	25	34	11	10	30	25	135
Total	79	135	48	34	163	123	582
11:00 AM	20	33	13	10	39	25	140
11:15 AM	18	38	13	5	32	27	133
11:30 AM	16	39	12	9	37	32	145
11:45 AM	16	42	15	3	46	46	168
Total	70	152	53	27	154	130	586
12:00 PM	22	57	15	6	48	35	183
12:15 PM	13	41	9	9	35	42	149
12:30 PM	17	32	9	1	53	36	148
12:45 PM	20	27	17	5	39	31	139
Total	72	157	50	21	175	144	619
01:00 PM	10	25	19	9	44	30	137
01:15 PM	14	20	18	6	39	28	125
01:30 PM	23	42	19	7	29	33	153
01:45 PM	18	35	21	6	41	28	149
Total	65	122	77	28	153	119	564
02:00 PM	23	49	6	21	49	24	172
02:15 PM	18	38	15	6	80	45	202
02:30 PM	26	29	17	2	66	44	184
02:45 PM	19	38	16	4	61	55	193
Total	86	154	54	33	256	168	751
03:00 PM	19	28	10	6	62	56	181
03:15 PM	22	35	26	5	76	50	214
03:30 PM	28	46	11	6	69	45	205
03:45 PM	24	41	20	4	56	47	192
Total	93	150	67	21	263	198	792
04:00 PM	20	43	14	11	71	37	196
04:15 PM	22	49	19	15	70	44	219
04:30 PM	28	48	23	5	60	35	199
04:45 PM	18	48	14	4	59	34	177
Total	88	188	70	35	260	150	791
05:00 PM	17	42	13	7	77	32	188
05:15 PM	15	38	16	5	58	28	160
05:30 PM	17	40	14	1	61	36	169
05:45 PM	10	23	10	4	49	29	125
Total	59	143	53	17	245	125	642

Accurate Counts

978-664-2565

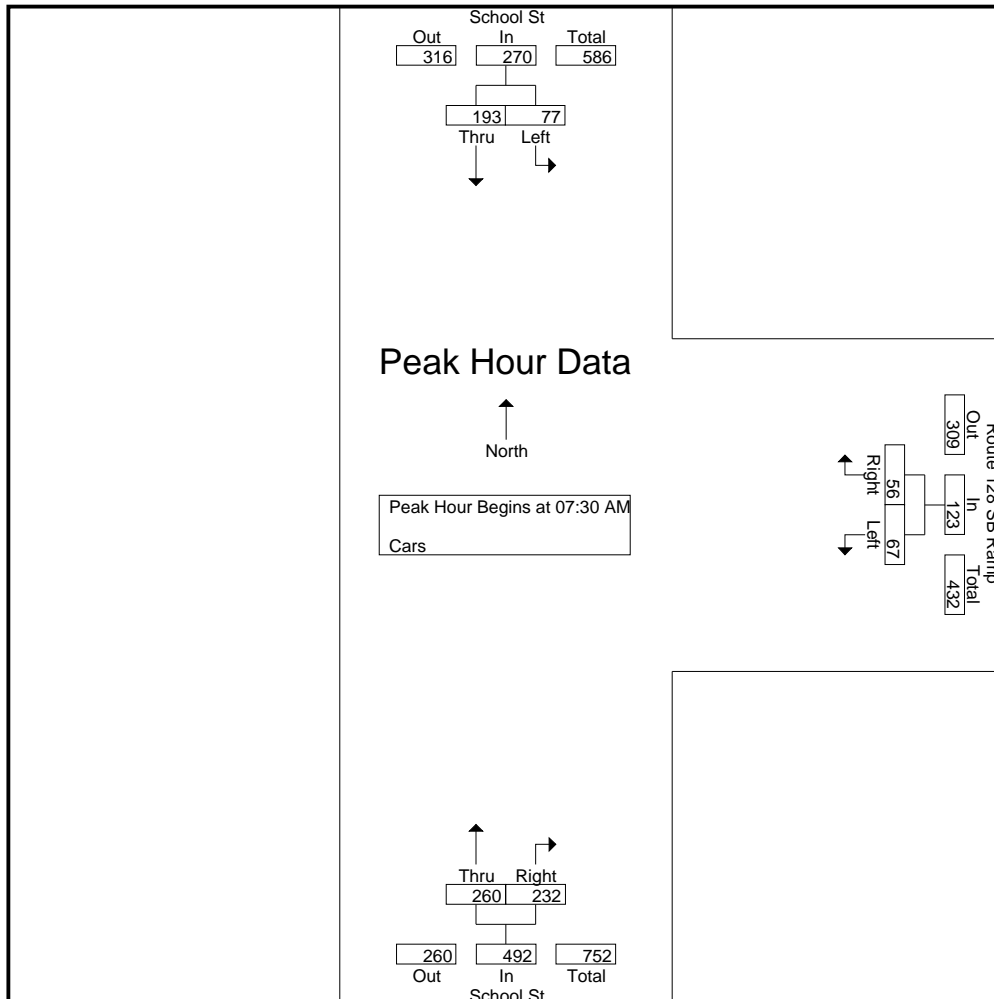
N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 10

Groups Printed- Cars

	School St From North		Route 128 SB Ramp From East		School St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
06:00 PM	15	28	13	2	43	19	120
06:15 PM	7	27	9	5	37	16	101
06:30 PM	14	24	5	0	42	18	103
06:45 PM	11	33	6	6	36	14	106
Total	47	112	33	13	158	67	430
Grand Total	909	1801	679	369	2450	1766	7974
Apprch %	33.5	66.5	64.8	35.2	58.1	41.9	
Total %	11.4	22.6	8.5	4.6	30.7	22.1	

	School St From North			Route 128 SB Ramp From East			School St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:30 AM										
07:30 AM	25	61	86	18	12	30	76	81	157	273
07:45 AM	20	47	67	16	16	32	74	63	137	236
08:00 AM	13	41	54	16	16	32	39	45	84	170
08:15 AM	19	44	63	17	12	29	71	43	114	206
Total Volume	77	193	270	67	56	123	260	232	492	885
% App. Total	28.5	71.5		54.5	45.5		52.8	47.2		
PHF	.770	.791	.785	.931	.875	.961	.855	.716	.783	.810



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

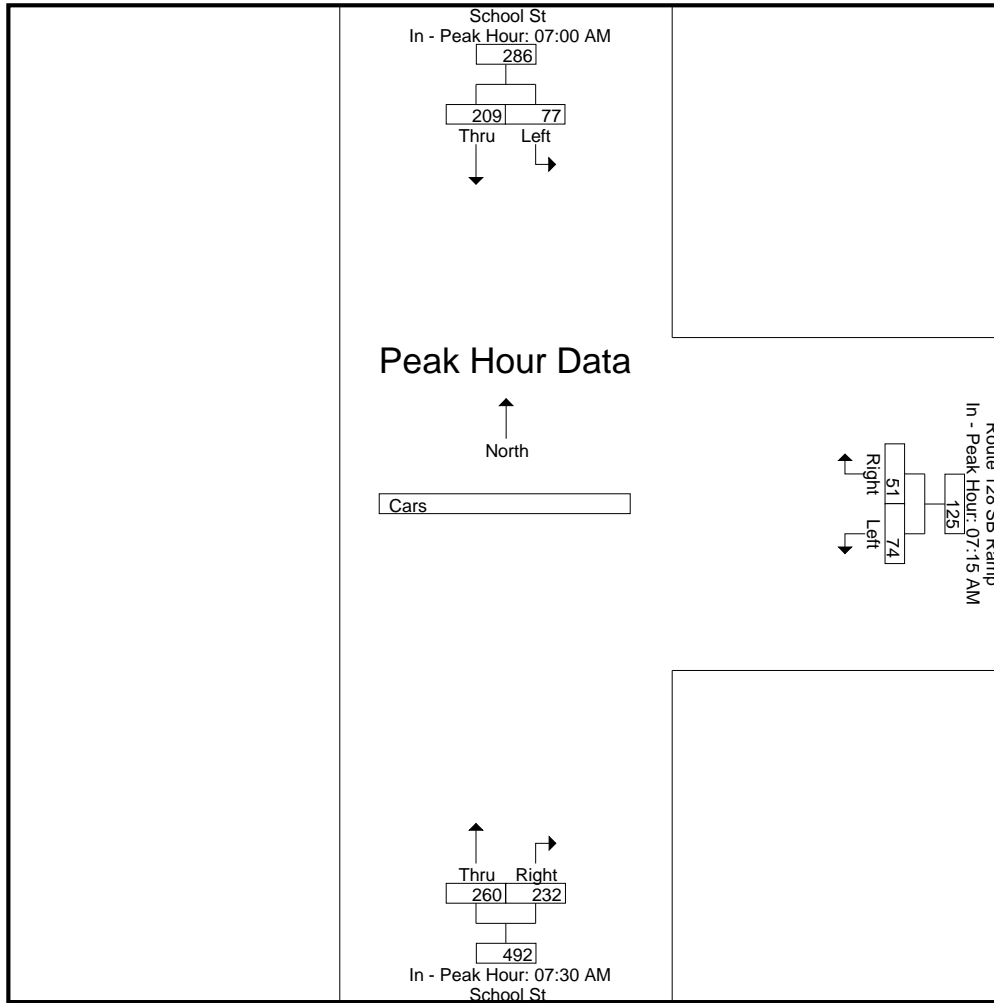
File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
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	School St From North			Route 128 SB Ramp From East			School St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total

Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:00 AM			07:15 AM			07:30 AM		
+0 mins.	22	32	54	24	7	31	76	81	157
+15 mins.	10	69	79	18	12	30	74	63	137
+30 mins.	25	61	86	16	16	32	39	45	84
+45 mins.	20	47	67	16	16	32	71	43	114
Total Volume	77	209	286	74	51	125	260	232	492
% App. Total	26.9	73.1		59.2	40.8		52.8	47.2	
PHF	.770	.757	.831	.771	.797	.977	.855	.716	.783



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 11:45 AM

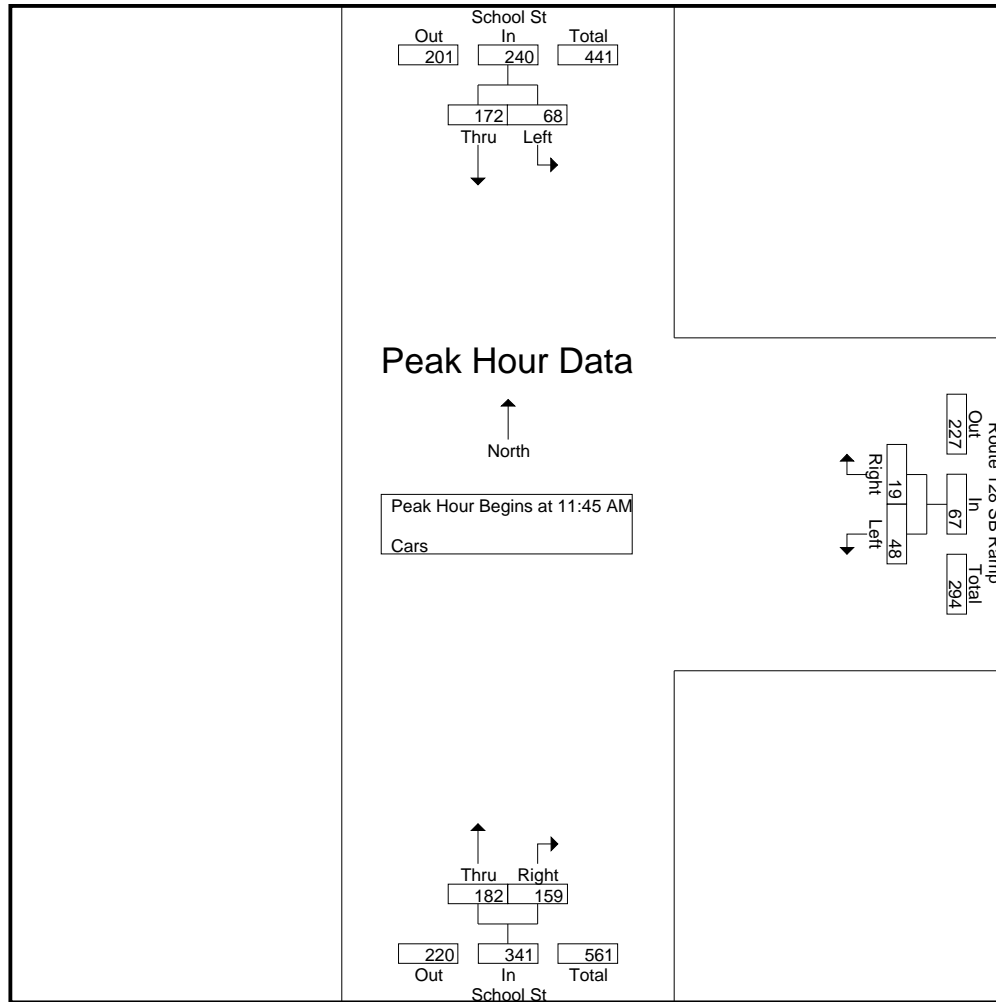
11:45 AM	16	42	58	15	3	18	46	46	92	168
12:00 PM	22	57	79	15	6	21	48	35	83	183
12:15 PM	13	41	54	9	9	18	35	42	77	149
12:30 PM	17	32	49	9	1	10	53	36	89	148
Total Volume	68	172	240	48	19	67	182	159	341	648
% App. Total	28.3	71.7		71.6	28.4		53.4	46.6		
PHF	.773	.754	.759	.800	.528	.798	.858	.864	.927	.885

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 12



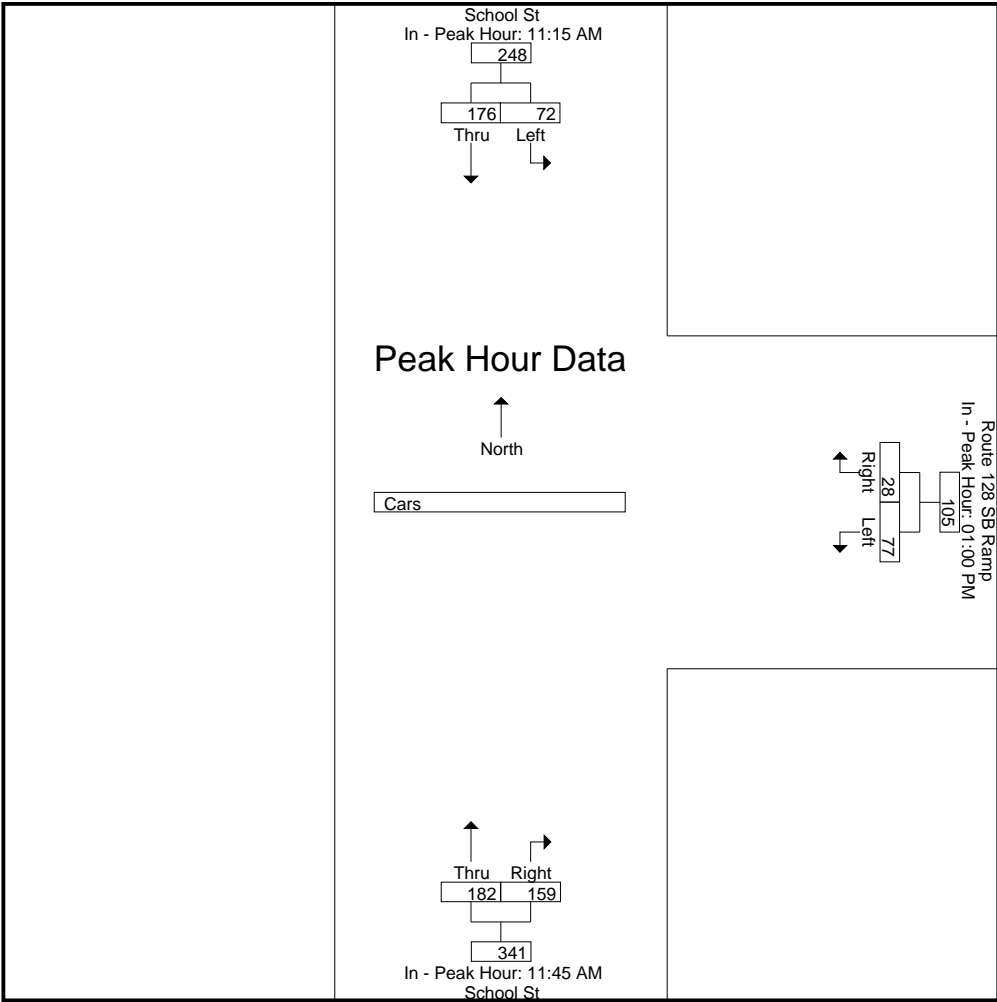
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	11:15 AM			01:00 PM			11:45 AM		
+0 mins.	18	38	56	19	9	28	46	46	92
+15 mins.	16	39	55	18	6	24	48	35	83
+30 mins.	16	42	58	19	7	26	35	42	77
+45 mins.	22	57	79	21	6	27	53	36	89
Total Volume	72	176	248	77	28	105	182	159	341
% App. Total	29	71		73.3	26.7		53.4	46.6	
PHF	.818	.772	.785	.917	.778	.938	.858	.864	.927

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 13



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 03:30 PM

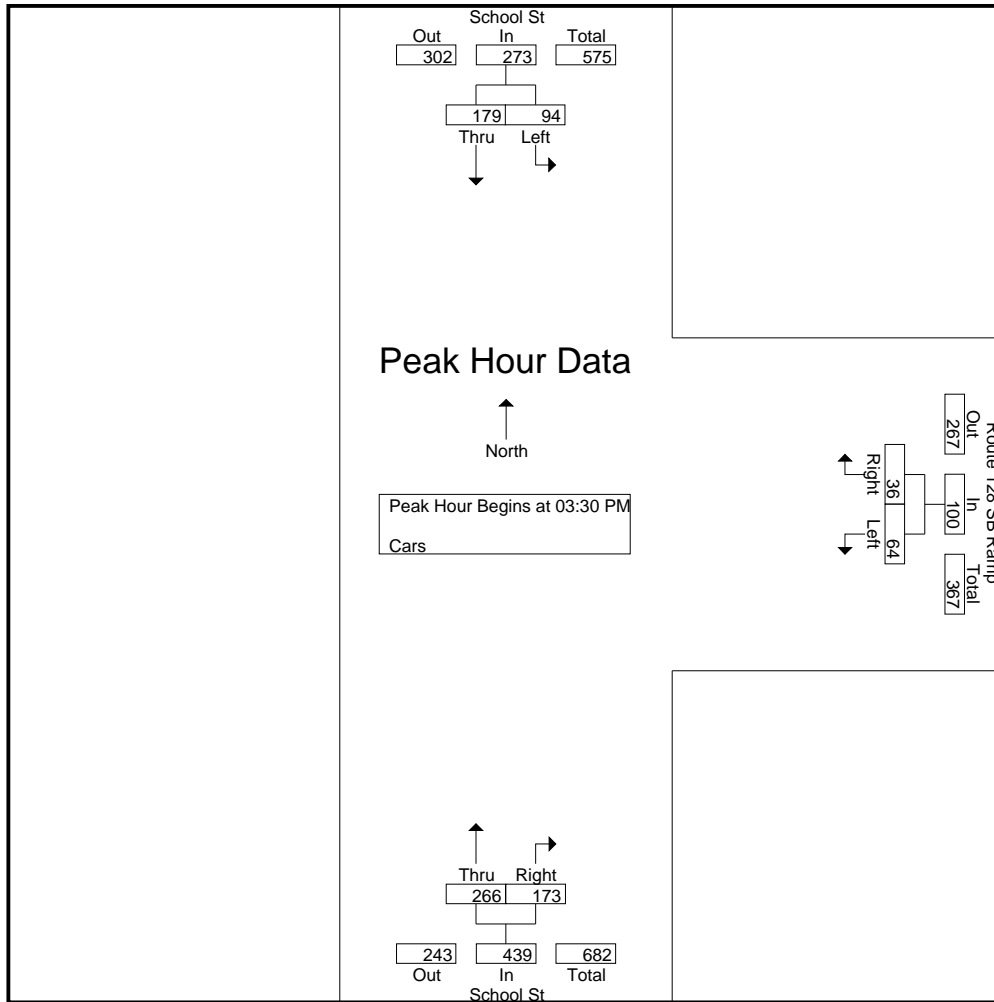
03:30 PM	28	46	74	11	6	17	69	45	114	205
03:45 PM	24	41	65	20	4	24	56	47	103	192
04:00 PM	20	43	63	14	11	25	71	37	108	196
04:15 PM	22	49	71	19	15	34	70	44	114	219
Total Volume	94	179	273	64	36	100	266	173	439	812
% App. Total	34.4	65.6		64	36		60.6	39.4		
PHF	.839	.913	.922	.800	.600	.735	.937	.920	.963	.927

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 14



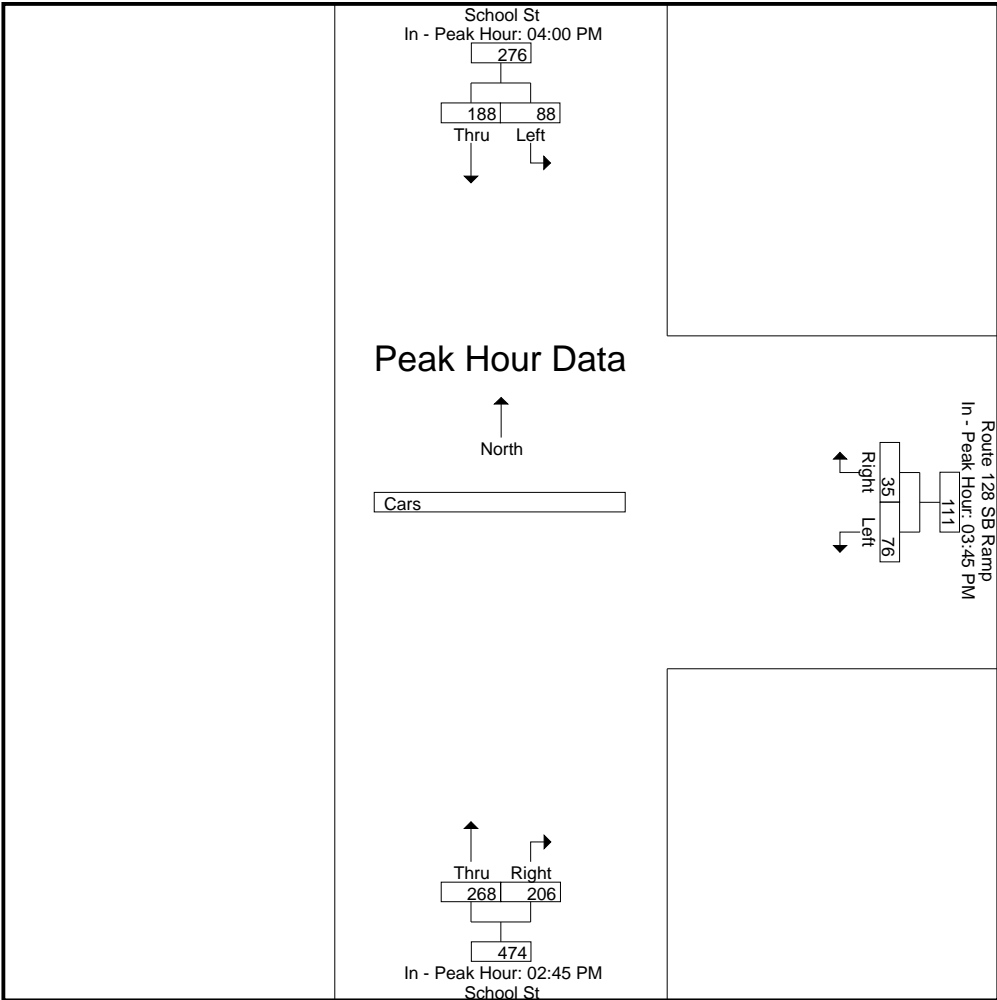
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	04:00 PM			03:45 PM			02:45 PM		
+0 mins.	20	43	63	20	4	24	61	55	116
+15 mins.	22	49	71	14	11	25	62	56	118
+30 mins.	28	48	76	19	15	34	76	50	126
+45 mins.	18	48	66	23	5	28	69	45	114
Total Volume	88	188	276	76	35	111	268	206	474
% App. Total	31.9	68.1		68.5	31.5		56.5	43.5	
PHF	.786	.959	.908	.826	.583	.816	.882	.920	.940

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
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Accurate Counts

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N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
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Groups Printed- Trucks

	School St From North		Route 128 SB Ramp From East		School St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
07:00 AM	1	2	0	0	0	1	4
07:15 AM	0	8	0	0	3	1	12
07:30 AM	1	1	0	0	1	0	3
07:45 AM	0	2	0	1	0	0	3
Total	2	13	0	1	4	2	22
08:00 AM	0	0	0	0	2	0	2
08:15 AM	0	1	1	1	1	0	4
08:30 AM	0	2	0	0	1	0	3
08:45 AM	2	2	0	1	2	1	8
Total	2	5	1	2	6	1	17
09:00 AM	1	1	0	0	0	1	3
09:15 AM	0	0	0	0	0	3	3
09:30 AM	2	0	0	1	1	1	5
09:45 AM	1	2	0	0	1	2	6
Total	4	3	0	1	2	7	17
10:00 AM	0	0	1	0	1	1	3
10:15 AM	0	1	2	0	1	0	4
10:30 AM	2	0	1	1	1	0	5
10:45 AM	2	2	0	1	3	5	13
Total	4	3	4	2	6	6	25
11:00 AM	0	1	0	1	3	1	6
11:15 AM	1	0	1	0	0	2	4
11:30 AM	1	1	0	0	2	1	5
11:45 AM	0	0	0	1	1	0	2
Total	2	2	1	2	6	4	17
12:00 PM	0	3	0	0	0	1	4
12:15 PM	1	1	1	1	1	0	5
12:30 PM	0	0	0	0	4	0	4
12:45 PM	1	0	0	0	1	0	2
Total	2	4	1	1	6	1	15
01:00 PM	0	1	1	0	0	0	2
01:15 PM	0	1	0	0	1	1	3
01:30 PM	0	1	0	0	1	0	2
01:45 PM	0	2	1	0	2	0	5
Total	0	5	2	0	4	1	12
02:00 PM	0	3	0	0	3	0	6
02:15 PM	0	1	0	1	3	0	5
02:30 PM	0	0	1	0	0	1	2
02:45 PM	0	0	1	0	2	0	3
Total	0	4	2	1	8	1	16
03:00 PM	0	1	0	0	1	0	2
03:15 PM	0	2	0	2	2	1	7
03:30 PM	0	0	1	0	1	0	2
03:45 PM	0	0	0	0	1	0	1
Total	0	3	1	2	5	1	12
04:00 PM	0	0	0	0	1	1	2
04:15 PM	2	1	0	0	0	1	4
04:30 PM	0	0	0	0	1	0	1
04:45 PM	1	0	0	0	5	0	6
Total	3	1	0	0	7	2	13
05:00 PM	1	2	0	2	0	0	5
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	0	0	1	1
Total	1	2	0	2	0	1	6

Accurate Counts

978-664-2565

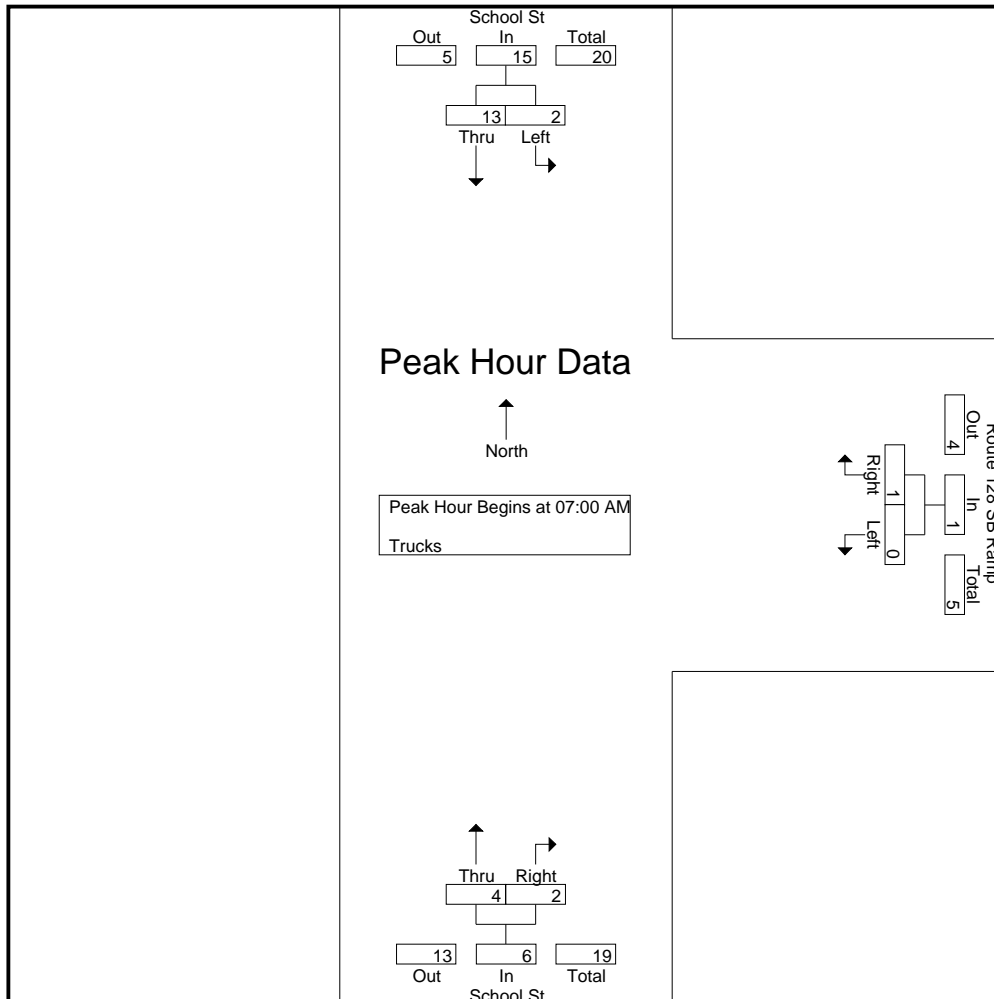
N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 17

Groups Printed- Trucks

	School St From North		Route 128 SB Ramp From East		School St From South		
Start Time	Left	Thru	Left	Right	Thru	Right	Int. Total
06:00 PM	0	0	0	0	0	0	0
06:15 PM	0	1	0	0	0	0	1
06:30 PM	0	0	0	0	0	0	0
06:45 PM	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	1
Grand Total	20	46	12	14	54	27	173
Apprch %	30.3	69.7	46.2	53.8	66.7	33.3	
Total %	11.6	26.6	6.9	8.1	31.2	15.6	

	School St From North			Route 128 SB Ramp From East			School St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	1	2	3	0	0	0	0	1	1	4
07:15 AM	0	8	8	0	0	0	3	1	4	12
07:30 AM	1	1	2	0	0	0	1	0	1	3
07:45 AM	0	2	2	0	1	1	0	0	0	3
Total Volume	2	13	15	0	1	1	4	2	6	22
% App. Total	13.3	86.7		0	100		66.7	33.3		
PHF	.500	.406	.469	.000	.250	.250	.333	.500	.375	.458



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

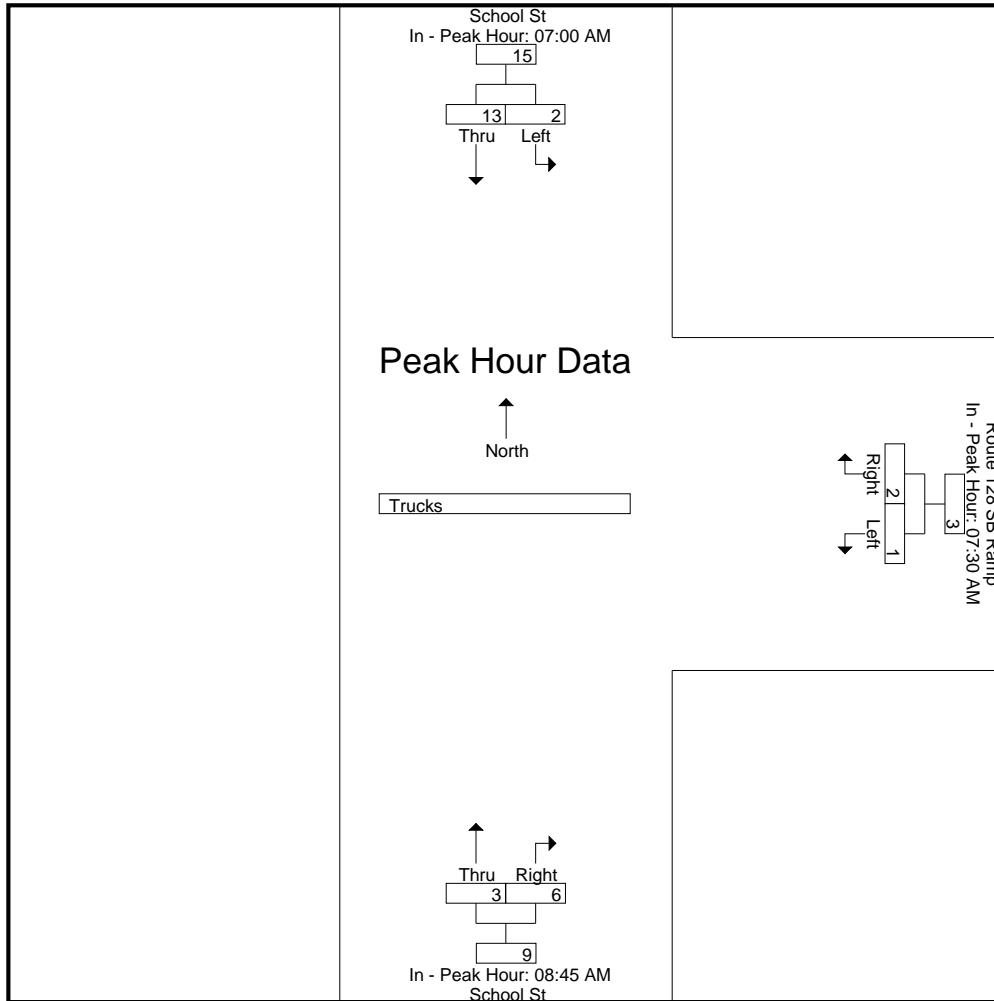
File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 18

	School St From North			Route 128 SB Ramp From East			School St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total

Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:00 AM			07:30 AM			08:45 AM		
+0 mins.	1	2	3	0	0	0	2	1	3
+15 mins.	0	8	8	0	1	1	0	1	1
+30 mins.	1	1	2	0	0	0	0	3	3
+45 mins.	0	2	2	1	1	2	1	1	2
Total Volume	2	13	15	1	2	3	3	6	9
% App. Total	13.3	86.7		33.3	66.7		33.3	66.7	
PHF	.500	.406	.469	.250	.500	.375	.375	.500	.750



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 10:15 AM

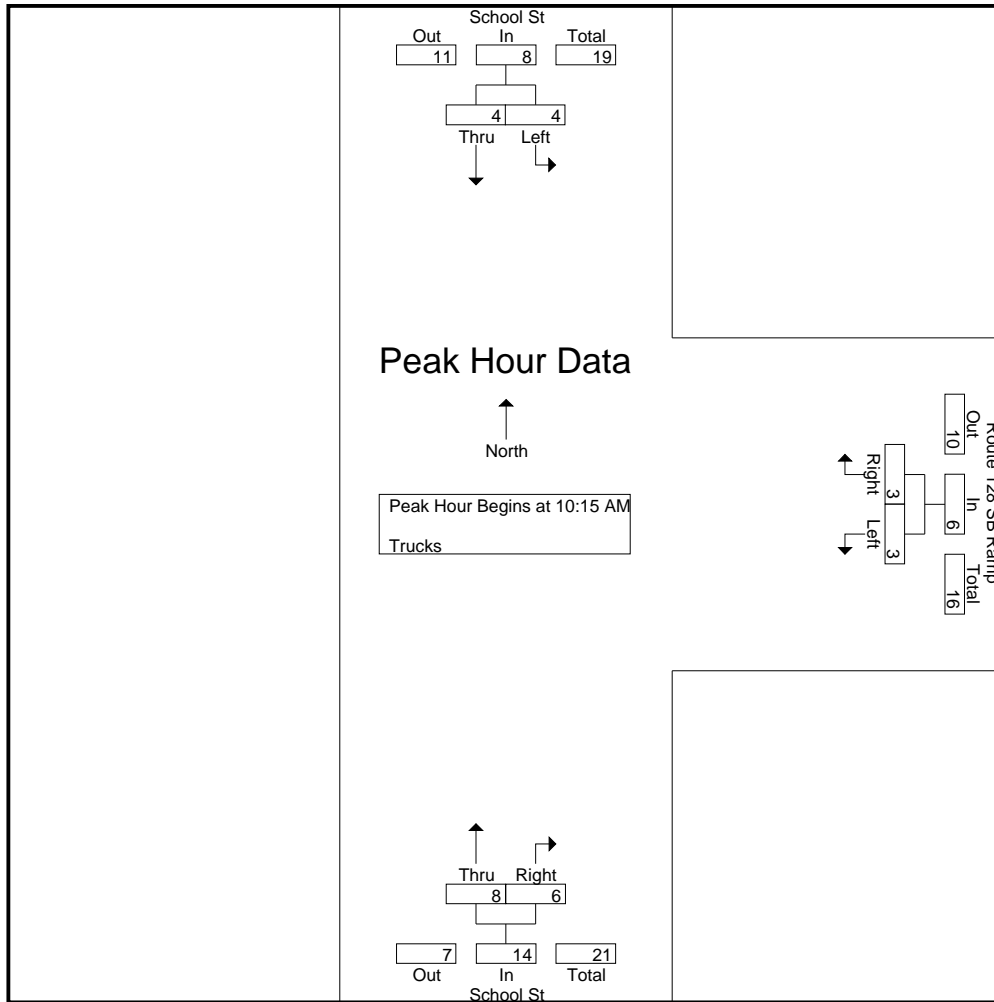
10:15 AM	0	1	1	2	0	2	1	0	1	4
10:30 AM	2	0	2	1	1	2	1	0	1	5
10:45 AM	2	2	4	0	1	1	3	5	8	13
11:00 AM	0	1	1	0	1	1	3	1	4	6
Total Volume	4	4	8	3	3	6	8	6	14	28
% App. Total	50	50		50	50		57.1	42.9		
PHF	.500	.500	.500	.375	.750	.750	.667	.300	.438	.538

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
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Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

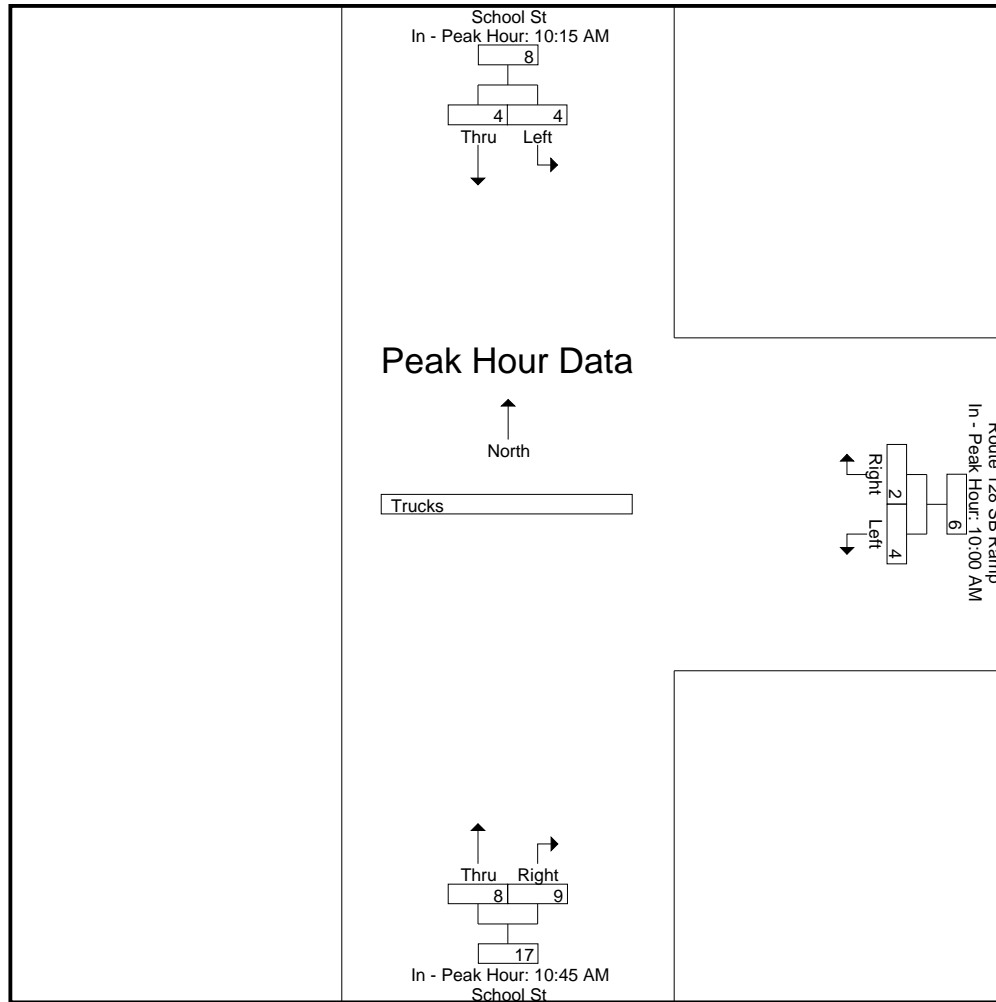
	10:15 AM			10:00 AM			10:45 AM		
+0 mins.	0	1	1	1	0	1	3	5	8
+15 mins.	2	0	2	2	0	2	3	1	4
+30 mins.	2	2	4	1	1	2	0	2	2
+45 mins.	0	1	1	0	1	1	2	1	3
Total Volume	4	4	8	4	2	6	8	9	17
% App. Total	50	50		66.7	33.3		47.1	52.9	
PHF	.500	.500	.500	.500	.500	.750	.667	.450	.531

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
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Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 02:00 PM

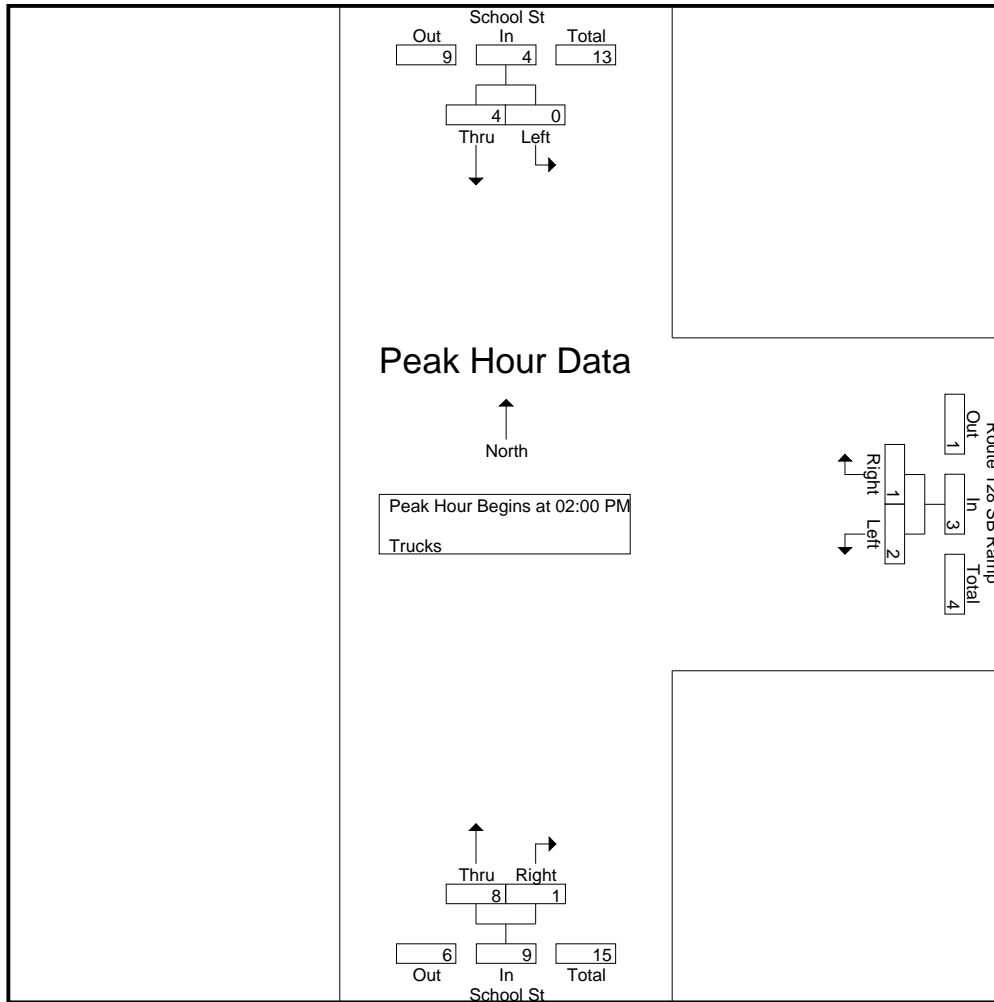
02:00 PM	0	3	3	0	0	0	3	0	3	6
02:15 PM	0	1	1	0	1	1	3	0	3	5
02:30 PM	0	0	0	1	0	1	0	1	1	2
02:45 PM	0	0	0	1	0	1	2	0	2	3
Total Volume	0	4	4	2	1	3	8	1	9	16
% App. Total	0	100		66.7	33.3		88.9	11.1		
PHF	.000	.333	.333	.500	.250	.750	.667	.250	.750	.667

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 21



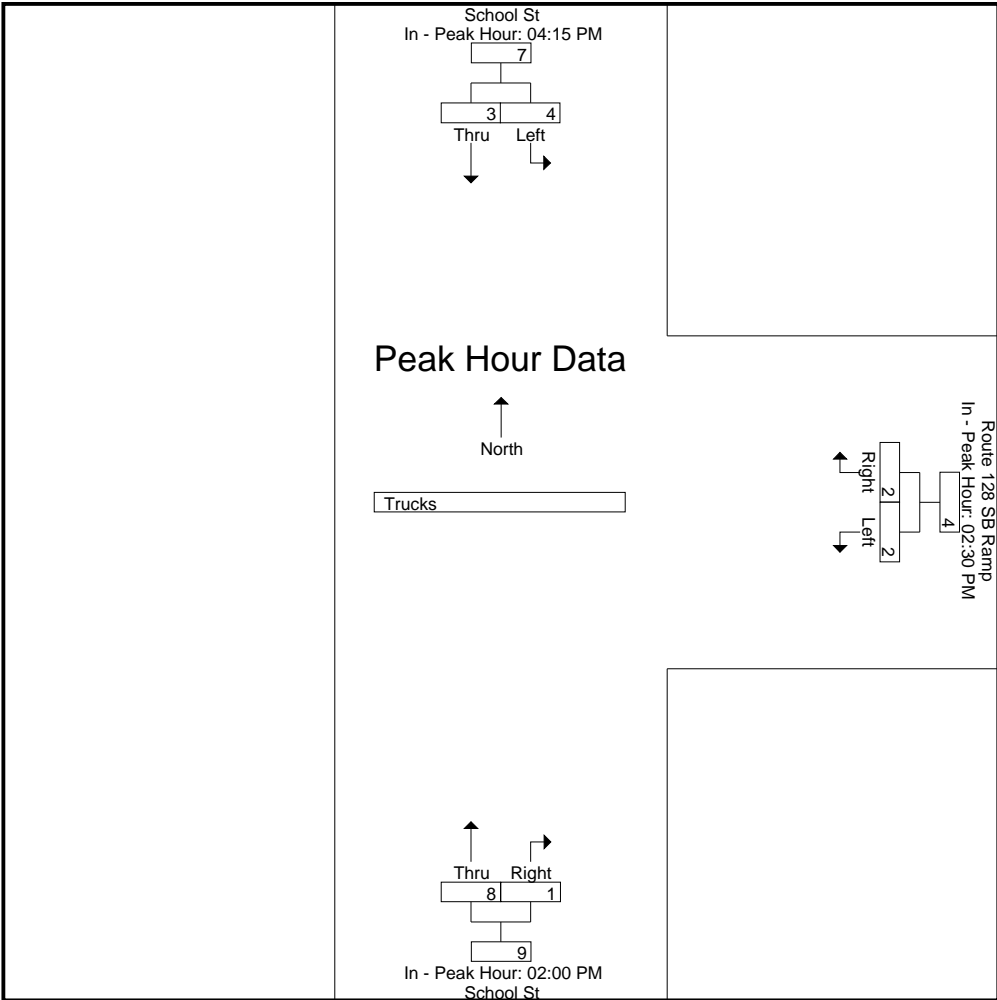
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	04:15 PM			02:30 PM			02:00 PM		
+0 mins.	2	1	3	1	0	1	3	0	3
+15 mins.	0	0	0	1	0	1	3	0	3
+30 mins.	1	0	1	0	0	0	0	1	1
+45 mins.	1	2	3	0	2	2	2	0	2
Total Volume	4	3	7	2	2	4	8	1	9
% App. Total	57.1	42.9		50	50		88.9	11.1	
PHF	.500	.375	.583	.500	.250	.500	.667	.250	.750

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 22



978-664-2565

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 23

Accurate Counts

978-664-2565

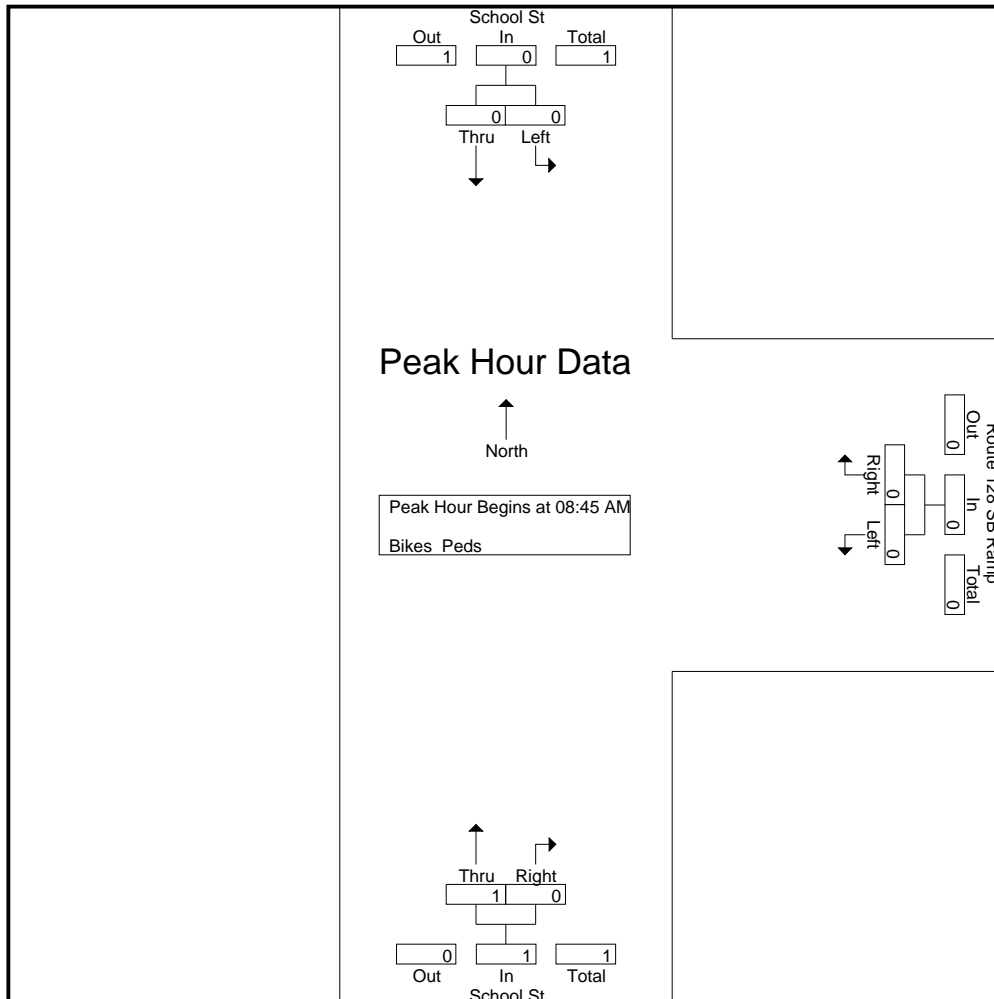
N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 24

Groups Printed- Bikes Peds

	School St From North			Route 128 SB Ramp From East			School St From South			Exclu. Total	Inclu. Total	Int. Total
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds			
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0	0	0	0	0	0
06:30 PM	0	0	0	0	0	0	0	0	0	0	0	0
06:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	2	0	0	0	2	2	0	0	2	4	6
Apprch %	0	100		0	0		100	0				
Total %	0	50		0	0		50	0		33.3	66.7	

	School St From North			Route 128 SB Ramp From East			School St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:45 AM										
08:45 AM	0	0	0	0	0	0	0	0	0	0
09:00 AM	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	1	0	1	1
Total Volume	0	0	0	0	0	0	1	0	1	1
% App. Total	0	0		0	0		100	0		
PHF	.000	.000	.000	.000	.000	.000	.250	.000	.250	.250



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

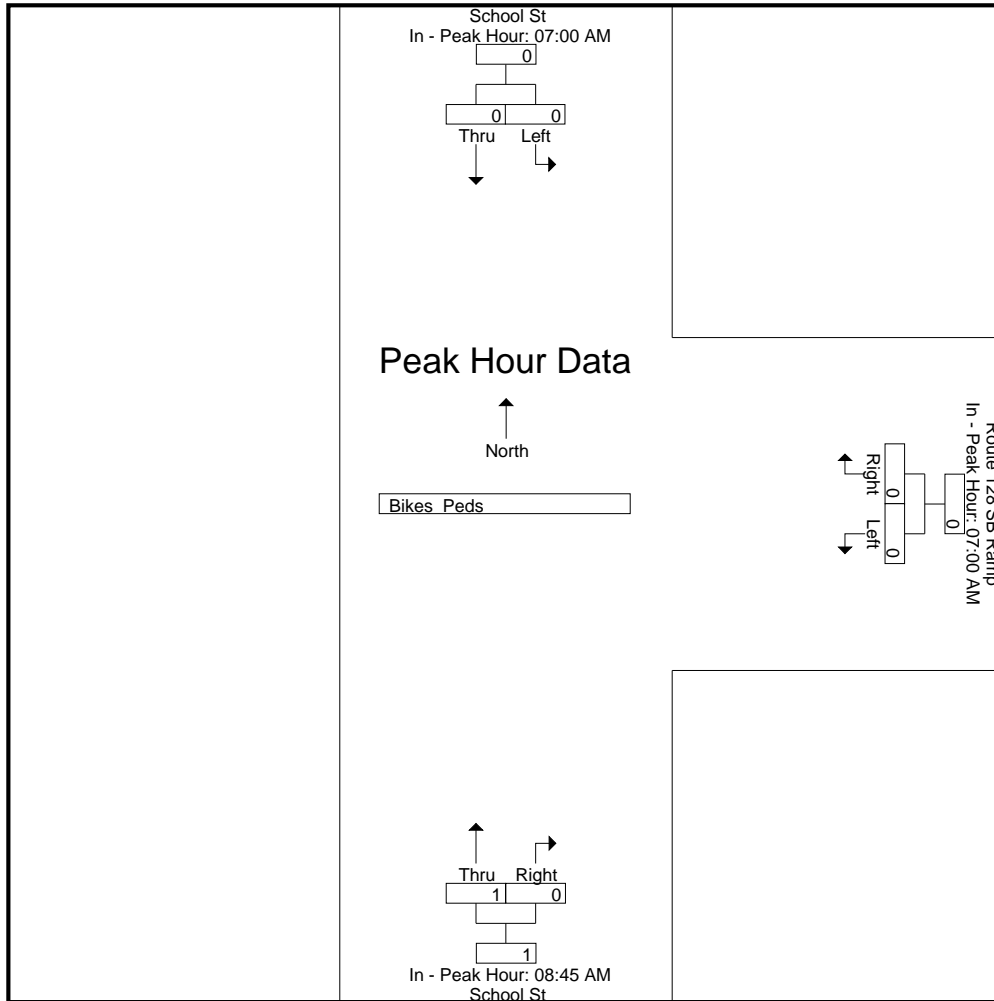
File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 25

	School St From North			Route 128 SB Ramp From East			School St From South			
Start Time	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	Int. Total

Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:00 AM			07:00 AM			08:45 AM		
+0 mins.	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0
+30 mins.	0	0	0	0	0	0	0	0	0
+45 mins.	0	0	0	0	0	0	1	0	1
Total Volume	0	0	0	0	0	0	1	0	1
% App. Total	0	0		0	0		100	0	
PHF	.000	.000	.000	.000	.000	.000	.250	.000	.250



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 10:15 AM

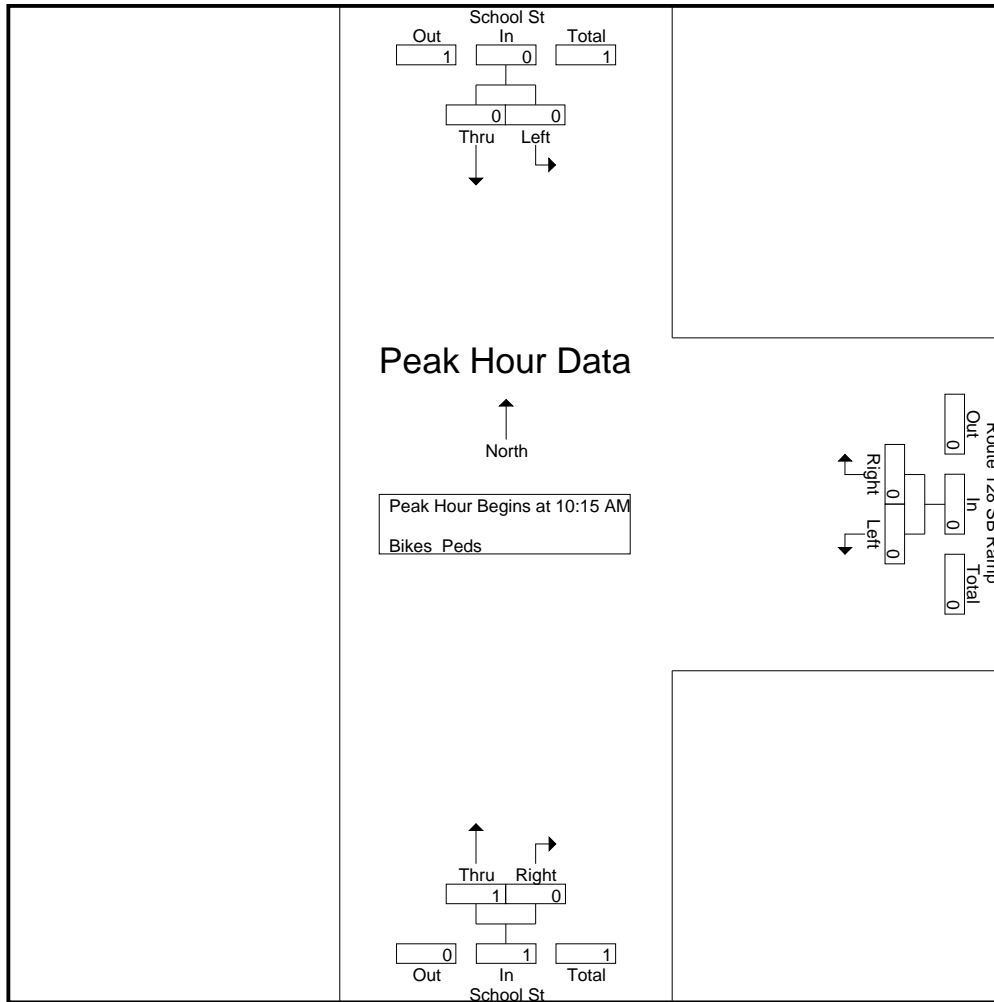
10:15 AM	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	1	0	1	1
Total Volume	0	0	0	0	0	0	1	0	1	1
% App. Total	0	0		0	0		100	0		
PHF	.000	.000	.000	.000	.000	.000	.250	.000	.250	.250

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 26



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

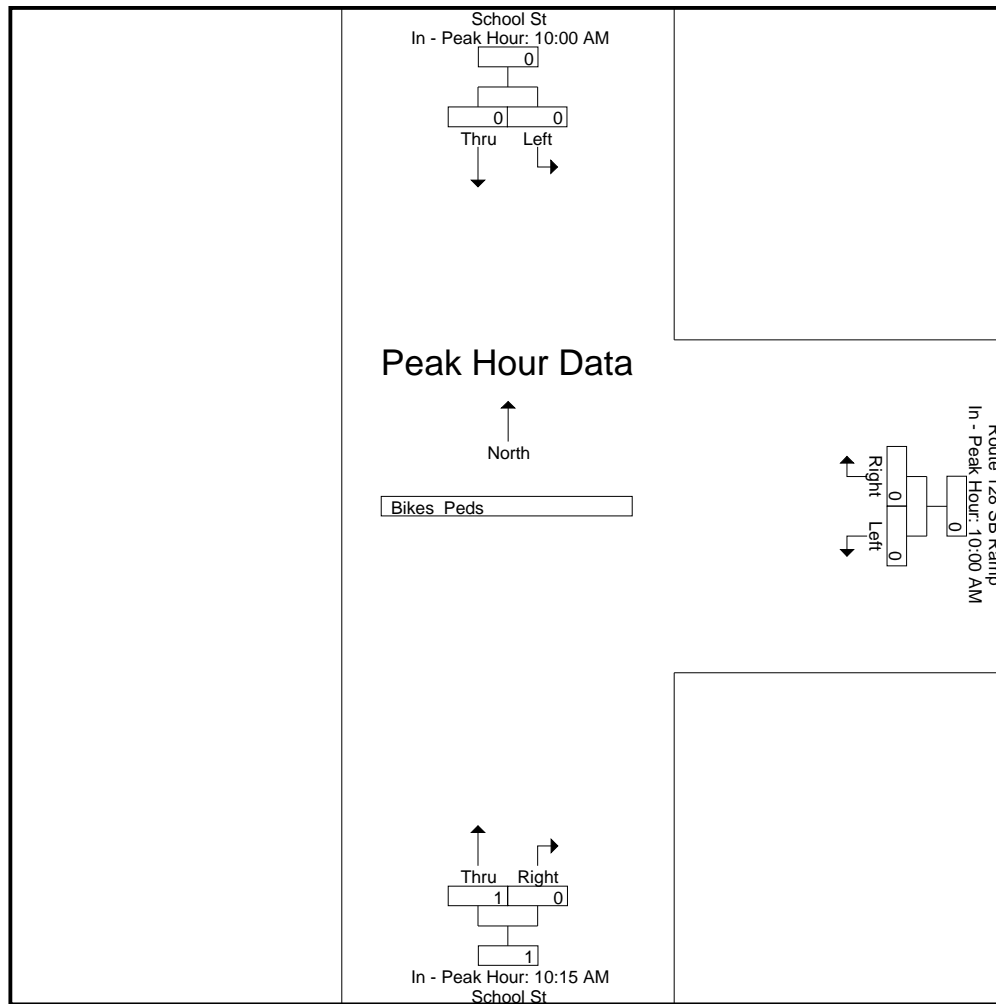
Peak Hour for Each Approach Begins at:

	10:00 AM			10:00 AM			10:15 AM		
+0 mins.	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0
+30 mins.	0	0	0	0	0	0	0	0	0
+45 mins.	0	0	0	0	0	0	1	0	1
Total Volume	0	0	0	0	0	0	1	0	1
% App. Total	0	0		0	0		100	0	
PHF	.000	.000	.000	.000	.000	.000	.250	.000	.250

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 27



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 03:15 PM

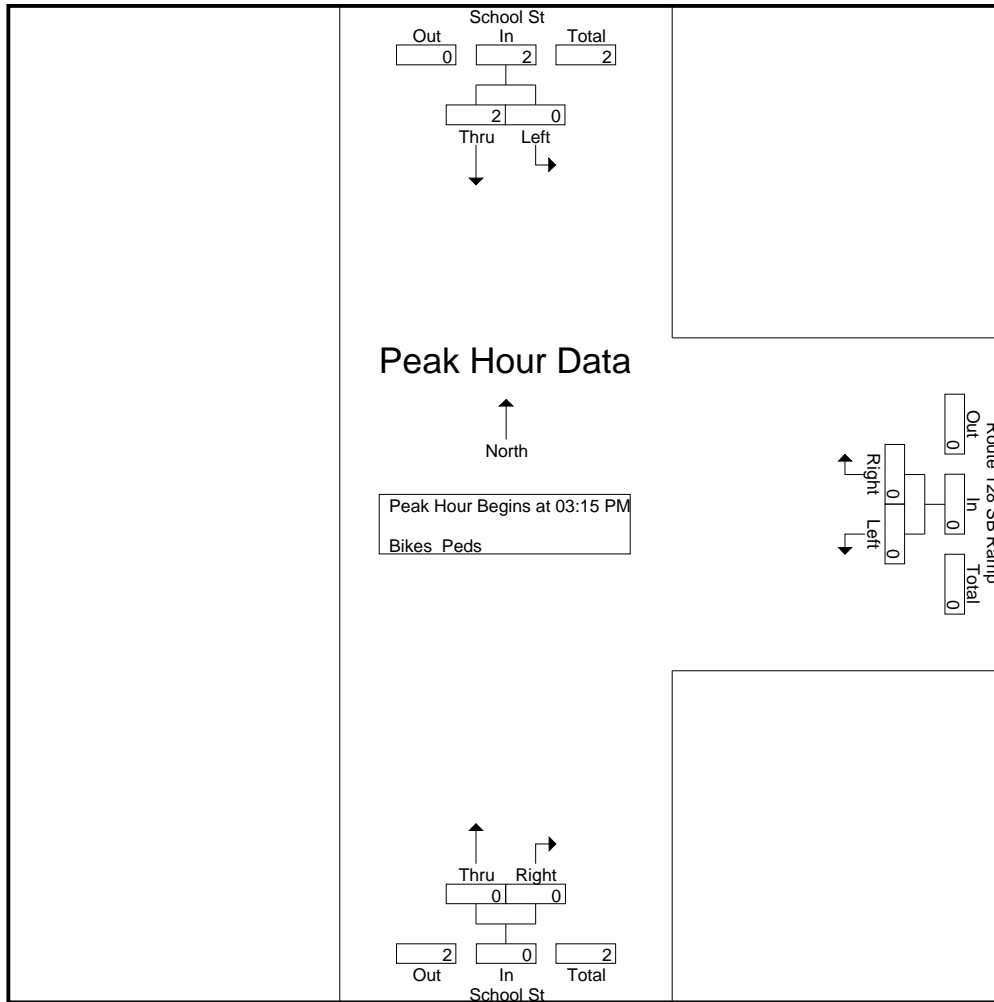
Peak Hour for Entire Intersection Begins at 03:15 PM									
03:15 PM	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0
03:45 PM	0	1	1	0	0	0	0	0	1
04:00 PM	0	1	1	0	0	0	0	0	1
Total Volume	0	2	2	0	0	0	0	0	2
% App. Total	0	100		0	0		0	0	
PHF	.000	.500	.500	.000	.000	.000	.000	.000	.500

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 28



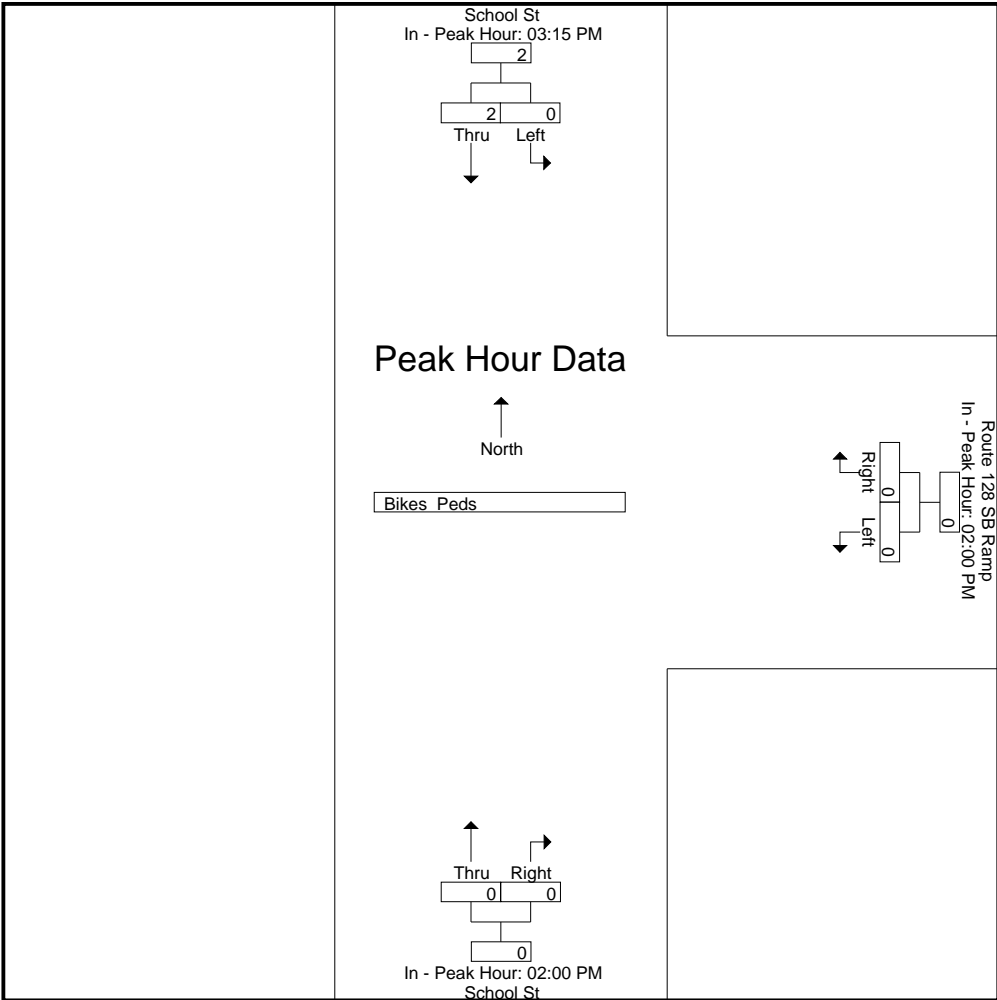
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	03:15 PM			02:00 PM			02:00 PM		
+0 mins.	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0
+30 mins.	0	1	1	0	0	0	0	0	0
+45 mins.	0	1	1	0	0	0	0	0	0
Total Volume	0	2	2	0	0	0	0	0	0
% App. Total	0	100		0	0		0	0	
PHF	.000	.500	.500	.000	.000	.000	.000	.000	.000

N/S Street : School Street
E/W Street : Route 128 SB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990002
Site Code : 11990002
Start Date : 1/11/2023
Page No : 29



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 1

Groups Printed- Cars - Trucks

	School St From North			Mill St From East			School St From South			Route 128 NB Ramp From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	2	38	4	1	2	14	5	38	0	11	1	20	136
07:15 AM	10	85	6	1	2	12	4	58	1	20	2	40	241
07:30 AM	13	64	4	3	4	24	14	108	2	26	1	21	284
07:45 AM	4	56	7	0	0	15	15	92	0	29	6	30	254
Total	29	243	21	5	8	65	38	296	3	86	10	111	915
08:00 AM	0	49	7	0	1	19	11	54	0	12	5	23	181
08:15 AM	1	52	11	3	1	11	12	74	0	30	2	34	231
08:30 AM	1	43	3	1	0	10	21	66	1	29	9	31	215
08:45 AM	3	46	8	0	1	11	14	74	0	26	6	28	217
Total	5	190	29	4	3	51	58	268	1	97	22	116	844
09:00 AM	2	38	12	0	1	11	7	55	2	26	3	16	173
09:15 AM	1	23	3	0	3	7	8	39	1	16	4	28	133
09:30 AM	3	29	4	0	0	14	7	52	0	17	3	15	144
09:45 AM	2	40	8	2	0	14	15	62	0	17	2	23	185
Total	8	130	27	2	4	46	37	208	3	76	12	82	635
10:00 AM	2	34	12	1	2	8	7	46	1	10	4	23	150
10:15 AM	1	42	9	1	0	8	9	60	0	19	4	10	163
10:30 AM	5	30	9	0	1	7	14	54	1	20	3	21	165
10:45 AM	2	34	12	1	2	11	10	46	0	10	3	25	156
Total	10	140	42	3	5	34	40	206	2	59	14	79	634
11:00 AM	2	40	4	0	1	9	20	45	0	15	3	24	163
11:15 AM	4	38	10	0	1	8	5	38	1	17	3	19	144
11:30 AM	4	41	8	0	2	13	18	45	0	17	4	30	182
11:45 AM	1	49	8	1	4	11	12	56	1	24	5	26	198
Total	11	168	30	1	8	41	55	184	2	73	15	99	687
12:00 PM	7	49	16	1	2	14	12	51	2	19	3	31	207
12:15 PM	3	39	11	1	1	12	21	49	1	16	8	20	182
12:30 PM	4	30	8	1	1	7	22	62	1	25	3	28	192
12:45 PM	2	35	8	0	1	4	13	46	1	19	4	23	156
Total	16	153	43	3	5	37	68	208	5	79	18	102	737
01:00 PM	6	32	7	1	0	10	7	51	3	15	6	20	158
01:15 PM	2	32	5	0	0	3	7	53	0	13	5	30	150
01:30 PM	5	47	7	1	2	4	18	45	1	15	5	17	167
01:45 PM	2	49	6	1	0	6	14	43	2	22	5	28	178
Total	15	160	25	3	2	23	46	192	6	65	21	95	653
02:00 PM	5	48	7	0	3	7	18	42	1	26	5	39	201
02:15 PM	5	39	9	0	1	11	16	90	1	27	9	32	240
02:30 PM	1	36	10	0	0	7	21	84	2	22	18	28	229
02:45 PM	0	47	10	3	0	12	16	78	4	29	4	34	237
Total	11	170	36	3	4	37	71	294	8	104	36	133	907
03:00 PM	3	35	3	1	2	9	20	88	4	24	5	38	232
03:15 PM	5	51	7	0	0	16	23	78	2	31	6	45	264
03:30 PM	1	39	14	1	0	15	21	82	1	20	8	44	246
03:45 PM	0	53	10	0	0	4	15	76	2	24	5	46	235
Total	9	178	34	2	2	44	79	324	9	99	24	173	977
04:00 PM	2	42	14	1	0	3	16	64	1	40	12	57	252
04:15 PM	6	47	15	2	1	7	16	72	0	39	9	37	251
04:30 PM	6	52	13	3	2	6	10	61	2	32	9	43	239
04:45 PM	3	50	8	1	1	8	9	53	2	35	8	39	217
Total	17	191	50	7	4	24	51	250	5	146	38	176	959
05:00 PM	4	43	6	0	0	8	17	70	2	35	6	50	241
05:15 PM	2	46	5	1	0	13	12	49	2	26	3	44	203
05:30 PM	4	38	8	1	0	12	16	61	3	27	6	42	218

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 2

Groups Printed- Cars - Trucks

	School St From North			Mill St From East			School St From South			Route 128 NB Ramp From West			Int. Total
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
05:45 PM	3	27	5	3	1	5	12	60	0	16	4	38	174
Total	13	154	24	5	1	38	57	240	7	104	19	174	836
06:00 PM	3	30	5	0	2	4	11	38	0	24	7	28	152
06:15 PM	5	32	2	0	0	2	14	28	0	24	6	37	150
06:30 PM	2	22	3	0	0	4	9	38	0	20	3	28	129
06:45 PM	2	34	3	1	1	11	12	27	2	17	1	24	135
Total	12	118	13	1	3	21	46	131	2	85	17	117	566
Grand Total	156	1995	374	39	49	461	646	2801	53	1073	246	1457	9350
Apprch %	6.2	79	14.8	7.1	8.9	84	18.5	80	1.5	38.7	8.9	52.5	
Total %	1.7	21.3	4	0.4	0.5	4.9	6.9	30	0.6	11.5	2.6	15.6	
Cars	152	1964	360	37	46	447	636	2760	53	1048	245	1426	9174
% Cars	97.4	98.4	96.3	94.9	93.9	97	98.5	98.5	100	97.7	99.6	97.9	98.1
Trucks	4	31	14	2	3	14	10	41	0	25	1	31	176
% Trucks	2.6	1.6	3.7	5.1	6.1	3	1.5	1.5	0	2.3	0.4	2.1	1.9

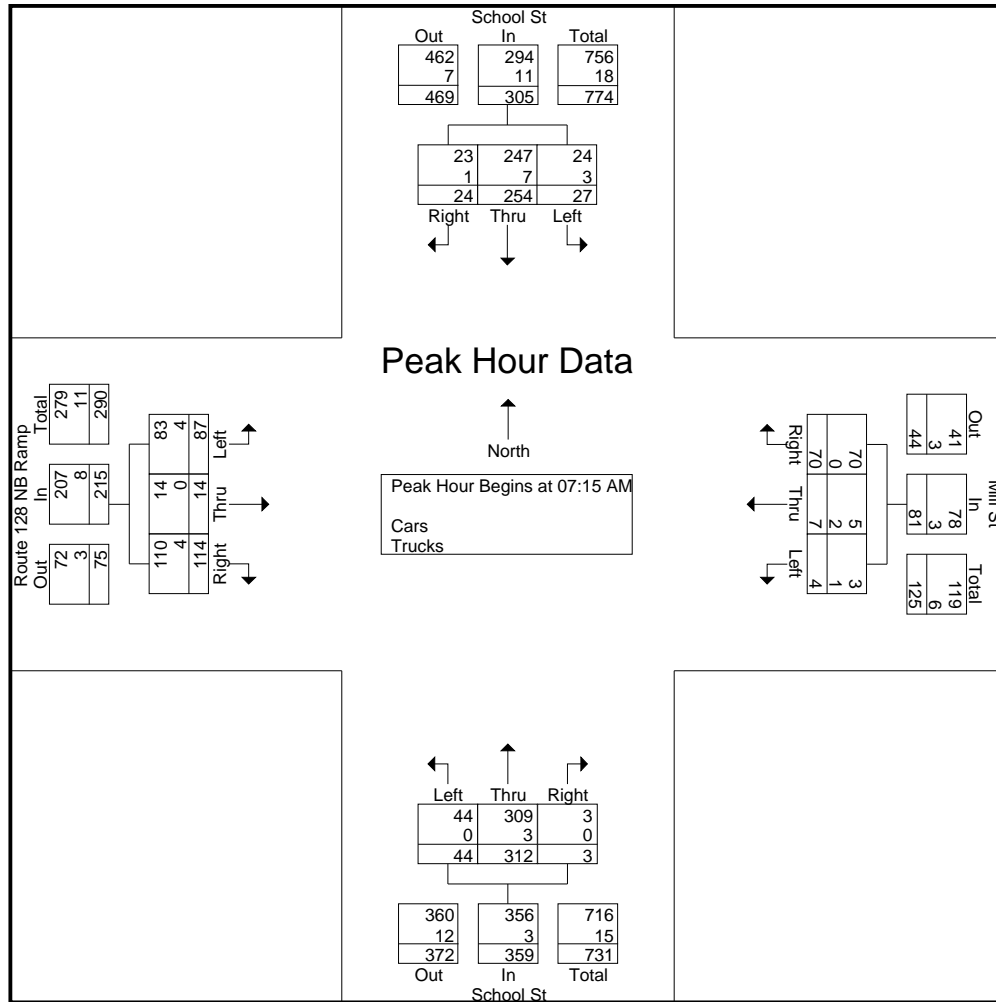
	School St From North				Mill St From East				School St From South				Route 128 NB Ramp From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	10	85	6	101	1	2	12	15	4	58	1	63	20	2	40	62	241
07:30 AM	13	64	4	81	3	4	24	31	14	108	2	124	26	1	21	48	284
07:45 AM	4	56	7	67	0	0	15	15	15	92	0	107	29	6	30	65	254
08:00 AM	0	49	7	56	0	1	19	20	11	54	0	65	12	5	23	40	181
Total Volume	27	254	24	305	4	7	70	81	44	312	3	359	87	14	114	215	960
% App. Total	8.9	83.3	7.9		4.9	8.6	86.4		12.3	86.9	0.8		40.5	6.5	53		
PHF	.519	.747	.857	.755	.333	.438	.729	.653	.733	.722	.375	.724	.750	.583	.713	.827	.845
Cars	24	247	23	294	3	5	70	78	44	309	3	356	83	14	110	207	935
% Cars	88.9	97.2	95.8	96.4	75.0	71.4	100	96.3	100	99.0	100	99.2	95.4	100	96.5	96.3	97.4
Trucks	3	7	1	11	1	2	0	3	0	3	0	3	4	0	4	8	25
% Trucks	11.1	2.8	4.2	3.6	25.0	28.6	0	3.7	0	1.0	0	0.8	4.6	0	3.5	3.7	2.6

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 3



Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

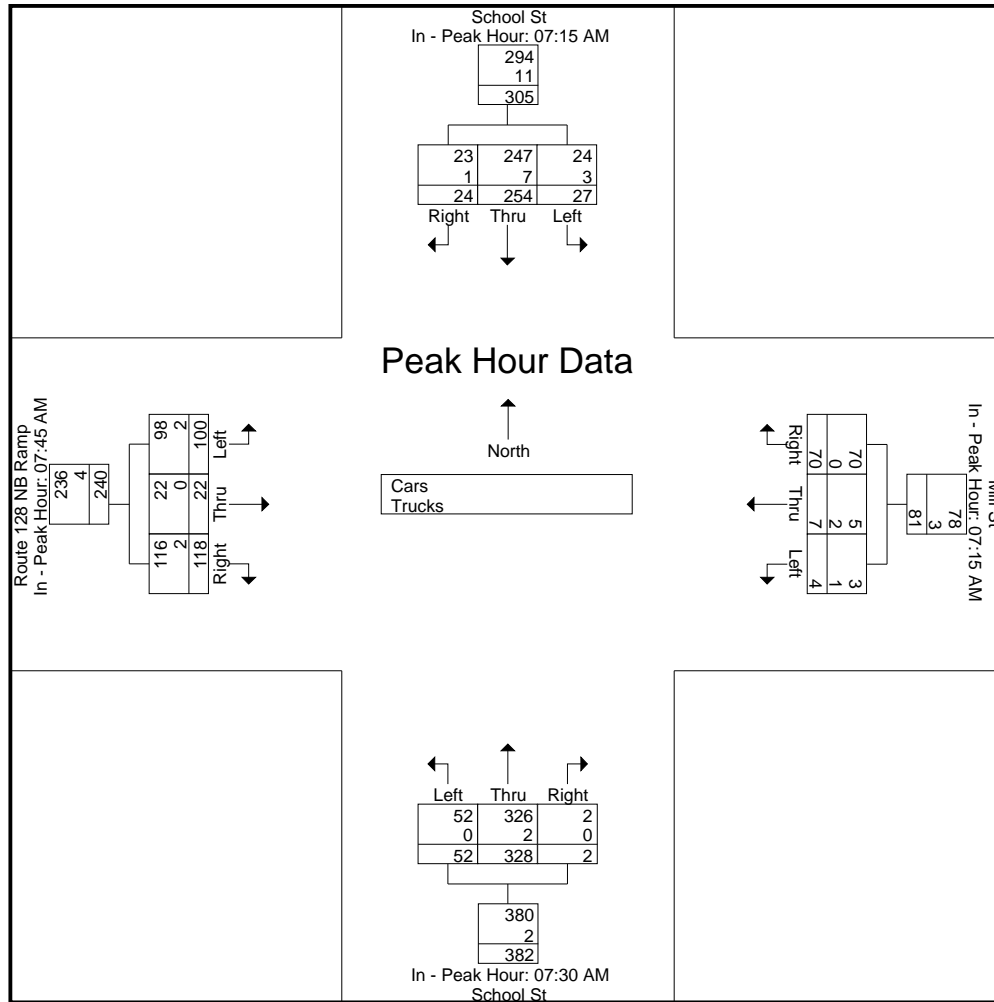
	07:15 AM				07:15 AM				07:30 AM				07:45 AM			
+0 mins.	10	85	6	101	1	2	12	15	14	108	2	124	29	6	30	65
+15 mins.	13	64	4	81	3	4	24	31	15	92	0	107	12	5	23	40
+30 mins.	4	56	7	67	0	0	15	15	11	54	0	65	30	2	34	66
+45 mins.	0	49	7	56	0	1	19	20	12	74	0	86	29	9	31	69
Total Volume	27	254	24	305	4	7	70	81	52	328	2	382	100	22	118	240
% App. Total	8.9	83.3	7.9		4.9	8.6	86.4		13.6	85.9	0.5		41.7	9.2	49.2	
PHF	.519	.747	.857	.755	.333	.438	.729	.653	.867	.759	.250	.770	.833	.611	.868	.870
Cars	24	247	23	294	3	5	70	78	52	326	2	380	98	22	116	236
% Cars	88.9	97.2	95.8	96.4	75	71.4	100	96.3	100	99.4	100	99.5	98	100	98.3	98.3
Trucks	3	7	1	11	1	2	0	3	0	2	0	2	2	0	2	4
% Trucks	11.1	2.8	4.2	3.6	25	28.6	0	3.7	0	0.6	0	0.5	2	0	1.7	1.7

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 4



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 11:45 AM

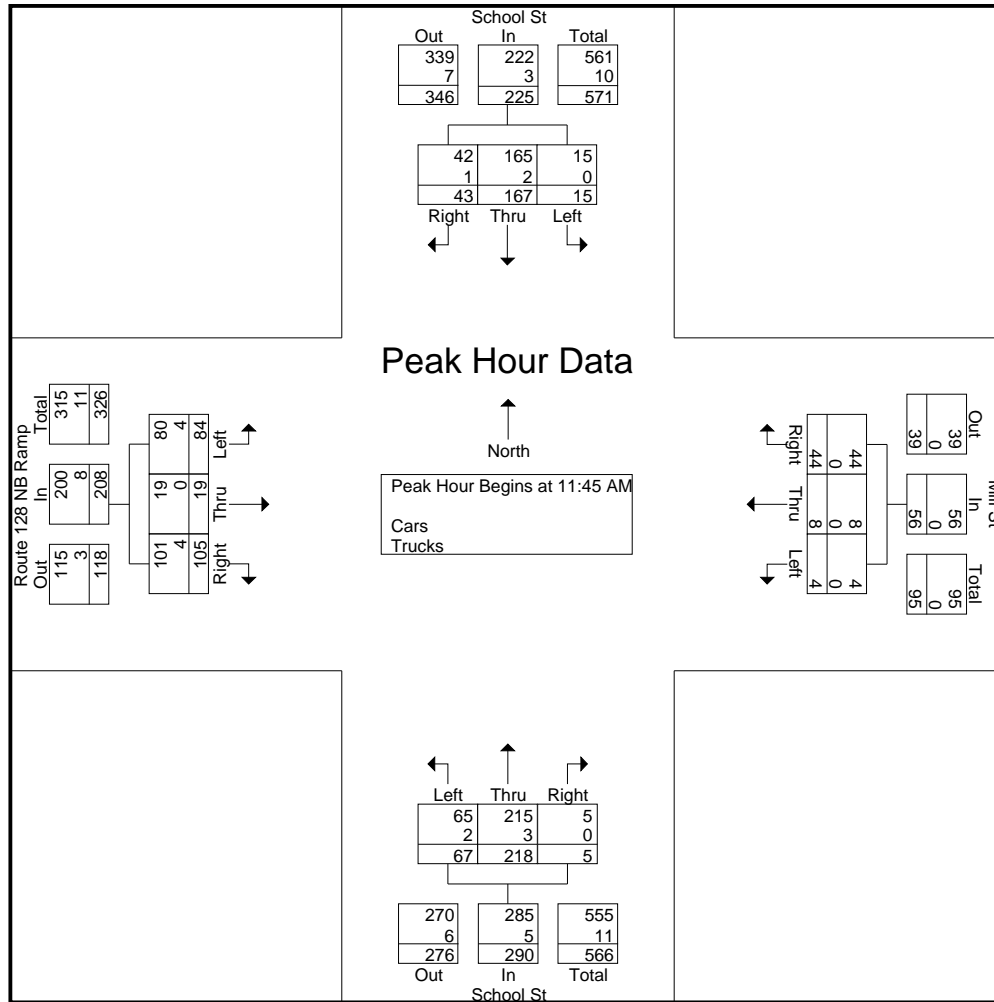
11:45 AM	1	49	8	58	1	4	11	16	12	56	1	69	24	5	26	55	198
12:00 PM	7	49	16	72	1	2	14	17	12	51	2	65	19	3	31	53	207
12:15 PM	3	39	11	53	1	1	12	14	21	49	1	71	16	8	20	44	182
12:30 PM	4	30	8	42	1	1	7	9	22	62	1	85	25	3	28	56	192
Total Volume	15	167	43	225	4	8	44	56	67	218	5	290	84	19	105	208	779
% App. Total	6.7	74.2	19.1		7.1	14.3	78.6		23.1	75.2	1.7		40.4	9.1	50.5		
PHF	.536	.852	.672	.781	1.00	.500	.786	.824	.761	.879	.625	.853	.840	.594	.847	.929	.941
Cars	15	165	42	222	4	8	44	56	65	215	5	285	80	19	101	200	763
% Cars	100	98.8	97.7	98.7	100	100	100	100	97.0	98.6	100	98.3	95.2	100	96.2	96.2	97.9
Trucks	0	2	1	3	0	0	0	0	2	3	0	5	4	0	4	8	16
% Trucks	0	1.2	2.3	1.3	0	0	0	0	3.0	1.4	0	1.7	4.8	0	3.8	3.8	2.1

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 5



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

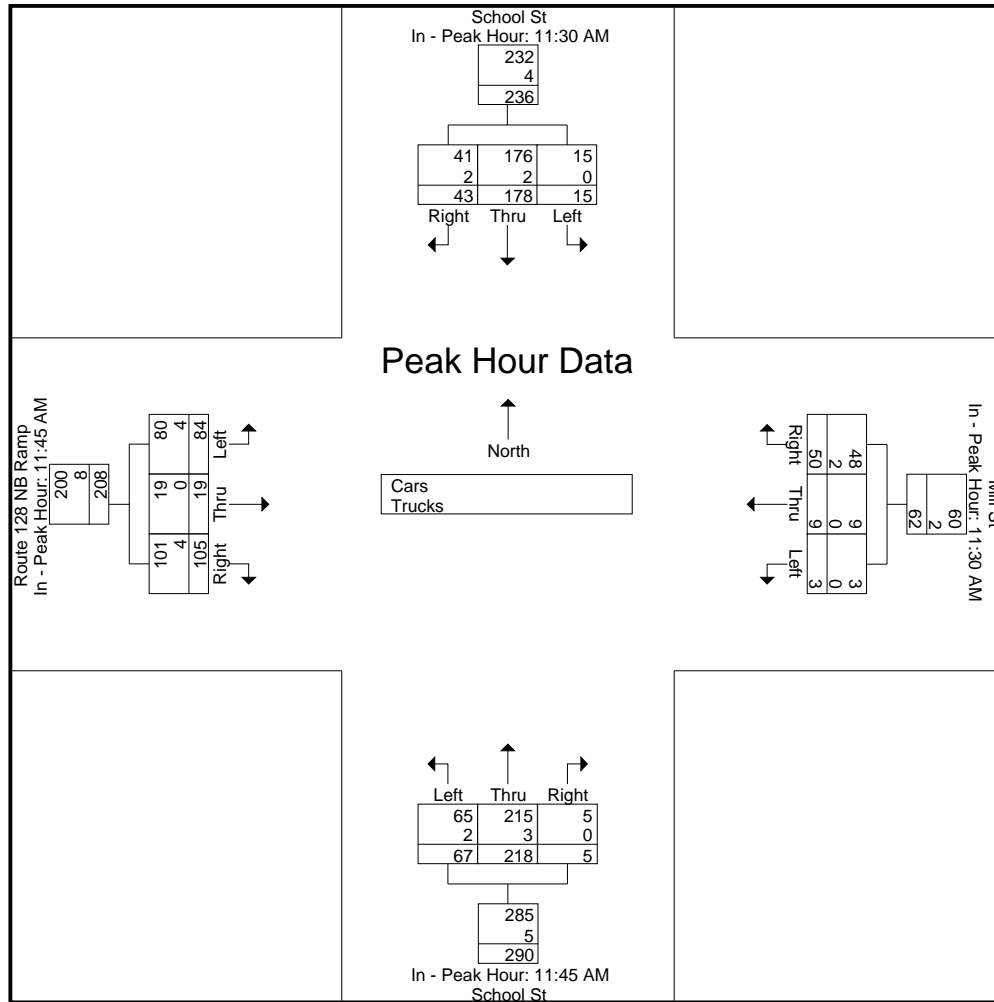
	11:30 AM				11:30 AM				11:45 AM				11:45 AM			
+0 mins.	4	41	8	53	0	2	13	15	12	56	1	69	24	5	26	55
+15 mins.	1	49	8	58	1	4	11	16	12	51	2	65	19	3	31	53
+30 mins.	7	49	16	72	1	2	14	17	21	49	1	71	16	8	20	44
+45 mins.	3	39	11	53	1	1	12	14	22	62	1	85	25	3	28	56
Total Volume	15	178	43	236	3	9	50	62	67	218	5	290	84	19	105	208
% App. Total	6.4	75.4	18.2		4.8	14.5	80.6		23.1	75.2	1.7		40.4	9.1	50.5	
PHF	.536	.908	.672	.819	.750	.563	.893	.912	.761	.879	.625	.853	.840	.594	.847	.929
Cars	15	176	41	232	3	9	48	60	65	215	5	285	80	19	101	200
% Cars	100	98.9	95.3	98.3	100	100	96	96.8	97	98.6	100	98.3	95.2	100	96.2	96.2
Trucks	0	2	2	4	0	0	2	2	2	3	0	5	4	0	4	8
% Trucks	0	1.1	4.7	1.7	0	0	4	3.2	3	1.4	0	1.7	4.8	0	3.8	3.8

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 6



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 03:15 PM

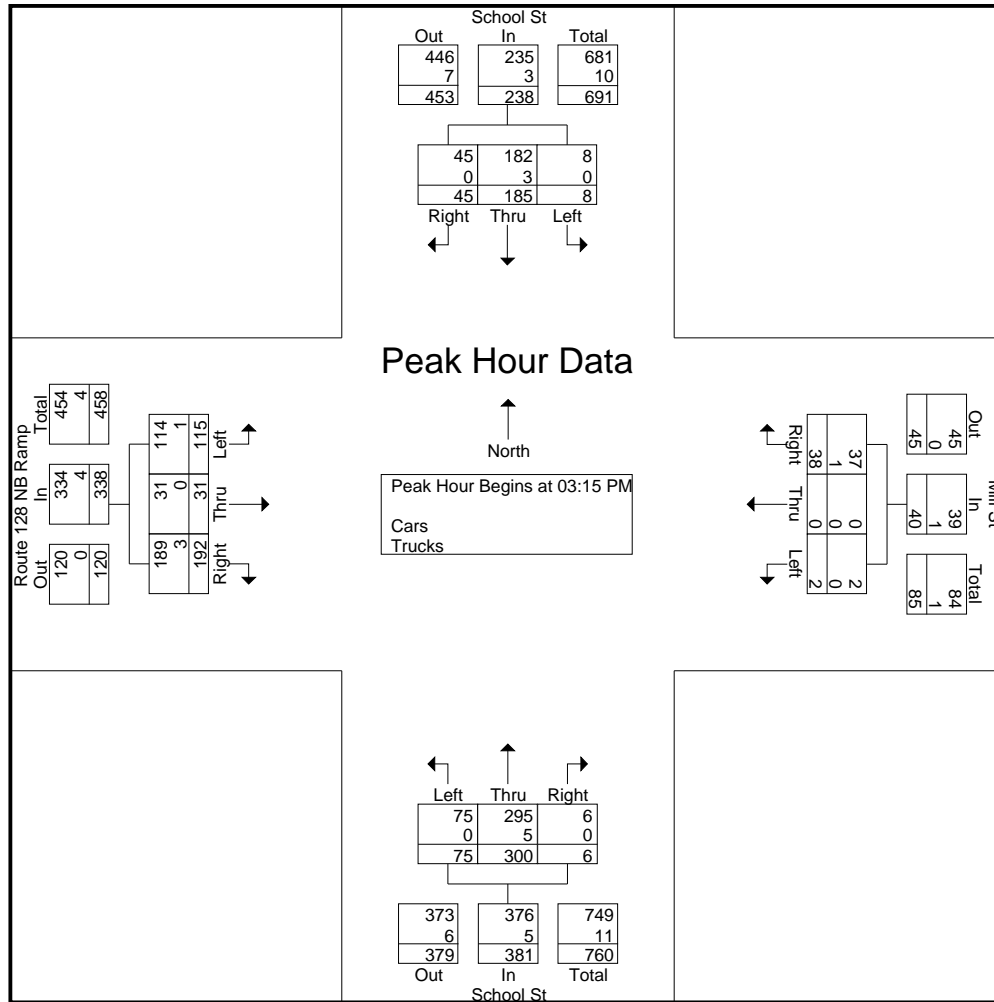
03:15 PM	5	51	7	63	0	0	16	16	23	78	2	103	31	6	45	82	264
03:30 PM	1	39	14	54	1	0	15	16	21	82	1	104	20	8	44	72	246
03:45 PM	0	53	10	63	0	0	4	4	15	76	2	93	24	5	46	75	235
04:00 PM	2	42	14	58	1	0	3	4	16	64	1	81	40	12	57	109	252
Total Volume	8	185	45	238	2	0	38	40	75	300	6	381	115	31	192	338	997
% App. Total	3.4	77.7	18.9		5	0	95		19.7	78.7	1.6		34	9.2	56.8		
PHF	.400	.873	.804	.944	.500	.000	.594	.625	.815	.915	.750	.916	.719	.646	.842	.775	.944
Cars	8	182	45	235	2	0	37	39	75	295	6	376	114	31	189	334	984
% Cars	100	98.4	100	98.7	100	0	97.4	97.5	100	98.3	100	98.7	99.1	100	98.4	98.8	98.7
Trucks	0	3	0	3	0	0	1	1	0	5	0	5	1	0	3	4	13
% Trucks	0	1.6	0	1.3	0	0	2.6	2.5	0	1.7	0	1.3	0.9	0	1.6	1.2	1.3

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 7



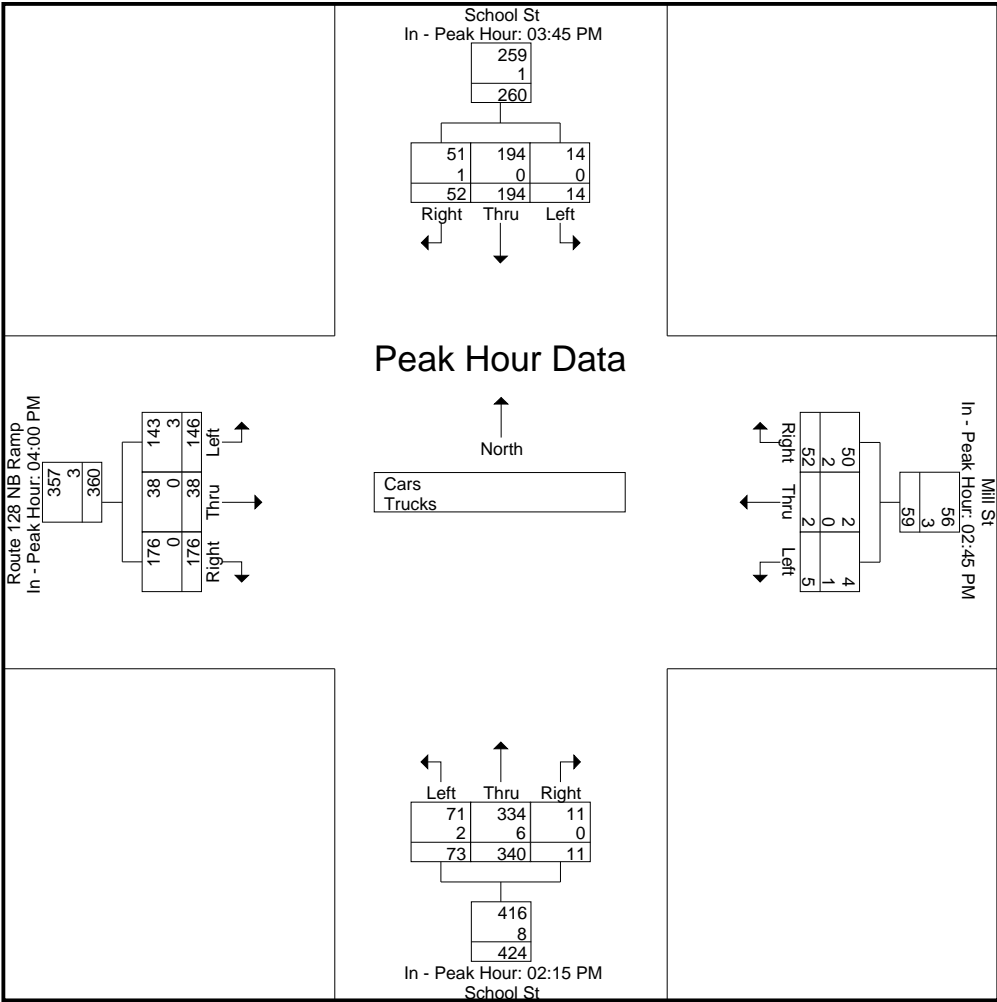
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	03:45 PM				02:45 PM				02:15 PM				04:00 PM			
+0 mins.	0	53	10	63	3	0	12	15	16	90	1	107	40	12	57	109
+15 mins.	2	42	14	58	1	2	9	12	21	84	2	107	39	9	37	85
+30 mins.	6	47	15	68	0	0	16	16	16	78	4	98	32	9	43	84
+45 mins.	6	52	13	71	1	0	15	16	20	88	4	112	35	8	39	82
Total Volume	14	194	52	260	5	2	52	59	73	340	11	424	146	38	176	360
% App. Total	5.4	74.6	20		8.5	3.4	88.1		17.2	80.2	2.6		40.6	10.6	48.9	
PHF	.583	.915	.867	.915	.417	.250	.813	.922	.869	.944	.688	.946	.913	.792	.772	.826
Cars	14	194	51	259	4	2	50	56	71	334	11	416	143	38	176	357
% Cars	100	100	98.1	99.6	80	100	96.2	94.9	97.3	98.2	100	98.1	97.9	100	100	99.2
Trucks	0	0	1	1	1	0	2	3	2	6	0	8	3	0	0	3
% Trucks	0	0	1.9	0.4	20	0	3.8	5.1	2.7	1.8	0	1.9	2.1	0	0	0.8

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 8



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 9

Groups Printed- Cars

	School St From North			Mill St From East			School St From South			Route 128 NB Ramp From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	2	38	2	1	2	13	5	38	0	11	1	18	131
07:15 AM	7	81	5	1	1	12	4	56	1	18	2	38	226
07:30 AM	13	63	4	2	3	24	14	108	2	25	1	20	279
07:45 AM	4	54	7	0	0	15	15	92	0	29	6	29	251
Total	26	236	18	4	6	64	38	294	3	83	10	105	887
08:00 AM	0	49	7	0	1	19	11	53	0	11	5	23	179
08:15 AM	1	51	11	3	1	11	12	73	0	30	2	34	229
08:30 AM	1	42	2	1	0	10	21	66	1	28	9	30	211
08:45 AM	2	44	8	0	1	11	14	72	0	25	6	25	208
Total	4	186	28	4	3	51	58	264	1	94	22	112	827
09:00 AM	2	38	11	0	1	11	6	54	2	26	3	16	170
09:15 AM	1	23	3	0	3	7	8	37	1	16	4	27	130
09:30 AM	3	29	4	0	0	14	6	51	0	16	3	14	140
09:45 AM	2	40	7	2	0	14	15	60	0	16	2	22	180
Total	8	130	25	2	4	46	35	202	3	74	12	79	620
10:00 AM	2	33	11	1	2	8	7	44	1	10	4	23	146
10:15 AM	1	40	8	1	0	8	9	60	0	18	3	10	158
10:30 AM	5	29	9	0	1	7	14	54	1	19	3	19	161
10:45 AM	2	34	11	1	2	5	9	45	0	9	3	23	144
Total	10	136	39	3	5	28	39	203	2	56	13	75	609
11:00 AM	2	40	3	0	1	8	18	43	0	14	3	24	156
11:15 AM	4	37	10	0	1	8	5	35	1	17	3	18	139
11:30 AM	4	41	7	0	2	11	18	45	0	16	4	29	177
11:45 AM	1	49	8	1	4	11	11	56	1	23	5	25	195
Total	11	167	28	1	8	38	52	179	2	70	15	96	667
12:00 PM	7	48	15	1	2	14	12	50	2	19	3	29	202
12:15 PM	3	38	11	1	1	12	20	48	1	16	8	19	178
12:30 PM	4	30	8	1	1	7	22	61	1	22	3	28	188
12:45 PM	2	35	8	0	1	4	12	45	1	19	4	22	153
Total	16	151	42	3	5	37	66	204	5	76	18	98	721
01:00 PM	6	31	7	1	0	10	7	51	3	15	6	20	157
01:15 PM	2	32	4	0	0	3	7	52	0	12	5	30	147
01:30 PM	5	47	7	1	1	4	18	45	1	14	5	16	164
01:45 PM	2	46	6	1	0	6	14	42	2	21	5	28	173
Total	15	156	24	3	1	23	46	190	6	62	21	94	641
02:00 PM	5	46	7	0	3	6	18	42	1	25	5	39	197
02:15 PM	5	39	9	0	1	11	16	86	1	27	9	31	235
02:30 PM	1	35	10	0	0	6	20	84	2	22	18	28	226
02:45 PM	0	46	10	2	0	11	16	77	4	29	4	34	233
Total	11	166	36	2	4	34	70	289	8	103	36	132	891
03:00 PM	3	34	3	1	2	9	19	87	4	24	5	37	228
03:15 PM	5	49	7	0	0	15	23	76	2	31	6	44	258
03:30 PM	1	38	14	1	0	15	21	81	1	20	8	42	242
03:45 PM	0	53	10	0	0	4	15	76	2	23	5	46	234
Total	9	174	34	2	2	43	78	320	9	98	24	169	962
04:00 PM	2	42	14	1	0	3	16	62	1	40	12	57	250
04:15 PM	6	47	14	2	1	7	16	71	0	39	9	37	249
04:30 PM	6	52	13	3	2	6	10	61	2	31	9	43	238
04:45 PM	3	50	8	1	1	8	9	52	2	33	8	39	214
Total	17	191	49	7	4	24	51	246	5	143	38	176	951
05:00 PM	4	42	6	0	0	8	17	70	2	35	6	50	240
05:15 PM	2	46	5	1	0	13	12	49	2	26	3	44	203
05:30 PM	4	38	8	1	0	12	16	60	3	27	6	42	217
05:45 PM	3	27	5	3	1	5	12	59	0	16	4	38	173
Total	13	153	24	5	1	38	57	238	7	104	19	174	833

Accurate Counts

978-664-2565

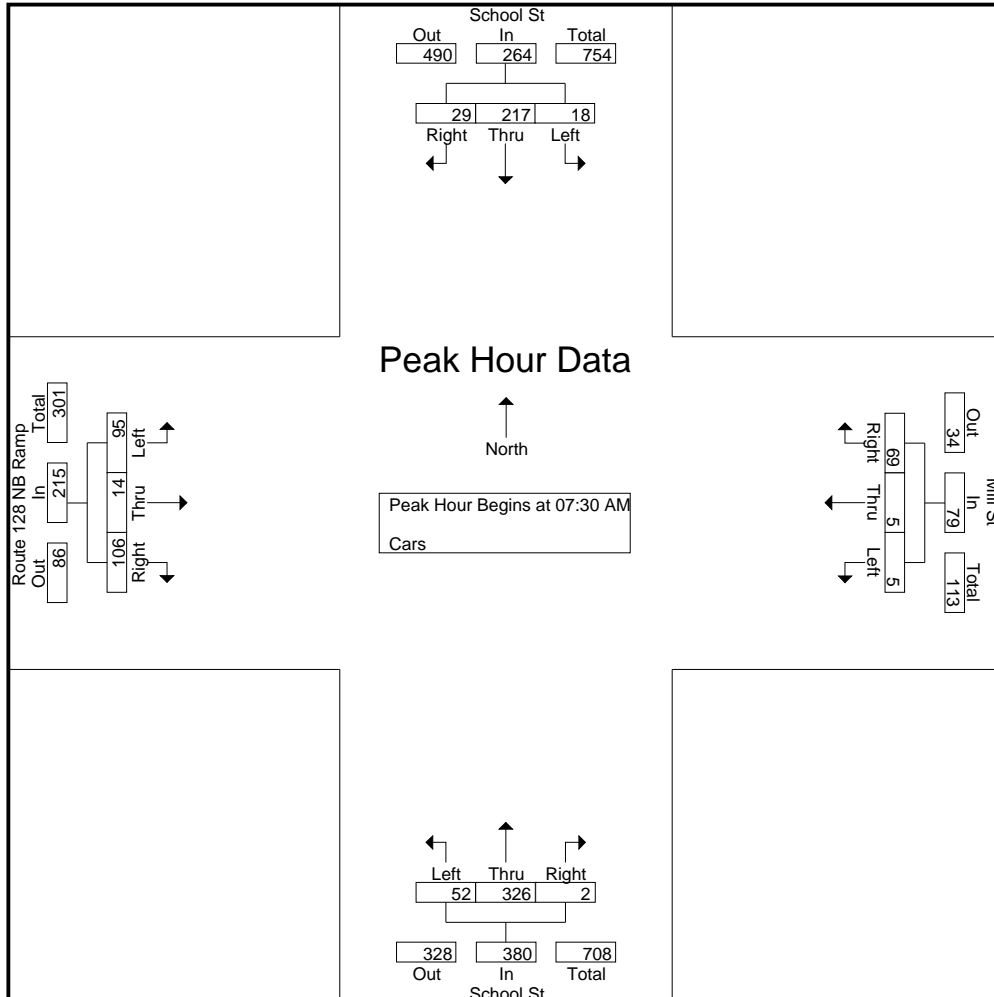
N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 10

Groups Printed- Cars

	School St From North			Mill St From East			School St From South			Route 128 NB Ramp From West			Int. Total
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
06:00 PM	3	30	5	0	2	4	11	38	0	24	7	28	152
06:15 PM	5	32	2	0	0	2	14	28	0	24	6	37	150
06:30 PM	2	22	3	0	0	4	9	38	0	20	3	27	128
06:45 PM	2	34	3	1	1	11	12	27	2	17	1	24	135
Total	12	118	13	1	3	21	46	131	2	85	17	116	565
Grand Total	152	1964	360	37	46	447	636	2760	53	1048	245	1426	9174
Apprch %	6.1	79.3	14.5	7	8.7	84.3	18.4	80	1.5	38.5	9	52.4	
Total %	1.7	21.4	3.9	0.4	0.5	4.9	6.9	30.1	0.6	11.4	2.7	15.5	

	School St From North				Mill St From East				School St From South				Route 128 NB Ramp From West				Int. Total
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	13	63	4	80	2	3	24	29	14	108	2	124	25	1	20	46	279
07:45 AM	4	54	7	65	0	0	15	15	15	92	0	107	29	6	29	64	251
08:00 AM	0	49	7	56	0	1	19	20	11	53	0	64	11	5	23	39	179
08:15 AM	1	51	11	63	3	1	11	15	12	73	0	85	30	2	34	66	229
Total Volume	18	217	29	264	5	5	69	79	52	326	2	380	95	14	106	215	938
% App. Total	6.8	82.2	11		6.3	6.3	87.3		13.7	85.8	0.5		44.2	6.5	49.3		
PHF	.346	.861	.659	.825	.417	.417	.719	.681	.867	.755	.250	.766	.792	.583	.779	.814	.841



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

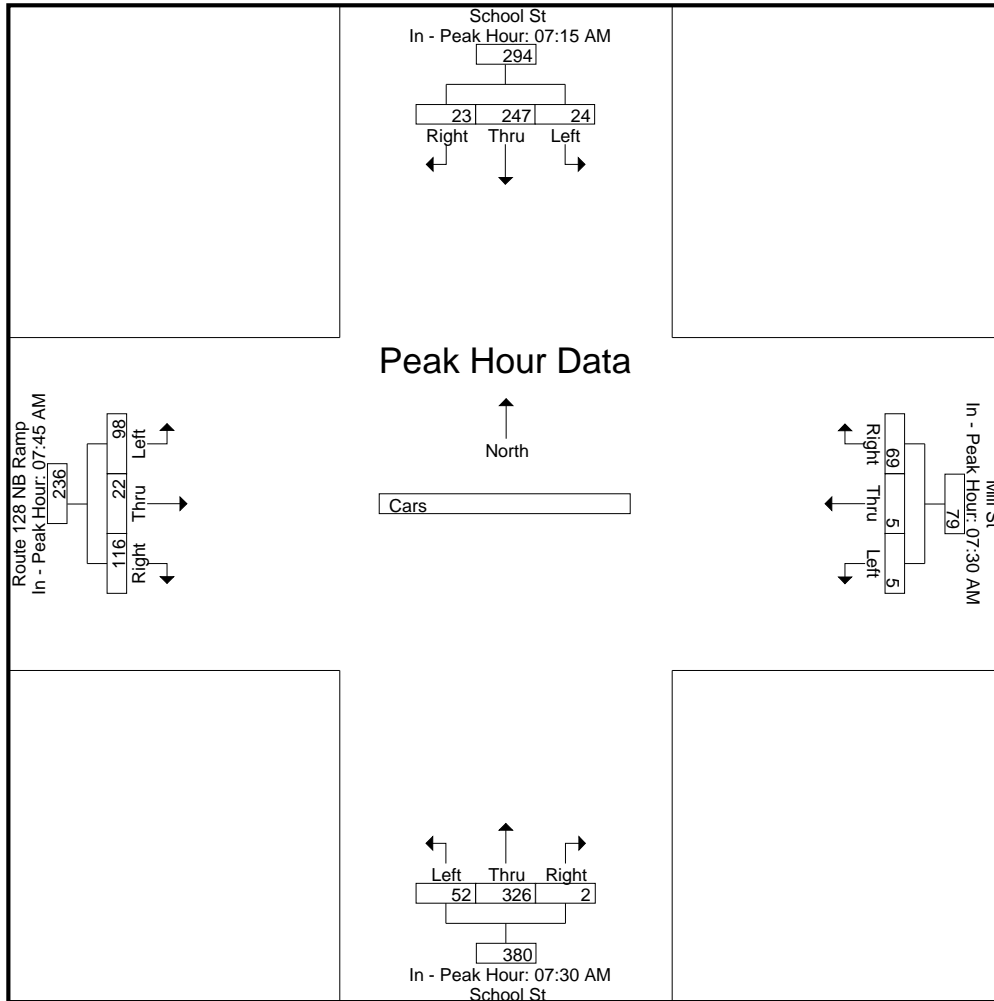
File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 11

	School St From North				Mill St From East				School St From South				Route 128 NB Ramp 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 09:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:15 AM				07:30 AM				07:30 AM				07:45 AM				
+0 mins.	7	81	5	93	2	3	24	29	14	108	2	124	29	6	29	64	
+15 mins.	13	63	4	80	0	0	15	15	15	92	0	107	11	5	23	39	
+30 mins.	4	54	7	65	0	1	19	20	11	53	0	64	30	2	34	66	
+45 mins.	0	49	7	56	3	1	11	15	12	73	0	85	28	9	30	67	
Total Volume	24	247	23	294	5	5	69	79	52	326	2	380	98	22	116	236	
% App. Total	8.2	84	7.8		6.3	6.3	87.3		13.7	85.8	0.5		41.5	9.3	49.2		
PHF	.462	.762	.821	.790	.417	.417	.719	.681	.867	.755	.250	.766	.817	.611	.853	.881	



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 11:45 AM

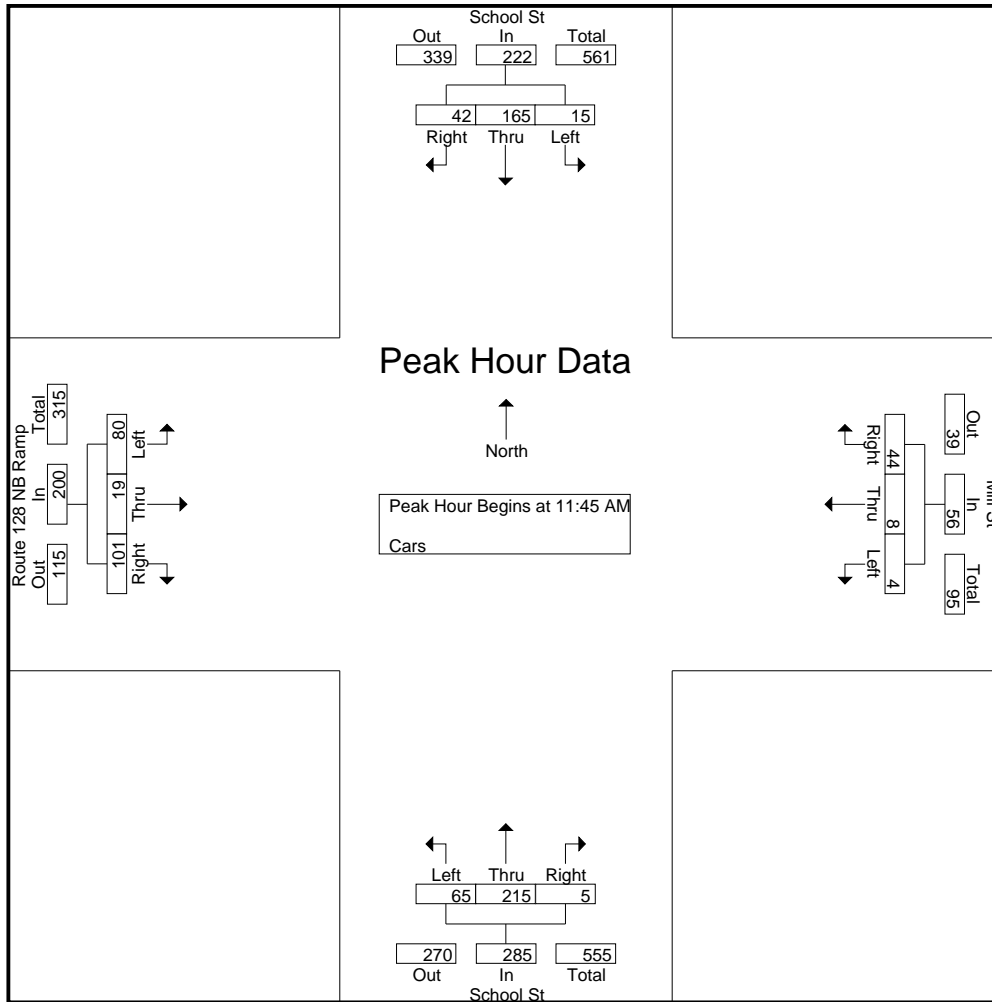
11:45 AM	1	49	8	58	1	4	11	16	11	56	1	68	23	5	25	53	195
12:00 PM	7	48	15	70	1	2	14	17	12	50	2	64	19	3	29	51	202
12:15 PM	3	38	11	52	1	1	12	14	20	48	1	69	16	8	19	43	178
12:30 PM	4	30	8	42	1	1	7	9	22	61	1	84	22	3	28	53	188
Total Volume	15	165	42	222	4	8	44	56	65	215	5	285	80	19	101	200	763
% App. Total	6.8	74.3	18.9		7.1	14.3	78.6		22.8	75.4	1.8		40	9.5	50.5		
PHF	.536	.842	.700	.793	1.00	.500	.786	.824	.739	.881	.625	.848	.870	.594	.871	.943	.944

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 12



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

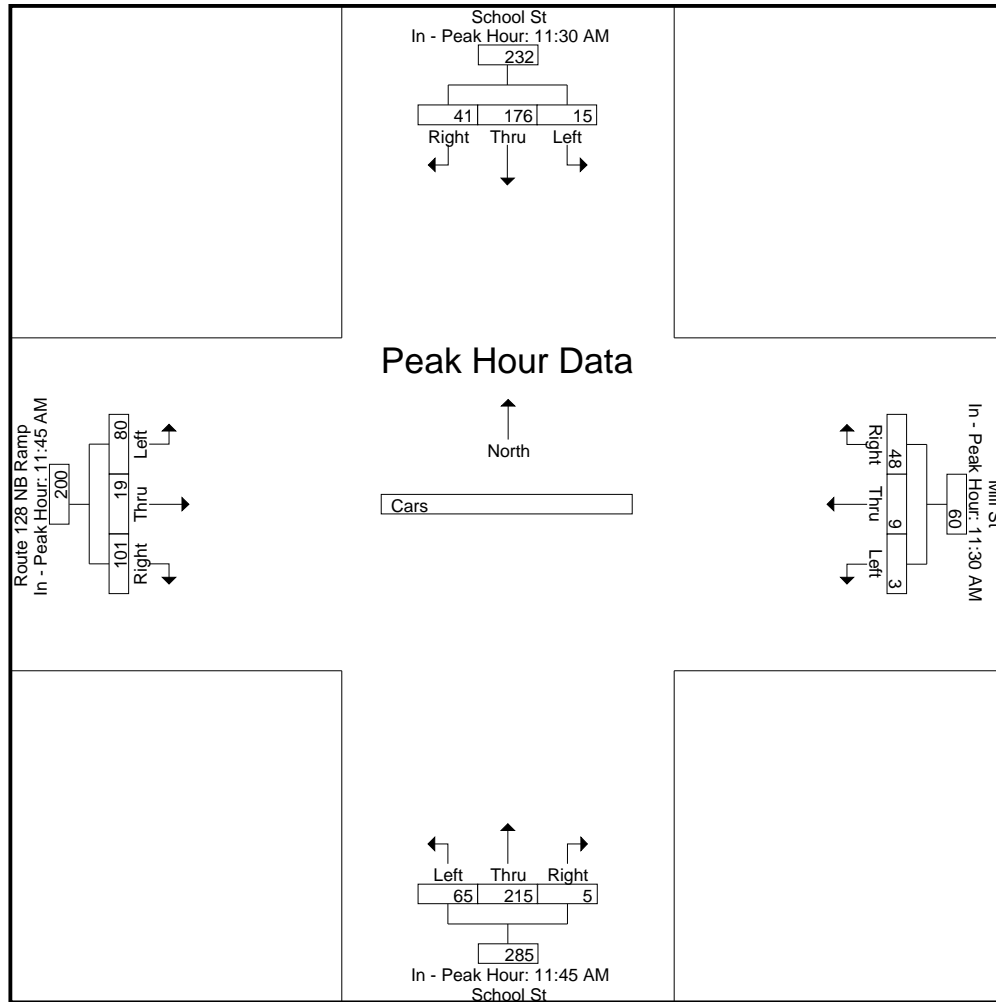
	11:30 AM				11:30 AM				11:45 AM				11:45 AM			
+0 mins.	4	41	7	52	0	2	11	13	11	56	1	68	23	5	25	53
+15 mins.	1	49	8	58	1	4	11	16	12	50	2	64	19	3	29	51
+30 mins.	7	48	15	70	1	2	14	17	20	48	1	69	16	8	19	43
+45 mins.	3	38	11	52	1	1	12	14	22	61	1	84	22	3	28	53
Total Volume	15	176	41	232	3	9	48	60	65	215	5	285	80	19	101	200
% App. Total	6.5	75.9	17.7		5	15	80		22.8	75.4	1.8		40	9.5	50.5	
PHF	.536	.898	.683	.829	.750	.563	.857	.882	.739	.881	.625	.848	.870	.594	.871	.943

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 13



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 03:15 PM

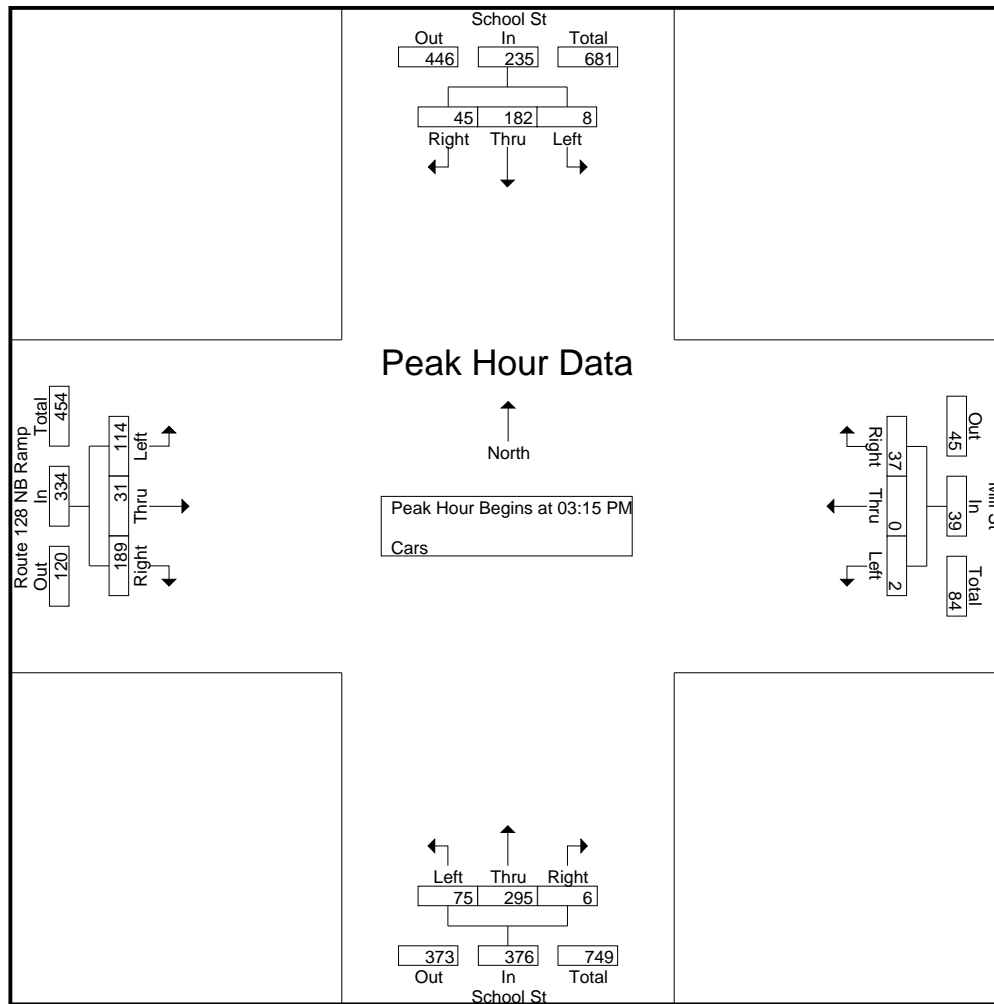
03:15 PM	5	49	7	61	0	0	15	15	23	76	2	101	31	6	44	81	258
03:30 PM	1	38	14	53	1	0	15	16	21	81	1	103	20	8	42	70	242
03:45 PM	0	53	10	63	0	0	4	4	15	76	2	93	23	5	46	74	234
04:00 PM	2	42	14	58	1	0	3	4	16	62	1	79	40	12	57	109	250
Total Volume	8	182	45	235	2	0	37	39	75	295	6	376	114	31	189	334	984
% App. Total	3.4	77.4	19.1		5.1	0	94.9		19.9	78.5	1.6		34.1	9.3	56.6		
PHF	.400	.858	.804	.933	.500	.000	.617	.609	.815	.910	.750	.913	.713	.646	.829	.766	.953

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 14



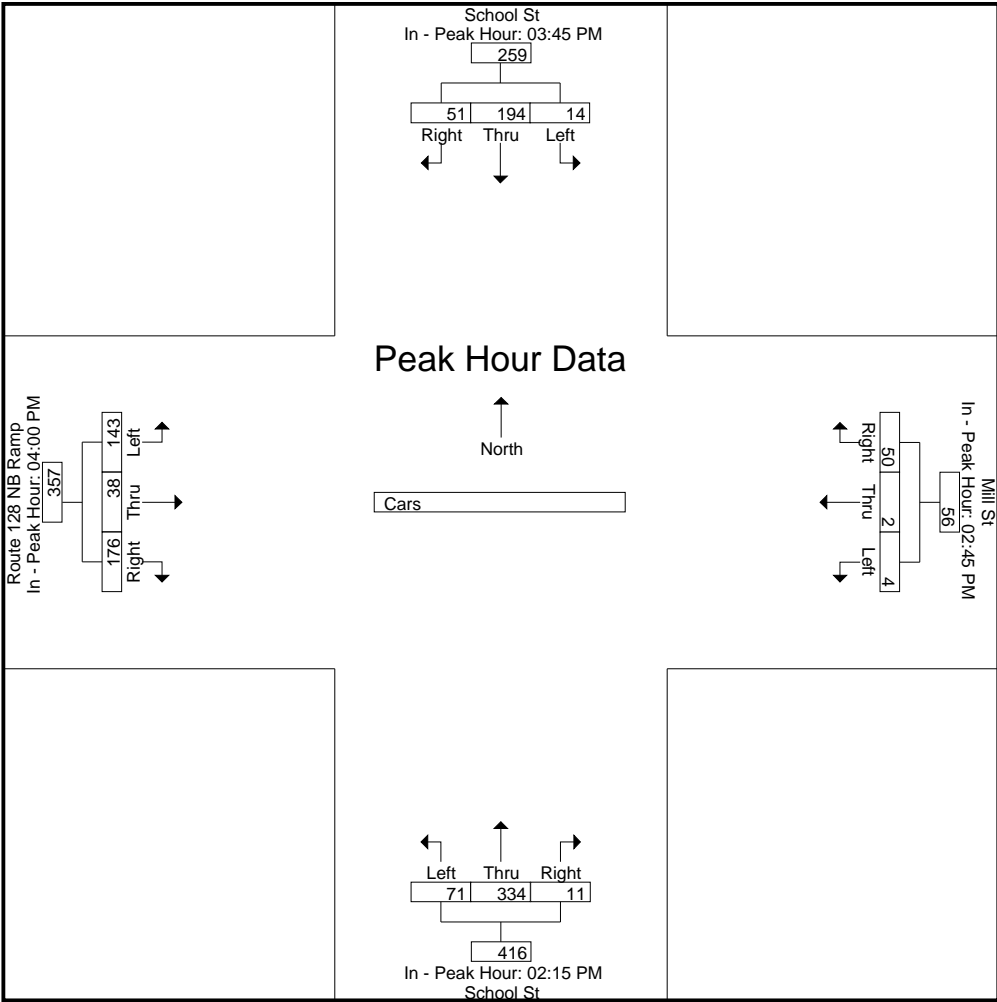
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	03:45 PM				02:45 PM				02:15 PM				04:00 PM			
+0 mins.	0	53	10	63	2	0	11	13	16	86	1	103	40	12	57	109
+15 mins.	2	42	14	58	1	2	9	12	20	84	2	106	39	9	37	85
+30 mins.	6	47	14	67	0	0	15	15	16	77	4	97	31	9	43	83
+45 mins.	6	52	13	71	1	0	15	16	19	87	4	110	33	8	39	80
Total Volume	14	194	51	259	4	2	50	56	71	334	11	416	143	38	176	357
% App. Total	5.4	74.9	19.7		7.1	3.6	89.3		17.1	80.3	2.6		40.1	10.6	49.3	
PHF	.583	.915	.911	.912	.500	.250	.833	.875	.888	.960	.688	.945	.894	.792	.772	.819

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 15



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 16

Groups Printed- Trucks

	School St From North			Mill St From East			School St From South			Route 128 NB Ramp From West			Int. Total
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:00 AM	0	0	2	0	0	1	0	0	0	0	0	2	5
07:15 AM	3	4	1	0	1	0	0	2	0	2	0	2	15
07:30 AM	0	1	0	1	1	0	0	0	0	1	0	1	5
07:45 AM	0	2	0	0	0	0	0	0	0	0	0	1	3
Total	3	7	3	1	2	1	0	2	0	3	0	6	28
08:00 AM	0	0	0	0	0	0	0	1	0	1	0	0	2
08:15 AM	0	1	0	0	0	0	0	1	0	0	0	0	2
08:30 AM	0	1	1	0	0	0	0	0	0	1	0	1	4
08:45 AM	1	2	0	0	0	0	0	2	0	1	0	3	9
Total	1	4	1	0	0	0	0	4	0	3	0	4	17
09:00 AM	0	0	1	0	0	0	1	1	0	0	0	0	3
09:15 AM	0	0	0	0	0	0	0	2	0	0	0	1	3
09:30 AM	0	0	0	0	0	0	1	1	0	1	0	1	4
09:45 AM	0	0	1	0	0	0	0	2	0	1	0	1	5
Total	0	0	2	0	0	0	2	6	0	2	0	3	15
10:00 AM	0	1	1	0	0	0	0	2	0	0	0	0	4
10:15 AM	0	2	1	0	0	0	0	0	0	1	1	0	5
10:30 AM	0	1	0	0	0	0	0	0	0	1	0	2	4
10:45 AM	0	0	1	0	0	6	1	1	0	1	0	2	12
Total	0	4	3	0	0	6	1	3	0	3	1	4	25
11:00 AM	0	0	1	0	0	1	2	2	0	1	0	0	7
11:15 AM	0	1	0	0	0	0	0	3	0	0	0	1	5
11:30 AM	0	0	1	0	0	2	0	0	0	1	0	1	5
11:45 AM	0	0	0	0	0	0	1	0	0	1	0	1	3
Total	0	1	2	0	0	3	3	5	0	3	0	3	20
12:00 PM	0	1	1	0	0	0	0	1	0	0	0	2	5
12:15 PM	0	1	0	0	0	0	1	1	0	0	0	1	4
12:30 PM	0	0	0	0	0	0	0	1	0	3	0	0	4
12:45 PM	0	0	0	0	0	0	1	1	0	0	0	1	3
Total	0	2	1	0	0	0	2	4	0	3	0	4	16
01:00 PM	0	1	0	0	0	0	0	0	0	0	0	0	1
01:15 PM	0	0	1	0	0	0	0	1	0	1	0	0	3
01:30 PM	0	0	0	0	1	0	0	0	0	1	0	1	3
01:45 PM	0	3	0	0	0	0	0	1	0	1	0	0	5
Total	0	4	1	0	1	0	0	2	0	3	0	1	12
02:00 PM	0	2	0	0	0	1	0	0	0	1	0	0	4
02:15 PM	0	0	0	0	0	0	0	4	0	0	0	1	5
02:30 PM	0	1	0	0	0	1	1	0	0	0	0	0	3
02:45 PM	0	1	0	1	0	1	0	1	0	0	0	0	4
Total	0	4	0	1	0	3	1	5	0	1	0	1	16
03:00 PM	0	1	0	0	0	0	1	1	0	0	0	1	4
03:15 PM	0	2	0	0	0	1	0	2	0	0	0	1	6
03:30 PM	0	1	0	0	0	0	0	1	0	0	0	2	4
03:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
Total	0	4	0	0	0	1	1	4	0	1	0	4	15
04:00 PM	0	0	0	0	0	0	0	2	0	0	0	0	2
04:15 PM	0	0	1	0	0	0	0	1	0	0	0	0	2
04:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
04:45 PM	0	0	0	0	0	0	0	1	0	2	0	0	3
Total	0	0	1	0	0	0	0	4	0	3	0	0	8
05:00 PM	0	1	0	0	0	0	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
05:45 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
Total	0	1	0	0	0	0	0	2	0	0	0	0	3

Accurate Counts

978-664-2565

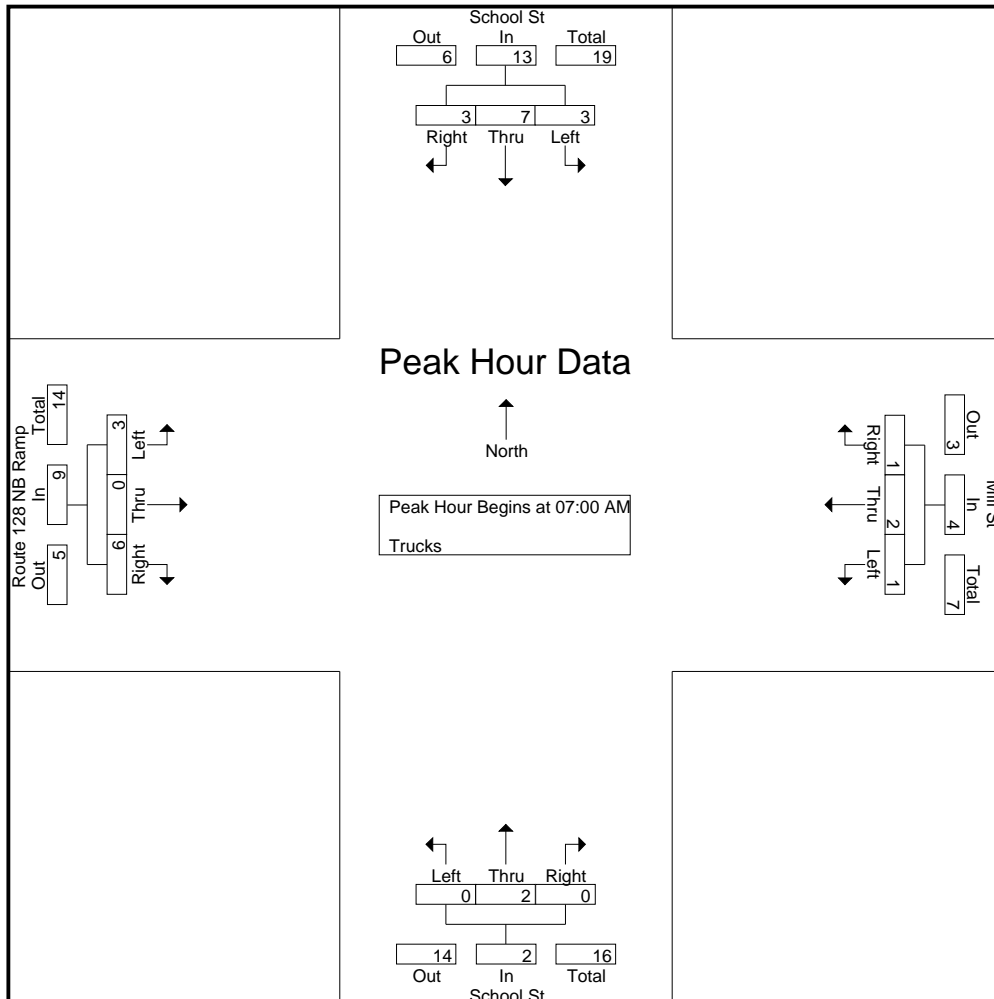
N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 17

Groups Printed- Trucks

	School St From North			Mill St From East			School St From South			Route 128 NB Ramp From West			Int. Total
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 PM	0	0	0	0	0	0	0	0	0	0	0	1	1
06:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	1	1
Grand Total	4	31	14	2	3	14	10	41	0	25	1	31	176
Apprch %	8.2	63.3	28.6	10.5	15.8	73.7	19.6	80.4	0	43.9	1.8	54.4	
Total %	2.3	17.6	8	1.1	1.7	8	5.7	23.3	0	14.2	0.6	17.6	

	School St From North				Mill St From East				School St From South				Route 128 NB Ramp From West				Int. Total
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	0	2	2	0	0	1	1	0	0	0	0	0	0	2	2	5
07:15 AM	3	4	1	8	0	1	0	1	0	2	0	2	2	0	2	4	15
07:30 AM	0	1	0	1	1	1	0	2	0	0	0	0	1	0	1	2	5
07:45 AM	0	2	0	2	0	0	0	0	0	0	0	0	0	0	1	1	3
Total Volume	3	7	3	13	1	2	1	4	0	2	0	2	3	0	6	9	28
% App. Total	23.1	53.8	23.1		25	50	25		0	100	0		33.3	0	66.7		
PHF	.250	.438	.375	.406	.250	.500	.250	.500	.000	.250	.000	.250	.375	.000	.750	.563	.467



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

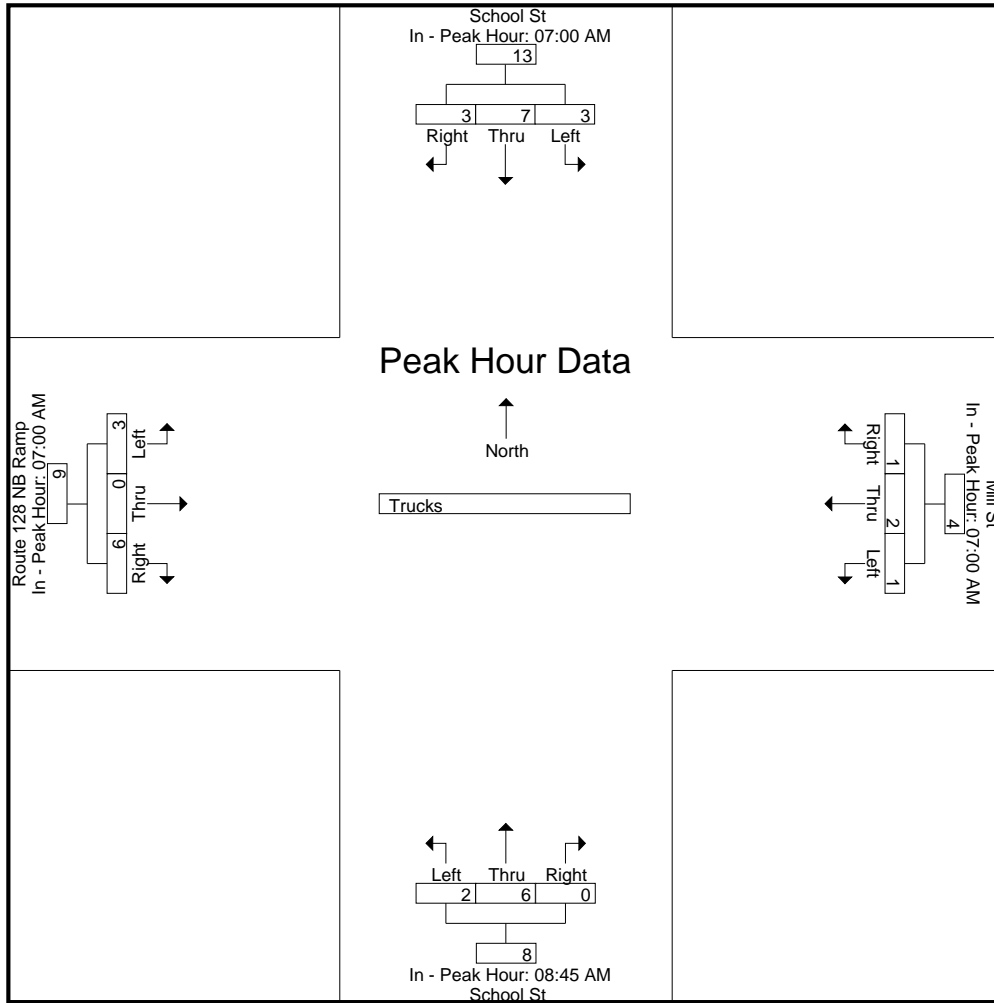
File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 18

	School St From North				Mill St From East				School St From South				Route 128 NB Ramp 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 09:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:00 AM				07:00 AM				08:45 AM				07:00 AM			
+0 mins.	0	0	2	2	0	0	1	1	0	2	0	2	0	0	2	2
+15 mins.	3	4	1	8	0	1	0	1	1	1	0	2	2	0	2	4
+30 mins.	0	1	0	1	1	1	0	2	0	2	0	2	1	0	1	2
+45 mins.	0	2	0	2	0	0	0	0	1	1	0	2	0	0	1	1
Total Volume	3	7	3	13	1	2	1	4	2	6	0	8	3	0	6	9
% App. Total	23.1	53.8	23.1		25	50	25		25	75	0		33.3	0	66.7	
PHF	.250	.438	.375	.406	.250	.500	.250	.500	.500	.750	.000	1.000	.375	.000	.750	.563



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 10:45 AM

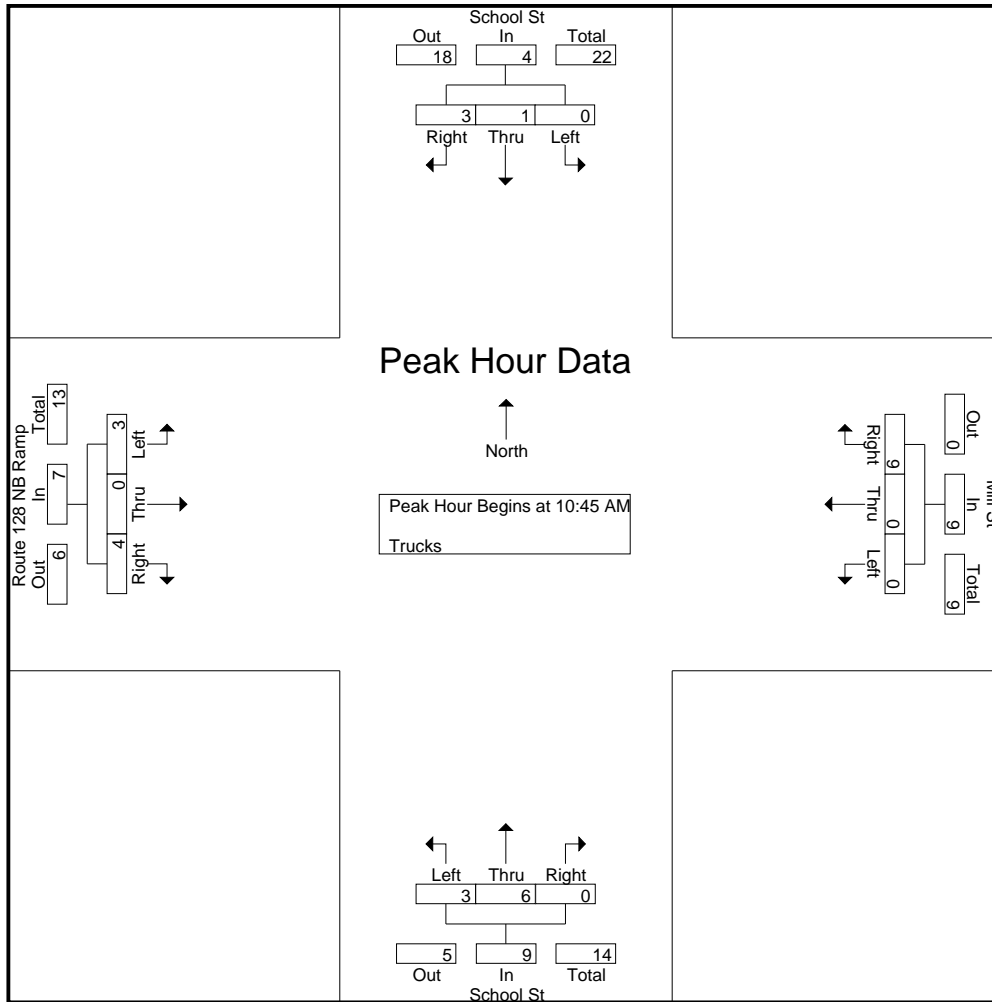
10:45 AM	0	0	1	1	0	0	6	6	1	1	0	2	1	0	2	3	12
11:00 AM	0	0	1	1	0	0	1	1	2	2	0	4	1	0	0	1	7
11:15 AM	0	1	0	1	0	0	0	0	0	3	0	3	0	0	1	1	5
11:30 AM	0	0	1	1	0	0	2	2	0	0	0	0	1	0	1	2	5
Total Volume	0	1	3	4	0	0	9	9	3	6	0	9	3	0	4	7	29
% App. Total	0	25	75		0	0	100		33.3	66.7	0		42.9	0	57.1		
PHF	.000	.250	.750	1.00	.000	.000	.375	.375	.375	.500	.000	.563	.750	.000	.500	.583	.604

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 19



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

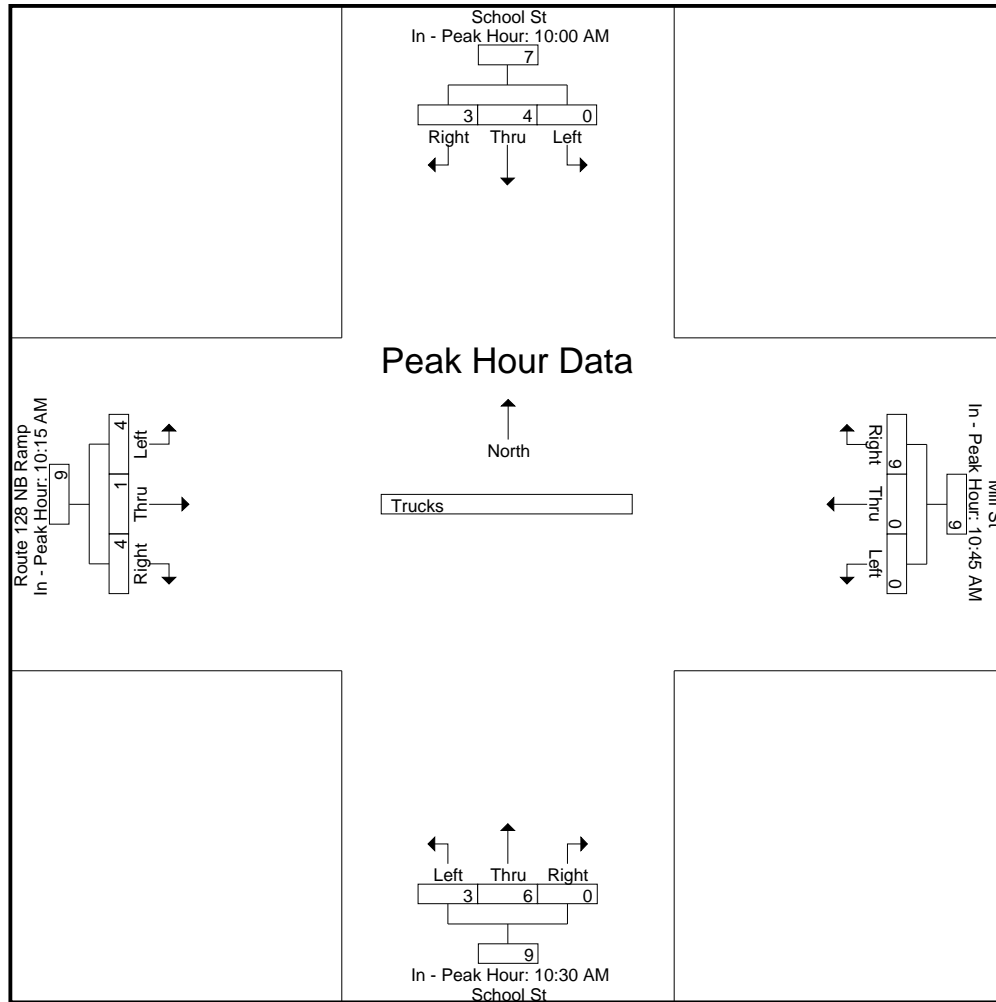
	10:00 AM				10:45 AM				10:30 AM				10:15 AM			
+0 mins.	0	1	1	2	0	0	6	6	0	0	0	0	1	1	0	2
+15 mins.	0	2	1	3	0	0	1	1	1	1	0	2	1	0	2	3
+30 mins.	0	1	0	1	0	0	0	0	2	2	0	4	1	0	2	3
+45 mins.	0	0	1	1	0	0	2	2	0	3	0	3	1	0	0	1
Total Volume	0	4	3	7	0	0	9	9	3	6	0	9	4	1	4	9
% App. Total	0	57.1	42.9		0	0	100		33.3	66.7	0		44.4	11.1	44.4	
PHF	.000	.500	.750	.583	.000	.000	.375	.375	.375	.500	.000	.563	1.000	.250	.500	.750

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 20



Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 02:45 PM

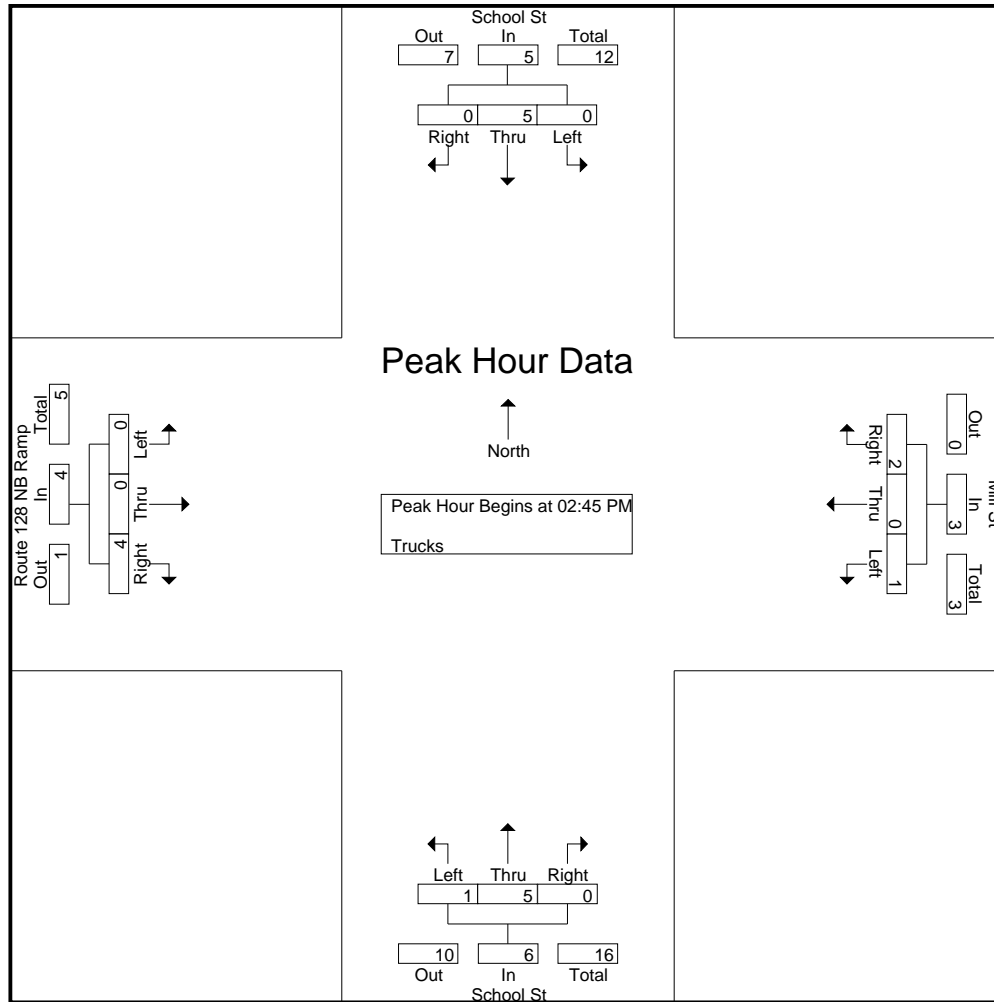
02:45 PM	0	1	0	1	1	0	1	2	0	1	0	1	0	0	0	0	4
03:00 PM	0	1	0	1	0	0	0	0	1	1	0	2	0	0	1	1	4
03:15 PM	0	2	0	2	0	0	1	1	0	2	0	2	0	0	1	1	6
03:30 PM	0	1	0	1	0	0	0	0	0	1	0	1	0	0	2	2	4
Total Volume	0	5	0	5	1	0	2	3	1	5	0	6	0	0	4	4	18
% App. Total	0	100	0		33.3	0	66.7		16.7	83.3	0		0	0	100		
PHF	.000	.625	.000	.625	.250	.000	.500	.375	.250	.625	.000	.750	.000	.000	.500	.500	.750

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 21



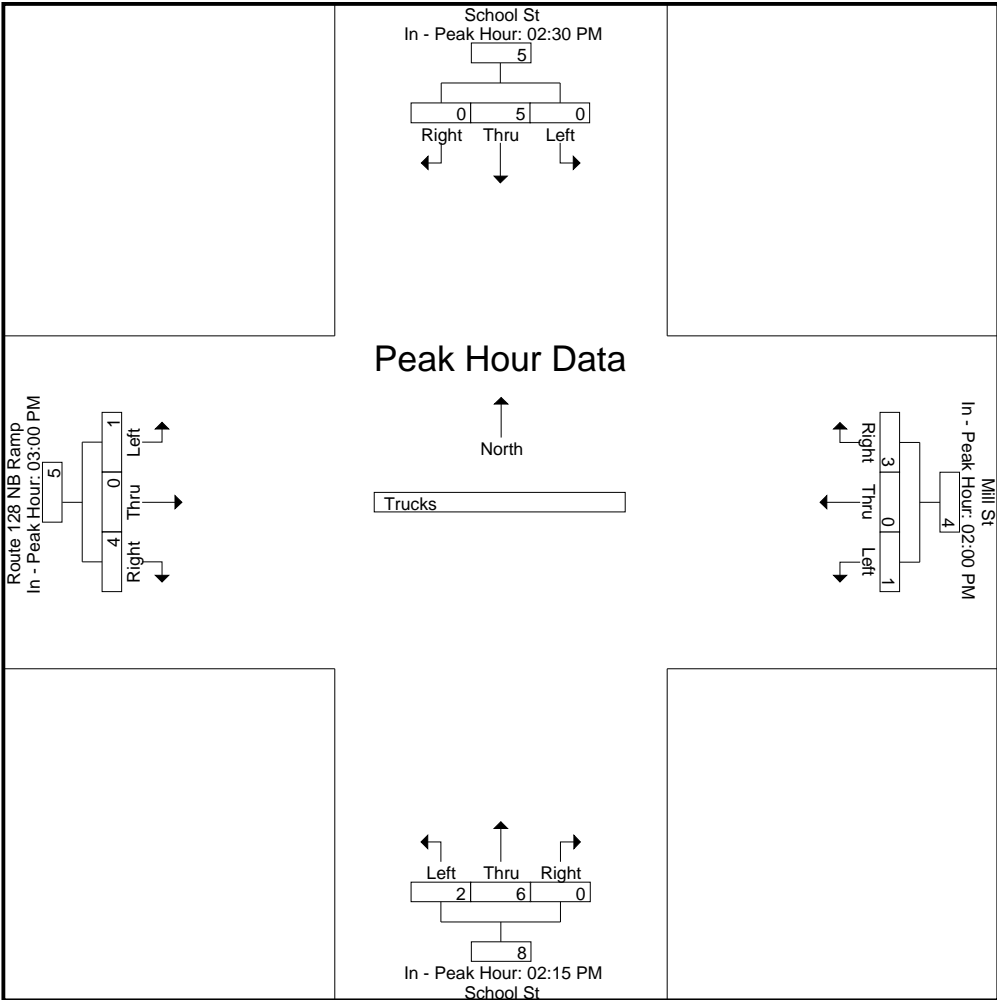
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	02:30 PM				02:00 PM				02:15 PM				03:00 PM			
+0 mins.	0	1	0	1	0	0	1	1	0	4	0	4	0	0	1	1
+15 mins.	0	1	0	1	0	0	0	0	1	0	0	1	0	0	1	1
+30 mins.	0	1	0	1	0	0	1	1	0	1	0	1	0	0	2	2
+45 mins.	0	2	0	2	1	0	1	2	1	1	0	2	1	0	0	1
Total Volume	0	5	0	5	1	0	3	4	2	6	0	8	1	0	4	5
% App. Total	0	100	0		25	0	75		25	75	0		20	0	80	
PHF	.000	.625	.000	.625	.250	.000	.750	.500	.500	.375	.000	.500	.250	.000	.500	.625

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 22



978-664-2565

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 23

Accurate Counts

978-664-2565

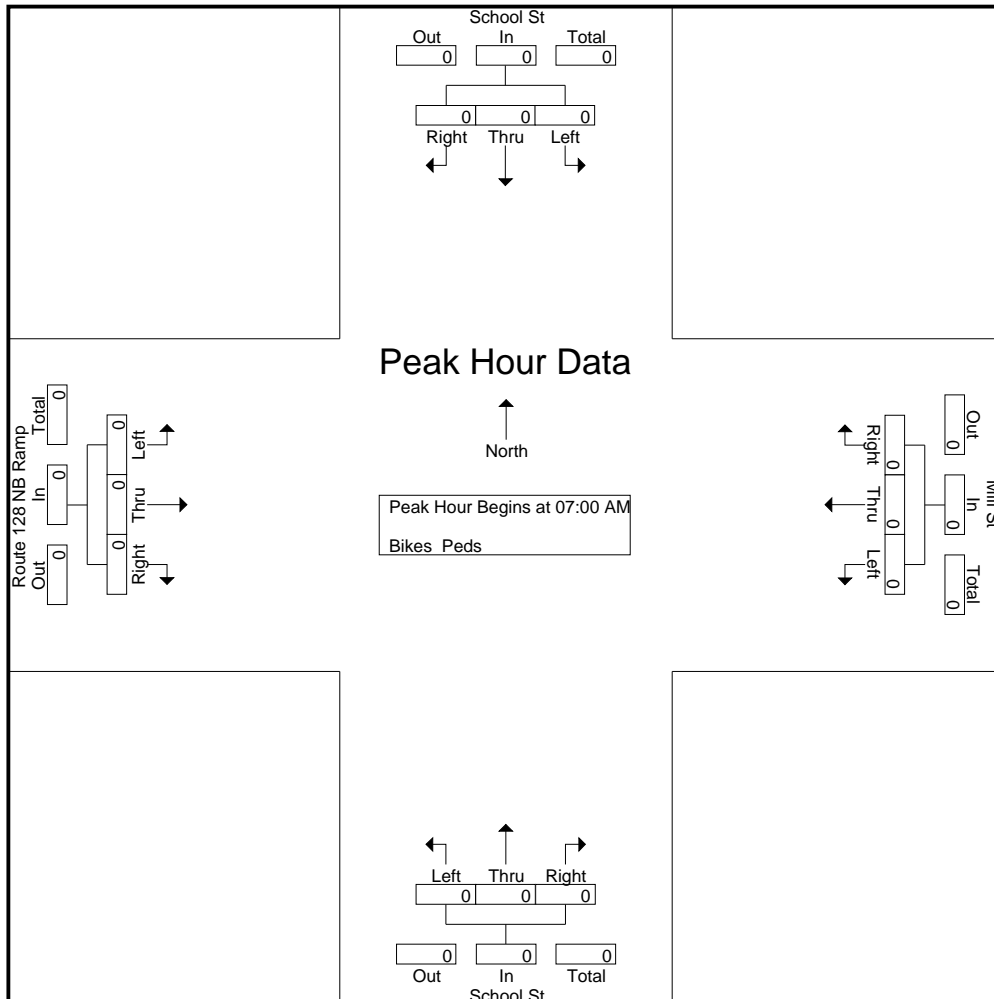
N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 24

Groups Printed- Bikes Peds

	School St From North				Mill St From East				School St From South				Route 128 NB Ramp From West				Exclu. Total	Inclu. Total	Int. Total
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	4	0	1	0	0	0	0	0	1	5	1	6
Apprch %	0	0	0		0	0	0		0	100	0		0	0	0				
Total %	0	0	0		0	0	0		0	100	0		0	0	0		83.3	16.7	

	School St From North				Mill St From East				School St From South				Route 128 NB Ramp 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 09:45 AM - Peak 1 of 1																			
Peak Hour for Entire Intersection Begins at 07:00 AM																			
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0		0	0	0		0	0	0		0	0	0				
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

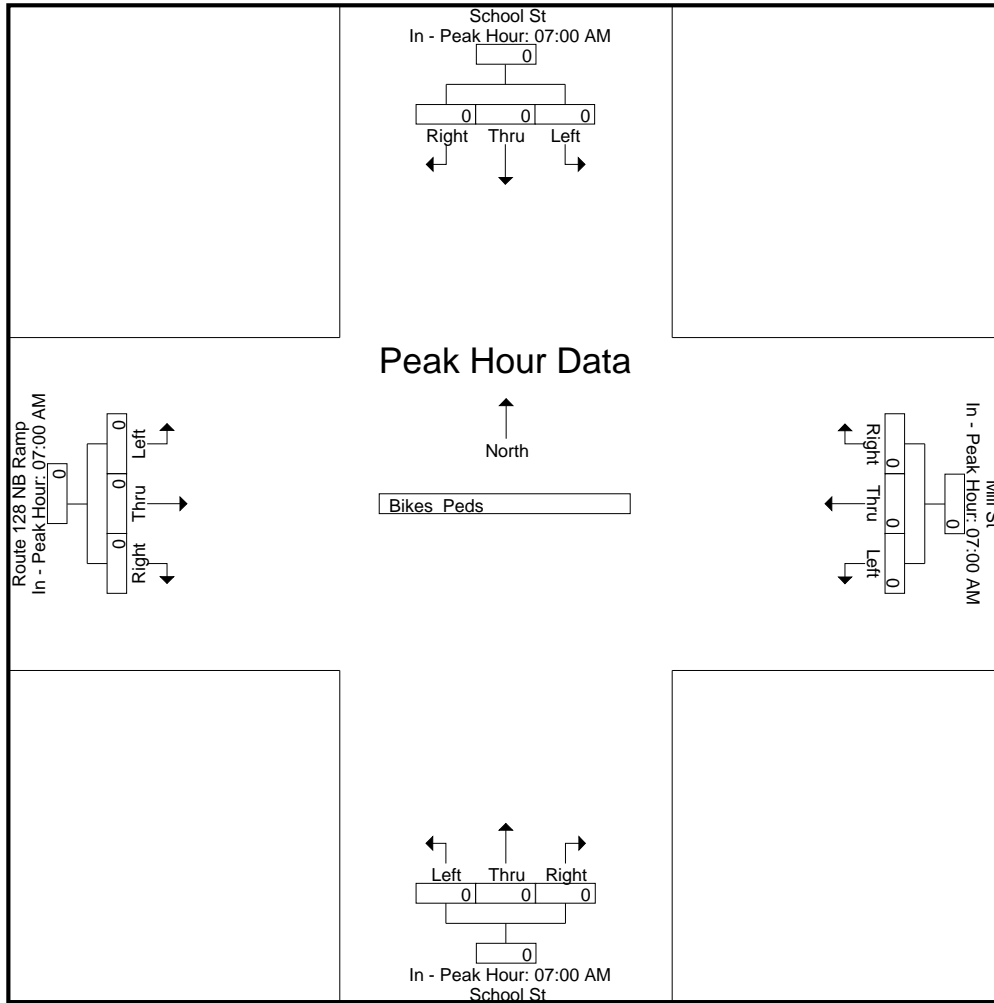
File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 25

	School St From North				Mill St From East				School St From South				Route 128 NB Ramp 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 09:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:00 AM				07:00 AM				07:00 AM				07:00 AM			
+0 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+30 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+45 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0		0	0	0		0	0	0		0	0	0	
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 10:15 AM

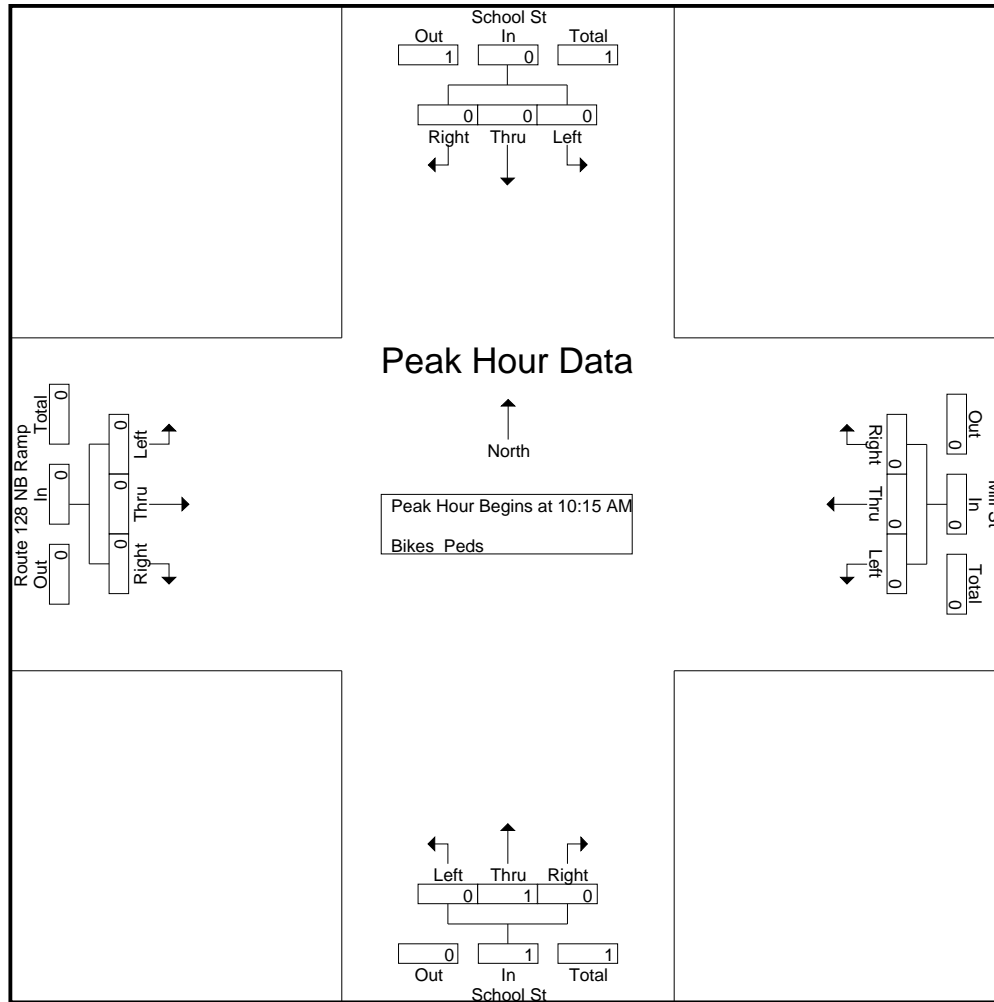
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
Total Volume	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
% App. Total	0	0	0		0	0	0		0	100	0		0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.250	.000	.000	.000	.000	.250

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 26



Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1

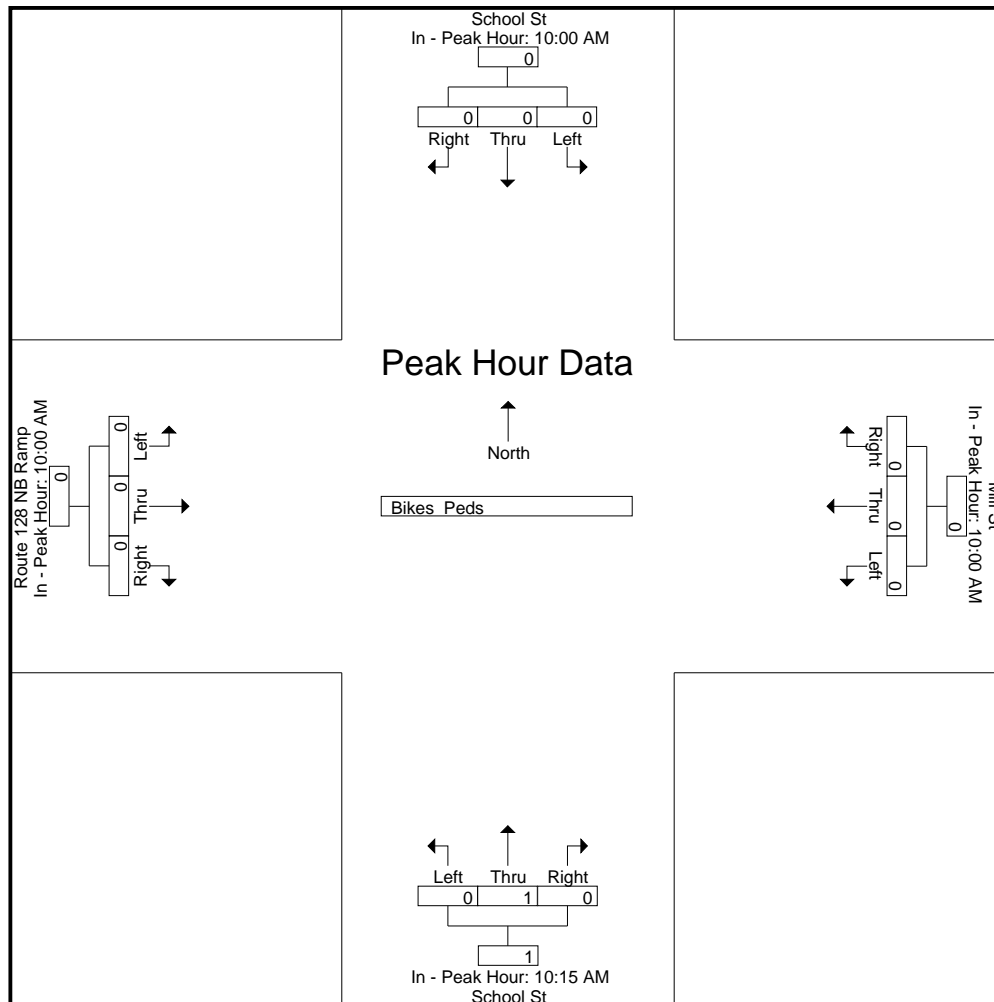
Peak Hour for Each Approach Begins at:

	10:00 AM				10:00 AM				10:15 AM				10:00 AM			
+0 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+30 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+45 mins.	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
% App. Total	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.250	.000	.000	.000	.000

978-664-2565

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 27



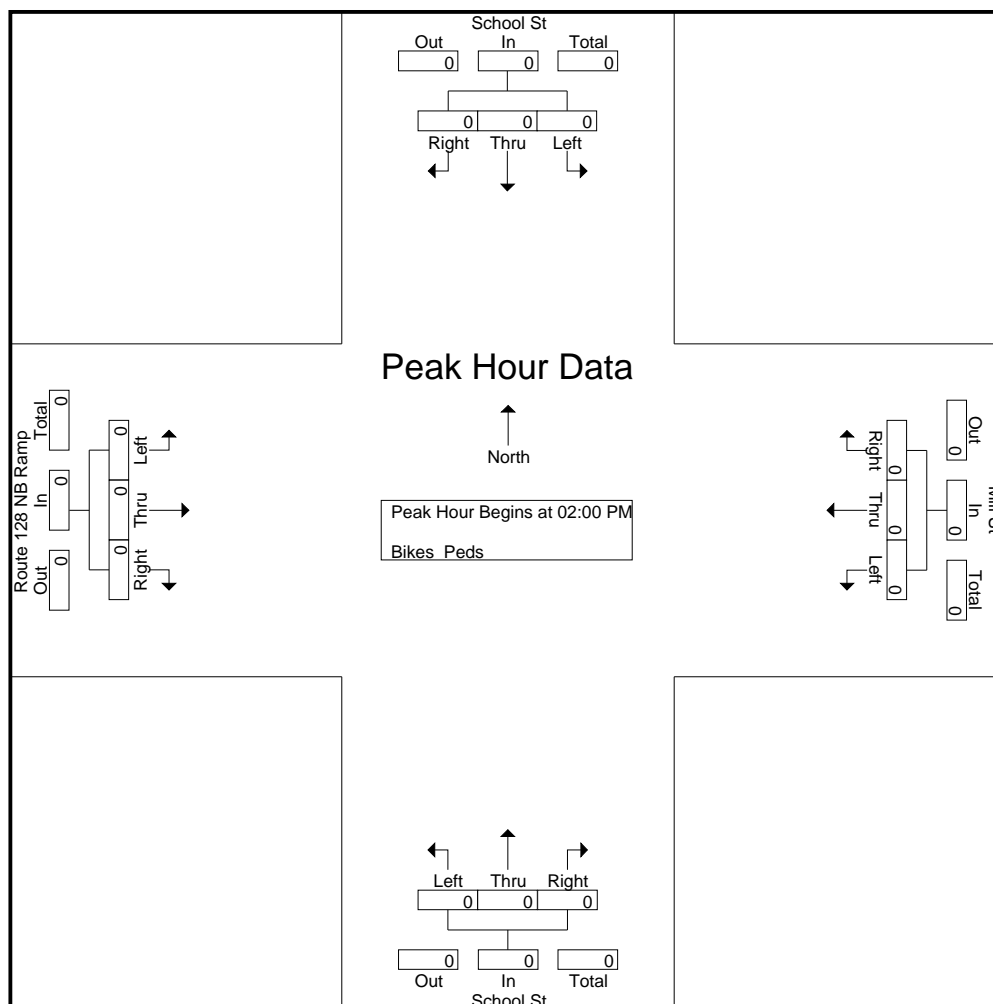
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 02:00 PM

[illegible]

978-664-2565

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 28

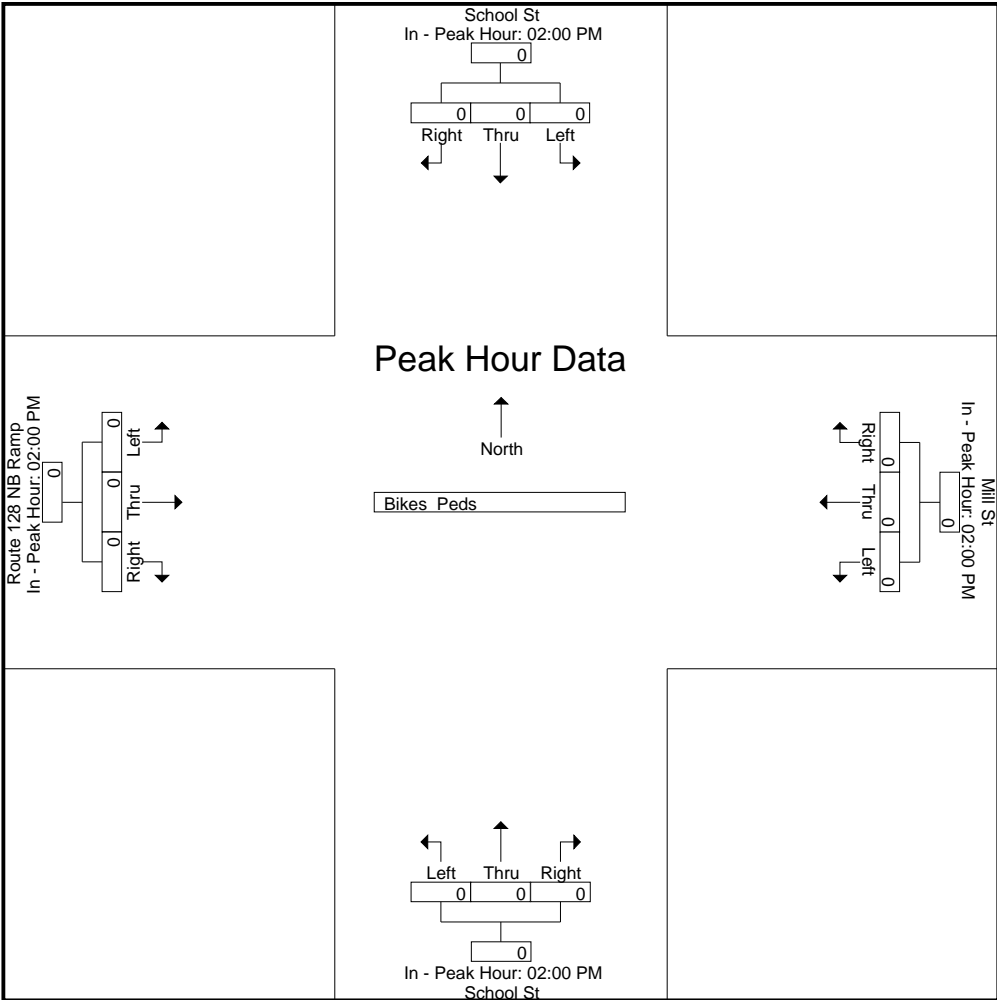


Peak Hour for Each Approach Begins at:

Peak Hour for Each Approach Begins at:																
	02:00 PM				02:00 PM				02:00 PM				02:00 PM			
+0 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+30 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+45 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

N/S Street : School Street
E/W Street : Mill St / Route 128 NB Ramp
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990003
Site Code : 11990003
Start Date : 1/11/2023
Page No : 29



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
Page No : 1

Groups Printed- Cars - Trucks

	School St From North			Pleasant St From East			School St From South			Pleasant St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	0	57	3	2	0	25	2	15	0	5	0	8	117
07:15 AM	0	101	8	3	5	51	0	14	0	3	0	23	208
07:30 AM	0	100	6	22	39	84	0	29	0	6	0	67	353
07:45 AM	0	77	9	3	11	56	0	35	0	9	0	13	213
Total	0	335	26	30	55	216	2	93	0	23	0	111	891
08:00 AM	0	64	6	3	9	32	0	30	0	4	0	21	169
08:15 AM	0	86	2	6	14	55	3	41	0	5	0	21	233
08:30 AM	0	67	7	2	4	41	4	37	0	9	0	10	181
08:45 AM	0	63	8	4	1	36	3	41	0	10	0	6	172
Total	0	280	23	15	28	164	10	149	0	28	0	58	755
Grand Total	0	615	49	45	83	380	12	242	0	51	0	169	1646
Apprch %	0	92.6	7.4	8.9	16.3	74.8	4.7	95.3	0	23.2	0	76.8	
Total %	0	37.4	3	2.7	5	23.1	0.7	14.7	0	3.1	0	10.3	
Cars	0	595	46	45	82	376	12	239	0	49	0	168	1612
% Cars	0	96.7	93.9	100	98.8	98.9	100	98.8	0	96.1	0	99.4	97.9
Trucks	0	20	3	0	1	4	0	3	0	2	0	1	34
% Trucks	0	3.3	6.1	0	1.2	1.1	0	1.2	0	3.9	0	0.6	2.1

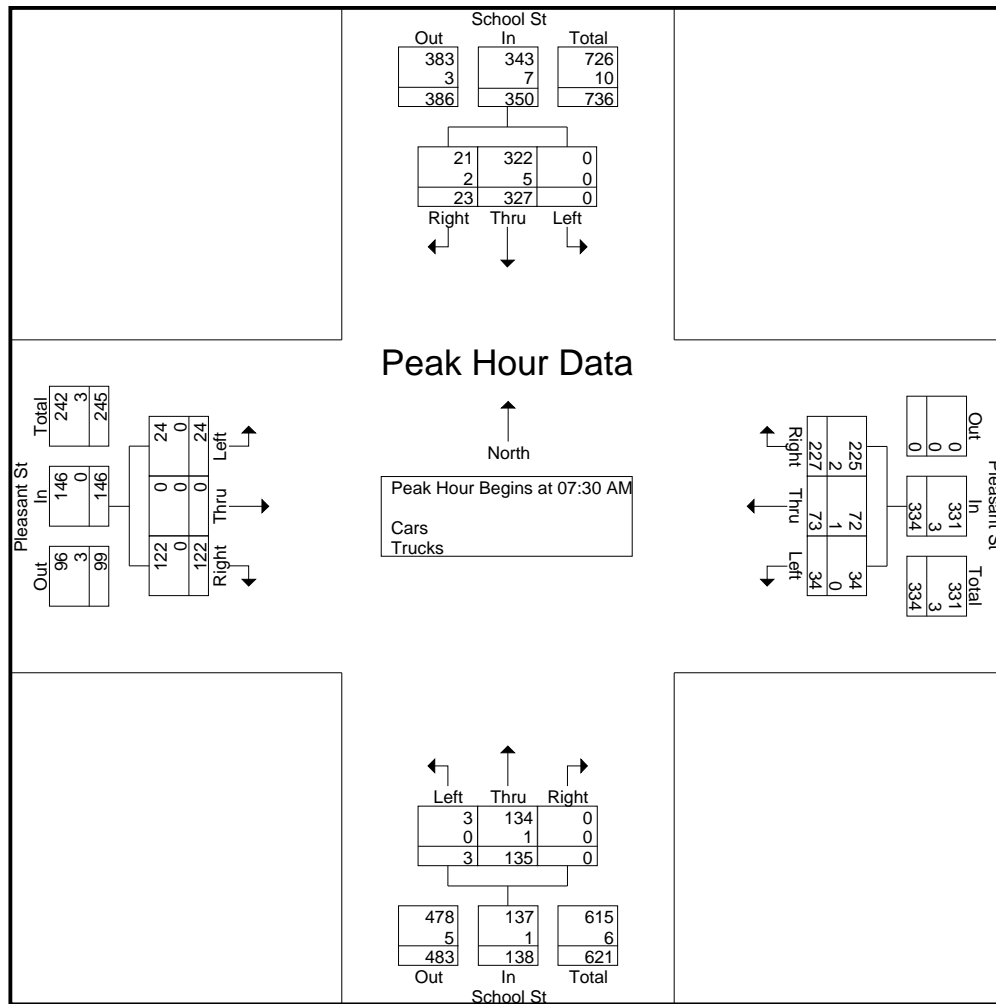
	School St From North				Pleasant St From East				School St From South				Pleasant St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	0	100	6	106	22	39	84	145	0	29	0	29	6	0	67	73	353
07:45 AM	0	77	9	86	3	11	56	70	0	35	0	35	9	0	13	22	213
08:00 AM	0	64	6	70	3	9	32	44	0	30	0	30	4	0	21	25	169
08:15 AM	0	86	2	88	6	14	55	75	3	41	0	44	5	0	21	26	233
Total Volume	0	327	23	350	34	73	227	334	3	135	0	138	24	0	122	146	968
% App. Total	0	93.4	6.6		10.2	21.9	68		2.2	97.8	0		16.4	0	83.6		
PHF	.000	.818	.639	.825	.386	.468	.676	.576	.250	.823	.000	.784	.667	.000	.455	.500	.686
Cars	0	322	21	343	34	72	225	331	3	134	0	137	24	0	122	146	957
% Cars	0	98.5	91.3	98.0	100	98.6	99.1	99.1	100	99.3	0	99.3	100	0	100	100	98.9
Trucks	0	5	2	7	0	1	2	3	0	1	0	1	0	0	0	0	11
% Trucks	0	1.5	8.7	2.0	0	1.4	0.9	0.9	0	0.7	0	0.7	0	0	0	0	1.1

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
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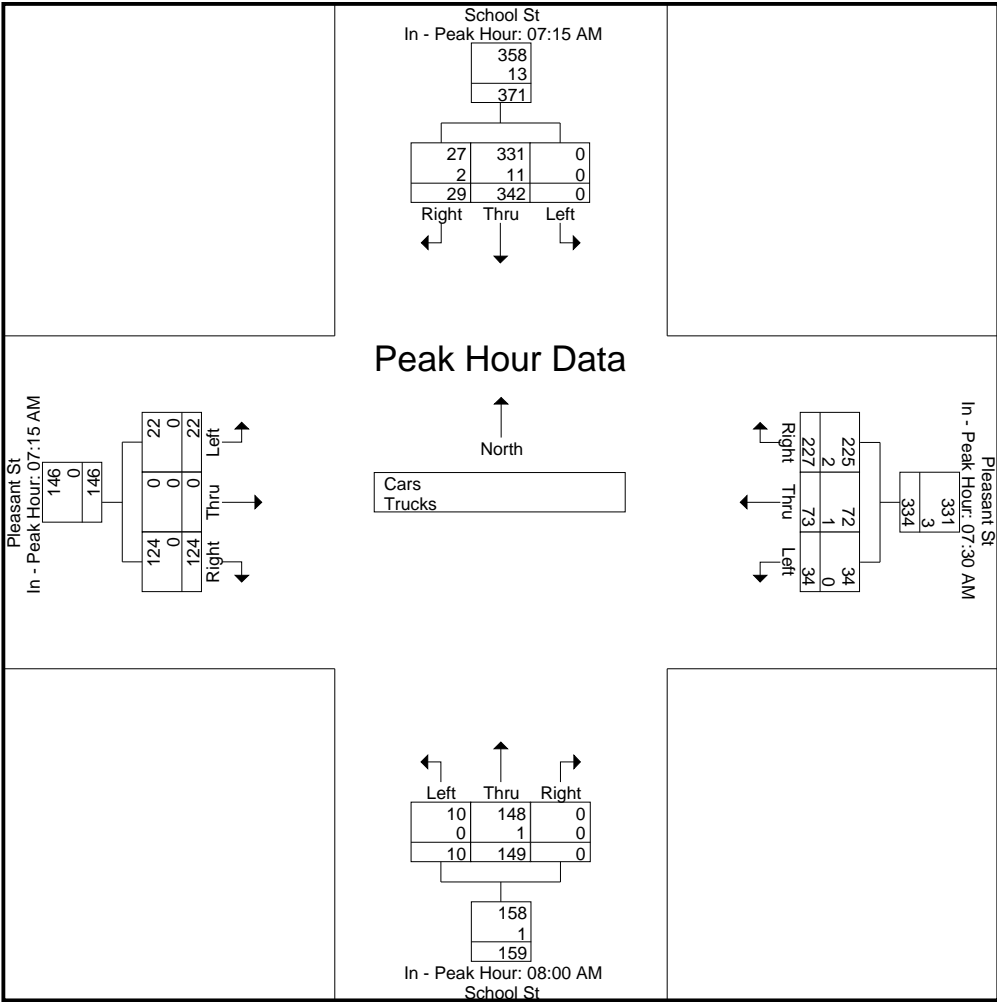
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:15 AM				07:30 AM				08:00 AM				07:15 AM			
+0 mins.	0	101	8	109	22	39	84	145	0	30	0	30	3	0	23	26
+15 mins.	0	100	6	106	3	11	56	70	3	41	0	44	6	0	67	73
+30 mins.	0	77	9	86	3	9	32	44	4	37	0	41	9	0	13	22
+45 mins.	0	64	6	70	6	14	55	75	3	41	0	44	4	0	21	25
Total Volume	0	342	29	371	34	73	227	334	10	149	0	159	22	0	124	146
% App. Total	0	92.2	7.8		10.2	21.9	68		6.3	93.7	0		15.1	0	84.9	
PHF	.000	.847	.806	.851	.386	.468	.676	.576	.625	.909	.000	.903	.611	.000	.463	.500
Cars	0	331	27	358	34	72	225	331	10	148	0	158	22	0	124	146
% Cars	0	96.8	93.1	96.5	100	98.6	99.1	99.1	100	99.3	0	99.4	100	0	100	100
Trucks	0	11	2	13	0	1	2	3	0	1	0	1	0	0	0	0
% Trucks	0	3.2	6.9	3.5	0	1.4	0.9	0.9	0	0.7	0	0.6	0	0	0	0

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
Page No : 3



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
Page No : 4

Groups Printed- Cars

	School St From North			Pleasant St From East			School St From South			Pleasant St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	0	54	2	2	0	25	2	14	0	5	0	7	111
07:15 AM	0	95	8	3	5	49	0	14	0	3	0	23	200
07:30 AM	0	97	5	22	38	84	0	28	0	6	0	67	347
07:45 AM	0	75	8	3	11	56	0	35	0	9	0	13	210
Total	0	321	23	30	54	214	2	91	0	23	0	110	868
08:00 AM	0	64	6	3	9	31	0	30	0	4	0	21	168
08:15 AM	0	86	2	6	14	54	3	41	0	5	0	21	232
08:30 AM	0	64	7	2	4	41	4	37	0	9	0	10	178
08:45 AM	0	60	8	4	1	36	3	40	0	8	0	6	166
Total	0	274	23	15	28	162	10	148	0	26	0	58	744
Grand Total	0	595	46	45	82	376	12	239	0	49	0	168	1612
Apprch %	0	92.8	7.2	8.9	16.3	74.8	4.8	95.2	0	22.6	0	77.4	
Total %	0	36.9	2.9	2.8	5.1	23.3	0.7	14.8	0	3	0	10.4	

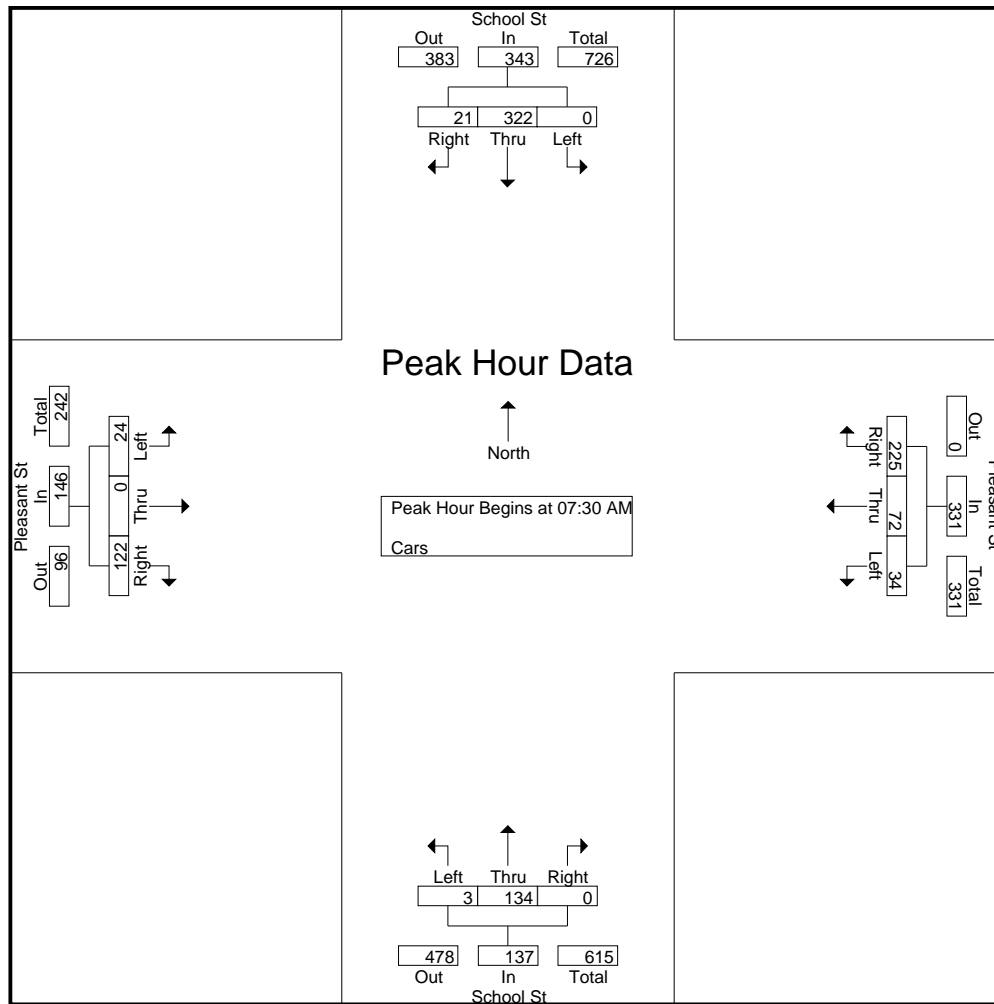
	School St From North				Pleasant St From East				School St From South				Pleasant St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	0	97	5	102	22	38	84	144	0	28	0	28	6	0	67	73	347
07:45 AM	0	75	8	83	3	11	56	70	0	35	0	35	9	0	13	22	210
08:00 AM	0	64	6	70	3	9	31	43	0	30	0	30	4	0	21	25	168
08:15 AM	0	86	2	88	6	14	54	74	3	41	0	44	5	0	21	26	232
Total Volume	0	322	21	343	34	72	225	331	3	134	0	137	24	0	122	146	957
% App. Total	0	93.9	6.1		10.3	21.8	68		2.2	97.8	0		16.4	0	83.6		
PHF	.000	.830	.656	.841	.386	.474	.670	.575	.250	.817	.000	.778	.667	.000	.455	.500	.689

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
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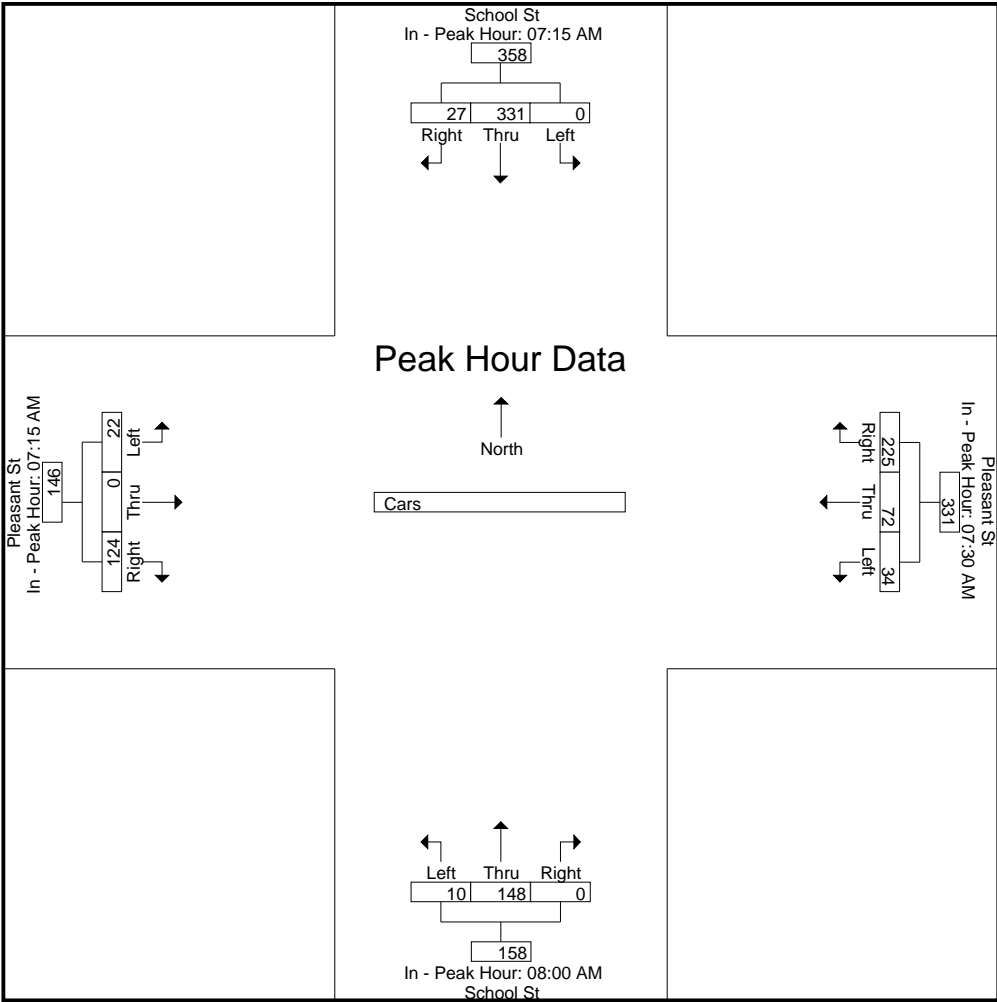
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:15 AM				07:30 AM				08:00 AM				07:15 AM			
+0 mins.	0	95	8	103	22	38	84	144	0	30	0	30	3	0	23	26
+15 mins.	0	97	5	102	3	11	56	70	3	41	0	44	6	0	67	73
+30 mins.	0	75	8	83	3	9	31	43	4	37	0	41	9	0	13	22
+45 mins.	0	64	6	70	6	14	54	74	3	40	0	43	4	0	21	25
Total Volume	0	331	27	358	34	72	225	331	10	148	0	158	22	0	124	146
% App. Total	0	92.5	7.5		10.3	21.8	68		6.3	93.7	0		15.1	0	84.9	
PHF	.000	.853	.844	.869	.386	.474	.670	.575	.625	.902	.000	.898	.611	.000	.463	.500

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
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Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
Page No : 7

Groups Printed- Trucks

	School St From North			Pleasant St From East			School St From South			Pleasant St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	0	3	1	0	0	0	0	1	0	0	0	1	6
07:15 AM	0	6	0	0	0	2	0	0	0	0	0	0	8
07:30 AM	0	3	1	0	1	0	0	1	0	0	0	0	6
07:45 AM	0	2	1	0	0	0	0	0	0	0	0	0	3
Total	0	14	3	0	1	2	0	2	0	0	0	1	23
08:00 AM	0	0	0	0	0	1	0	0	0	0	0	0	1
08:15 AM	0	0	0	0	0	1	0	0	0	0	0	0	1
08:30 AM	0	3	0	0	0	0	0	0	0	0	0	0	3
08:45 AM	0	3	0	0	0	0	0	1	0	2	0	0	6
Total	0	6	0	0	0	2	0	1	0	2	0	0	11
Grand Total	0	20	3	0	1	4	0	3	0	2	0	1	34
Apprch %	0	87	13	0	20	80	0	100	0	66.7	0	33.3	
Total %	0	58.8	8.8	0	2.9	11.8	0	8.8	0	5.9	0	2.9	

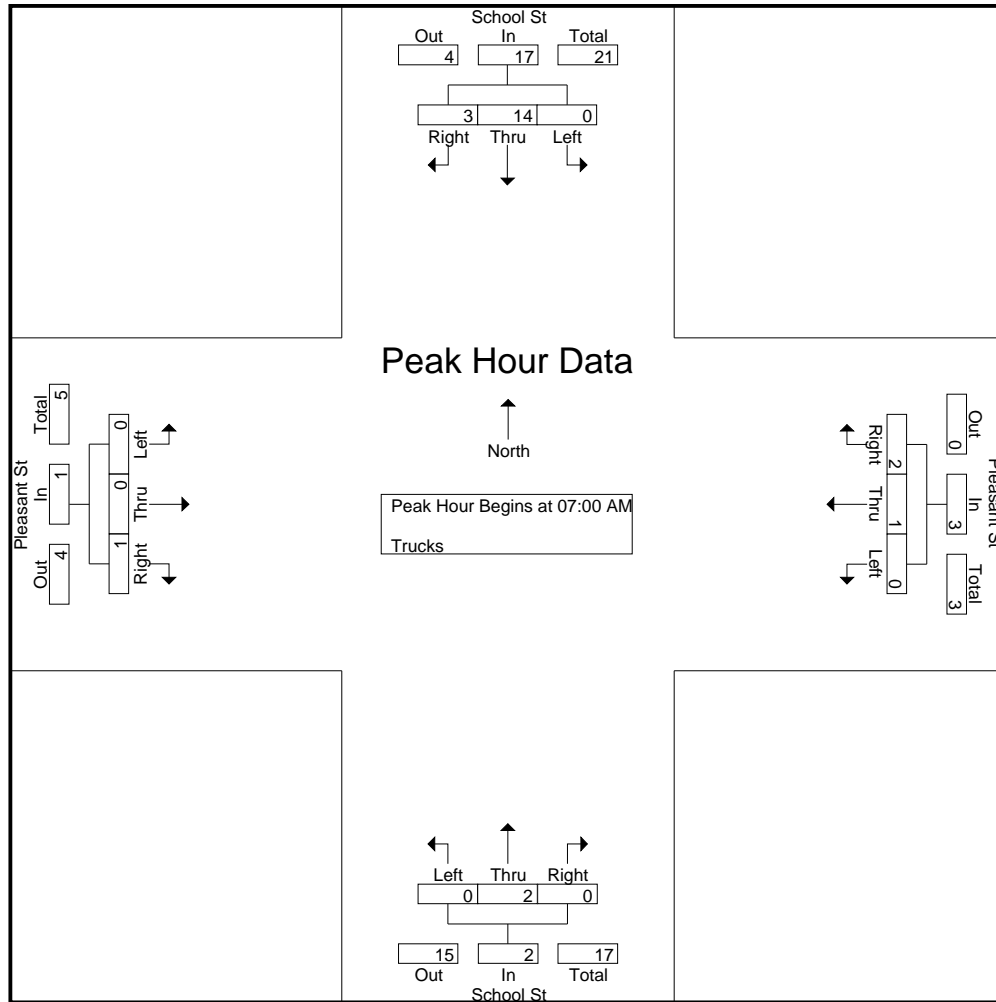
	School St From North				Pleasant St From East				School St From South				Pleasant St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	3	1	4	0	0	0	0	0	1	0	1	0	0	1	1	6
07:15 AM	0	6	0	6	0	0	2	2	0	0	0	0	0	0	0	0	8
07:30 AM	0	3	1	4	0	1	0	1	0	1	0	1	0	0	0	0	6
07:45 AM	0	2	1	3	0	0	0	0	0	0	0	0	0	0	0	0	3
Total Volume	0	14	3	17	0	1	2	3	0	2	0	2	0	0	1	1	23
% App. Total	0	82.4	17.6		0	33.3	66.7		0	100	0		0	0	100		
PHF	.000	.583	.750	.708	.000	.250	.250	.375	.000	.500	.000	.500	.000	.000	.250	.250	.719

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
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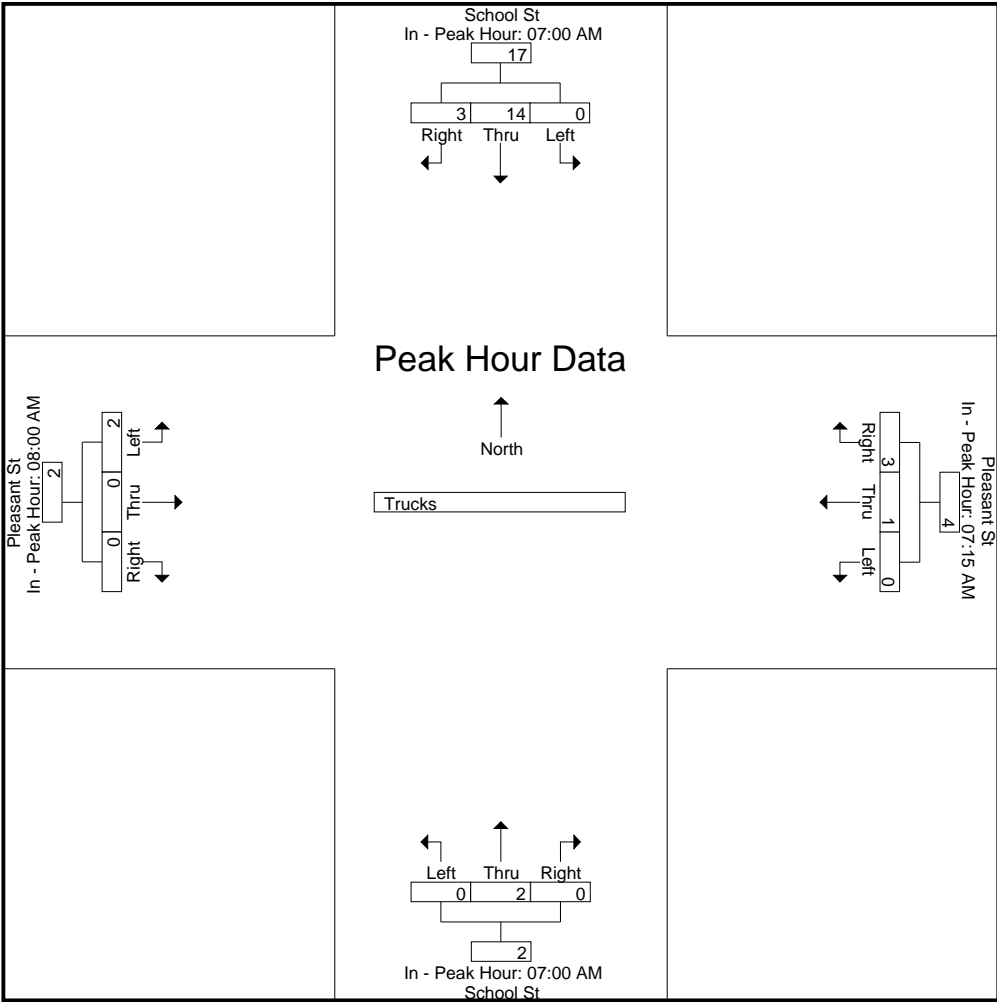
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:00 AM				07:15 AM				07:00 AM				08:00 AM			
+0 mins.	0	3	1	4	0	0	2	2	0	1	0	1	0	0	0	0
+15 mins.	0	6	0	6	0	1	0	1	0	0	0	0	0	0	0	0
+30 mins.	0	3	1	4	0	0	0	0	0	1	0	1	0	0	0	0
+45 mins.	0	2	1	3	0	0	1	1	0	0	0	0	2	0	0	2
Total Volume	0	14	3	17	0	1	3	4	0	2	0	2	2	0	0	2
% App. Total	0	82.4	17.6		0	25	75		0	100	0		100	0	0	
PHF	.000	.583	.750	.708	.000	.250	.375	.500	.000	.500	.000	.500	.250	.000	.000	.250

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
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Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
Page No : 10

Groups Printed- Bikes Peds

	School St From North				Pleasant St From East				School St From South				Pleasant St From West				Exclu. Total	Inclu. Total	Int. Total
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
07:00 AM	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
07:15 AM	0	0	0	9	0	0	0	0	0	0	0	1	0	1	0	0	10	1	11
07:30 AM	0	0	0	5	0	0	0	1	0	0	0	1	0	0	0	0	7	0	7
07:45 AM	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Total	0	0	0	18	0	0	0	1	0	0	0	2	0	1	0	0	21	1	22
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2
08:15 AM	0	0	0	1	0	0	0	0	0	0	0	4	0	0	0	0	5	0	5
08:30 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
08:45 AM	0	0	0	2	0	0	0	1	0	0	0	1	0	0	0	0	4	0	4
Total	0	0	0	4	0	0	0	1	0	0	0	5	0	0	0	2	12	0	12
Grand Total	0	0	0	22	0	0	0	2	0	0	0	7	0	1	0	2	33	1	34
Apprch %	0	0	0		0	0	0		0	0	0		0	100	0				
Total %	0	0	0		0	0	0		0	0	0		0	100	0		97.1	2.9	

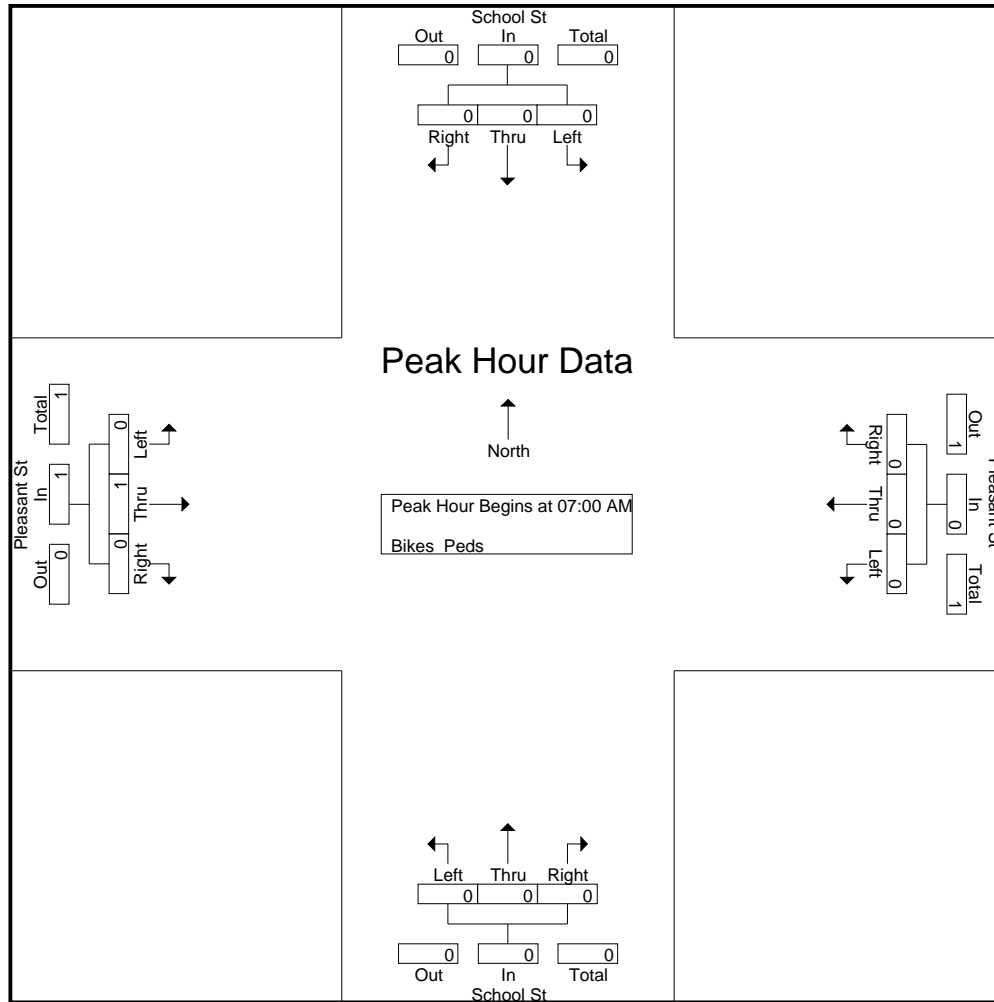
	School St From North				Pleasant St From East				School St From South				Pleasant St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													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

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
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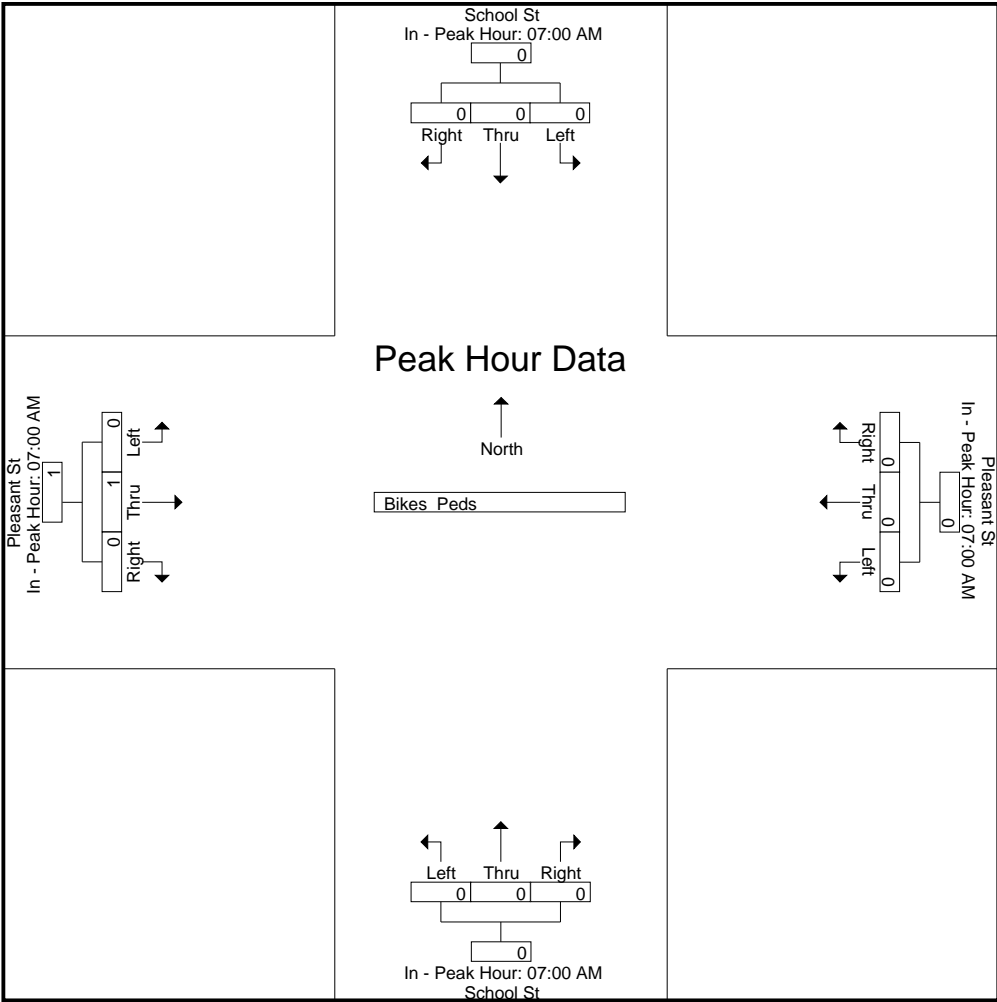
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:00 AM				07:00 AM				07:00 AM				07:00 AM			
+0 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
+30 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+45 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
% App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.250

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
Page No : 12



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
Page No : 1

Groups Printed- Cars - Trucks

	School St From North			Pleasant St From East			School St From South			Pleasant St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
03:00 PM	0	72	8	3	11	55	5	38	0	6	0	10	208
03:15 PM	0	66	12	1	6	38	7	53	0	13	0	10	206
03:30 PM	0	73	12	3	9	41	3	51	0	13	0	14	219
03:45 PM	0	87	8	2	5	46	3	35	0	4	0	15	205
Total	0	298	40	9	31	180	18	177	0	36	0	49	838
04:00 PM	0	90	11	5	11	45	3	31	0	6	0	11	213
04:15 PM	0	75	8	2	5	50	4	36	0	2	0	12	194
04:30 PM	0	93	5	2	11	34	4	37	0	4	0	11	201
04:45 PM	0	85	9	0	12	26	4	28	0	7	0	11	182
Total	0	343	33	9	39	155	15	132	0	19	0	45	790
05:00 PM	0	83	8	3	7	43	5	36	0	6	0	14	205
05:15 PM	0	79	10	1	12	23	6	33	0	5	0	12	181
05:30 PM	0	76	6	2	6	57	5	17	0	3	0	7	179
05:45 PM	0	54	5	1	5	32	2	36	0	7	0	9	151
Total	0	292	29	7	30	155	18	122	0	21	0	42	716
Grand Total	0	933	102	25	100	490	51	431	0	76	0	136	2344
Apprch %	0	90.1	9.9	4.1	16.3	79.7	10.6	89.4	0	35.8	0	64.2	
Total %	0	39.8	4.4	1.1	4.3	20.9	2.2	18.4	0	3.2	0	5.8	
Cars	0	926	101	25	98	482	51	427	0	73	0	136	2319
% Cars	0	99.2	99	100	98	98.4	100	99.1	0	96.1	0	100	98.9
Trucks	0	7	1	0	2	8	0	4	0	3	0	0	25
% Trucks	0	0.8	1	0	2	1.6	0	0.9	0	3.9	0	0	1.1

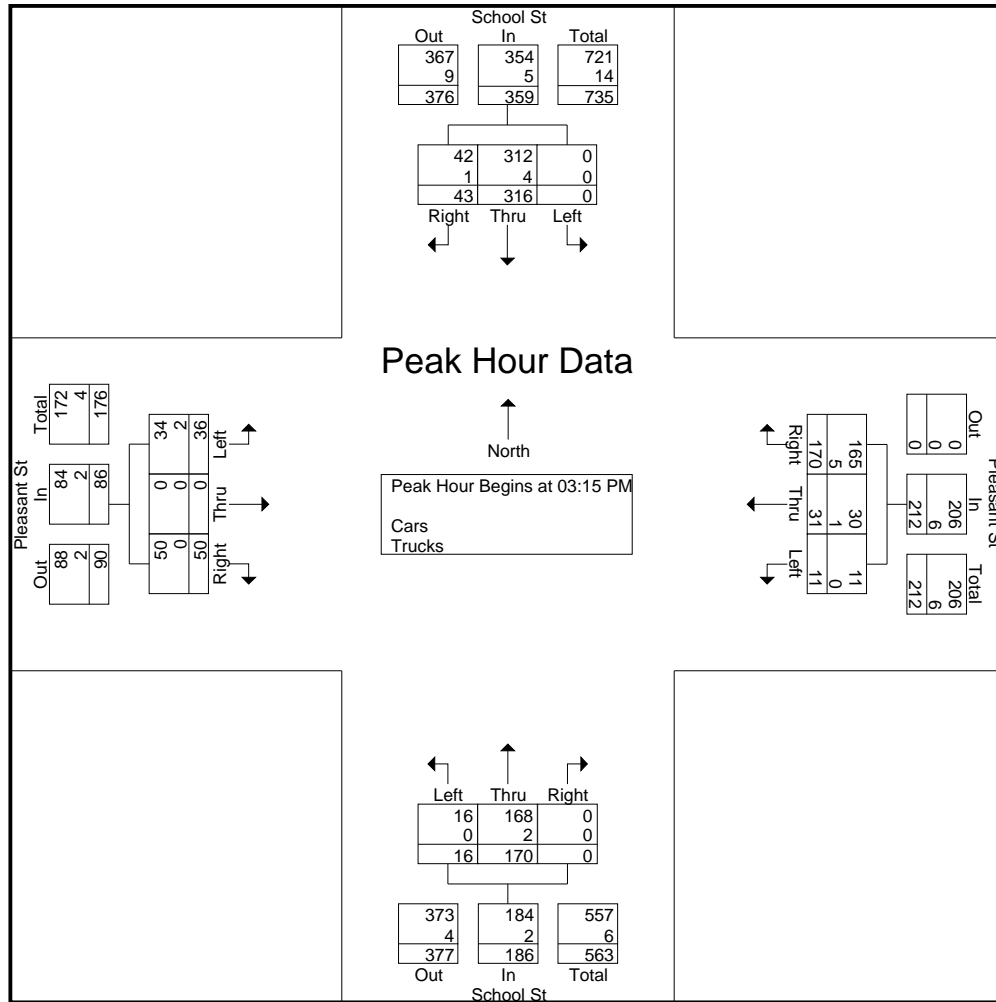
	School St From North				Pleasant St From East				School St From South				Pleasant St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:15 PM																	
03:15 PM	0	66	12	78	1	6	38	45	7	53	0	60	13	0	10	23	206
03:30 PM	0	73	12	85	3	9	41	53	3	51	0	54	13	0	14	27	219
03:45 PM	0	87	8	95	2	5	46	53	3	35	0	38	4	0	15	19	205
04:00 PM	0	90	11	101	5	11	45	61	3	31	0	34	6	0	11	17	213
Total Volume	0	316	43	359	11	31	170	212	16	170	0	186	36	0	50	86	843
% App. Total	0	88	12		5.2	14.6	80.2		8.6	91.4	0		41.9	0	58.1		
PHF	.000	.878	.896	.889	.550	.705	.924	.869	.571	.802	.000	.775	.692	.000	.833	.796	.962
Cars	0	312	42	354	11	30	165	206	16	168	0	184	34	0	50	84	828
% Cars	0	98.7	97.7	98.6	100	96.8	97.1	97.2	100	98.8	0	98.9	94.4	0	100	97.7	98.2
Trucks	0	4	1	5	0	1	5	6	0	2	0	2	2	0	0	2	15
% Trucks	0	1.3	2.3	1.4	0	3.2	2.9	2.8	0	1.2	0	1.1	5.6	0	0	2.3	1.8

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
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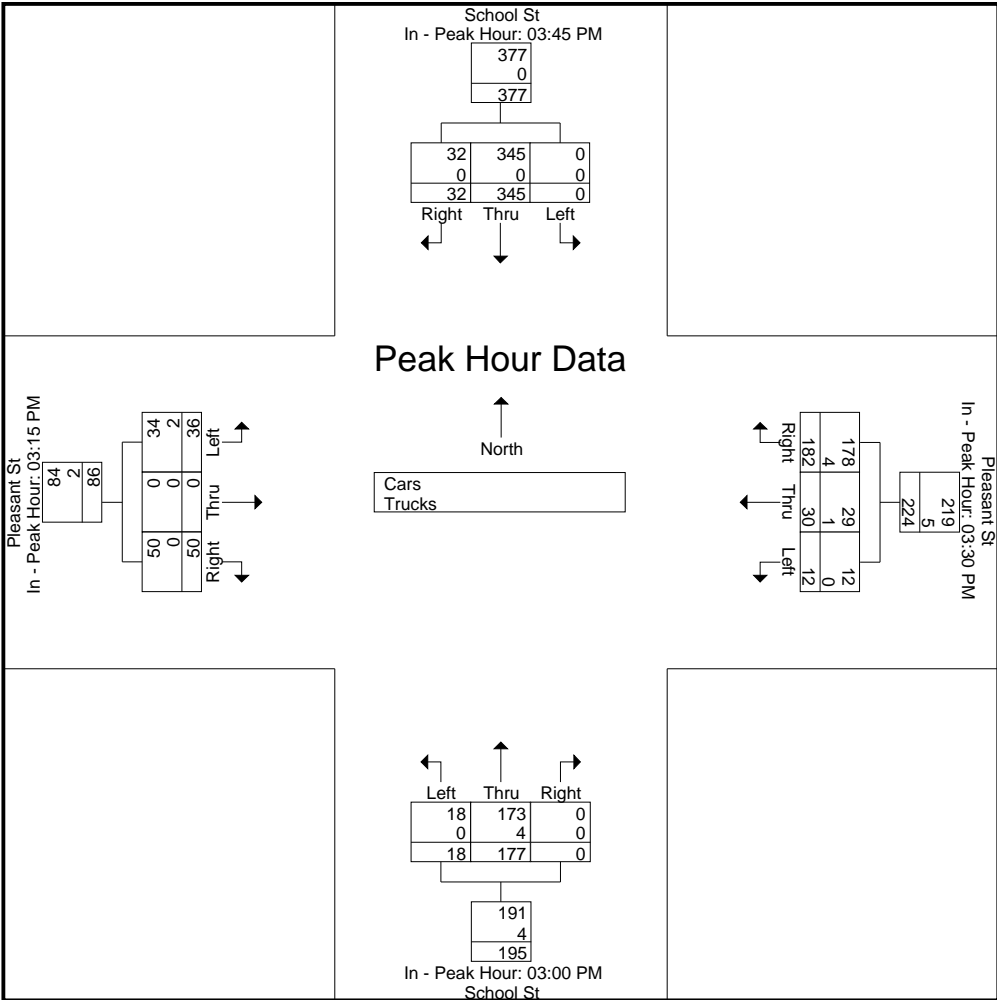
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	03:45 PM				03:30 PM				03:00 PM				03:15 PM			
+0 mins.	0	87	8	95	3	9	41	53	5	38	0	43	13	0	10	23
+15 mins.	0	90	11	101	2	5	46	53	7	53	0	60	13	0	14	27
+30 mins.	0	75	8	83	5	11	45	61	3	51	0	54	4	0	15	19
+45 mins.	0	93	5	98	2	5	50	57	3	35	0	38	6	0	11	17
Total Volume	0	345	32	377	12	30	182	224	18	177	0	195	36	0	50	86
% App. Total	0	91.5	8.5		5.4	13.4	81.2		9.2	90.8	0		41.9	0	58.1	
PHF	.000	.927	.727	.933	.600	.682	.910	.918	.643	.835	.000	.813	.692	.000	.833	.796
Cars	0	345	32	377	12	29	178	219	18	173	0	191	34	0	50	84
% Cars	0	100	100	100	100	96.7	97.8	97.8	100	97.7	0	97.9	94.4	0	100	97.7
Trucks	0	0	0	0	0	1	4	5	0	4	0	4	2	0	0	2
% Trucks	0	0	0	0	0	3.3	2.2	2.2	0	2.3	0	2.1	5.6	0	0	2.3

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
Page No : 3



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
Page No : 4

Groups Printed- Cars

	School St From North			Pleasant St From East			School St From South			Pleasant St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
03:00 PM	0	70	8	3	10	54	5	36	0	5	0	10	201
03:15 PM	0	63	12	1	6	37	7	52	0	13	0	10	201
03:30 PM	0	72	11	3	8	39	3	50	0	11	0	14	211
03:45 PM	0	87	8	2	5	46	3	35	0	4	0	15	205
Total	0	292	39	9	29	176	18	173	0	33	0	49	818
04:00 PM	0	90	11	5	11	43	3	31	0	6	0	11	211
04:15 PM	0	75	8	2	5	50	4	36	0	2	0	12	194
04:30 PM	0	93	5	2	11	34	4	37	0	4	0	11	201
04:45 PM	0	85	9	0	12	26	4	28	0	7	0	11	182
Total	0	343	33	9	39	153	15	132	0	19	0	45	788
05:00 PM	0	82	8	3	7	43	5	36	0	6	0	14	204
05:15 PM	0	79	10	1	12	23	6	33	0	5	0	12	181
05:30 PM	0	76	6	2	6	56	5	17	0	3	0	7	178
05:45 PM	0	54	5	1	5	31	2	36	0	7	0	9	150
Total	0	291	29	7	30	153	18	122	0	21	0	42	713
Grand Total	0	926	101	25	98	482	51	427	0	73	0	136	2319
Apprch %	0	90.2	9.8	4.1	16.2	79.7	10.7	89.3	0	34.9	0	65.1	
Total %	0	39.9	4.4	1.1	4.2	20.8	2.2	18.4	0	3.1	0	5.9	

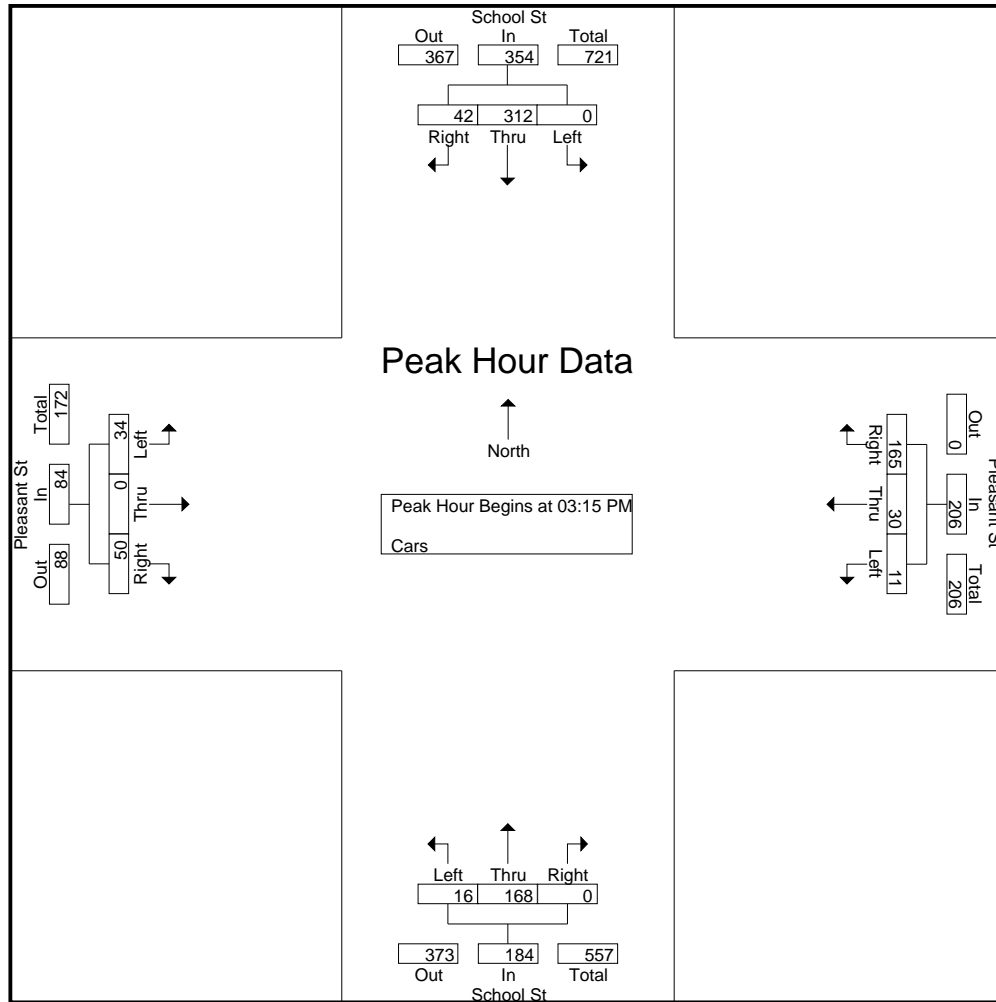
	School St From North				Pleasant St From East				School St From South				Pleasant St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:15 PM																	
03:15 PM	0	63	12	75	1	6	37	44	7	52	0	59	13	0	10	23	201
03:30 PM	0	72	11	83	3	8	39	50	3	50	0	53	11	0	14	25	211
03:45 PM	0	87	8	95	2	5	46	53	3	35	0	38	4	0	15	19	205
04:00 PM	0	90	11	101	5	11	43	59	3	31	0	34	6	0	11	17	211
Total Volume	0	312	42	354	11	30	165	206	16	168	0	184	34	0	50	84	828
% App. Total	0	88.1	11.9		5.3	14.6	80.1		8.7	91.3	0		40.5	0	59.5		
PHF	.000	.867	.875	.876	.550	.682	.897	.873	.571	.808	.000	.780	.654	.000	.833	.840	.981

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
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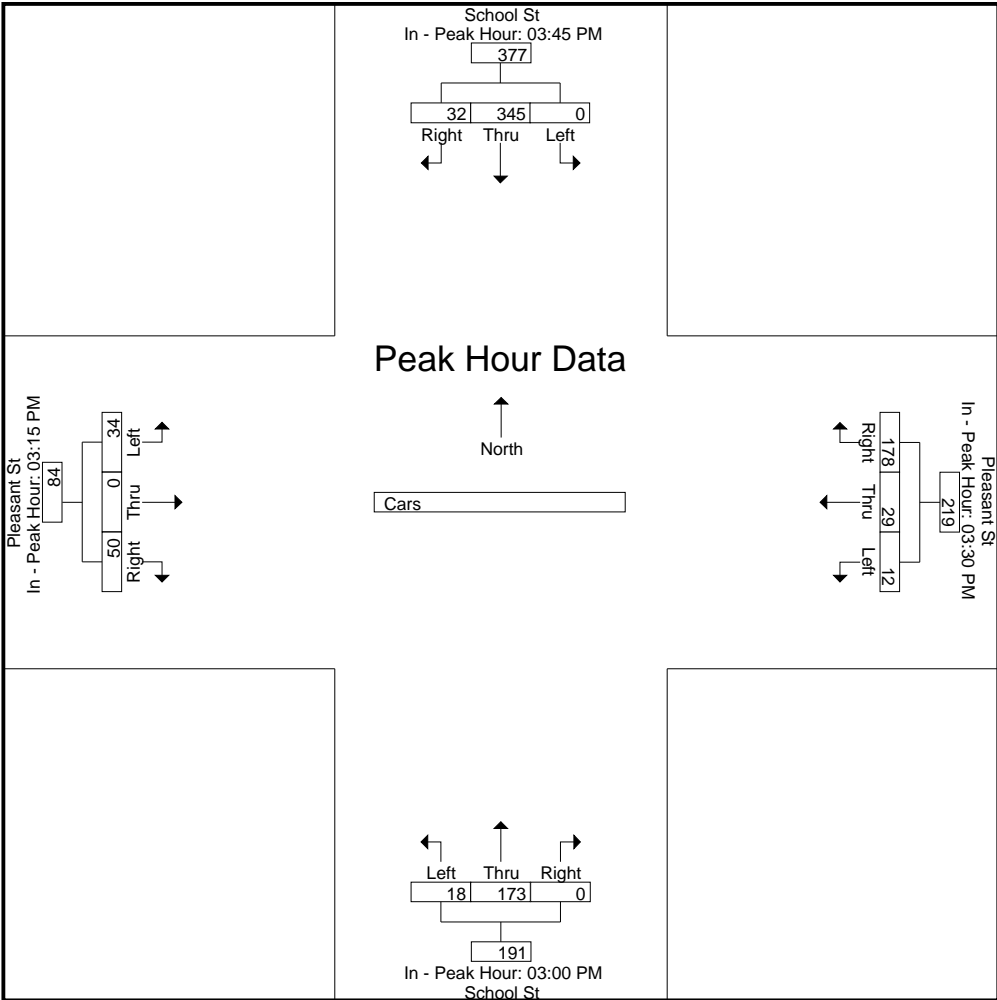
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	03:45 PM				03:30 PM				03:00 PM				03:15 PM			
+0 mins.	0	87	8	95	3	8	39	50	5	36	0	41	13	0	10	23
+15 mins.	0	90	11	101	2	5	46	53	7	52	0	59	11	0	14	25
+30 mins.	0	75	8	83	5	11	43	59	3	50	0	53	4	0	15	19
+45 mins.	0	93	5	98	2	5	50	57	3	35	0	38	6	0	11	17
Total Volume	0	345	32	377	12	29	178	219	18	173	0	191	34	0	50	84
% App. Total	0	91.5	8.5		5.5	13.2	81.3		9.4	90.6	0		40.5	0	59.5	
PHF	.000	.927	.727	.933	.600	.659	.890	.928	.643	.832	.000	.809	.654	.000	.833	.840

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
Page No : 6



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
Page No : 7

Groups Printed- Trucks

	School St From North			Pleasant St From East			School St From South			Pleasant St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
03:00 PM	0	2	0	0	1	1	0	2	0	1	0	0	7
03:15 PM	0	3	0	0	0	1	0	1	0	0	0	0	5
03:30 PM	0	1	1	0	1	2	0	1	0	2	0	0	8
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	6	1	0	2	4	0	4	0	3	0	0	20
04:00 PM	0	0	0	0	0	2	0	0	0	0	0	0	2
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	2	0	0	0	0	0	0	2
05:00 PM	0	1	0	0	0	0	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	1	0	0	0	0	0	0	1
05:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	1
Total	0	1	0	0	0	2	0	0	0	0	0	0	3
Grand Total	0	7	1	0	2	8	0	4	0	3	0	0	25
Apprch %	0	87.5	12.5	0	20	80	0	100	0	100	0	0	
Total %	0	28	4	0	8	32	0	16	0	12	0	0	

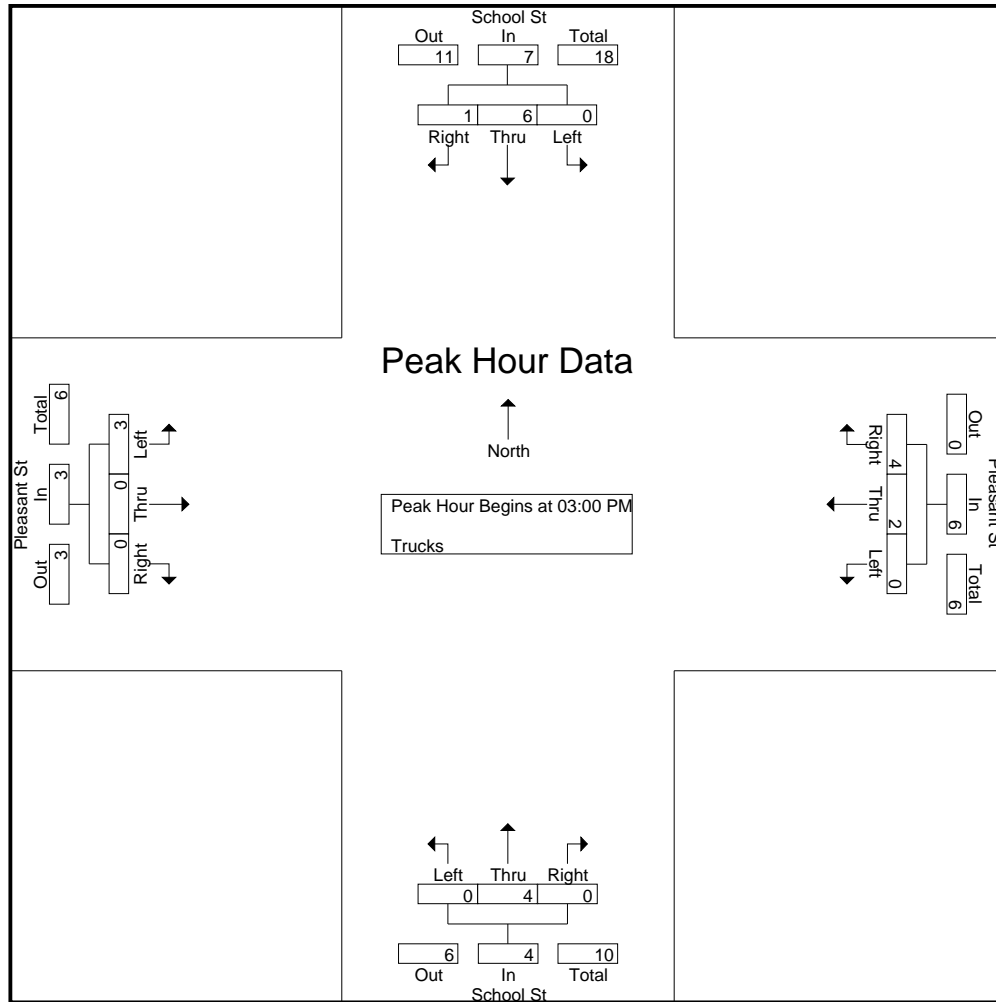
	School St From North				Pleasant St From East				School St From South				Pleasant St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:00 PM																	
03:00 PM	0	2	0	2	0	1	1	2	0	2	0	2	1	0	0	1	7
03:15 PM	0	3	0	3	0	0	1	1	0	1	0	1	0	0	0	0	5
03:30 PM	0	1	1	2	0	1	2	3	0	1	0	1	2	0	0	2	8
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	6	1	7	0	2	4	6	0	4	0	4	3	0	0	3	20
% App. Total	0	85.7	14.3		0	33.3	66.7		0	100	0		100	0	0		
PHF	.000	.500	.250	.583	.000	.500	.500	.500	.000	.500	.000	.500	.375	.000	.000	.375	.625

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
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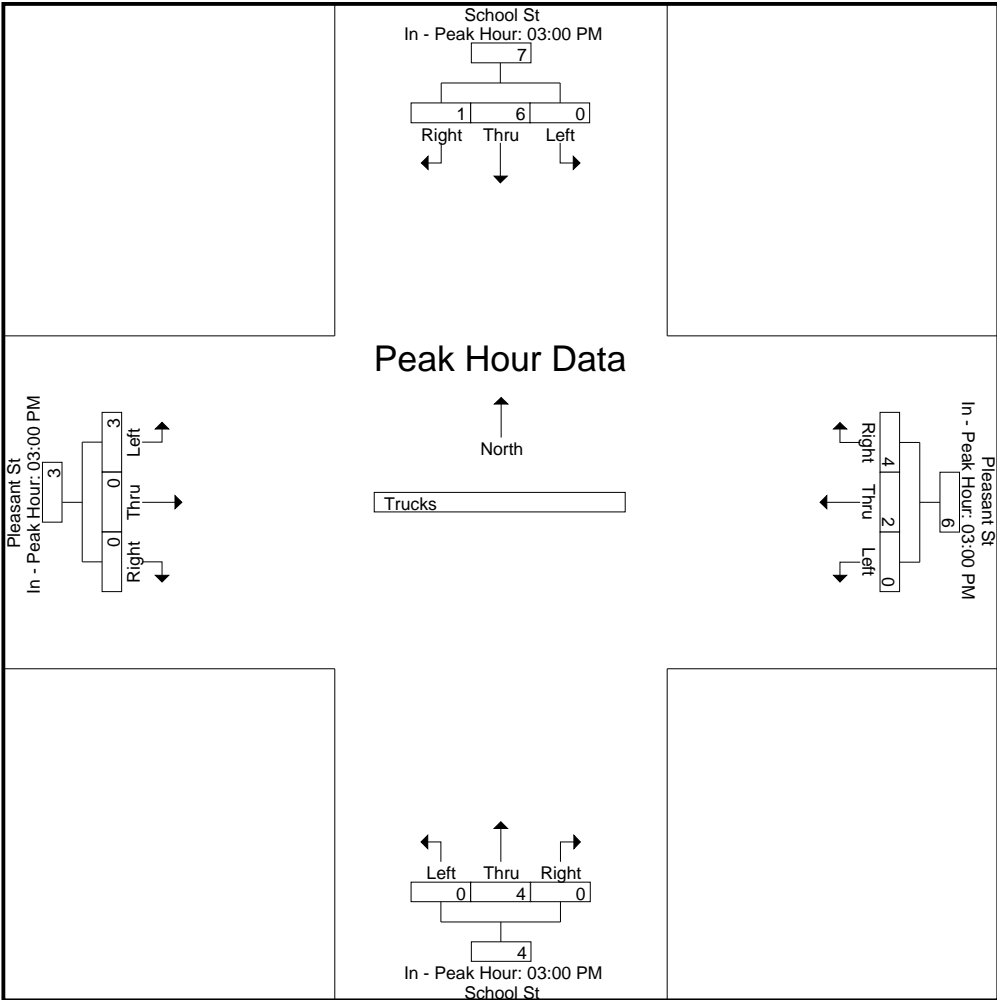
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	03:00 PM				03:00 PM				03:00 PM				03:00 PM			
+0 mins.	0	2	0	2	0	1	1	2	0	2	0	2	1	0	0	1
+15 mins.	0	3	0	3	0	0	1	1	0	1	0	1	0	0	0	0
+30 mins.	0	1	1	2	0	1	2	3	0	1	0	1	2	0	0	2
+45 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	6	1	7	0	2	4	6	0	4	0	4	3	0	0	3
% App. Total	0	85.7	14.3		0	33.3	66.7		0	100	0		100	0	0	
PHF	.000	.500	.250	.583	.000	.500	.500	.500	.000	.500	.000	.500	.375	.000	.000	.375

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
Page No : 9



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
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Groups Printed- Bikes Peds

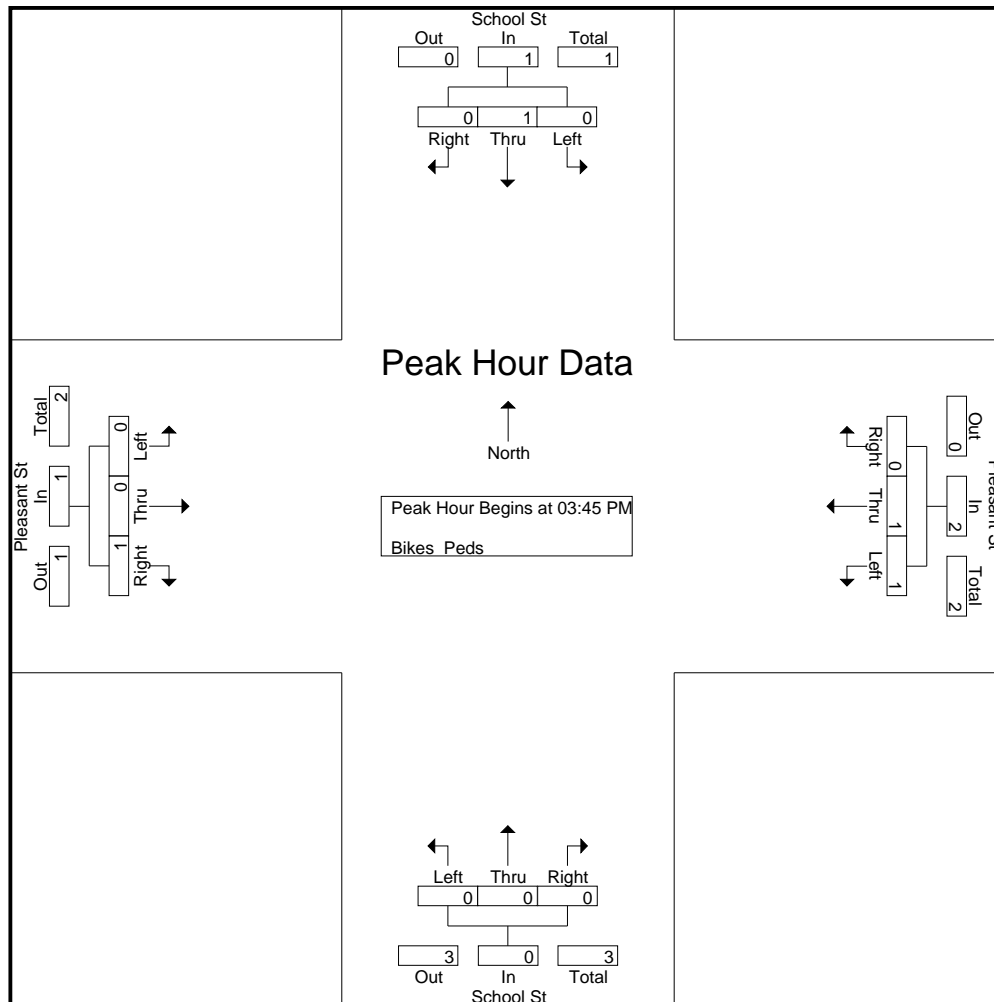
	School St From North				Pleasant St From East				School St From South				Pleasant St From West				Exclu. Total	Inclu. Total	Int. Total
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
03:00 PM	0	0	0	4	0	1	0	0	0	0	0	0	0	0	0	3	7	1	8
03:15 PM	0	0	0	8	0	0	0	0	0	0	0	1	0	0	0	0	9	0	9
03:30 PM	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	2	5	0	5
03:45 PM	0	1	0	5	0	0	0	0	0	0	0	0	0	0	0	0	5	1	6
Total	0	1	0	20	0	1	0	0	0	0	0	1	0	0	0	5	26	2	28
04:00 PM	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	2	1	3
04:15 PM	0	0	0	3	0	0	0	0	0	0	0	1	0	0	1	0	4	1	5
04:30 PM	0	0	0	3	0	1	0	0	0	0	0	0	0	0	0	0	3	1	4
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	8	1	1	0	0	0	0	0	1	0	0	1	0	9	3	12
05:00 PM	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	3	0	3
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	3	0	3
Grand Total	0	1	0	30	1	2	0	0	0	0	0	3	0	0	1	5	38	5	43
Apprch %	0	100	0		33.3	66.7	0		0	0	0		0	0	100				
Total %	0	20	0		20	40	0		0	0	0		0	0	20		88.4	11.6	

	School St From North				Pleasant St From East				School St From South				Pleasant St From West				Int. Total
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:45 PM																	
03:45 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
04:00 PM	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
04:30 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
Total Volume	0	1	0	1	1	1	0	2	0	0	0	0	0	0	1	1	4
% App. Total	0	100	0		50	50	0		0	0	0		0	0	100		
PHF	.000	.250	.000	.250	.250	.250	.000	.500	.000	.000	.000	.000	.000	.000	.250	.250	1.00

978-664-2565

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
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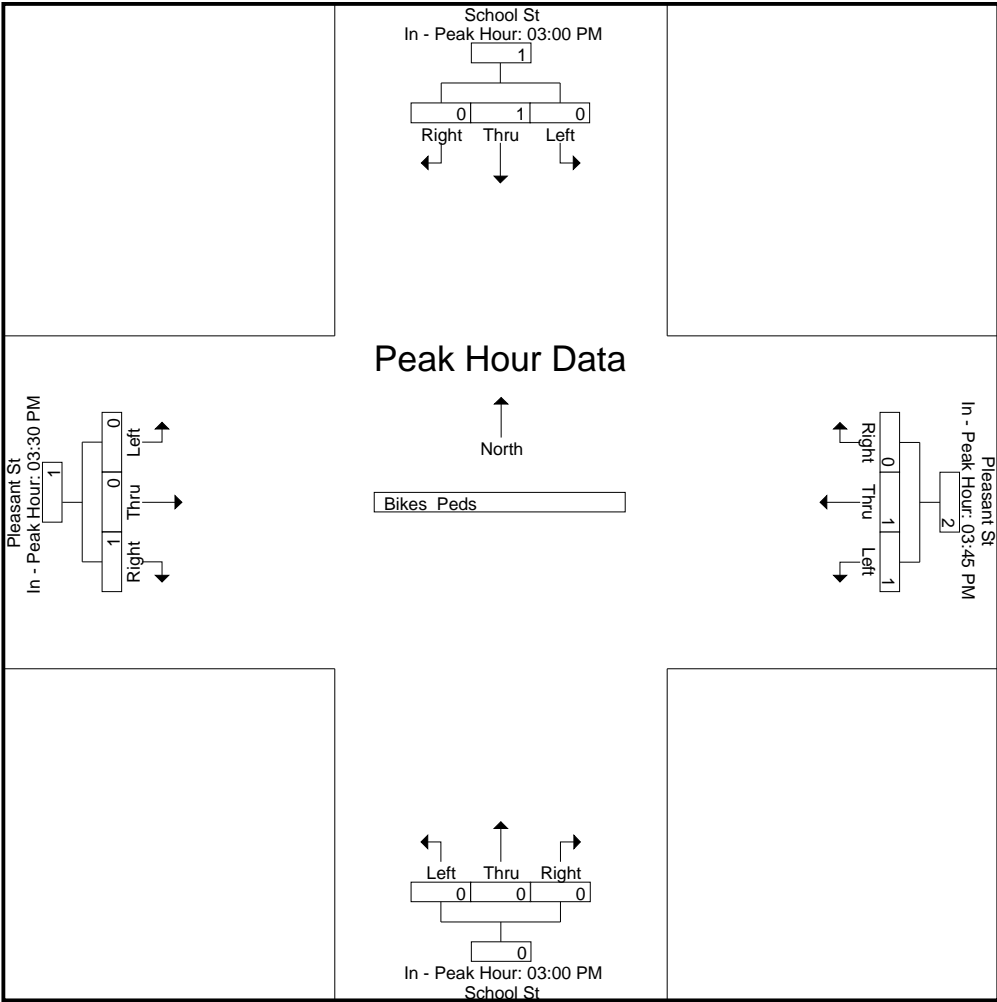
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

[illegible]

N/S Street : School Street
E/W Street : Pleasant Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990004
Site Code : 11990004
Start Date : 1/11/2023
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File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
Page No : 1

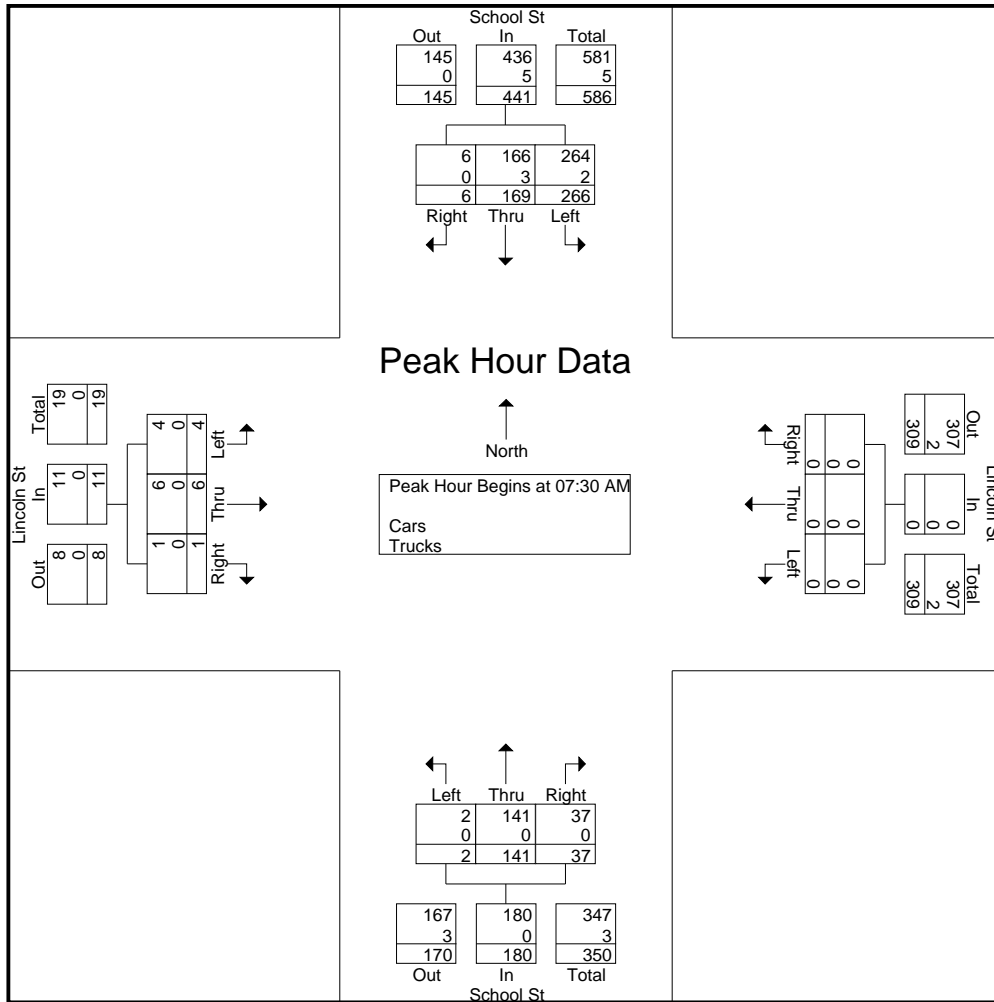
[illegible]

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
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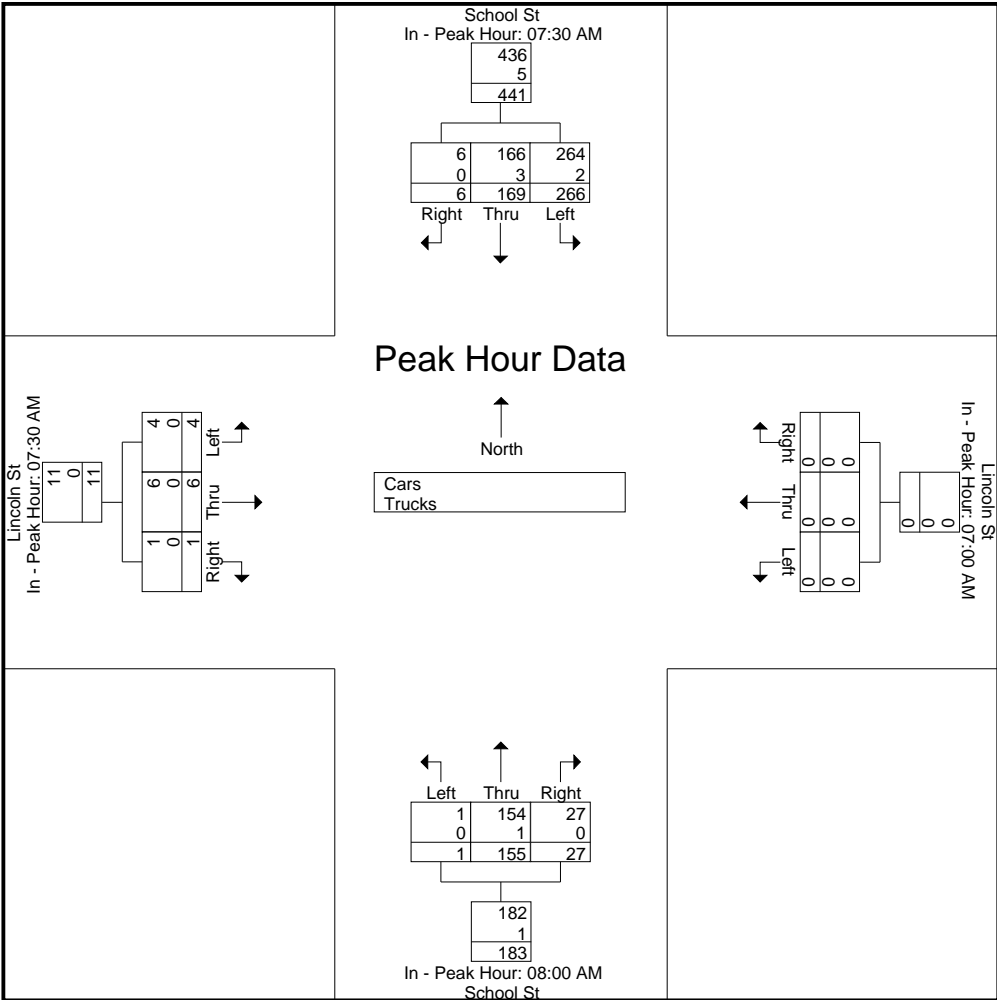
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:30 AM				07:00 AM				08:00 AM				07:30 AM			
+0 mins.	107	46	2	155	0	0	0	0	0	28	10	38	1	3	0	4
+15 mins.	53	34	0	87	0	0	0	0	1	44	11	56	0	0	1	1
+30 mins.	48	39	1	88	0	0	0	0	0	42	5	47	1	0	0	1
+45 mins.	58	50	3	111	0	0	0	0	0	41	1	42	2	3	0	5
Total Volume	266	169	6	441	0	0	0	0	1	155	27	183	4	6	1	11
% App. Total	60.3	38.3	1.4		0	0	0		0.5	84.7	14.8		36.4	54.5	9.1	
PHF	.621	.845	.500	.711	.000	.000	.000	.000	.250	.881	.614	.817	.500	.500	.250	.550
Cars	264	166	6	436	0	0	0	0	1	154	27	182	4	6	1	11
% Cars	99.2	98.2	100	98.9	0	0	0	0	100	99.4	100	99.5	100	100	100	100
Trucks	2	3	0	5	0	0	0	0	0	1	0	1	0	0	0	0
% Trucks	0.8	1.8	0	1.1	0	0	0	0	0	0.6	0	0.5	0	0	0	0

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
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Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
Page No : 4

Groups Printed- Cars

	School St From North			Lincoln St From East			School St From South			Lincoln St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	39	23	0	0	0	0	0	15	1	0	0	0	78
07:15 AM	75	26	0	0	0	0	0	14	7	0	0	0	122
07:30 AM	105	45	2	0	0	0	0	32	13	1	3	0	201
07:45 AM	53	32	0	0	0	0	1	37	3	0	0	1	127
Total	272	126	2	0	0	0	1	98	24	1	3	1	528
08:00 AM	48	39	1	0	0	0	0	28	10	1	0	0	127
08:15 AM	58	50	3	0	0	0	1	44	11	2	3	0	172
08:30 AM	32	42	0	0	0	0	0	42	5	0	0	0	121
08:45 AM	28	41	1	0	0	0	0	40	1	1	0	0	112
Total	166	172	5	0	0	0	1	154	27	4	3	0	532
Grand Total	438	298	7	0	0	0	2	252	51	5	6	1	1060
Apprch %	59	40.1	0.9	0	0	0	0.7	82.6	16.7	41.7	50	8.3	
Total %	41.3	28.1	0.7	0	0	0	0.2	23.8	4.8	0.5	0.6	0.1	

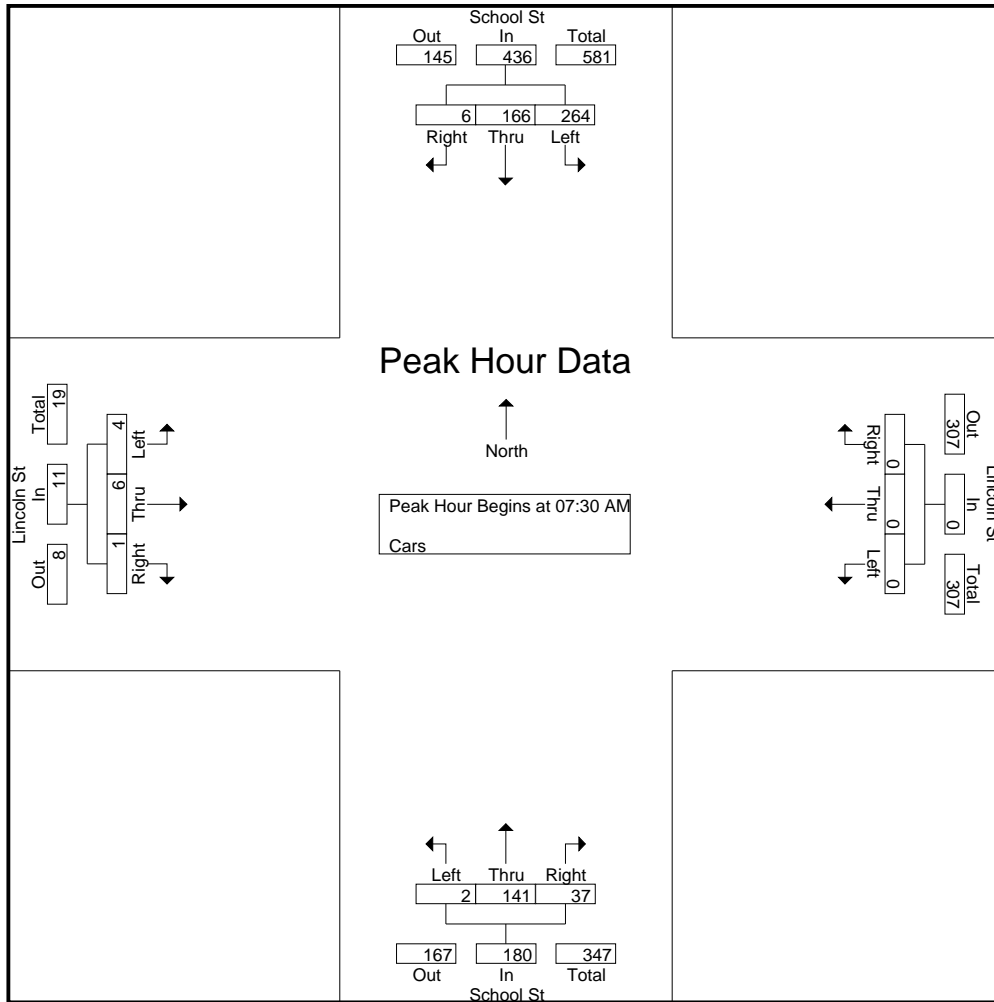
	School St From North				Lincoln St From East				School St From South				Lincoln St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	105	45	2	152	0	0	0	0	0	32	13	45	1	3	0	4	201
07:45 AM	53	32	0	85	0	0	0	0	1	37	3	41	0	0	1	1	127
08:00 AM	48	39	1	88	0	0	0	0	0	28	10	38	1	0	0	1	127
08:15 AM	58	50	3	111	0	0	0	0	1	44	11	56	2	3	0	5	172
Total Volume	264	166	6	436	0	0	0	0	2	141	37	180	4	6	1	11	627
% App. Total	60.6	38.1	1.4		0	0	0		1.1	78.3	20.6		36.4	54.5	9.1		
PHF	.629	.830	.500	.717	.000	.000	.000	.000	.500	.801	.712	.804	.500	.500	.250	.550	.780

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
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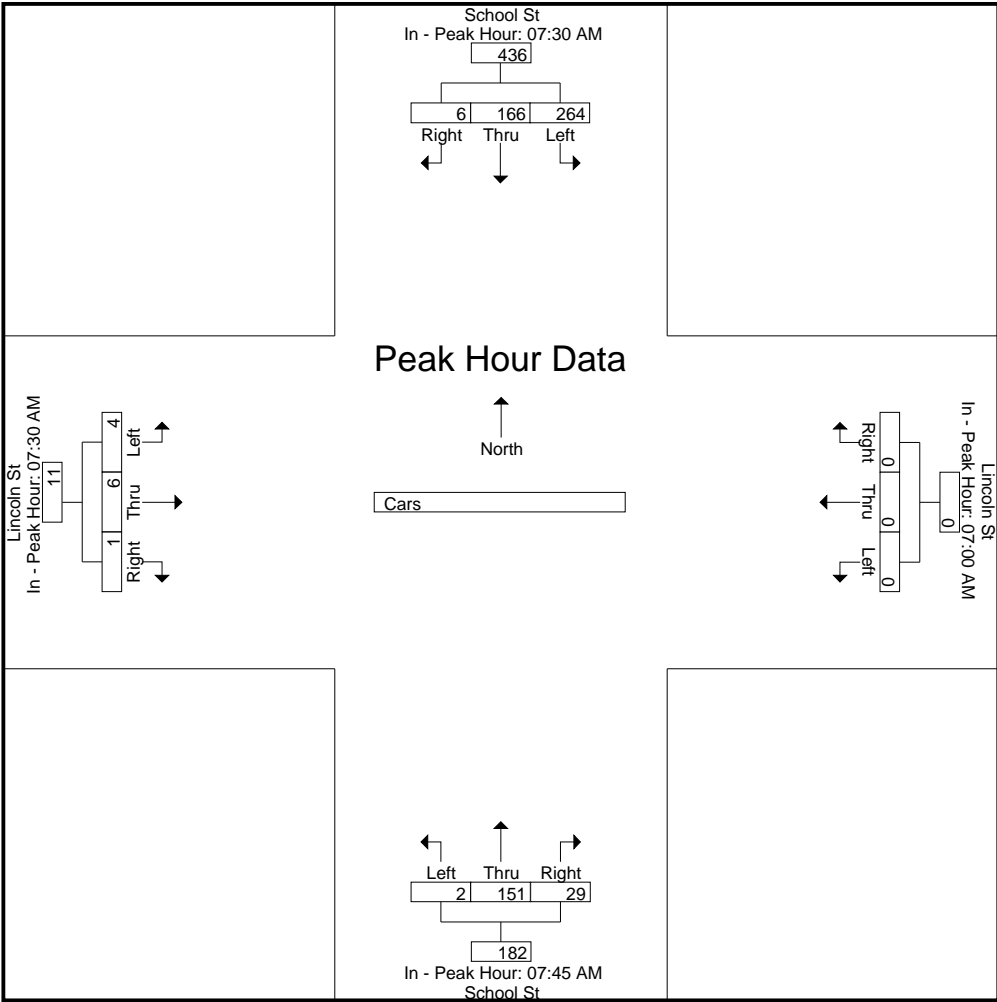
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:30 AM				07:00 AM				07:45 AM				07:30 AM			
+0 mins.	105	45	2	152	0	0	0	0	1	37	3	41	1	3	0	4
+15 mins.	53	32	0	85	0	0	0	0	0	28	10	38	0	0	1	1
+30 mins.	48	39	1	88	0	0	0	0	1	44	11	56	1	0	0	1
+45 mins.	58	50	3	111	0	0	0	0	0	42	5	47	2	3	0	5
Total Volume	264	166	6	436	0	0	0	0	2	151	29	182	4	6	1	11
% App. Total	60.6	38.1	1.4		0	0	0		1.1	83	15.9		36.4	54.5	9.1	
PHF	.629	.830	.500	.717	.000	.000	.000	.000	.500	.858	.659	.813	.500	.500	.250	.550

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
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Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
Page No : 7

Groups Printed- Trucks

	School St From North			Lincoln St From East			School St From South			Lincoln St From West			Int. Total
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:00 AM	2	1	0	0	0	0	0	1	0	0	0	0	4
07:15 AM	5	0	0	0	0	0	0	0	0	0	0	0	5
07:30 AM	2	1	0	0	0	0	0	0	0	0	0	0	3
07:45 AM	0	2	0	0	0	0	0	0	0	0	0	0	2
Total	9	4	0	0	0	0	0	1	0	0	0	0	14
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	2	1	0	0	0	0	0	0	0	0	0	0	3
08:45 AM	2	1	0	0	0	0	0	1	0	0	0	0	4
Total	4	2	0	0	0	0	0	1	0	0	0	0	7
Grand Total	13	6	0	0	0	0	0	2	0	0	0	0	21
Apprch %	68.4	31.6	0	0	0	0	0	100	0	0	0	0	
Total %	61.9	28.6	0	0	0	0	0	9.5	0	0	0	0	

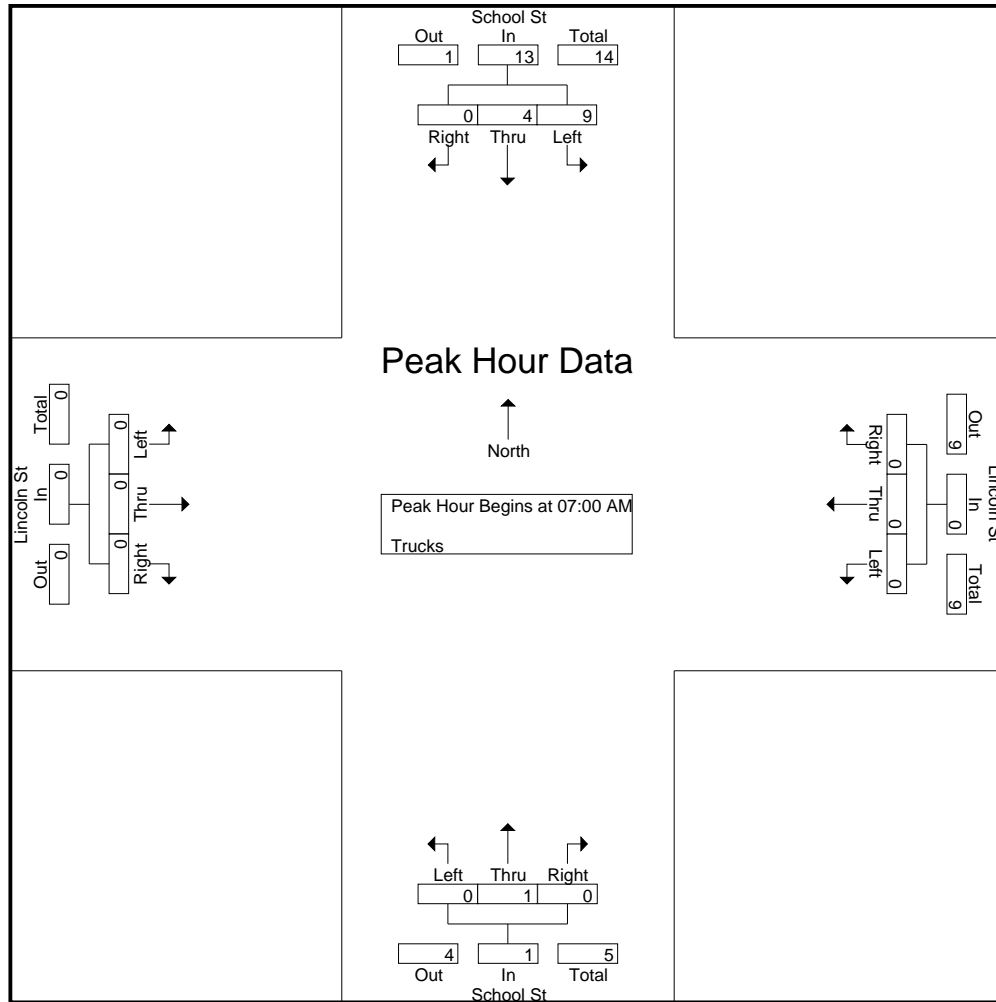
	School St From North				Lincoln St From East				School St From South				Lincoln St From West				Int. Total
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	2	1	0	3	0	0	0	0	0	1	0	1	0	0	0	0	4
07:15 AM	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	5
07:30 AM	2	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
07:45 AM	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
Total Volume	9	4	0	13	0	0	0	0	0	1	0	1	0	0	0	0	14
% App. Total	69.2	30.8	0		0	0	0		0	100	0		0	0	0		
PHF	.450	.500	.000	.650	.000	.000	.000	.000	.000	.250	.000	.250	.000	.000	.000	.000	.700

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
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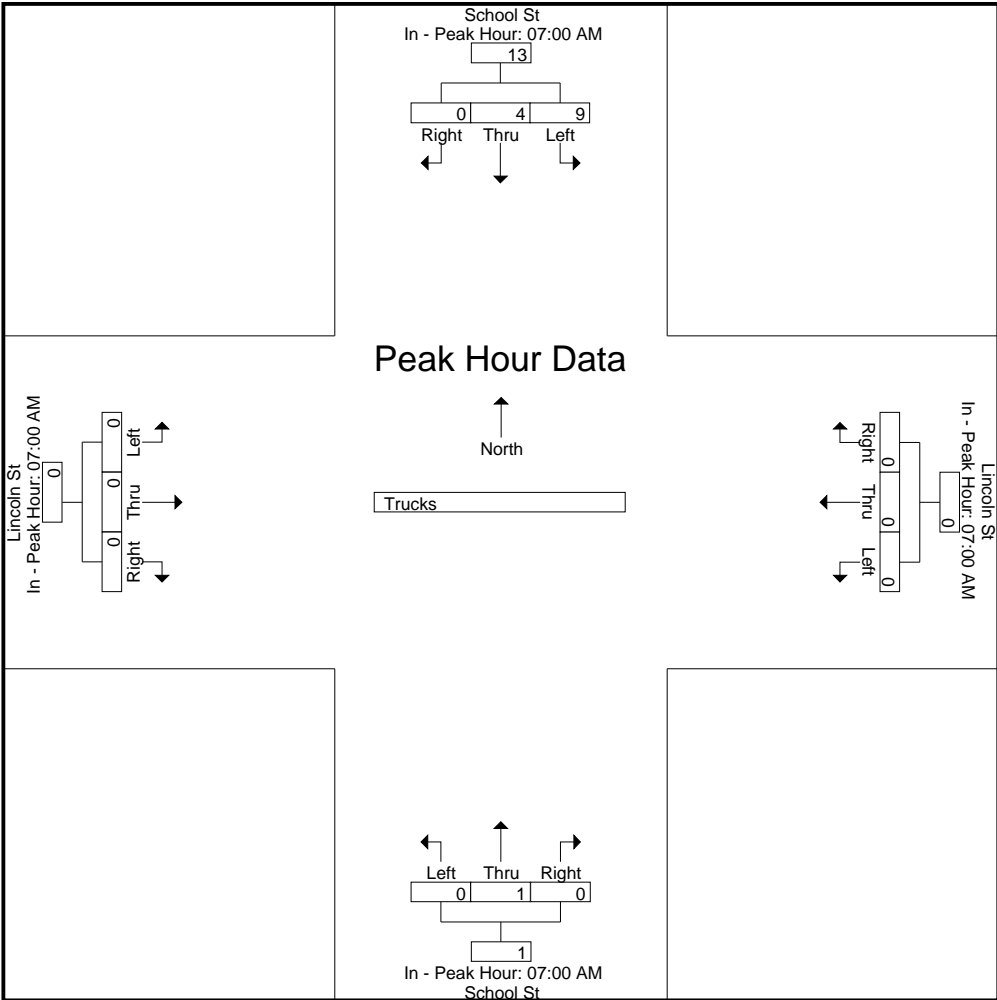
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:00 AM				07:00 AM				07:00 AM				07:00 AM			
+0 mins.	2	1	0	3	0	0	0	0	0	1	0	1	0	0	0	0
+15 mins.	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
+30 mins.	2	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0
+45 mins.	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	9	4	0	13	0	0	0	0	0	1	0	1	0	0	0	0
% App. Total	69.2	30.8	0		0	0	0		0	100	0		0	0	0	
PHF	.450	.500	.000	.650	.000	.000	.000	.000	.000	.250	.000	.250	.000	.000	.000	.000

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
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Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
Page No : 10

Groups Printed- Bikes Peds

	School St From North				Lincoln St From East				School St From South				Lincoln St From West				Exclu. Total	Inclu. Total	Int. Total
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
07:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	2	0	2
07:15 AM	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	3	0	3
07:30 AM	0	0	0	4	0	0	0	0	0	1	0	0	0	0	0	0	4	1	5
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1
Total	0	0	0	5	0	0	0	2	0	1	0	0	0	0	0	3	10	1	11
08:00 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	3	0	3
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1
Total	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	4	5	0	5
Grand Total	0	0	0	6	0	0	0	2	0	1	0	0	0	0	0	7	15	1	16
Apprch %	0	0	0		0	0	0		0	100	0		0	0	0				
Total %	0	0	0		0	0	0		0	100	0		0	0	0		93.8	6.2	

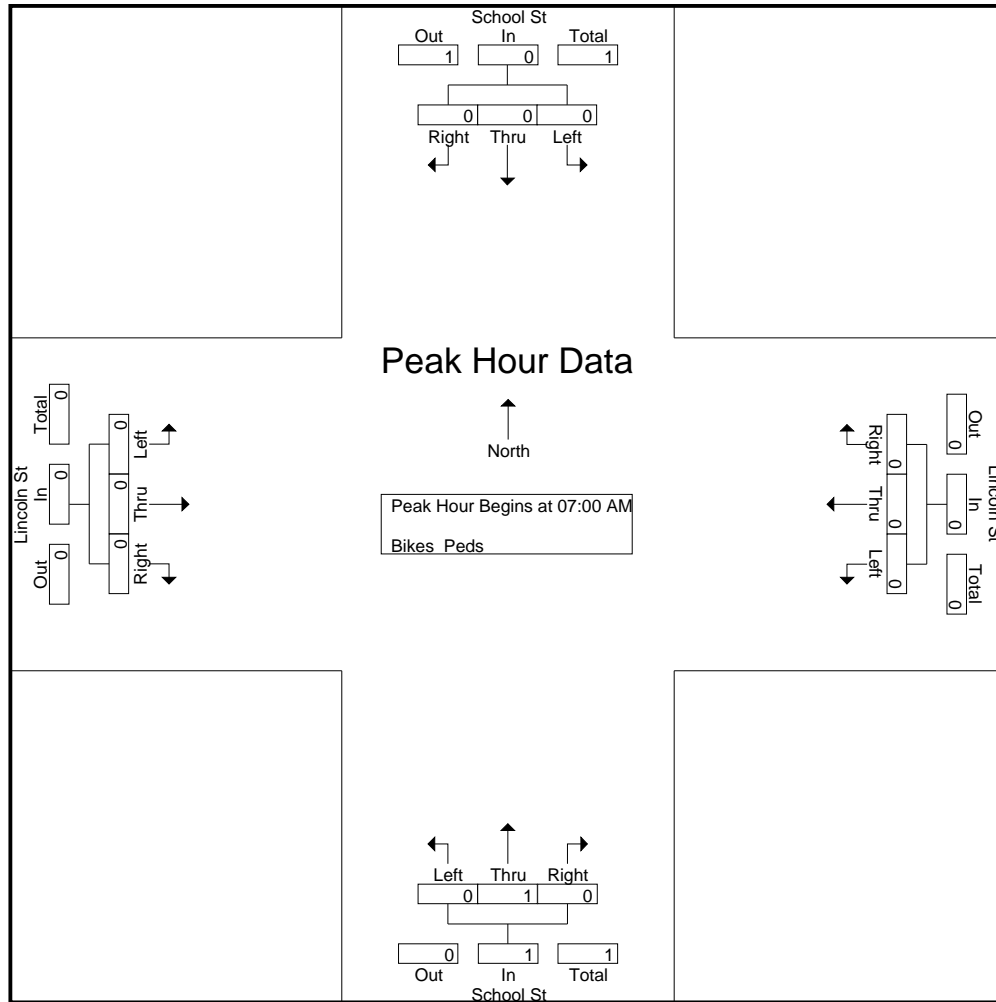
	School St From North				Lincoln St From East				School St From South				Lincoln St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1															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

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
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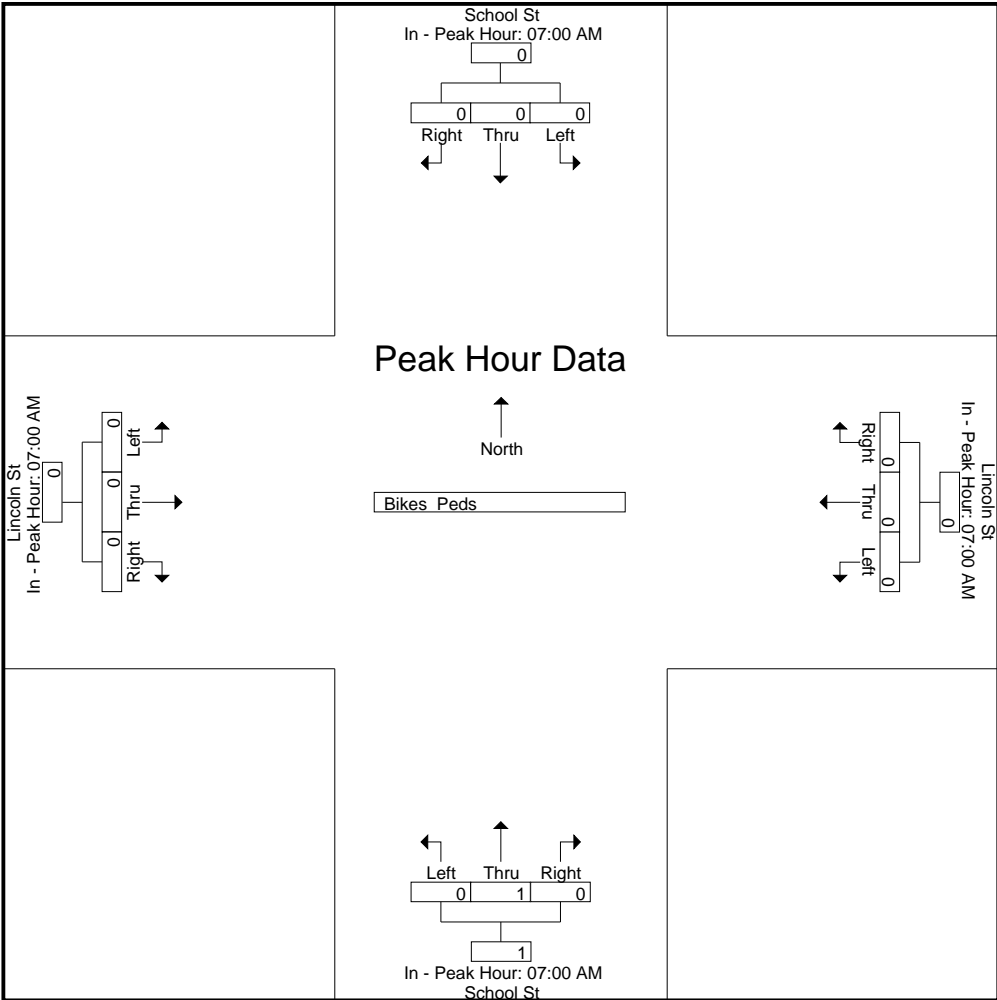
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	07:00 AM				07:00 AM				07:00 AM				07:00 AM			
+0 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+15 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+30 mins.	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
+45 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
% App. Total	0	0	0	0	0	0	0	0	0	100	0		0	0	0	
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.250	.000	.000	.000	.000

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
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File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
Page No : 1

	School St From North			Lincoln St From East			School St From South			Lincoln St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
03:00 PM	40	42	2	0	0	0	0	43	3	0	1	0	131
03:15 PM	28	48	1	0	0	0	1	58	2	3	0	0	141
03:30 PM	40	45	0	0	0	0	0	54	4	1	0	0	144
03:45 PM	65	37	1	0	0	0	0	33	8	2	0	0	146
Total	173	172	4	0	0	0	1	188	17	6	1	0	562
04:00 PM	67	39	1	0	0	0	0	36	6	2	1	0	152
04:15 PM	47	43	1	0	0	0	0	38	6	0	1	0	136
04:30 PM	51	50	3	0	0	0	0	42	4	1	1	0	152
04:45 PM	54	42	1	0	0	0	0	34	3	0	2	0	136
Total	219	174	6	0	0	0	0	150	19	3	5	0	576
05:00 PM	60	37	3	0	0	0	1	39	9	1	0	0	150
05:15 PM	51	38	0	0	0	0	0	39	4	0	0	0	132
05:30 PM	47	36	2	0	0	0	1	24	2	0	0	0	112
05:45 PM	28	31	1	0	0	0	0	35	3	1	0	0	99
Total	186	142	6	0	0	0	2	137	18	2	0	0	493
Grand Total	578	488	16	0	0	0	3	475	54	11	6	0	1631
Apprch %	53.4	45.1	1.5	0	0	0	0.6	89.3	10.2	64.7	35.3	0	
Total %	35.4	29.9	1	0	0	0	0.2	29.1	3.3	0.7	0.4	0	
Cars	573	485	16	0	0	0	3	472	54	11	6	0	1620
% Cars	99.1	99.4	100	0	0	0	100	99.4	100	100	100	0	99.3
Trucks	5	3	0	0	0	0	0	3	0	0	0	0	11
% Trucks	0.9	0.6	0	0	0	0	0	0.6	0	0	0	0	0.7

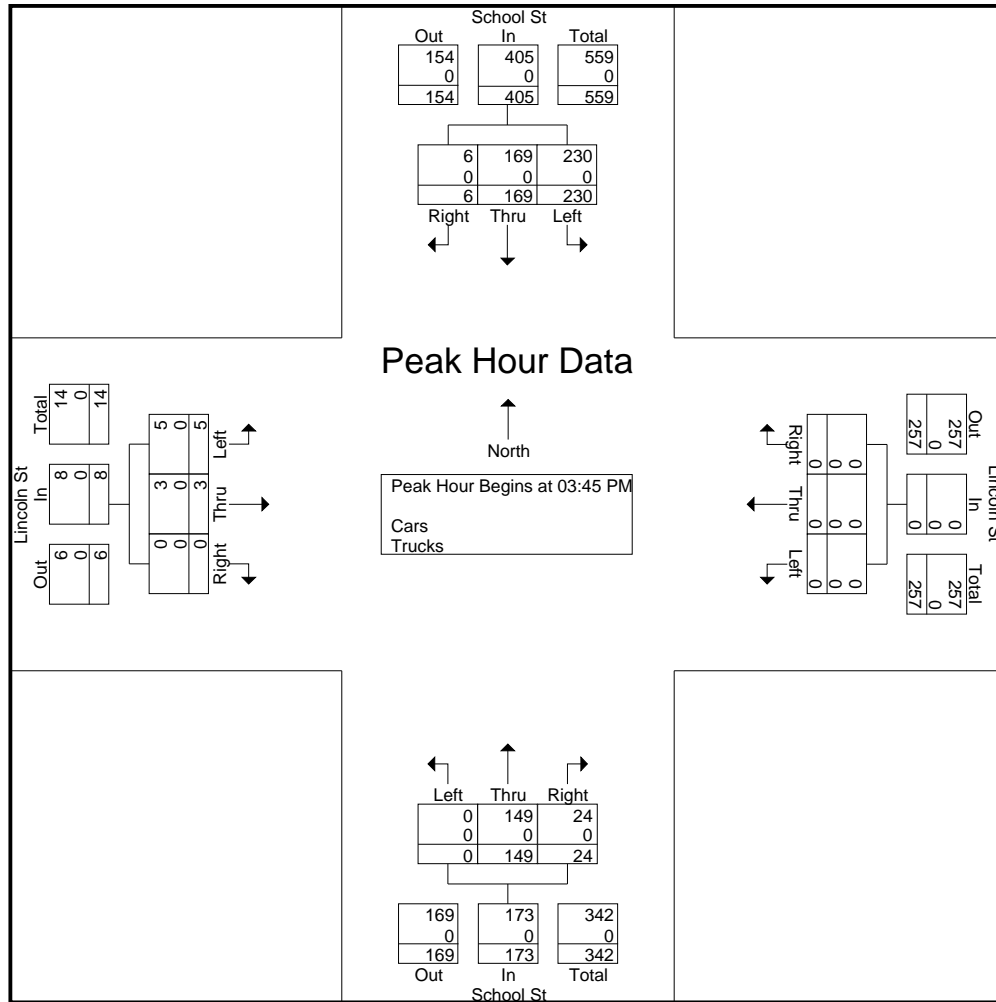
[illegible]

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
Page No : 2



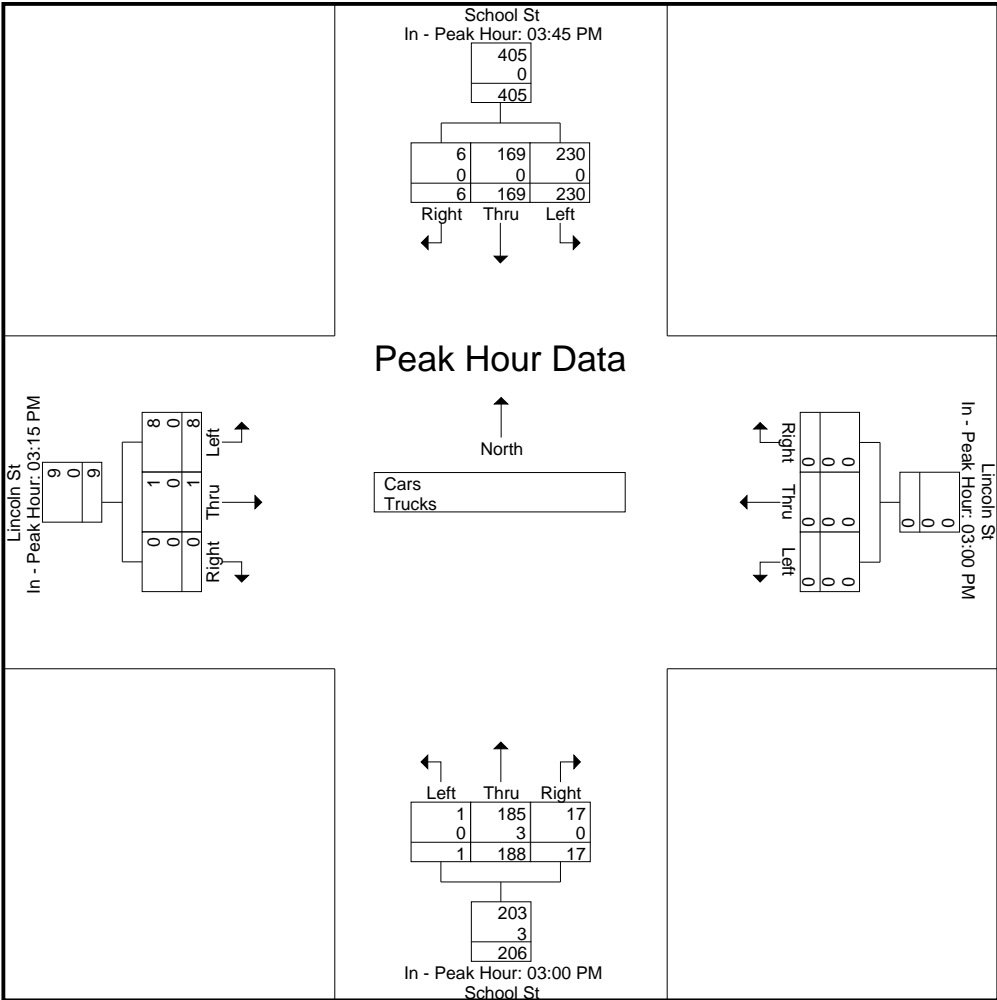
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	03:45 PM				03:00 PM				03:00 PM				03:15 PM			
+0 mins.	65	37	1	103	0	0	0	0	0	43	3	46	3	0	0	3
+15 mins.	67	39	1	107	0	0	0	0	1	58	2	61	1	0	0	1
+30 mins.	47	43	1	91	0	0	0	0	0	54	4	58	2	0	0	2
+45 mins.	51	50	3	104	0	0	0	0	0	33	8	41	2	1	0	3
Total Volume	230	169	6	405	0	0	0	0	1	188	17	206	8	1	0	9
% App. Total	56.8	41.7	1.5		0	0	0		0.5	91.3	8.3		88.9	11.1	0	
PHF	.858	.845	.500	.946	.000	.000	.000	.000	.250	.810	.531	.844	.667	.250	.000	.750
Cars	230	169	6	405	0	0	0	0	1	185	17	203	8	1	0	9
% Cars	100	100	100	100	0	0	0	0	100	98.4	100	98.5	100	100	0	100
Trucks	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0
% Trucks	0	0	0	0	0	0	0	0	0	1.6	0	1.5	0	0	0	0

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
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Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
Page No : 4

Groups Printed- Cars

	School St From North			Lincoln St From East			School St From South			Lincoln St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
03:00 PM	39	41	2	0	0	0	0	42	3	0	1	0	128
03:15 PM	26	47	1	0	0	0	1	57	2	3	0	0	137
03:30 PM	39	45	0	0	0	0	0	53	4	1	0	0	142
03:45 PM	65	37	1	0	0	0	0	33	8	2	0	0	146
Total	169	170	4	0	0	0	1	185	17	6	1	0	553
04:00 PM	67	39	1	0	0	0	0	36	6	2	1	0	152
04:15 PM	47	43	1	0	0	0	0	38	6	0	1	0	136
04:30 PM	51	50	3	0	0	0	0	42	4	1	1	0	152
04:45 PM	53	42	1	0	0	0	0	34	3	0	2	0	135
Total	218	174	6	0	0	0	0	150	19	3	5	0	575
05:00 PM	60	36	3	0	0	0	1	39	9	1	0	0	149
05:15 PM	51	38	0	0	0	0	0	39	4	0	0	0	132
05:30 PM	47	36	2	0	0	0	1	24	2	0	0	0	112
05:45 PM	28	31	1	0	0	0	0	35	3	1	0	0	99
Total	186	141	6	0	0	0	2	137	18	2	0	0	492
Grand Total	573	485	16	0	0	0	3	472	54	11	6	0	1620
Apprch %	53.4	45.2	1.5	0	0	0	0.6	89.2	10.2	64.7	35.3	0	
Total %	35.4	29.9	1	0	0	0	0.2	29.1	3.3	0.7	0.4	0	

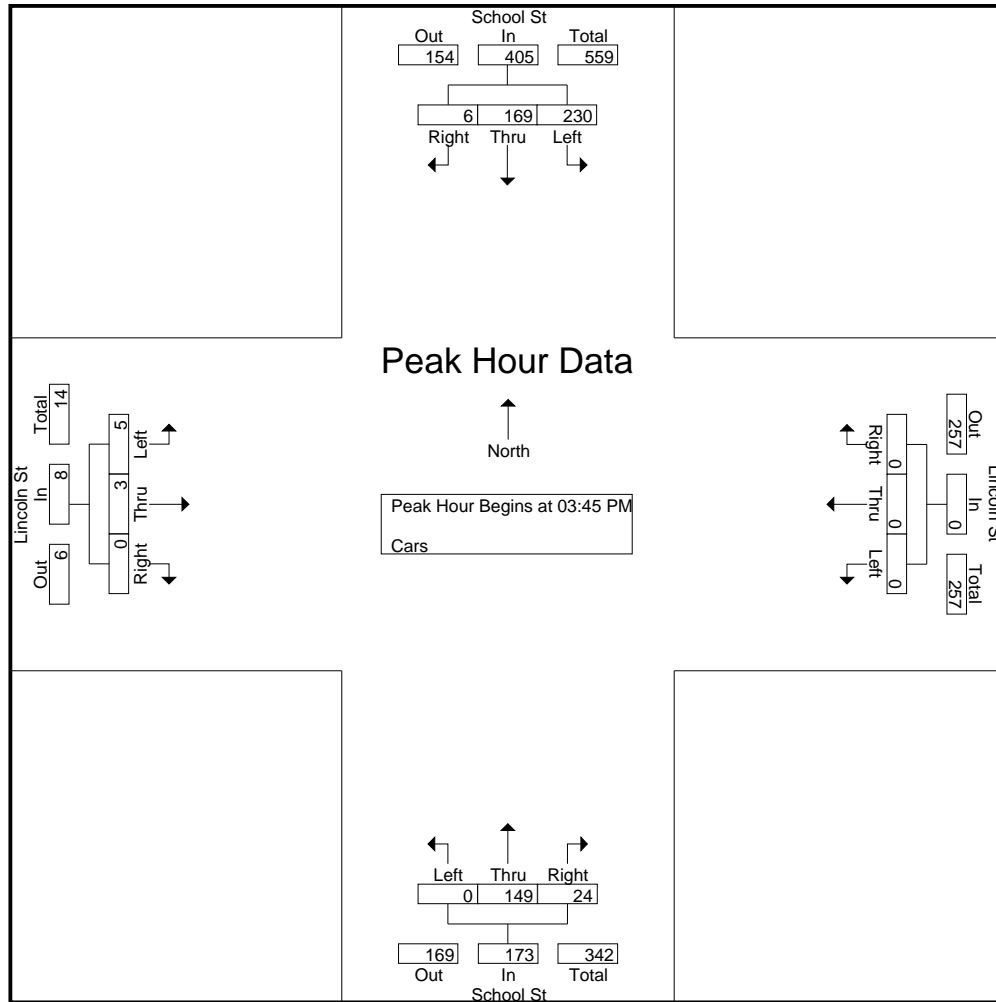
	School St From North				Lincoln St From East				School St From South				Lincoln St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:45 PM																	
03:45 PM	65	37	1	103	0	0	0	0	0	33	8	41	2	0	0	2	146
04:00 PM	67	39	1	107	0	0	0	0	0	36	6	42	2	1	0	3	152
04:15 PM	47	43	1	91	0	0	0	0	0	38	6	44	0	1	0	1	136
04:30 PM	51	50	3	104	0	0	0	0	0	42	4	46	1	1	0	2	152
Total Volume	230	169	6	405	0	0	0	0	0	149	24	173	5	3	0	8	586
% App. Total	56.8	41.7	1.5		0	0	0		0	86.1	13.9		62.5	37.5	0		
PHF	.858	.845	.500	.946	.000	.000	.000	.000	.000	.887	.750	.940	.625	.750	.000	.667	.964

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
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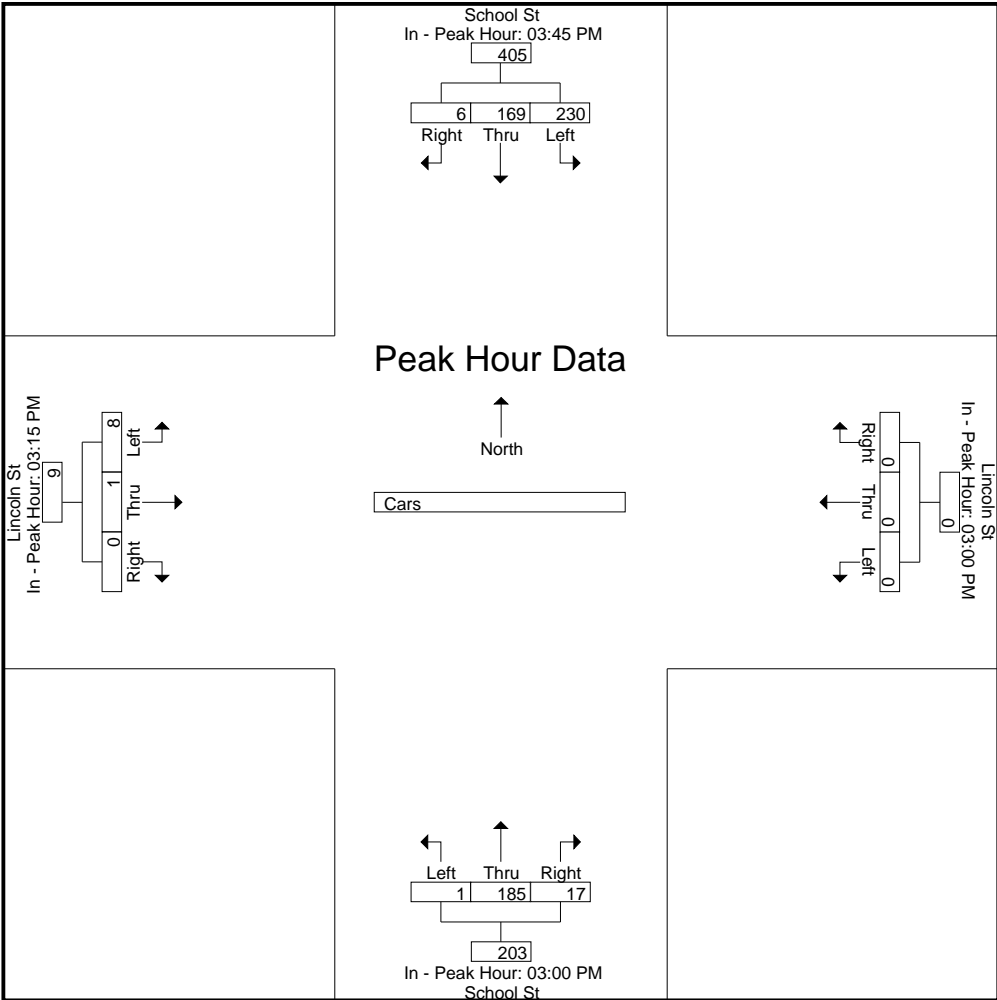
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	03:45 PM				03:00 PM				03:00 PM				03:15 PM			
+0 mins.	65	37	1	103	0	0	0	0	0	42	3	45	3	0	0	3
+15 mins.	67	39	1	107	0	0	0	0	1	57	2	60	1	0	0	1
+30 mins.	47	43	1	91	0	0	0	0	0	53	4	57	2	0	0	2
+45 mins.	51	50	3	104	0	0	0	0	0	33	8	41	2	1	0	3
Total Volume	230	169	6	405	0	0	0	0	1	185	17	203	8	1	0	9
% App. Total	56.8	41.7	1.5		0	0	0		0.5	91.1	8.4		88.9	11.1	0	
PHF	.858	.845	.500	.946	.000	.000	.000	.000	.250	.811	.531	.846	.667	.250	.000	.750

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
Page No : 6



Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
Page No : 7

Groups Printed- Trucks

	School St From North			Lincoln St From East			School St From South			Lincoln St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
03:00 PM	1	1	0	0	0	0	0	1	0	0	0	0	3
03:15 PM	2	1	0	0	0	0	0	1	0	0	0	0	4
03:30 PM	1	0	0	0	0	0	0	1	0	0	0	0	2
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	4	2	0	0	0	0	0	3	0	0	0	0	9
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	1	0	0	0	0	0	0	0	0	0	0	0	1
Total	1	0	0	0	0	0	0	0	0	0	0	0	1
05:00 PM	0	1	0	0	0	0	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	0	0	0	0	0	0	1
Grand Total	5	3	0	0	0	0	0	3	0	0	0	0	11
Apprch %	62.5	37.5	0	0	0	0	0	100	0	0	0	0	
Total %	45.5	27.3	0	0	0	0	0	27.3	0	0	0	0	

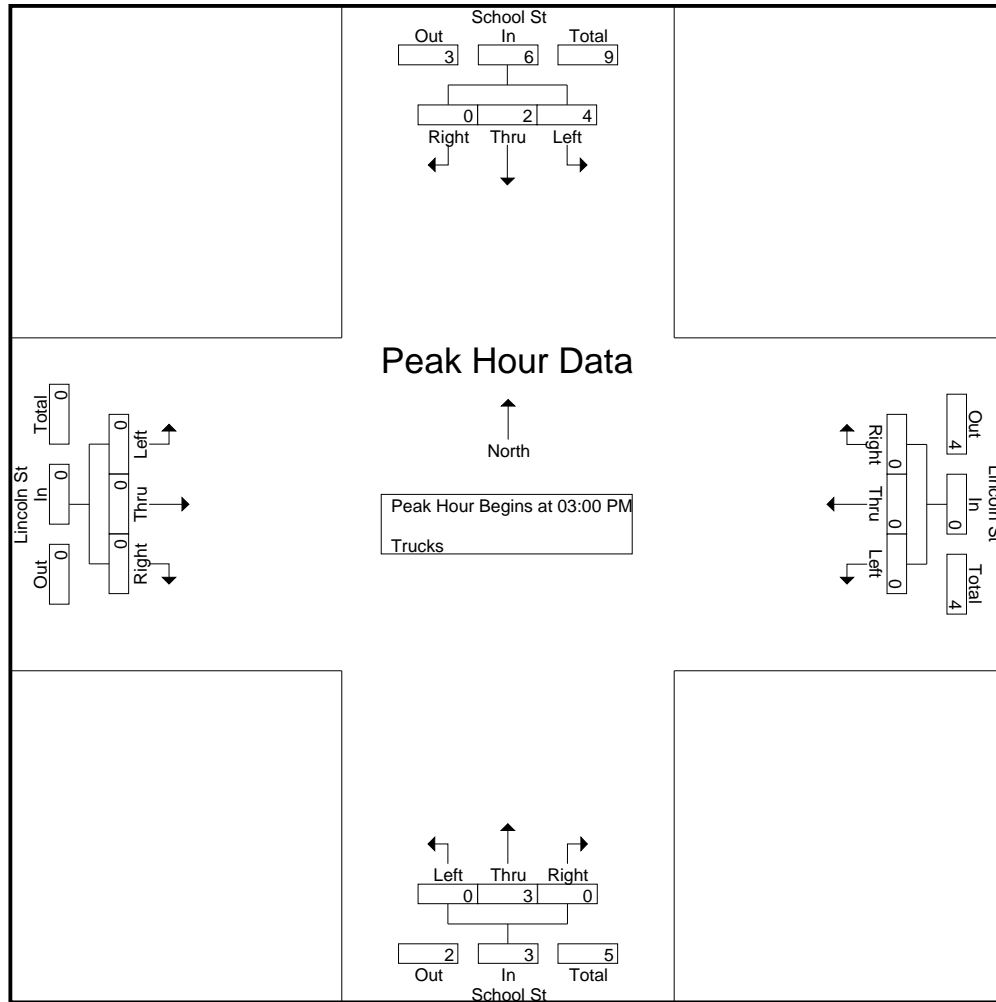
	School St From North				Lincoln St From East				School St From South				Lincoln St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:00 PM																	
03:00 PM	1	1	0	2	0	0	0	0	0	1	0	1	0	0	0	0	3
03:15 PM	2	1	0	3	0	0	0	0	0	1	0	1	0	0	0	0	4
03:30 PM	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	2
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	4	2	0	6	0	0	0	0	0	3	0	3	0	0	0	0	9
% App. Total	66.7	33.3	0		0	0	0		0	100	0		0	0	0		
PHF	.500	.500	.000	.500	.000	.000	.000	.000	.000	.750	.000	.750	.000	.000	.000	.000	.563

Accurate Counts

978-664-2565

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
Page No : 8



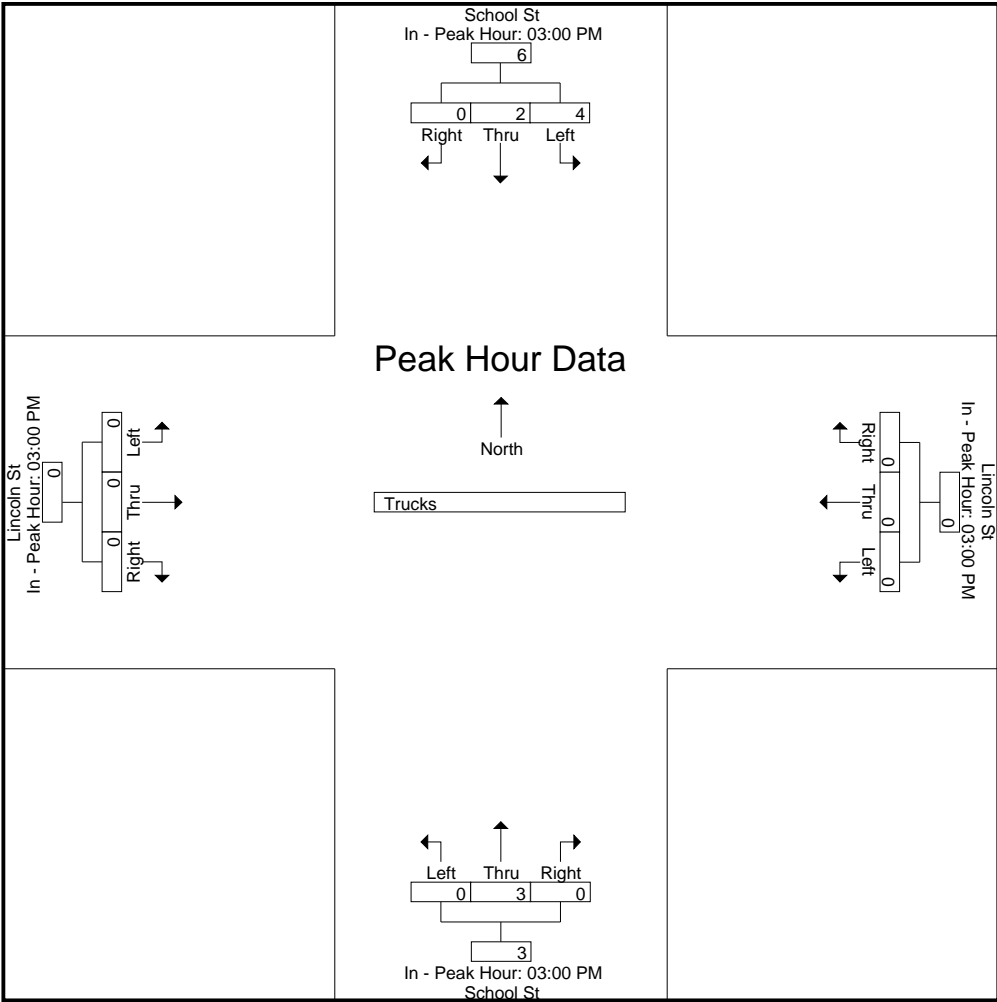
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

	03:00 PM				03:00 PM				03:00 PM				03:00 PM			
+0 mins.	1	1	0	2	0	0	0	0	0	1	0	1	0	0	0	0
+15 mins.	2	1	0	3	0	0	0	0	0	1	0	1	0	0	0	0
+30 mins.	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0
+45 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	4	2	0	6	0	0	0	0	0	3	0	3	0	0	0	0
% App. Total	66.7	33.3	0		0	0	0		0	100	0		0	0	0	
PHF	.500	.500	.000	.500	.000	.000	.000	.000	.000	.750	.000	.750	.000	.000	.000	.000

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
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978-664-2565

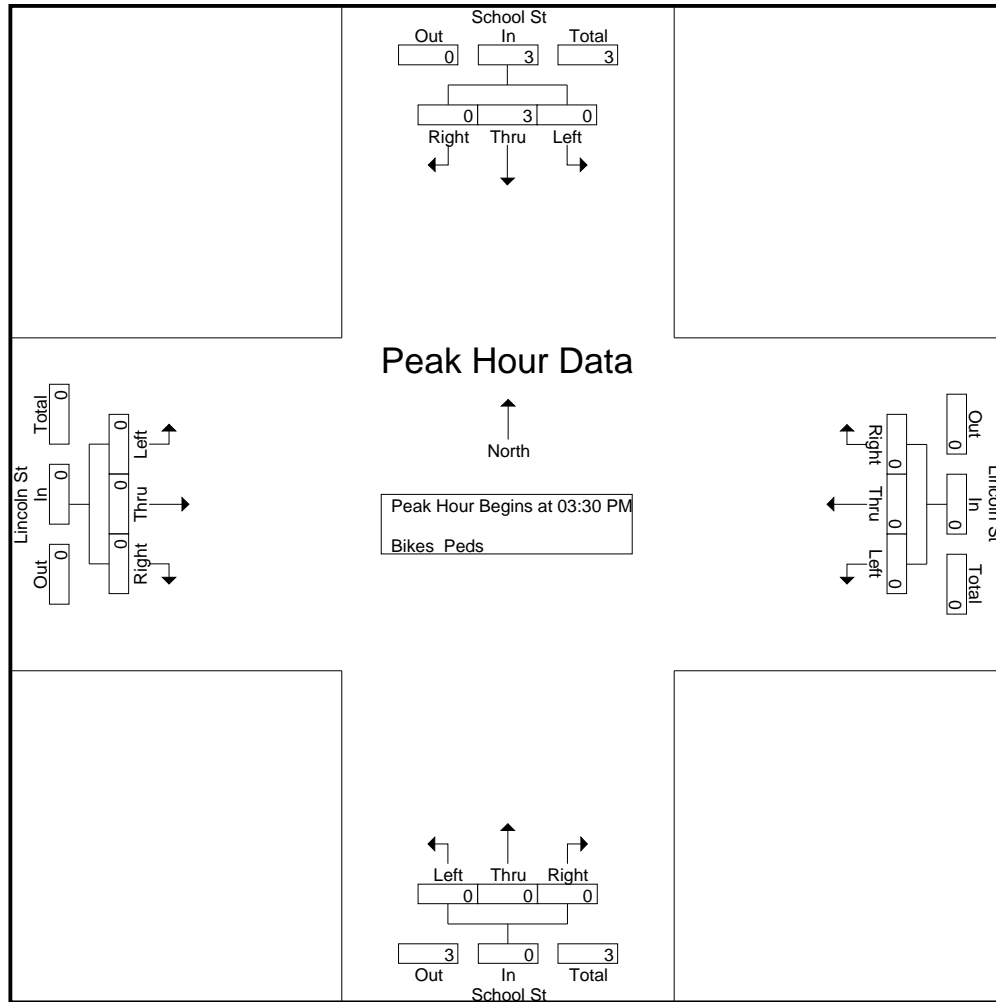
File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
Page No : 10

[illegible]

978-664-2565

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
Page No : 11



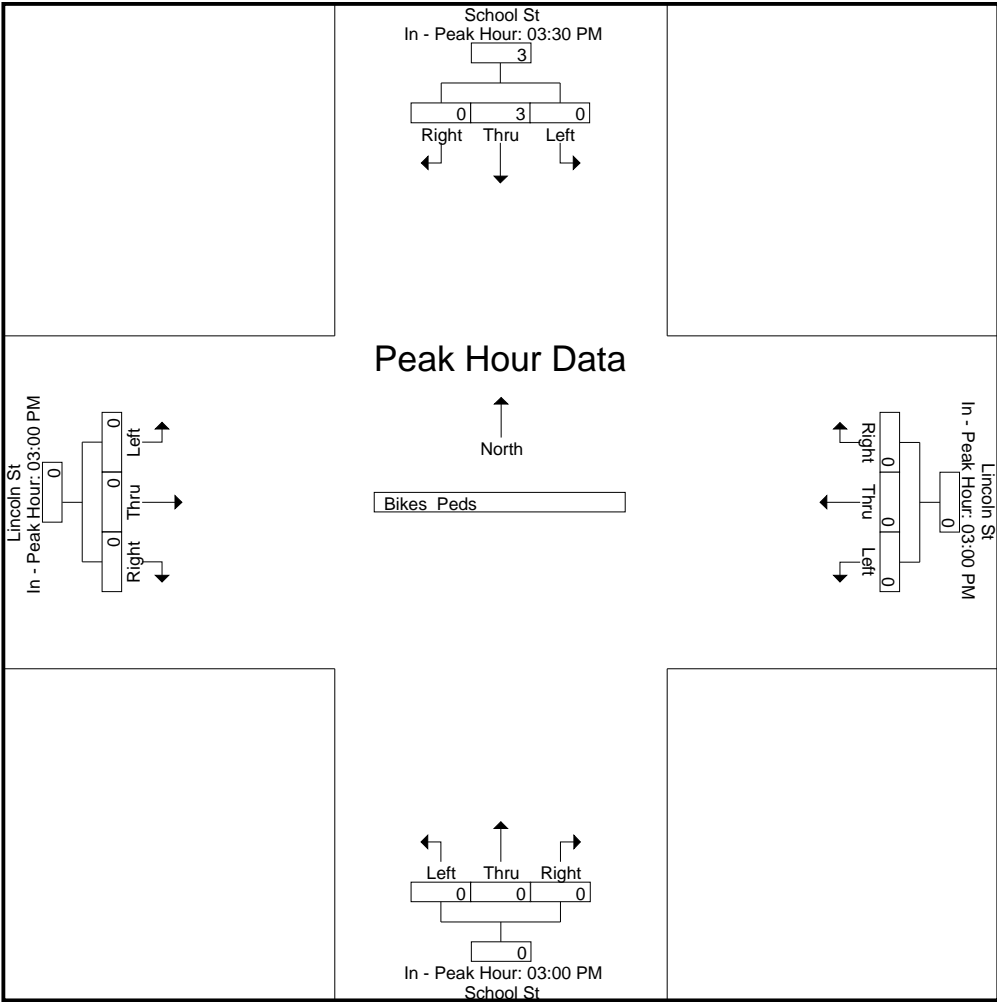
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

[illegible]

N/S Street : School Street
E/W Street : Lincoln Street
City/State : Manchester By The Sea, MA
Weather : Cloudy

File Name : 11990005
Site Code : 11990005
Start Date : 1/11/2023
Page No : 12



Attachment C

Automatic Traffic Recorder (ATR) Counts

Accurate Counts
978-664-2565

Location : School Street
Location : South of Atwater Avenue
City/State: Manchester By The Sea, MA
Direction: SB

11990001

1/11/2023	0 - 15	> 15 -	> 20 -	> 25 -	> 30 -	> 35 -	> 40 -	> 45 -	> 50 -	> 55 -	> 60 -	> 65 -	> 70	
Time	MPH	20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	MPH	Total
12:00 AM	0	0	0	3	4	0	0	0	0	0	0	0	0	7
1:00	0	0	0	1	0	0	0	0	0	0	0	0	0	1
2:00	1	0	1	1	3	0	0	1	0	0	0	0	0	7
3:00	0	0	0	0	2	0	0	0	0	0	0	0	0	2
4:00	0	0	0	0	3	0	0	0	0	0	0	0	0	3
5:00	0	1	0	5	4	1	1	0	0	0	0	0	0	12
6:00	0	3	4	37	32	22	4	0	0	0	0	0	0	102
7:00	0	5	29	57	104	83	13	5	0	0	0	0	0	296
8:00	1	4	14	36	63	77	22	3	1	0	0	0	0	221
9:00	0	4	26	52	61	36	14	4	0	0	0	0	0	197
10:00	0	6	31	45	47	33	17	3	0	1	1	0	0	184
11:00	0	9	33	41	59	38	10	0	0	0	0	0	0	190
12:00 PM	0	9	20	48	66	34	11	2	0	0	0	0	0	190
1:00	0	7	24	45	50	28	14	4	2	1	0	0	1	176
2:00	0	6	21	47	59	37	15	4	1	0	0	0	0	190
3:00	0	4	16	57	72	52	11	6	0	0	0	0	0	218
4:00	1	7	35	59	55	57	13	1	1	0	0	0	0	229
5:00	0	6	28	49	57	21	8	0	0	0	0	0	0	169
6:00	0	9	32	47	38	22	3	0	0	0	0	0	0	151
7:00	0	11	30	24	36	14	3	0	0	0	0	0	0	118
8:00	1	9	19	17	16	14	5	0	0	0	0	0	0	81
9:00	0	1	6	9	11	5	2	0	0	0	0	0	0	34
10:00	0	2	4	4	1	0	0	0	0	0	0	0	0	11
11:00	0	2	1	2	3	1	0	0	0	0	0	0	0	9
Total	4	105	374	686	846	575	166	33	5	2	1	0	1	2798

Percentile	15th	50th	85th	95th
Speed	24	31	38	41
Mean Speed (Average)	31.3			
10 MPH Pace Speed	25-34			
Number in Pace	1523			
Percent in Pace	54.4%			
Number > 35 MPH	783			
Percent > 35 MPH	28.0%			

Accurate Counts
978-664-2565

Location : School Street
Location : South of Atwater Avenue
City/State: Manchester By The Sea, MA
Direction: SB

11990001

1/12/2023	0 - 15	> 15 -	> 20 -	> 25 -	> 30 -	> 35 -	> 40 -	> 45 -	> 50 -	> 55 -	> 60 -	> 65 -	> 70	Total
Time	MPH	20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	MPH	
12:00 AM	0	1	1	3	0	1	0	0	0	0	0	0	0	6
1:00	0	0	0	0	1	1	0	0	0	0	0	0	0	2
2:00	0	1	1	2	1	0	0	0	0	0	0	0	0	5
3:00	1	1	1	0	1	0	0	0	0	0	0	0	0	4
4:00	0	1	2	1	0	2	0	0	0	0	0	0	0	6
5:00	0	2	2	12	5	4	0	0	0	0	0	0	0	25
6:00	0	2	16	33	28	13	0	0	0	0	1	0	0	93
7:00	0	7	18	68	103	74	10	0	0	0	0	0	0	280
8:00	0	4	12	53	71	53	20	3	0	1	0	0	0	217
9:00	0	6	23	45	59	28	12	3	0	1	0	0	0	177
10:00	0	13	29	42	54	28	4	1	0	0	0	0	0	171
11:00	0	3	28	34	61	42	6	2	0	0	0	0	0	176
12:00 PM	0	7	20	35	53	28	17	3	0	0	0	0	0	163
1:00	0	3	14	38	78	49	5	5	1	0	0	0	0	193
2:00	0	2	33	46	68	44	10	4	0	0	0	0	0	207
3:00	0	3	35	63	79	30	5	1	0	0	0	1	0	217
4:00	0	8	54	47	79	36	6	0	0	0	0	0	0	230
5:00	0	5	28	58	51	21	2	2	0	0	0	0	0	167
6:00	0	10	25	37	25	21	4	0	0	0	0	0	0	122
7:00	1	8	44	35	22	4	3	0	0	0	0	0	0	117
8:00	0	6	24	19	19	6	1	0	0	0	0	0	0	75
9:00	0	2	4	12	16	9	4	0	0	0	0	0	0	47
10:00	0	0	2	3	2	1	1	0	1	0	0	0	0	10
11:00	0	0	0	0	1	2	0	0	0	0	0	0	0	3
Total	2	95	416	686	877	497	110	24	2	2	1	1	0	2713

Percentile	15th	50th	85th	95th
Speed	24	31	37	40
Mean Speed (Average)	30.7			
10 MPH Pace Speed	25-34			
Number in Pace	1554			
Percent in Pace	57.3%			
Number > 35 MPH	637			
Percent > 35 MPH	23.5%			

Grand Total	6	200	790	1372	1723	1072	276	57	7	4	2	1	1	5511
Percentile				15th	50th	85th	95th							
Speed				24	31	37	41							
Mean Speed (Average)				31.0										
10 MPH Pace Speed				25-34										
Number in Pace				3076										
Percent in Pace				55.8%										
Number > 35 MPH				1420										
Percent > 35 MPH				25.8%										

Accurate Counts
978-664-2565

Location : School Street
Location : South of Atwater Avenue
City/State: Manchester By The Sea, MA
Direction: NB

11990001

1/11/2023	0 - 15	> 15 -	> 20 -	> 25 -	> 30 -	> 35 -	> 40 -	> 45 -	> 50 -	> 55 -	> 60 -	> 65 -	> 70	
Time	MPH	20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	MPH	Total
12:00 AM	0	0	0	0	2	0	0	1	0	0	0	0	0	3
1:00	0	0	0	1	0	0	0	0	0	0	0	0	0	1
2:00	0	0	0	0	0	2	0	0	0	0	0	0	0	2
3:00	0	0	0	0	0	0	0	1	0	0	0	0	0	1
4:00	0	0	1	0	0	1	0	2	0	0	0	0	0	4
5:00	0	0	13	3	5	2	1	1	0	0	0	0	0	25
6:00	0	1	13	14	12	11	11	2	0	0	0	0	0	64
7:00	1	4	16	40	42	74	36	13	1	0	0	0	0	227
8:00	0	6	32	65	50	76	20	5	1	3	0	0	0	258
9:00	0	3	13	56	30	61	20	6	0	0	0	0	0	189
10:00	0	1	15	45	33	65	21	6	0	0	0	0	0	186
11:00	0	3	12	22	39	56	35	8	0	0	0	0	0	175
12:00 PM	3	2	9	24	44	53	36	11	2	0	0	0	0	184
1:00	0	0	7	24	40	52	34	8	1	0	0	0	0	166
2:00	0	1	16	35	50	84	55	13	2	1	0	0	0	257
3:00	1	8	27	49	62	93	44	6	0	0	0	0	0	290
4:00	0	1	33	49	53	100	45	10	0	0	0	0	0	291
5:00	1	5	49	24	73	74	30	2	0	0	0	0	0	258
6:00	0	9	30	23	42	48	18	1	0	0	0	0	0	171
7:00	0	1	11	8	25	36	10	1	1	0	0	0	0	93
8:00	0	0	4	4	22	28	12	8	0	0	0	0	0	78
9:00	0	0	1	2	13	12	3	2	0	0	0	0	0	33
10:00	0	0	0	1	4	10	3	0	0	0	0	0	0	18
11:00	0	0	1	0	2	4	4	1	0	0	0	0	0	12
Total	6	45	303	489	643	942	438	108	8	4	0	0	0	2986

Percentile	15th	50th	85th	95th
Speed	26	35	41	44
Mean Speed (Average)	34.1			
10 MPH Pace Speed	30-39			
Number in Pace	1576			
Percent in Pace	52.8%			
Number > 35 MPH	1500			
Percent > 35 MPH	50.2%			

Accurate Counts
978-664-2565

Location : School Street
Location : South of Atwater Avenue
City/State: Manchester By The Sea, MA
Direction: NB

11990001

1/12/2023	0 - 15	> 15 -	> 20 -	> 25 -	> 30 -	> 35 -	> 40 -	> 45 -	> 50 -	> 55 -	> 60 -	> 65 -	> 70	Total
Time	MPH	20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	MPH	
12:00 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	2
1:00	0	0	0	0	1	0	1	0	0	0	0	0	0	2
2:00	0	0	1	1	0	0	0	0	0	0	0	0	0	2
3:00	0	1	1	1	1	1	2	0	0	0	0	0	0	7
4:00	0	2	1	0	2	1	0	1	0	0	0	0	0	7
5:00	0	3	6	6	3	4	1	0	0	0	0	0	0	23
6:00	0	8	21	8	28	11	3	0	0	0	0	0	0	79
7:00	0	6	23	24	38	55	37	7	0	1	0	0	0	191
8:00	0	4	35	70	43	53	30	3	3	3	0	0	0	244
9:00	0	4	16	39	38	45	25	6	1	0	0	0	0	174
10:00	0	1	11	38	40	41	17	3	2	0	0	0	0	153
11:00	5	2	16	27	36	61	28	5	2	0	2	0	0	184
12:00 PM	1	2	16	22	35	65	30	9	3	1	0	0	0	184
1:00	0	1	17	22	38	40	24	5	0	0	0	0	0	147
2:00	0	5	22	36	63	110	47	17	2	0	0	0	0	302
3:00	0	2	39	74	68	66	47	7	2	0	0	0	0	305
4:00	0	4	36	53	65	75	26	4	0	0	0	0	0	263
5:00	1	10	45	35	56	73	15	2	0	1	0	0	0	238
6:00	0	4	31	23	35	35	16	2	0	0	0	0	0	146
7:00	0	2	16	9	19	25	11	2	0	0	0	0	0	84
8:00	0	0	1	4	26	24	9	4	0	0	0	0	0	68
9:00	1	0	2	2	9	15	7	1	0	0	0	0	0	37
10:00	1	0	1	1	10	13	3	0	0	0	0	0	0	29
11:00	0	0	0	1	1	0	1	1	0	0	0	0	0	4
Total	9	62	357	496	655	814	380	79	15	6	2	0	0	2875

Percentile	15th	50th	85th	95th
Speed	25	34	40	43
Mean Speed (Average)	33.4			
10 MPH Pace Speed	30-39			
Number in Pace	1463			
Percent in Pace	50.9%			
Number > 35 MPH	1296			
Percent > 35 MPH	45.1%			

Grand Total	15	107	660	985	1298	1756	818	187	23	10	2	0	0	5861
Percentile				15th	50th	85th	95th							
Speed				25	35	40	44							
Mean Speed (Average)				33.7										
10 MPH Pace Speed				30-39										
Number in Pace				3039										
Percent in Pace				51.9%										
Number > 35 MPH				2796										
Percent > 35 MPH				47.7%										

Accurate Counts
978-664-2565

Location : School Street
Location : South of Atwater Avenue
City/State: Manchester By The Sea, MA
Direction: Combined

11990001

1/11/2023	0 - 15	> 15 -	> 20 -	> 25 -	> 30 -	> 35 -	> 40 -	> 45 -	> 50 -	> 55 -	> 60 -	> 65 -	> 70	
Time	MPH	20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	MPH	Total
12:00 AM	0	0	0	3	6	0	0	1	0	0	0	0	0	10
1:00	0	0	0	2	0	0	0	0	0	0	0	0	0	2
2:00	1	0	1	1	3	2	0	1	0	0	0	0	0	9
3:00	0	0	0	0	2	0	0	1	0	0	0	0	0	3
4:00	0	0	1	0	3	1	0	2	0	0	0	0	0	7
5:00	0	1	13	8	9	3	2	1	0	0	0	0	0	37
6:00	0	4	17	51	44	33	15	2	0	0	0	0	0	166
7:00	1	9	45	97	146	157	49	18	1	0	0	0	0	523
8:00	1	10	46	101	113	153	42	8	2	3	0	0	0	479
9:00	0	7	39	108	91	97	34	10	0	0	0	0	0	386
10:00	0	7	46	90	80	98	38	9	0	1	1	0	0	370
11:00	0	12	45	63	98	94	45	8	0	0	0	0	0	365
12:00 PM	3	11	29	72	110	87	47	13	2	0	0	0	0	374
1:00	0	7	31	69	90	80	48	12	3	1	0	0	1	342
2:00	0	7	37	82	109	121	70	17	3	1	0	0	0	447
3:00	1	12	43	106	134	145	55	12	0	0	0	0	0	508
4:00	1	8	68	108	108	157	58	11	1	0	0	0	0	520
5:00	1	11	77	73	130	95	38	2	0	0	0	0	0	427
6:00	0	18	62	70	80	70	21	1	0	0	0	0	0	322
7:00	0	12	41	32	61	50	13	1	1	0	0	0	0	211
8:00	1	9	23	21	38	42	17	8	0	0	0	0	0	159
9:00	0	1	7	11	24	17	5	2	0	0	0	0	0	67
10:00	0	2	4	5	5	10	3	0	0	0	0	0	0	29
11:00	0	2	2	2	5	5	4	1	0	0	0	0	0	21
Total	10	150	677	1175	1489	1517	604	141	13	6	1	0	1	5784

Percentile	15th	50th	85th	95th
Speed	25	33	40	43
Mean Speed (Average)	32.8			
10 MPH Pace Speed	30-39			
Number in Pace	2999			
Percent in Pace	51.8%			
Number > 35 MPH	2283			
Percent > 35 MPH	39.5%			

Accurate Counts
978-664-2565

Location : School Street
Location : South of Atwater Avenue
City/State: Manchester By The Sea, MA
Direction: Combined

11990001

1/12/2023	0 - 15	> 15 -	> 20 -	> 25 -	> 30 -	> 35 -	> 40 -	> 45 -	> 50 -	> 55 -	> 60 -	> 65 -	> 70	
Time	MPH	20 MPH	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	MPH	Total
12:00 AM	0	2	1	3	0	2	0	0	0	0	0	0	0	8
1:00	0	0	0	0	2	1	1	0	0	0	0	0	0	4
2:00	0	1	2	3	1	0	0	0	0	0	0	0	0	7
3:00	1	2	2	1	2	1	2	0	0	0	0	0	0	11
4:00	0	3	3	1	2	3	0	1	0	0	0	0	0	13
5:00	0	5	8	18	8	8	1	0	0	0	0	0	0	48
6:00	0	10	37	41	56	24	3	0	0	0	1	0	0	172
7:00	0	13	41	92	141	129	47	7	0	1	0	0	0	471
8:00	0	8	47	123	114	106	50	6	3	4	0	0	0	461
9:00	0	10	39	84	97	73	37	9	1	1	0	0	0	351
10:00	0	14	40	80	94	69	21	4	2	0	0	0	0	324
11:00	5	5	44	61	97	103	34	7	2	0	2	0	0	360
12:00 PM	1	9	36	57	88	93	47	12	3	1	0	0	0	347
1:00	0	4	31	60	116	89	29	10	1	0	0	0	0	340
2:00	0	7	55	82	131	154	57	21	2	0	0	0	0	509
3:00	0	5	74	137	147	96	52	8	2	0	0	1	0	522
4:00	0	12	90	100	144	111	32	4	0	0	0	0	0	493
5:00	1	15	73	93	107	94	17	4	0	1	0	0	0	405
6:00	0	14	56	60	60	56	20	2	0	0	0	0	0	268
7:00	1	10	60	44	41	29	14	2	0	0	0	0	0	201
8:00	0	6	25	23	45	30	10	4	0	0	0	0	0	143
9:00	1	2	6	14	25	24	11	1	0	0	0	0	0	84
10:00	1	0	3	4	12	14	4	0	1	0	0	0	0	39
11:00	0	0	0	1	2	2	1	1	0	0	0	0	0	7
Total	11	157	773	1182	1532	1311	490	103	17	8	3	1	0	5588

Percentile	15th	50th	85th	95th
Speed	25	32	39	42
Mean Speed (Average)	32.1			
10 MPH Pace Speed	30-39			
Number in Pace	2840			
Percent in Pace	50.8%			
Number > 35 MPH	1933			
Percent > 35 MPH	34.6%			

Grand Total	21	307	1450	2357	3021	2828	1094	244	30	14	4	1	1	11372
Percentile				15th	50th	85th	95th							
Speed				25	33	39	43							
Mean Speed (Average)				32.4										
10 MPH Pace Speed				30-39										
Number in Pace				5840										
Percent in Pace				51.4%										
Number > 35 MPH				4216										
Percent > 35 MPH				37.1%										

Accurate Counts
978-664-2565

Location : School Street
Location : South of Atwater Avenue
City/State: Manchester By The Sea, MA

11990001

1/11/2023	SB		Hour Totals		NB		Hour Totals		Combined Totals	
Time	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00	1	66			1	49				
12:15	3	47			0	40				
12:30	1	35			2	56				
12:45	2	42	7	190	0	39	3	184	10	374
1:00	0	38			1	44				
1:15	0	36			0	44				
1:30	1	56			0	33				
1:45	0	46	1	176	0	45	1	166	2	342
2:00	0	42			0	49				
2:15	3	52			2	84				
2:30	4	48			0	59				
2:45	0	48	7	190	0	65	2	257	9	447
3:00	1	46			0	68				
3:15	0	51			0	83				
3:30	1	67			0	75				
3:45	0	54	2	218	1	64	1	290	3	508
4:00	0	50			1	78				
4:15	1	61			0	85				
4:30	1	64			3	65				
4:45	1	54	3	229	0	63	4	291	7	520
5:00	3	52			1	87				
5:15	4	44			3	58				
5:30	3	49			11	59				
5:45	2	24	12	169	10	54	25	258	37	427
6:00	17	44			9	44				
6:15	13	30			11	39				
6:30	25	34			20	44				
6:45	47	43	102	151	24	44	64	171	166	322
7:00	55	49			24	34				
7:15	84	25			49	28				
7:30	90	23			82	16				
7:45	67	21	296	118	72	15	227	93	523	211
8:00	54	14			43	21				
8:15	63	31			76	18				
8:30	48	17			54	22				
8:45	56	19	221	81	85	17	258	78	479	159
9:00	61	13			64	14				
9:15	39	10			36	7				
9:30	47	5			31	5				
9:45	50	6	197	34	58	7	189	33	386	67
10:00	49	6			31	6				
10:15	42	5			58	5				
10:30	41	0			58	5				
10:45	52	0	184	11	39	2	186	18	370	29
11:00	43	4			48	5				
11:15	51	4			37	4				
11:30	48	1			44	2				
11:45	48	0	190	9	46	1	175	12	365	21
Total	1222	1576			1135	1851			2357	3427
Percent	43.7%	56.3%			38.0%	62.0%			40.8%	59.2%

Accurate Counts
978-664-2565

Location : School Street
Location : South of Atwater Avenue
City/State: Manchester By The Sea, MA

11990001

1/12/2023		SB		Hour Totals		NB		Hour Totals		Combined Totals	
Time	Morning	Afternoon		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		2	43			0	50				
12:15		1	52			1	40				
12:30		1	34			1	55				
12:45		2	34	6	163	0	39	2	184	8	347
1:00		2	49			1	41				
1:15		0	39			1	33				
1:30		0	40			0	32				
1:45		0	65	2	193	0	41	2	147	4	340
2:00		0	56			0	59				
2:15		4	46			1	73				
2:30		1	50			1	77				
2:45		0	55	5	207	0	93	2	302	7	509
3:00		2	44			3	68				
3:15		0	57			2	83				
3:30		0	63			2	74				
3:45		2	53	4	217	0	80	7	305	11	522
4:00		1	60			1	73				
4:15		1	55			1	77				
4:30		1	60			4	66				
4:45		3	55	6	230	1	47	7	263	13	493
5:00		2	50			4	56				
5:15		7	34			6	58				
5:30		10	49			10	62				
5:45		6	34	25	167	3	62	23	238	48	405
6:00		12	48			18	44				
6:15		10	24			19	42				
6:30		33	28			15	20				
6:45		38	22	93	122	27	40	79	146	172	268
7:00		47	51			21	25				
7:15		83	28			48	21				
7:30		85	16			66	23				
7:45		65	22	280	117	56	15	191	84	471	201
8:00		62	30			47	16				
8:15		62	12			82	26				
8:30		48	9			47	6				
8:45		45	24	217	75	68	20	244	68	461	143
9:00		47	17			44	10				
9:15		40	10			45	11				
9:30		47	17			41	9				
9:45		43	3	177	47	44	7	174	37	351	84
10:00		62	4			28	6				
10:15		38	2			41	8				
10:30		34	4			37	9				
10:45		37	0	171	10	47	6	153	29	324	39
11:00		59	3			45	4				
11:15		45	7			38	4				
11:30		37	0			48	2				
11:45		35	1	176	11	53	2	184	12	360	23
Total	1162	1559				1068	1815			2230	3374
Percent	42.7%	57.3%				37.0%	63.0%			39.8%	60.2%
Grand Total	2384	3135				2203	3666			4587	6801
Percent	43.2%	56.8%				37.5%	62.5%			40.3%	59.7%

ADT

ADT: 5,694

AADT: 5,694

Accurate Counts
978-664-2565

Location : School Street
Location : South of Atwater Avenue
City/State: Manchester By The Sea, MA

11990001

1/9/2023	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Week Average	
Time	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB
12:00 AM	*	*	*	*	7	3	6	2	*	*	*	*	*	*	6	2
1:00	*	*	*	*	1	1	2	2	*	*	*	*	*	*	2	2
2:00	*	*	*	*	7	2	5	2	*	*	*	*	*	*	6	2
3:00	*	*	*	*	2	1	4	7	*	*	*	*	*	*	3	4
4:00	*	*	*	*	3	4	6	7	*	*	*	*	*	*	4	6
5:00	*	*	*	*	12	25	25	23	*	*	*	*	*	*	18	24
6:00	*	*	*	*	102	64	93	79	*	*	*	*	*	*	98	72
7:00	*	*	*	*	296	227	280	191	*	*	*	*	*	*	288	209
8:00	*	*	*	*	221	258	217	244	*	*	*	*	*	*	219	251
9:00	*	*	*	*	197	189	177	174	*	*	*	*	*	*	187	182
10:00	*	*	*	*	184	186	171	153	*	*	*	*	*	*	178	170
11:00	*	*	*	*	190	175	176	184	*	*	*	*	*	*	183	180
12:00 PM	*	*	*	*	190	184	163	184	*	*	*	*	*	*	176	184
1:00	*	*	*	*	176	166	193	147	*	*	*	*	*	*	184	156
2:00	*	*	*	*	190	257	207	302	*	*	*	*	*	*	198	280
3:00	*	*	*	*	218	290	217	305	*	*	*	*	*	*	218	298
4:00	*	*	*	*	229	291	230	263	*	*	*	*	*	*	230	277
5:00	*	*	*	*	169	258	167	238	*	*	*	*	*	*	168	248
6:00	*	*	*	*	151	171	122	146	*	*	*	*	*	*	136	158
7:00	*	*	*	*	118	93	117	84	*	*	*	*	*	*	118	88
8:00	*	*	*	*	81	78	75	68	*	*	*	*	*	*	78	73
9:00	*	*	*	*	34	33	47	37	*	*	*	*	*	*	40	35
10:00	*	*	*	*	11	18	10	29	*	*	*	*	*	*	10	24
11:00	*	*	*	*	9	12	3	4	*	*	*	*	*	*	6	8
Total	0	0	0	0	2798	2986	2713	2875	0	0	0	0	0	0	2754	2933
Day	0		0		5784		5588		0		0		0		5687	
AM Peak					7:00	8:00	7:00	8:00							7:00	8:00
Volume					296	258	280	244							288	251
PM Peak					4:00	4:00	4:00	3:00							4:00	3:00
Volume					229	291	230	305							230	298
Comb Total	0		0		5784		5588		0		0		0		5687	
ADT	ADT: 5,694		AADT: 5,694													

Attachment D

MassDOT Seasonal Adjustment Data

Seasonal Adjustment

Project: Atwater Avenue - Manchester-By-The-Sea, MA
Date: 1/1/2023
Analyst: TEC, Inc.
Source: MassDOT Highway 2019 Weekday Seasonal Axle Correction Factors

Factor Grp	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	kle Factor
R1	1.22	1.14	1.12	1.06	1.00	0.96	0.87	0.85	0.96	0.99	1.04	1.12	0.85
R2	0.95	0.96	0.98	0.97	0.97	0.93	0.97	0.94	0.96	0.90	0.92	0.93	0.96
R3	1.15	1.06	1.07	1.00	0.89	0.88	0.89	0.89	0.95	0.92	1.02	1.01	0.97
R4-R7	1.09	1.09	1.11	1.02	0.96	0.92	0.89	0.89	0.99	0.98	1.09	1.13	0.98
U1-Boston	1.03	1.01	0.98	0.94	0.94	0.92	0.95	0.93	0.94	0.94	0.97	1.04	0.96
U1-Essex	1.09	1.06	1.03	0.99	0.94	0.90	0.88	0.86	0.93	0.94	0.99	1.06	0.93
U1-Southern	1.06	1.05	1.01	0.97	0.95	0.93	0.93	0.90	0.94	0.94	0.98	1.04	0.98
U1-West	1.19	1.14	1.09	0.95	0.92	0.89	0.89	0.86	0.91	0.95	0.97	1.07	0.84
U1-Worcester	1.02	1.04	0.97	0.94	0.93	0.91	0.95	0.91	0.93	0.92	0.95	1.10	0.88
U2	1.01	1.00	0.94	0.93	0.91	0.89	0.93	0.90	0.90	0.91	0.94	1.02	0.99
U3	1.06	1.03	0.98	0.94	0.93	0.91	0.95	0.91	0.92	0.93	0.97	1.00	0.98
U4-U7	1.01	1.00	0.95	0.92	0.88	0.86	0.92	0.91	0.92	0.94	0.99	1.04	0.99
Rec - East	1.04	1.16	1.12	0.98	0.92	0.88	0.77	0.81	0.94	1.02	1.08	1.12	0.99
Rec - West	1.30	1.23	1.32	1.18	0.95	0.82	0.70	0.69	0.97	0.96	1.16	1.15	0.98

Attachment E

Crash Data

Crash Data Summary Tables
 School Street @ Pleasant Street - Manchester-by-the-Sea, MA
 01/01/2017 - 12/31/2021

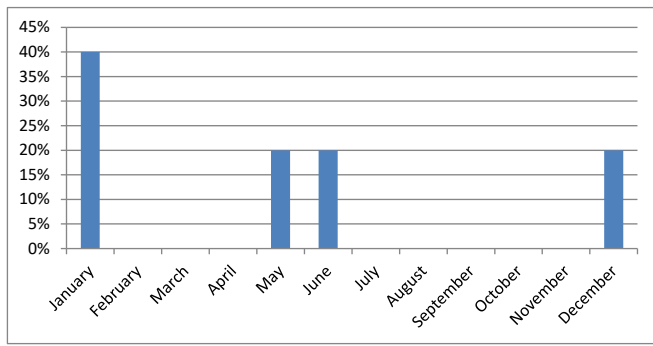
Collision Diagram	Crash Number	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Number of Vehicles	Vehicle Travel Directions				Crash Severity	Number of NonFatal Injuries	Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Report)
								V1	V2	V3	V4					
1	4339099	1/20/2017	4:30 PM	Daylight	Clear	Wet	2	S	W			Not Reported	0	Single Vehicle	Not Reported	
2	4430659	9/27/2017	7:27 PM	Dark - Lighted	Clear	Dry	2	S	E			Not Reported	0	Not Reported	Not Reported	
3	4476242	12/29/2017	12:49 PM	Daylight	Cloudy	Dry	2					Non-fatal injury	0	Angled	Disregarded Traffic Controls	
4	4478360	1/3/2018	1:00 PM	Daylight	Clear	Dry	2	N	W			Not Reported	0	Not Reported	Not Reported	
5	4512352	12/2/2017	4:51 PM	Dark - Lighted	Clear	Dry	2	S	W			Not Reported	0	Not Reported	Not Reported	
6	4559204	6/29/2018	10:53 AM	Daylight	Clear	Dry	2	W	N			Property Damage Only	0	Sideswipe	Excessive Speed	
7	4703702	5/21/2019	5:11 PM	Daylight	Clear	Dry	2	N	E			Property Damage Only	0	Sideswipe	Excessive Speed	
8	4801465	1/9/2020	3:00 PM	Daylight	Clear	Dry	2	S	S			Property Damage Only	0	Sideswipe	Excessive Speed	

Crash Data Summary Charts
 School Street @ Pleasant Street - Manchester-by-the-Sea, MA
 01/01/2017 - 12/31/2021

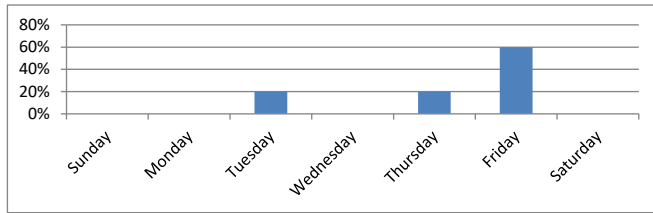
School Street @ Atwater Avenue

5

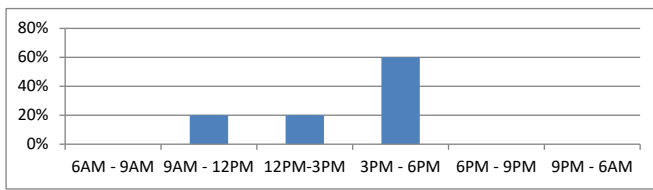
Month	#	%
January	2	40%
February	0	0%
March	0	0%
April	0	0%
May	1	20%
June	1	20%
July	0	0%
August	0	0%
September	0	0%
October	0	0%
November	0	0%
December	1	20%



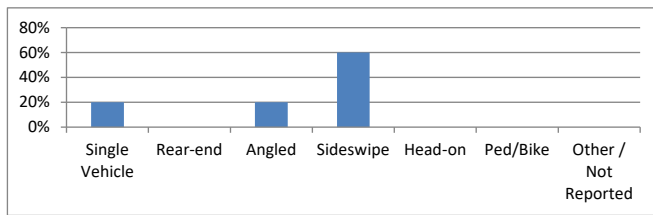
Day of Week	#	%
Sunday	0	0%
Monday	0	0%
Tuesday	1	20%
Wednesday	0	0%
Thursday	1	20%
Friday	3	60%
Saturday	0	0%



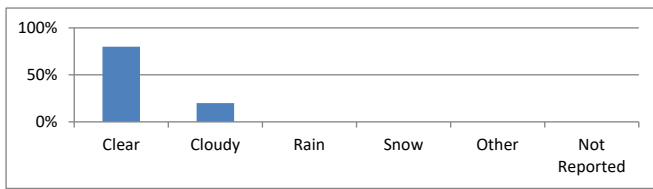
Time of Day	#	%
6AM - 9AM	0	0%
9AM - 12PM	1	20%
12PM-3PM	1	20%
3PM - 6PM	3	60%
6PM - 9PM	0	0%
9PM - 6AM	0	0%



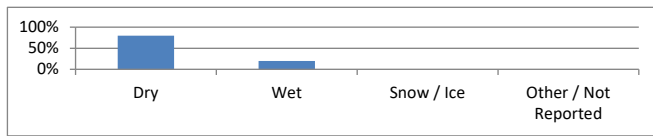
Manner of Collision	#	%
Single Vehicle	1	20%
Rear-end	0	0%
Angled	1	20%
Sideswipe	3	60%
Head-on	0	0%
Ped/Bike	0	0%
Other / Not Reported	0	0%



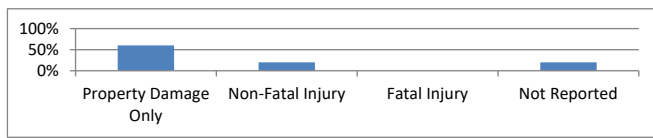
Weather Conditions	#	%
Clear	4	80%
Cloudy	1	20%
Rain	0	0%
Snow	0	0%
Other	0	0%
Not Reported	0	0%



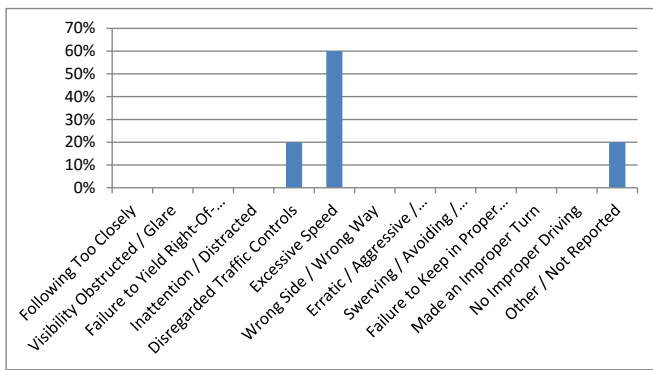
Road Surface	#	%
Dry	4	80%
Wet	1	20%
Snow / Ice	0	0%
Other / Not Reported	0	0%



Crash Severity	#	%
Property Damage Only	3	60%
Non-Fatal Injury	1	20%
Fatal Injury	0	0%
Not Reported	1	20%



Main Contributing Factor from Narrative	#	%
Following Too Closely	0	0%
Visibility Obstructed / Glare	0	0%
Failure to Yield Right-Of-Way	0	0%
Inattention / Distracted	0	0%
Disregarded Traffic Controls	1	20%
Excessive Speed	3	60%
Wrong Side / Wrong Way	0	0%
Erratic / Aggressive / Reckless Driving	0	0%
Swerving / Avoiding / Over-Steering / Over-Correcting	0	0%
Failure to Keep in Proper Lane	0	0%
Made an Improper Turn	0	0%
No Improper Driving	0	0%
Other / Not Reported	1	20%



Crash Data Summary Tables
 School Street @ Route 128 Southbound - Manchester-by-the-Sea, MA
 01/01/2017 - 12/31/2021

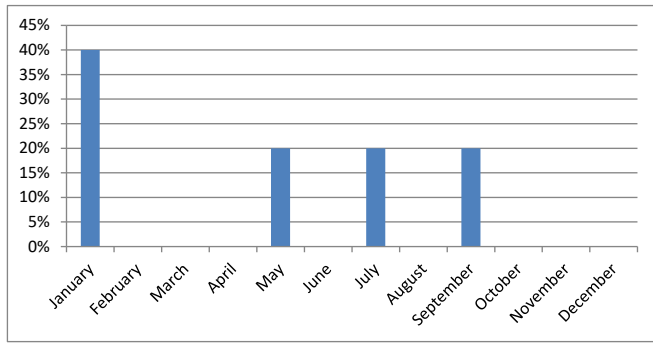
Collision Diagram	Crash Number	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Number of Vehicles	Vehicle Travel Directions				Crash Severity	Number of NonFatal Injuries	Manner of Collision	Detailed Narrative (from Crash Report)
								V1	V2	V3	V4				
1	4378034	5/31/2017	3:58 PM	Daylight	Clear	Dry	2	S				Property Damage Only	0	Angled	
2	4729579	7/27/2019	8:30 PM	Dark - Lighted	Clear	Dry	2	S	W			Non-fatal Injury	0	Angled	
3	4752214	9/20/2019	1:50 PM	Daylight	Clear	Dry	2	N	S			Property Damage Only	0	Angled	
4	4806172	1/21/2020	10:01 AM	Daylight	Clear	Dry	2	N	W			Non-fatal Injury	0	Angled	
5	4916568	1/6/2021	5:50 PM	Dark - Lighted	Clear	Dry	1	W				Property Damage Only	0	Single vehicle crash	

Crash Data Summary Charts
 School Street @ Route 128 Southbound - Manchester-by-the-Sea, MA
 01/01/2017 - 12/31/2021

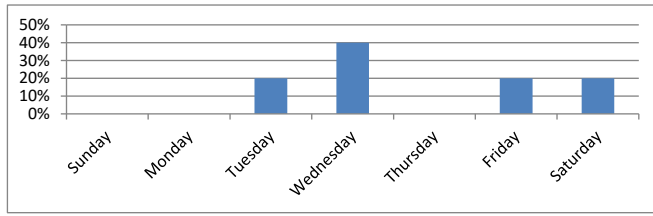
School Street @ Atwater Avenue

5

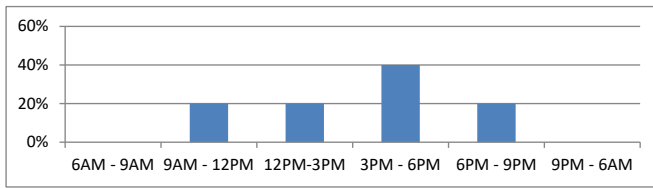
Month	#	%
January	2	40%
February	0	0%
March	0	0%
April	0	0%
May	1	20%
June	0	0%
July	1	20%
August	0	0%
September	1	20%
October	0	0%
November	0	0%
December	0	0%



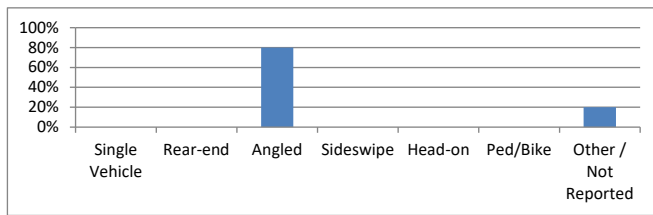
Day of Week	#	%
Sunday	0	0%
Monday	0	0%
Tuesday	1	20%
Wednesday	2	40%
Thursday	0	0%
Friday	1	20%
Saturday	1	20%



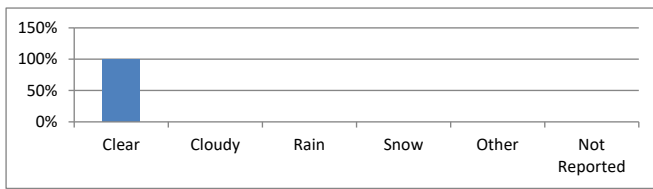
Time of Day	#	%
6AM - 9AM	0	0%
9AM - 12PM	1	20%
12PM-3PM	1	20%
3PM - 6PM	2	40%
6PM - 9PM	1	20%
9PM - 6AM	0	0%



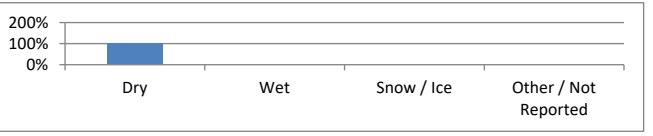
Manner of Collision	#	%
Single Vehicle	0	0%
Rear-end	0	0%
Angled	4	80%
Sideswipe	0	0%
Head-on	0	0%
Ped/Bike	0	0%
Other / Not Reported	1	20%



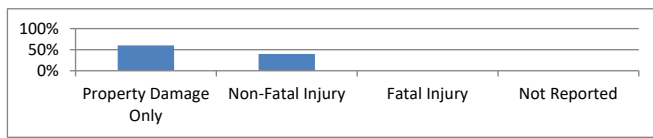
Weather Conditions	#	%
Clear	5	100%
Cloudy	0	0%
Rain	0	0%
Snow	0	0%
Other	0	0%
Not Reported	0	0%



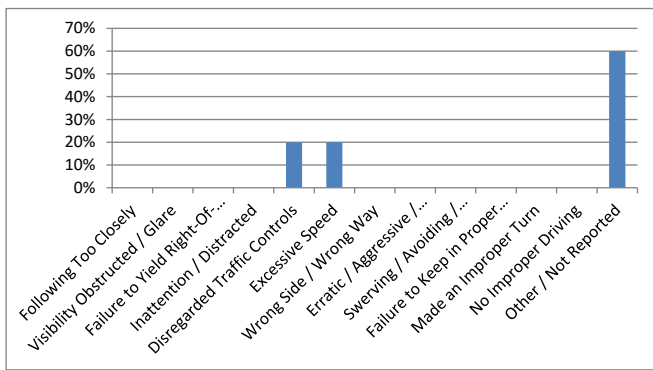
Road Surface	#	%
Dry	5	100%
Wet	0	0%
Snow / Ice	0	0%
Other / Not Reported	0	0%



Crash Severity	#	%
Property Damage Only	3	60%
Non-Fatal Injury	2	40%
Fatal Injury	0	0%
Not Reported	0	0%



Main Contributing Factor from Narrative	#	%
Following Too Closely	0	0%
Visibility Obstructed / Glare	0	0%
Failure to Yield Right-Of-Way	0	0%
Inattention / Distracted	0	0%
Disregarded Traffic Controls	1	20%
Excessive Speed	1	20%
Wrong Side / Wrong Way	0	0%
Erratic / Aggressive / Reckless Driving	0	0%
Swerving / Avoiding / Over-Steering / Over-Correcting	0	0%
Failure to Keep in Proper Lane	0	0%
Made an Improper Turn	0	0%
No Improper Driving	0	0%
Other / Not Reported	3	60%



Crash Data Summary Tables
 School Street @ Mill Street - Manchester-by-the-Sea, MA
 01/01/2017 - 12/31/2021

Collision Diagram	Crash Number	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Number of Vehicles	Vehicle Travel Directions				Crash Severity	Number of NonFatal Injuries	Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Report)
								V1	V2	V3	V4					
1	4470610	12/7/2017	4:45 PM	Dark - Not Lighted	Clear	Dry	2	E	S			Non-fatal Injury	1	Angled	Failure to Yield Right-of-Way	
2	4651771	1/16/2019	1:55 PM	Daylight	Clear	Dry	2	S	S			Property Damage Only	0	Rear-end	Not Reported	
3	4760314	10/9/2019	3:20 PM	Daylight	Rain	Dry	2					Property Damage Only	0	Rear-end	Followed Too Closely	
4	4894986	11/7/2020	1:48 PM	Daylight	Clear	Dry	2	N	N			Property Damage Only	0	Rear-end	Erratic / Aggressive / Reckless Driving	
5	4959029	5/7/2021	2:28 PM	Daylight	Clear	Dry	2	E	E			Property Damage Only	0	Sideswipe	No Improper Driving	
6	4960496	5/12/2021	12:23 PM	Daylight	Clear	Dry	2	N	N			Property Damage Only	0	Angled	Made an Improper Turn	

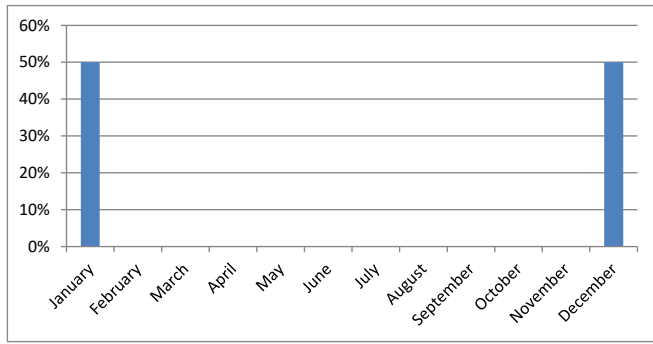
0

Crash Data Summary Charts
School Street @ Mill Stet - Manchester-by-the-Sea, MA
01/01/2017 - 12/31/2021

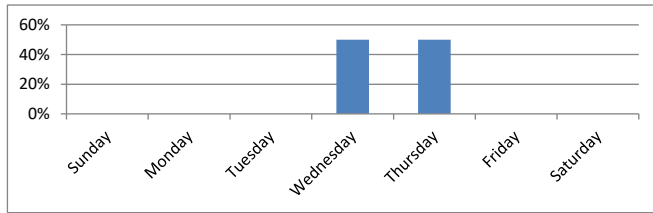
School Street @ Atwater Avenue

2

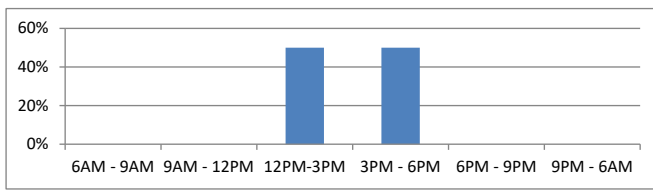
Month	#	%
January	1	50%
February	0	0%
March	0	0%
April	0	0%
May	0	0%
June	0	0%
July	0	0%
August	0	0%
September	0	0%
October	0	0%
November	0	0%
December	1	50%



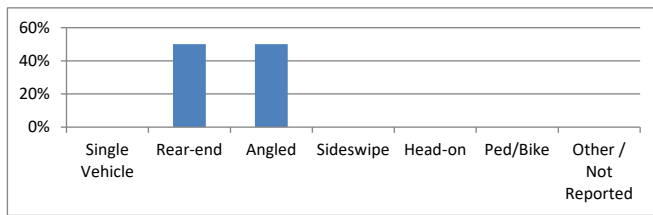
Day of Week	#	%
Sunday	0	0%
Monday	0	0%
Tuesday	0	0%
Wednesday	1	50%
Thursday	1	50%
Friday	0	0%
Saturday	0	0%



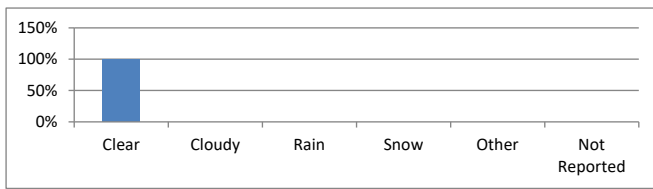
Time of Day	#	%
6AM - 9AM	0	0%
9AM - 12PM	0	0%
12PM-3PM	1	50%
3PM - 6PM	1	50%
6PM - 9PM	0	0%
9PM - 6AM	0	0%



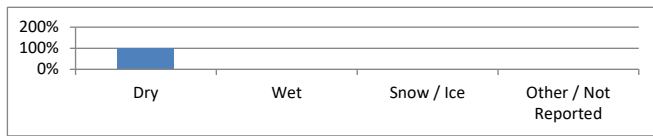
Manner of Collision	#	%
Single Vehicle	0	0%
Rear-end	1	50%
Angled	1	50%
Sideswipe	0	0%
Head-on	0	0%
Ped/Bike	0	0%
Other / Not Reported	0	0%



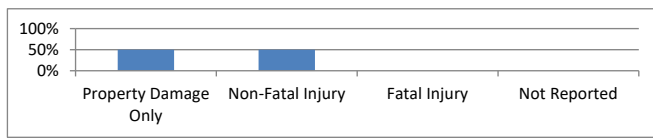
Weather Conditions	#	%
Clear	2	100%
Cloudy	0	0%
Rain	0	0%
Snow	0	0%
Other	0	0%
Not Reported	0	0%



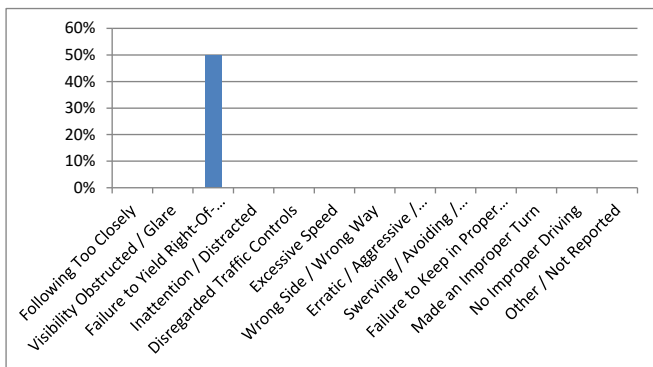
Road Surface	#	%
Dry	2	100%
Wet	0	0%
Snow / Ice	0	0%
Other / Not Reported	0	0%



Crash Severity	#	%
Property Damage Only	1	50%
Non-Fatal Injury	1	50%
Fatal Injury	0	0%
Not Reported	0	0%



Main Contributing Factor from Narrative	#	%
Following Too Closely	0	0%
Visibility Obstructed / Glare	0	0%
Failure to Yield Right-Of-Way	1	50%
Inattention / Distracted	0	0%
Disregarded Traffic Controls	0	0%
Excessive Speed	0	0%
Wrong Side / Wrong Way	0	0%
Erratic / Aggressive / Reckless Driving	0	0%
Swerving / Avoiding / Over-Steering / Over-Correcting	0	0%
Failure to Keep in Proper Lane	0	0%
Made an Improper Turn	0	0%
No Improper Driving	0	0%
Other / Not Reported	0	0%



Crash Data Summary Tables
 School Street @ Atwater Avenue - Manchester-by-the-Sea, MA
 01/01/2017 - 12/31/2021

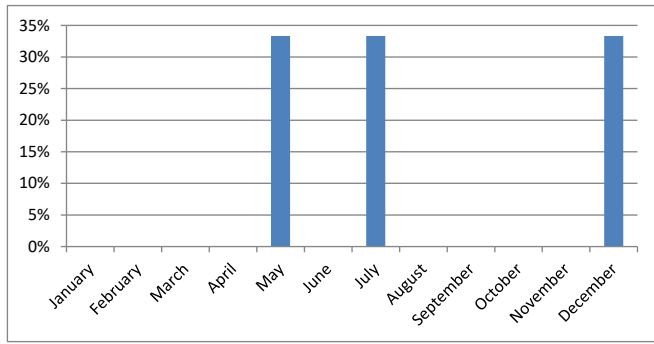
Collision Diagram	Crash Number	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Number of Vehicles	Vehicle Travel Directions				Crash Severity	Number of NonFatal Injuries	Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Report)
								V1	V2	V3	V4					
1	4378033	5/28/2017	4:44 PM	Daylight	Cloudy	Dry	1					Not Reported	0	Single Vehicle	Not Reported	
2	4856700	7/6/2020	4:27 PM	Daylight	Clear	Dry	2					Non-fatal injury	0	Angled	Disregarded Traffic Controls	
3	5050828	12/28/2021	1:15 PM	Daylight	Clear	Wet	2					Property Damage Only	0	Sideswipe	Excessive Speed	

Crash Data Summary Charts
School Street @ Atwater Avenue - Manchester-by-the-Sea, MA
01/01/2017 - 12/31/2021

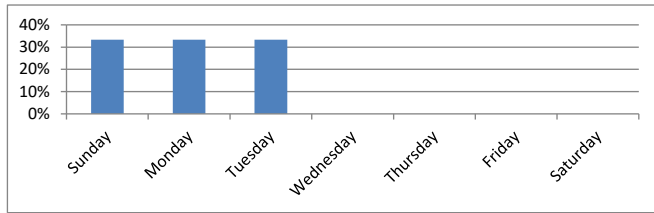
School Street @ Atwater Avenue

3

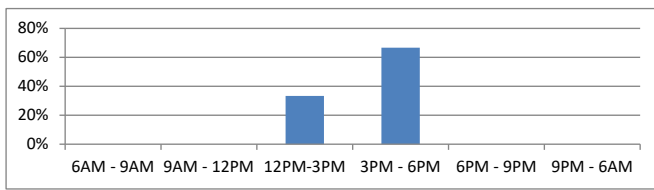
Month	#	%
January	0	0%
February	0	0%
March	0	0%
April	0	0%
May	1	33%
June	0	0%
July	1	33%
August	0	0%
September	0	0%
October	0	0%
November	0	0%
December	1	33%



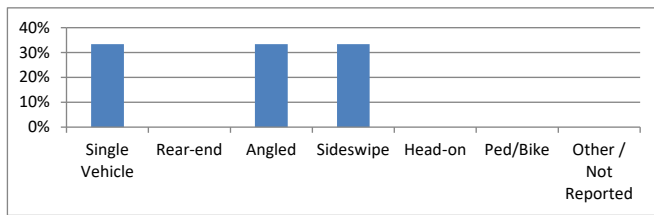
Day of Week	#	%
Sunday	1	33%
Monday	1	33%
Tuesday	1	33%
Wednesday	0	0%
Thursday	0	0%
Friday	0	0%
Saturday	0	0%



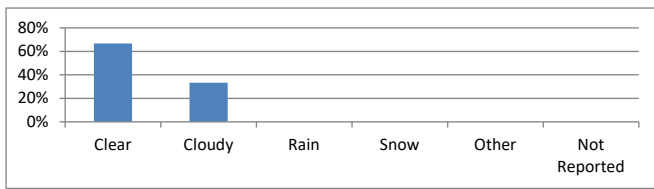
Time of Day	#	%
6AM - 9AM	0	0%
9AM - 12PM	0	0%
12PM-3PM	1	33%
3PM - 6PM	2	67%
6PM - 9PM	0	0%
9PM - 6AM	0	0%



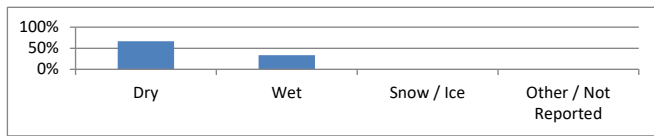
Manner of Collision	#	%
Single Vehicle	1	33%
Rear-end	0	0%
Angled	1	33%
Sideswipe	1	33%
Head-on	0	0%
Ped/Bike	0	0%
Other / Not Reported	0	0%



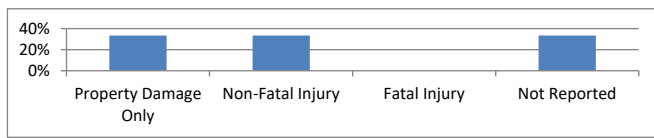
Weather Conditions	#	%
Clear	2	67%
Cloudy	1	33%
Rain	0	0%
Snow	0	0%
Other	0	0%
Not Reported	0	0%



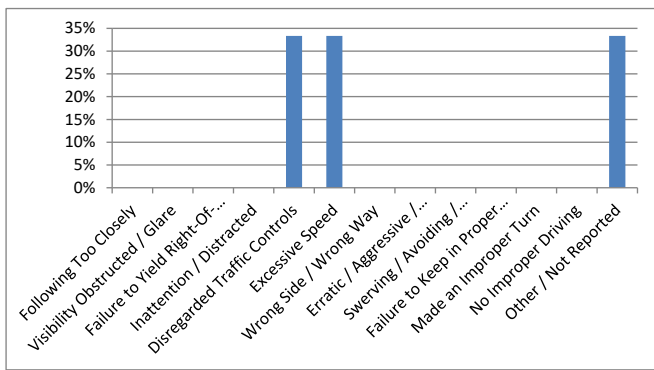
Road Surface	#	%
Dry	2	67%
Wet	1	33%
Snow / Ice	0	0%
Other / Not Reported	0	0%



Crash Severity	#	%
Property Damage Only	1	33%
Non-Fatal Injury	1	33%
Fatal Injury	0	0%
Not Reported	1	33%



Main Contributing Factor from Narrative	#	%
Following Too Closely	0	0%
Visibility Obstructed / Glare	0	0%
Failure to Yield Right-Of-Way	0	0%
Inattention / Distracted	0	0%
Disregarded Traffic Controls	1	33%
Excessive Speed	1	33%
Wrong Side / Wrong Way	0	0%
Erratic / Aggressive / Reckless Driving	0	0%
Swerving / Avoiding / Over-Steering / Over-Correcting	0	0%
Failure to Keep in Proper Lane	0	0%
Made an Improper Turn	0	0%
No Improper Driving	0	0%
Other / Not Reported	1	33%





INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Manchester-By-The-Sea COUNT DATE : 1/11/2023

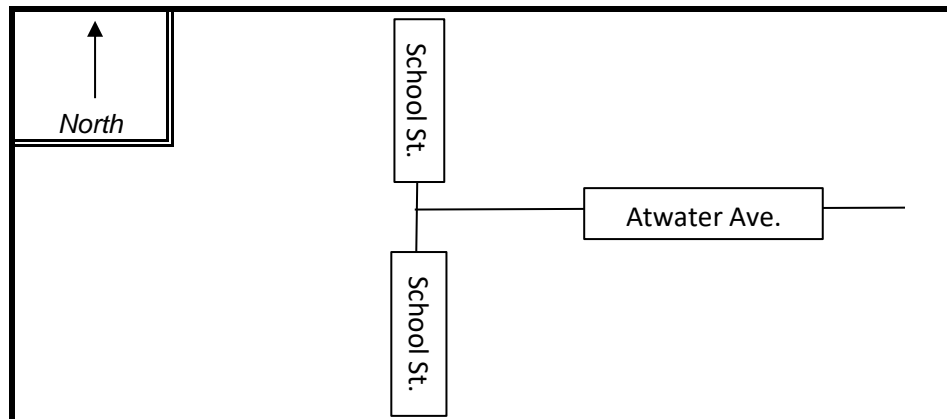
DISTRICT : 4 UNSIGNALIZED : ☒ SIGNALIZED : ☐

~ INTERSECTION DATA ~

MAJOR STREET : School Street

MINOR STREET(S) : Atwater Avenue

**INTERSECTION
DIAGRAM**
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	WB	NB	SB			
PEAK HOURLY VOLUMES (AM/PM) :	71	312	207			590

" K " FACTOR :

0.092

INTERSECTION ADT (V) = TOTAL DAILY
APPROACH VOLUME :

6,413

TOTAL # OF CRASHES :

1

OF
YEARS :

3

AVERAGE # OF
CRASHES PER YEAR (A) :

0.33

CRASH RATE CALCULATION :

0.14

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

Comments : _____

Project Title & Date: Atwater Avenue 2/23/23



INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Manchester-By-The-Sea COUNT DATE : 1/11/2023

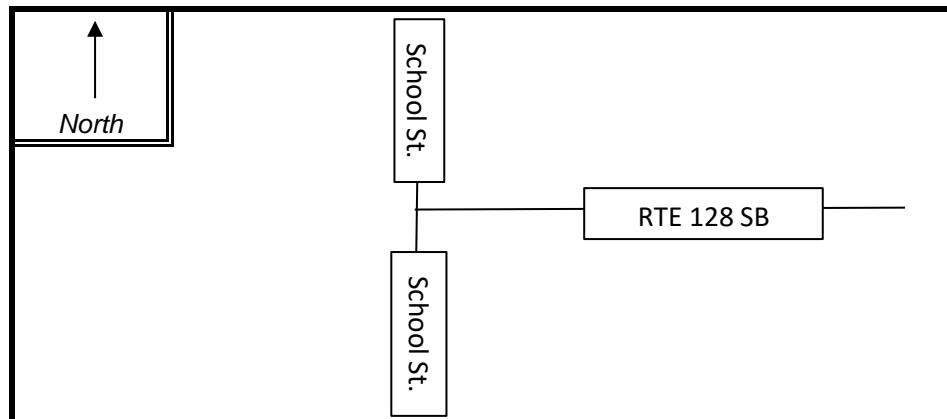
DISTRICT : 4 UNSIGNALIZED : ☒ X SIGNALIZED : ☐

~ INTERSECTION DATA ~

MAJOR STREET : School Street

MINOR STREET(S) : Route 128 Southbound On/Off Ramps

**INTERSECTION
DIAGRAM**
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	WB	NB	SB			
PEAK HOURLY VOLUMES (AM/PM) :	106	486	277			869

" K " FACTOR :

0.092

INTERSECTION ADT (V) = TOTAL DAILY
APPROACH VOLUME :

9,446

TOTAL # OF CRASHES :

3

OF
YEARS :

3

AVERAGE # OF
CRASHES PER YEAR (A) :

1.00

CRASH RATE CALCULATION :

0.29

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

Comments : _____

Project Title & Date: Atwater Avenue 2/23/23



INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Manchester-By-The-Sea COUNT DATE : 1/11/2023

DISTRICT : 4 UNSIGNALIZED : ☒ X SIGNALIZED : ☐

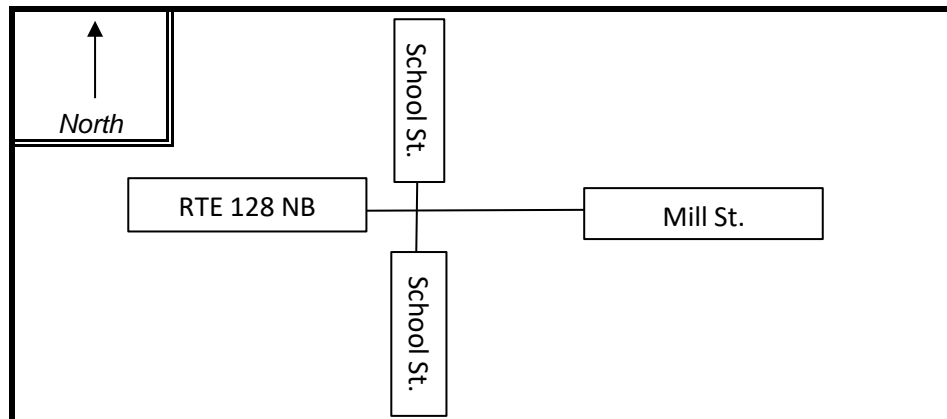
~ INTERSECTION DATA ~

MAJOR STREET : School Street

MINOR STREET(S) : Route 128 Northbound On/Off Ramps

Mill 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 (AM/PM) :	360	43	408	253		1,064

" K " FACTOR : **0.092** INTERSECTION ADT (V) = TOTAL DAILY APPROACH VOLUME : **11,565**

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

CRASH RATE CALCULATION :

0.55

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

Comments : _____

Project Title & Date: Atwater Avenue 2/23/23



INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Manchester-By-The-Sea COUNT DATE : 1/11/2023

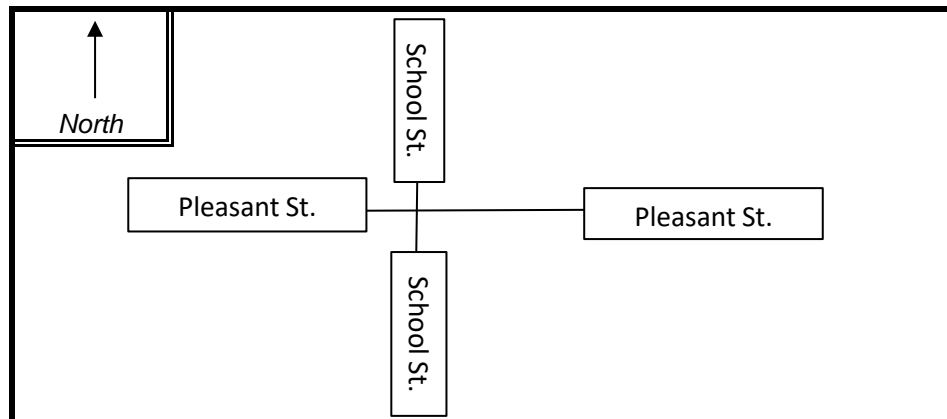
DISTRICT : 4 UNSIGNALIZED : ☒ SIGNALIZED : ☐

~ INTERSECTION DATA ~

MAJOR STREET : School Street

MINOR STREET(S) : Pleasant 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 (AM/PM) :	91	225	197	381		894

" K " FACTOR :

0.092

INTERSECTION ADT (V) = TOTAL DAILY
APPROACH VOLUME :

9,717

TOTAL # OF CRASHES :

3

OF
YEARS :

3

AVERAGE # OF
CRASHES PER YEAR (A) :

1.00

CRASH RATE CALCULATION :

0.28

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

Comments : _____

Project Title & Date: Atwater Avenue 2/23/23



INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Manchester-By-The-Sea COUNT DATE : 1/11/2023

DISTRICT : 4 UNSIGNALIZED : ☒ SIGNALIZED : ☐

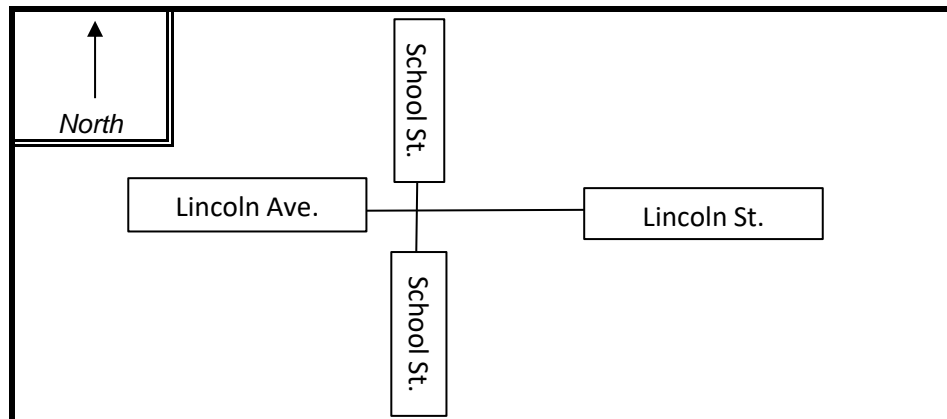
~ INTERSECTION DATA ~

MAJOR STREET : School Street

MINOR STREET(S) : Lincoln Street

Lincoln Avenue

**INTERSECTION
DIAGRAM
(Label Approaches)**



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	NB	SB			
PEAK HOURLY VOLUMES (AM/PM) :	11	207	517			735

" K " FACTOR :

0.094

INTERSECTION ADT (V) = TOTAL DAILY APPROACH VOLUME :

7,786

TOTAL # OF CRASHES :

0

OF YEARS :

4

AVERAGE # OF CRASHES PER YEAR (A) :

0.00

CRASH RATE CALCULATION :

0.00

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

Comments : _____

Project Title & Date: Atwater Avenue 2/23/23

Attachment F

MassDOT Ambient Growth Rate Data

MassDOT Yearly Growth Rates

for data from 2014 to 2018

Growth						
Group	Grow 2014 to 2015	Grow 2015 to 2016	Grow 2016 to 2017	Grow 2017 to 2018	Grow 2018 to 2019	
R1	0	0.023	0.004	0.018	0.016	
R2	0.05	0.068	0.004	0.014	0.014	
R3	-0.038	0.002	0.008	0.011	0.06	
R4-7	-0.01	0.003	0.001	0.011	0.012	
Rec - East		0.032	0.02	0.041	0.025	
Rec - West		0.051	-0.008	0.029	0	
U1-Boston	0.061	0.07	-0.003	0.012	0.006	
U1-Essex	0.024	0.025	0.007	0.014	0.011	
U1-Southeast	0.05	0.062	0.021	0.014	0	
U1-West	0.03	-0.027	0.02	0.028	0.013	
U1-Worcester	0.042	0.005	0.018	0.01	0.01	
U2	0.04	0.048	0.008	0.01	0.02	
U3	0.011	0.013	0.011	0.014	0.004	
U4-7	0.023	0.062	0.017	0.003	-0.004	

updated 5/1/2020

Attachment G

Specific Developments by Others

Transportation Impact Assessment

Proposed Multifamily Residential Development
School Street
Manchester-By-The-Sea, Massachusetts

Prepared for:

SLV School Street, LLC
Needham, Massachusetts

September 2020
Updated December 2021

Prepared by:

 **Vanasse &
Associates inc**
Transportation Engineers & Planners

35 New England Business Center Drive
Suite 140
Andover, MA 01810

Table 5
TRIP GENERATION SUMMARY^a

Time Period	Vehicle Trips		
	Entering	Exiting	Total
<i>Average Weekday:</i>	474	474	948
<i>Weekday Morning Peak Hour:</i>	16	49	65
<i>Weekday Evening Peak Hour:</i>	50	29	79

^aBased on ITE LUC 220, *Multifamily Housing (Low-Rise)*.

Project-Generated Traffic Volume Summary

As can be seen in Table 5, the Project is expected to generate approximately 948 vehicle trips on an average weekday (two-way, 24-hour volume, or 474 vehicles entering and 474 exiting), with 65 vehicle trips (16 vehicles entering and 49 exiting) expected during the weekday morning peak-hour and 79 vehicle trips (50 vehicles entering and 29 exiting) expected during the weekday evening peak-hour.

TRIP DISTRIBUTION AND ASSIGNMENT

The directional distribution of generated trips to and from the Project site was determined based on a review of Journey-to-Work data obtained from the U.S. Census for persons residing in the Town of Manchester-by-the-Sea and then refined based on existing traffic patterns within the study area. This methodology is consistent with the residential nature of the Project and the predominant land use within the study area (residential). The general trip distribution for the Project is graphically depicted on Figure 7. The additional traffic expected to be generated by the Project was assigned on the study area roadway network as shown on Figures 8 and 9, for the weekday morning and evening peak hours, respectively.

FUTURE TRAFFIC VOLUMES - BUILD CONDITION

The 2029 Build condition traffic volumes consist of the 2029 No-Build traffic volumes with the additional traffic expected to be generated by the Project added to them. The 2029 Build weekday morning and evening peak-hour traffic-volumes are graphically depicted on Figures 10 and 11, respectively.

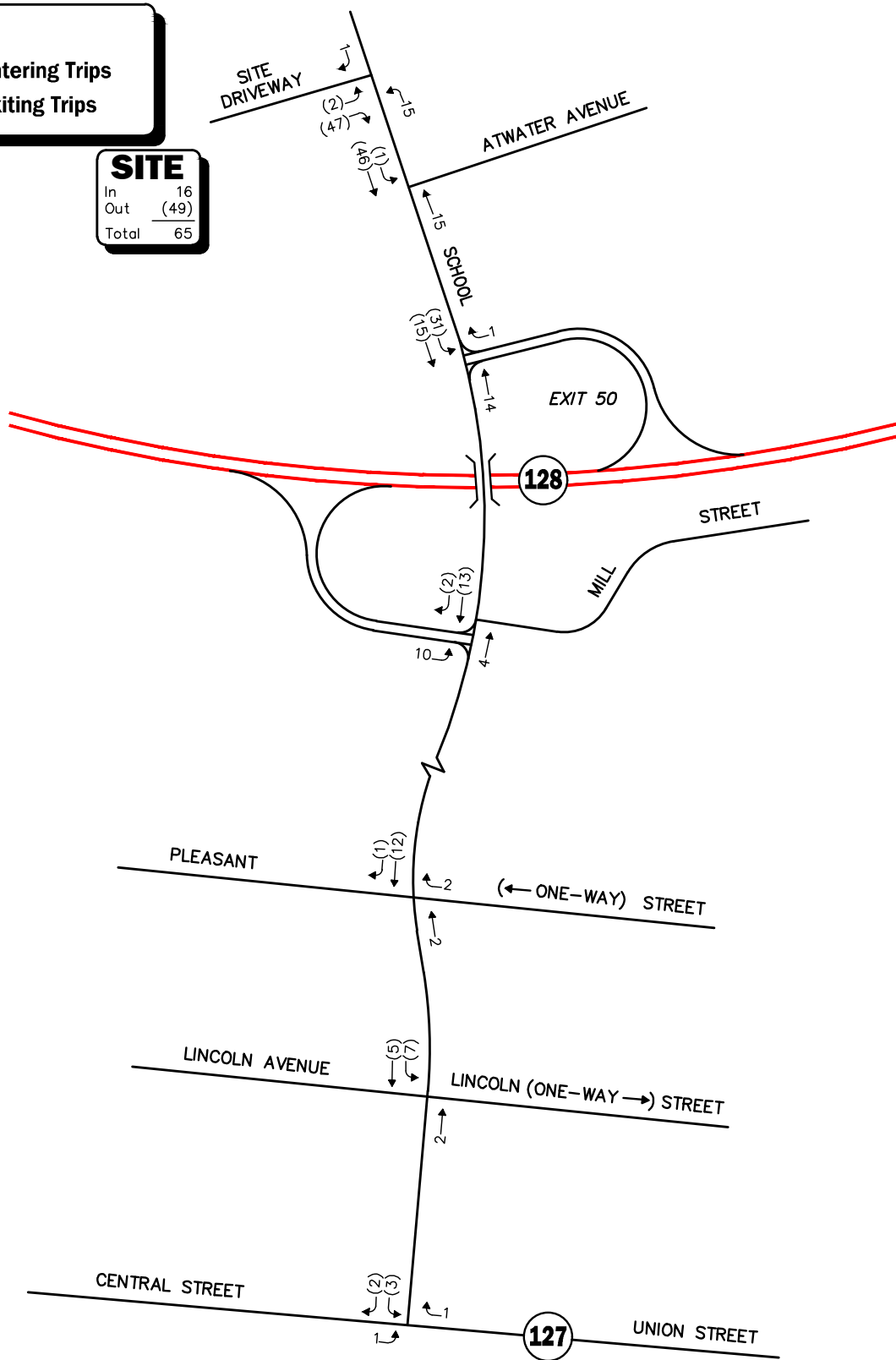
A summary of peak-hour projected traffic-volume changes outside of the study area that is the subject of this assessment is shown in Table 6. These changes are a result of the construction of the Project.

Legend:

XX Entering Trips
(XX) Exiting Trips

SITE

In	16
Out	(49)
Total	65



Not To Scale



Vanasse &
Associates inc

Figure 8

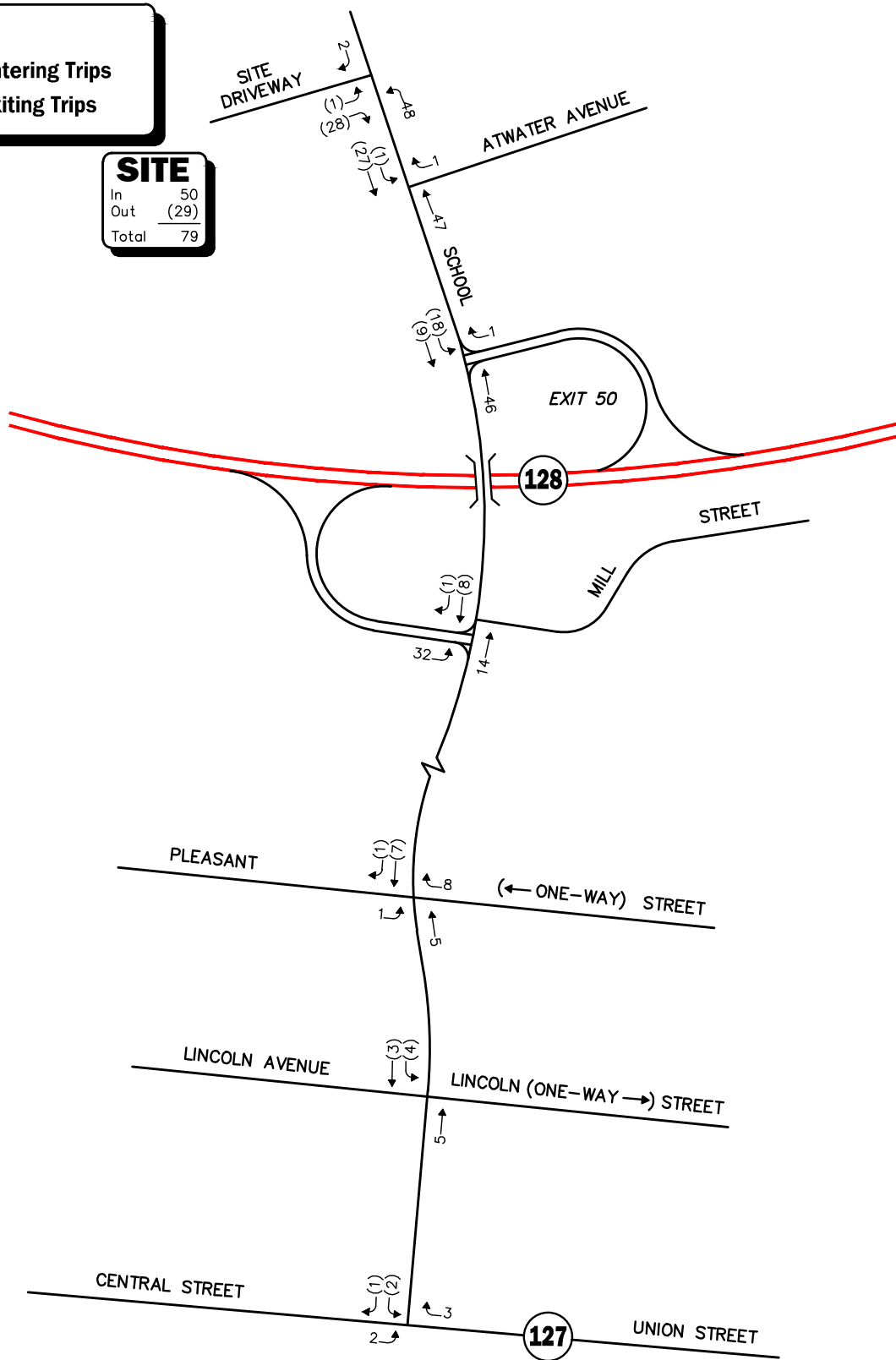
**Project-Generated
Weekday Morning
Peak-Hour Traffic Volumes**

Legend:

XX Entering Trips
(XX) Exiting Trips

SITE

In	50
Out	(29)
Total	79



Not To Scale



Vanasse &
Associates inc

Figure 9

**Project-Generated
Weekday Evening
Peak-Hour Traffic Volumes**

MEMORANDUM

TO: Cornerstone Church
c/o Mr. Alden Drake
53 Pleasant Street
Wenham, MA 01984

FROM: Mr. Jeffrey S. Dirk, P.E., PTOE, FITE 
Managing Partner
Vanasse & Associates, Inc.
35 New England Business Center Drive
Suite 140
Andover, MA 01810-1066
(978) 269-6830
jdirk@rdva.com

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

DATE: September 13, 2021

RE: 9064

SUBJECT: Transportation Impact Assessment
Cornerstone Church – 189-193 School Street
Manchester-by-the-Sea, Massachusetts

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Assessment (TIA) in order to determine the potential impacts on the transportation infrastructure associated with the proposed relocation of the Cornerstone Church to a new parish building to be located at 189-193 School Street in Manchester-by-the-Sea, Massachusetts (hereafter referred to as the “Project”). This assessment: i) reviews the existing conditions of the transportation infrastructure serving the Project site; ii) qualitatively evaluates the potential impact of the Project along School Street and Mill Street; and iii) provides an evaluation of lines of sight at the Project site driveway intersection with Mill Street.

This assessment was conducted in general accordance with the Massachusetts Department of Transportation (MassDOT) *Transportation Impact Assessment (TIA) Guidelines* and the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports. Based on this assessment, we have concluded the following with respect to the Project:

1. Using trip-generation statistics published by the Institute of Transportation Engineers (ITE),¹ the Project is expected to generate approximately 3 vehicle trips during the weekday morning peak-hour, 5 vehicle trips during the weekday evening peak-hour, 27 vehicle trips during the Saturday peak-hour of the church and 97 vehicle trips during the Sunday peak-hour of the church on a peak attendance day;
2. It is apparent that the Project will generate nominal traffic volume during the weekday peak hours (3 to 5 vehicle trips), with less than 30 vehicles expected during the Saturday peak-hour, or less than one (1) vehicle every two minutes. On a peak attendance day on a Sunday, the Project could produce up to 97 vehicle trips during a period when traffic volumes on both School Street and Mill Street are lower than those on a weekday or Saturday when there is reserve capacity to accommodate these trips. It is also important to note that parishioners stay after the service for social activities which disperses departing traffic volumes;

¹*Trip Generation*, 10th Edition; Institute of Transportation Engineers; Washington, DC; 2017.



PROJECT-GENERATED TRAFFIC

As proposed, the Project will entail the construction of a 9,745 sf church building. In order to determine the traffic characteristics of the Project, trip-generation methodologies established by the ITE⁴ and attendance data provided by the Cornerstone Church were used. The Cornerstone Church currently has one regular service that occurs at 10:00 AM on Sunday, which is expected to continue when the Church is relocated. The maximum number of vehicles that have been observed at the church for a regular service is 60, with 40 vehicles on a typical Sunday and 30 vehicles during the summer months. In addition to the data that was provided by the Cornerstone Church, trip-generation data for ITE Land Use Code (LUC) 560, *Church*, was also reviewed. The trip-generation calculations that were derived for the new church building during the Sunday peak-hour were found to closely correlate to the empirical data provided by the Cornerstone Church for a peak attendance day. As such, the ITE data was used to establish the traffic characteristics of the Project, the results of which are summarized in Table 2.

Table 2
TRIP-GENERATION SUMMARY^a

Time Period	Vehicle Trips		
	Entering	Exiting	Total
<i>Weekday Morning Peak-Hour:</i>	2	1	3
<i>Weekday Evening Peak-Hour:</i>	2	3	5
<i>Saturday Peak-Hour of Generator:</i>	16	11	27
<i>Sunday Peak-Hour of Generator:</i>	46	51	97

^aBased on ITE LUC 560, *Church*; 9,745 sf.

Project-Generated Traffic-Volume Summary

As can be seen in Table 2, the Project is expected to generate approximately 3 vehicle trips (2 vehicles entering and 1 exiting) during the weekday morning peak-hour, 5 vehicle trips (2 vehicles entering and 3 exiting) during the weekday evening peak-hour, 27 vehicle trips (16 vehicles entering and 11 exiting) during the Saturday peak-hour of the church and 97 vehicle trips (46 vehicles entering and 51 exiting) during the Sunday peak-hour of the church on a peak attendance day.

With consideration of the lower traffic volumes along School Street and Mill Street that occur during the Sunday morning peak-hour, it is apparent that the Project will generate nominal traffic volumes on a weekday, with limited impacts on a Saturday if and when the church is in use. On a Sunday on a peak attendance day, there is reserve capacity on School Street and Mill Street to accommodate the additional traffic as traffic volumes are lower than those on a weekday or a Saturday.

⁴Ibid 1.



Attachment H

Trip Generation Calculations

Trip Generation Assessment

Project: Atwater Avenue RDC - Manchester-by-the-Sea, MA
Date: 1/6/2023
Analyst: TEC, Inc.
Source: Institute of Transportation Engineers - Trip Generation - 11th Ed.

Proposed Development

Research and Development Center (LUC 760)

Units:	263	1000 SF Gross Floor Area		Total Trips		Total New Trips		% Distribution		# New Trips		Total New Pass-by Trips	Total New Primary Trips	# Passby Trips		# Primary Trips	
		Avg. Rates	Fitted Curve														
Weekday Daily	Weekday AM PH	2914	2799	2800	50%	50%	1400	1400	0	2800	0	0	0	0	0	1400	1400
		270	259	259	82%	18%	212	47	0	259	0	0	0	0	0	212	47
		258	246	246	16%	84%	39	207	0	246	0	0	0	0	0	39	207
Saturday Daily		502	435	436	50%	50%	218	218	0	436	0	0	0	0	0	218	218
Sat Midday PH		64	52	52	50%	50%	26	26	0	52	0	0	0	0	0	26	26

TOTAL NEW DEVELOPMENT		Total Trips	Total New Trips	Total New Pass-by Trips	Total New Primary Trips	Total Pass-by Trips	Total Primary Trips
Weekday Daily	Weekday AM Peak Hour	2800	In 1400 Out 1400	0	2800	0	1400
		259	212 47	0	259	0	212
		246	39 207	0	246	0	39
		436	218 218	0	436	0	218
Sat Midday Peak Hour		52	26 26	0	52	0	26



Land Use: 760

Research and Development Center

Description

A research and development center is a facility or group of facilities devoted almost exclusively to research and development activities. The range of specific types of businesses contained in this land use category varies significantly. Research and development centers may contain offices and light fabrication areas. General office building (Land Use 710), corporate headquarters building (Land Use 714), single tenant office building (Land Use 715), office park (Land Use 750), and business park (Land Use 770) are related uses.

Additional Data

The average numbers of person trips per vehicle trip at the 11 general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.4 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.4 during Weekday, AM Peak Hour of Generator
- 1.4 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 1.4 during Weekday, PM Peak Hour of Generator

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alberta (CAN), California, Iowa, Maryland, Minnesota, Montana, and Pennsylvania.

Source Numbers

105, 157, 213, 218, 253, 332, 384, 423, 630, 723, 911, 973

Research and Development Center (760)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 22

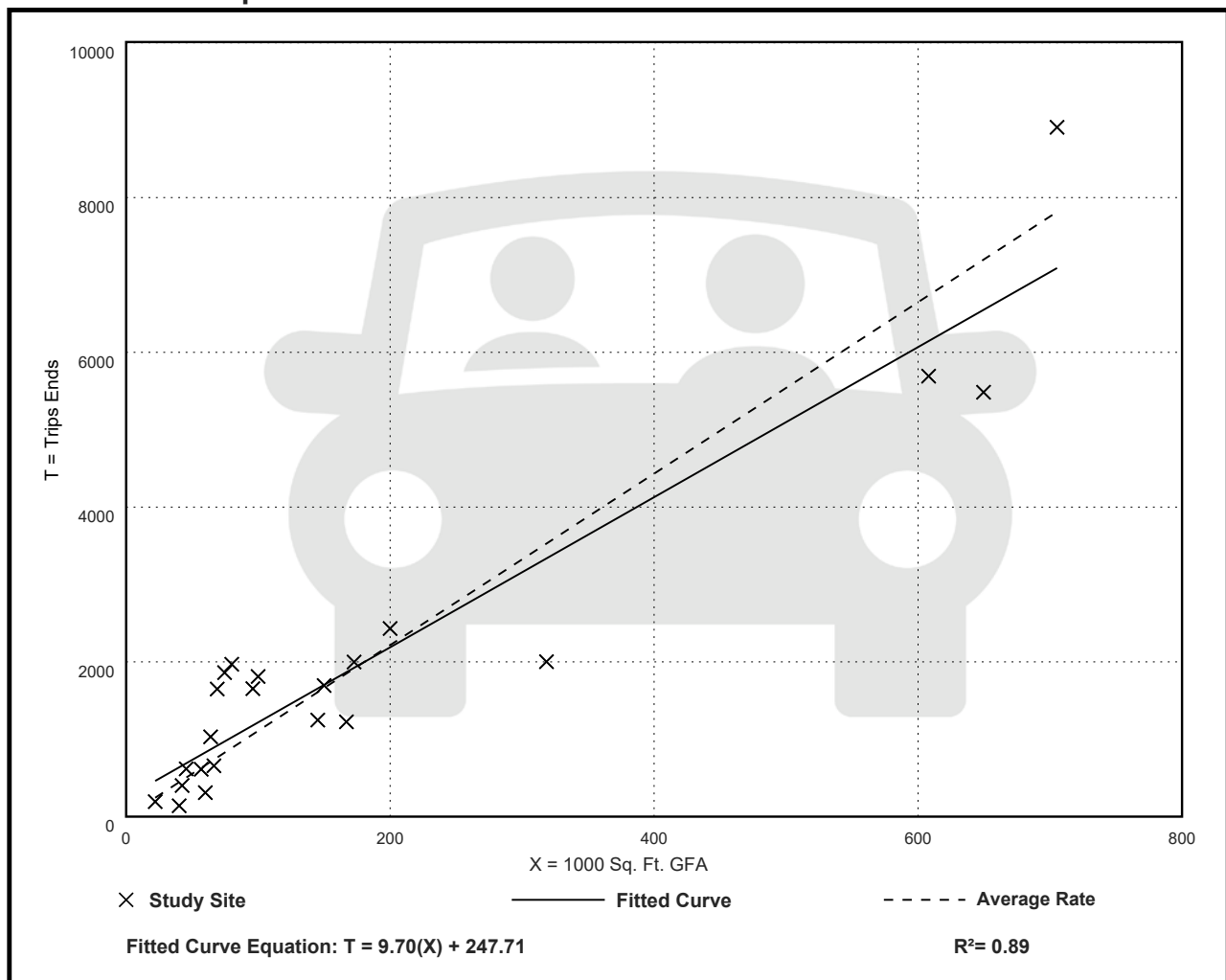
Avg. 1000 Sq. Ft. GFA: 179

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
11.08	3.48 - 24.95	4.45

Data Plot and Equation



Research and Development Center (760)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 7 and 9 a.m.

Setting/Location: General Urban/Suburban

Number of Studies: 39

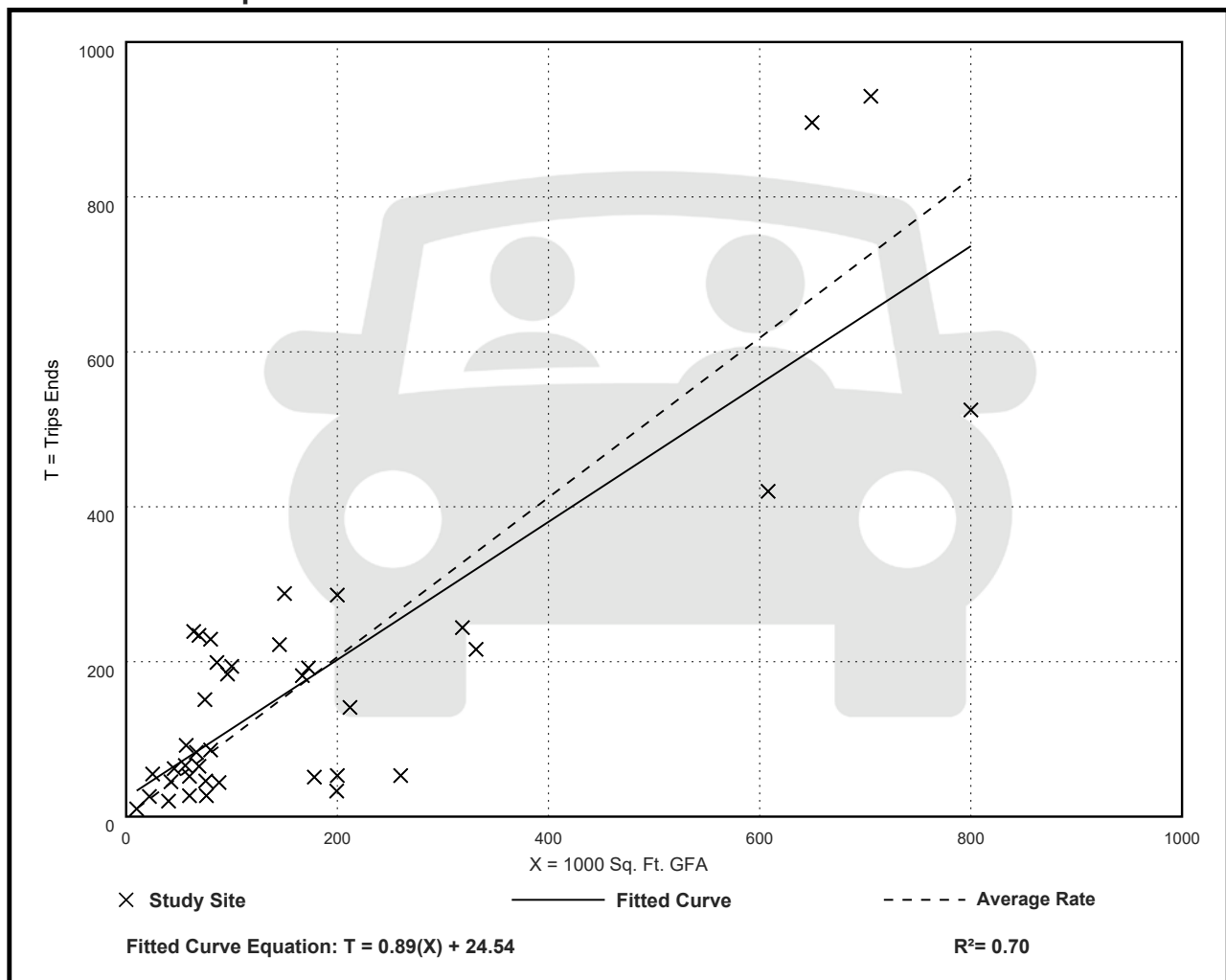
Avg. 1000 Sq. Ft. GFA: 173

Directional Distribution: 82% entering, 18% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.03	0.17 - 3.73	0.65

Data Plot and Equation



Research and Development Center (760)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban

Number of Studies: 39

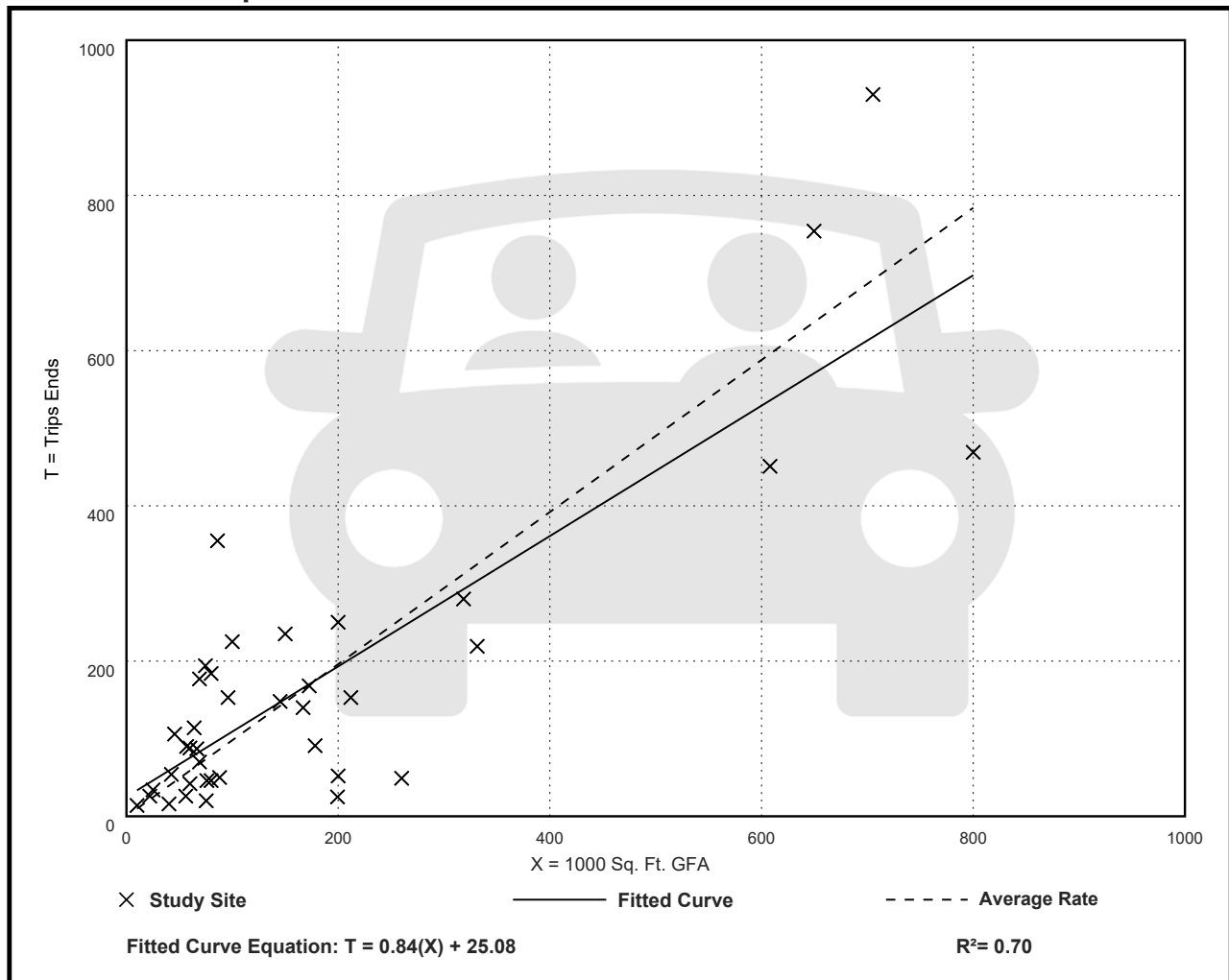
Avg. 1000 Sq. Ft. GFA: 173

Directional Distribution: 16% entering, 84% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.98	0.13 - 4.13	0.64

Data Plot and Equation



Research and Development Center (760)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Saturday

Setting/Location: General Urban/Suburban

Number of Studies: 19

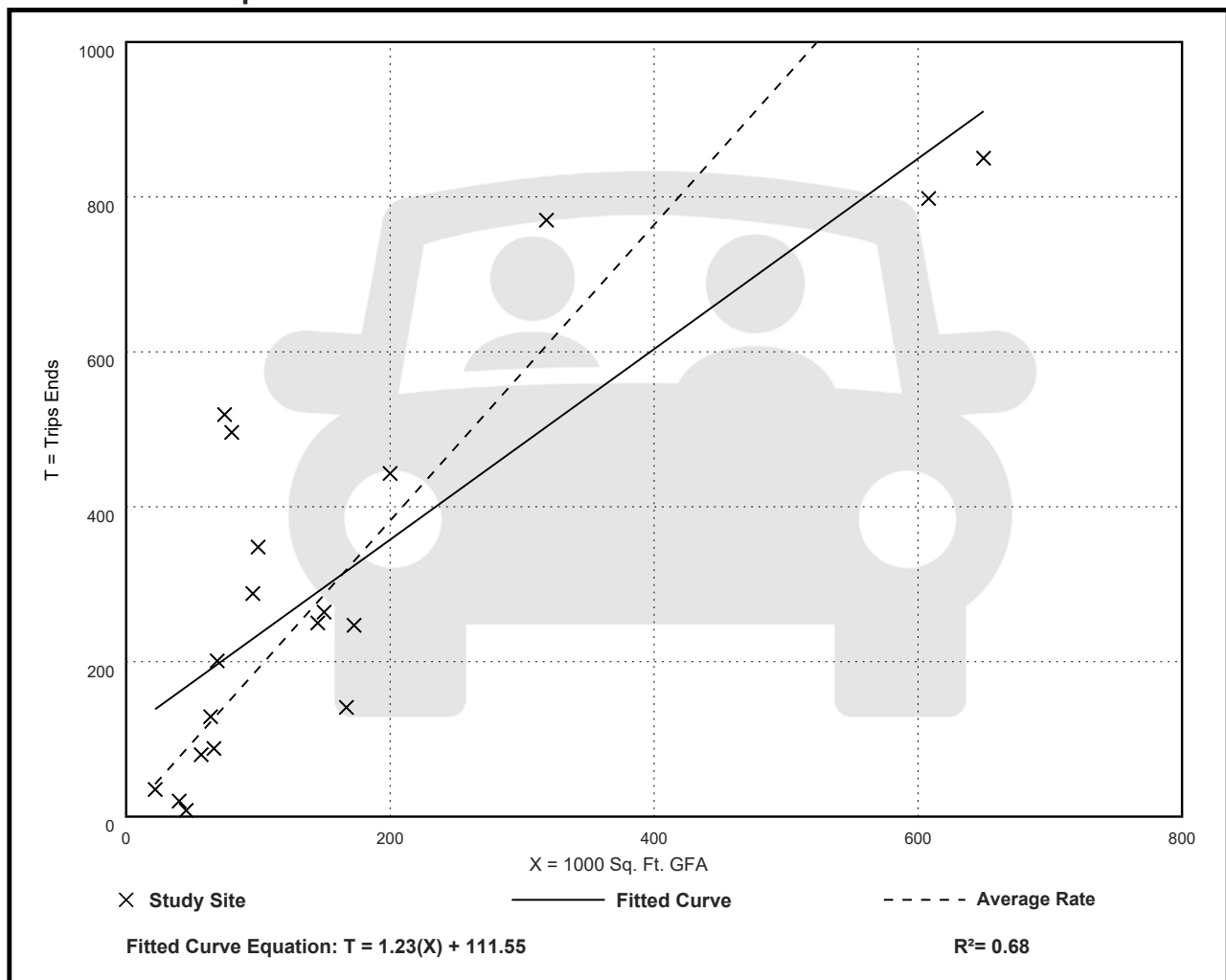
Avg. 1000 Sq. Ft. GFA: 165

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.91	0.18 - 6.96	1.28

Data Plot and Equation



Research and Development Center (760)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Saturday, Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 13

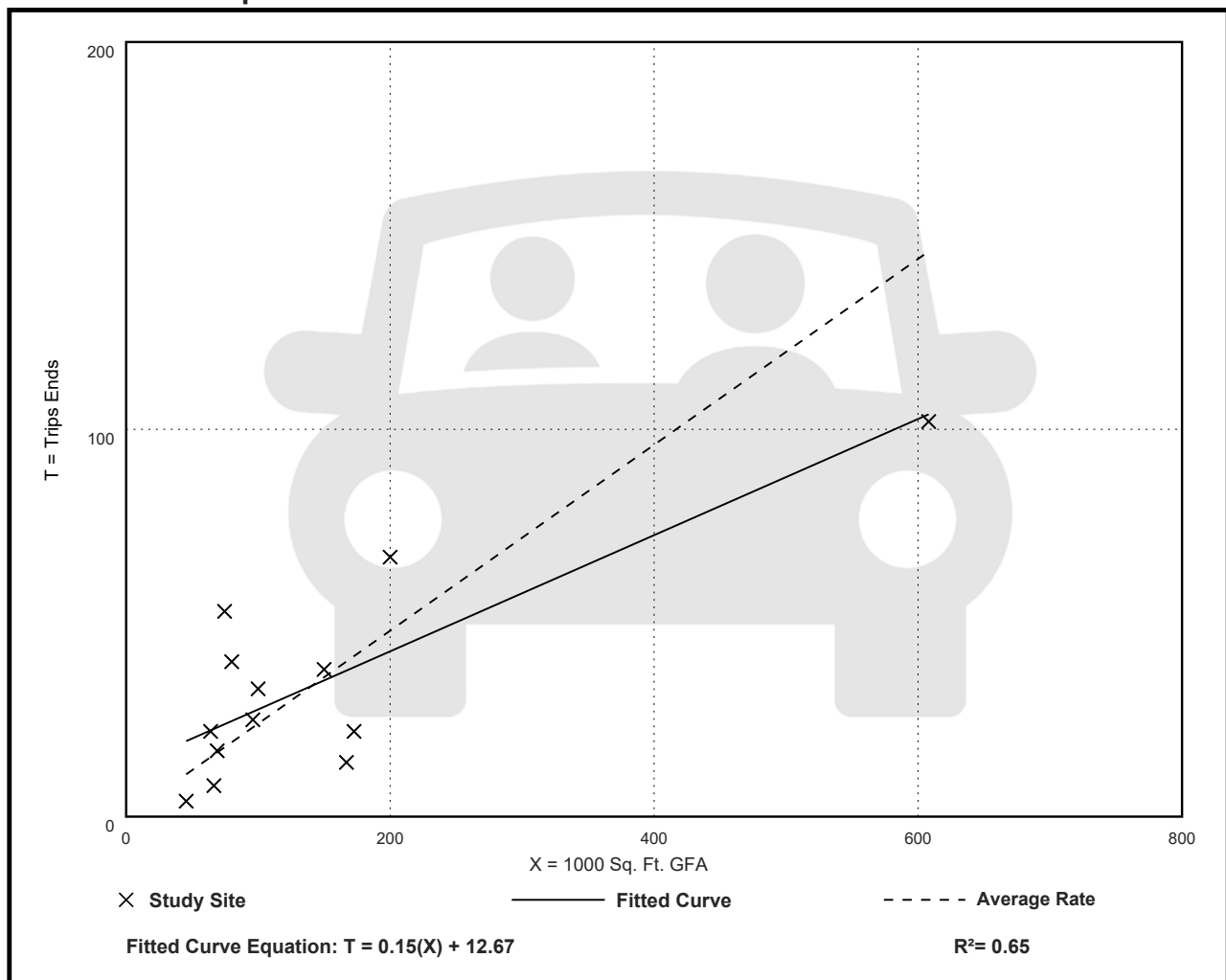
Avg. 1000 Sq. Ft. GFA: 146

Directional Distribution: Not Available

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.24	0.08 - 0.71	0.14

Data Plot and Equation



Research and Development Center (760)

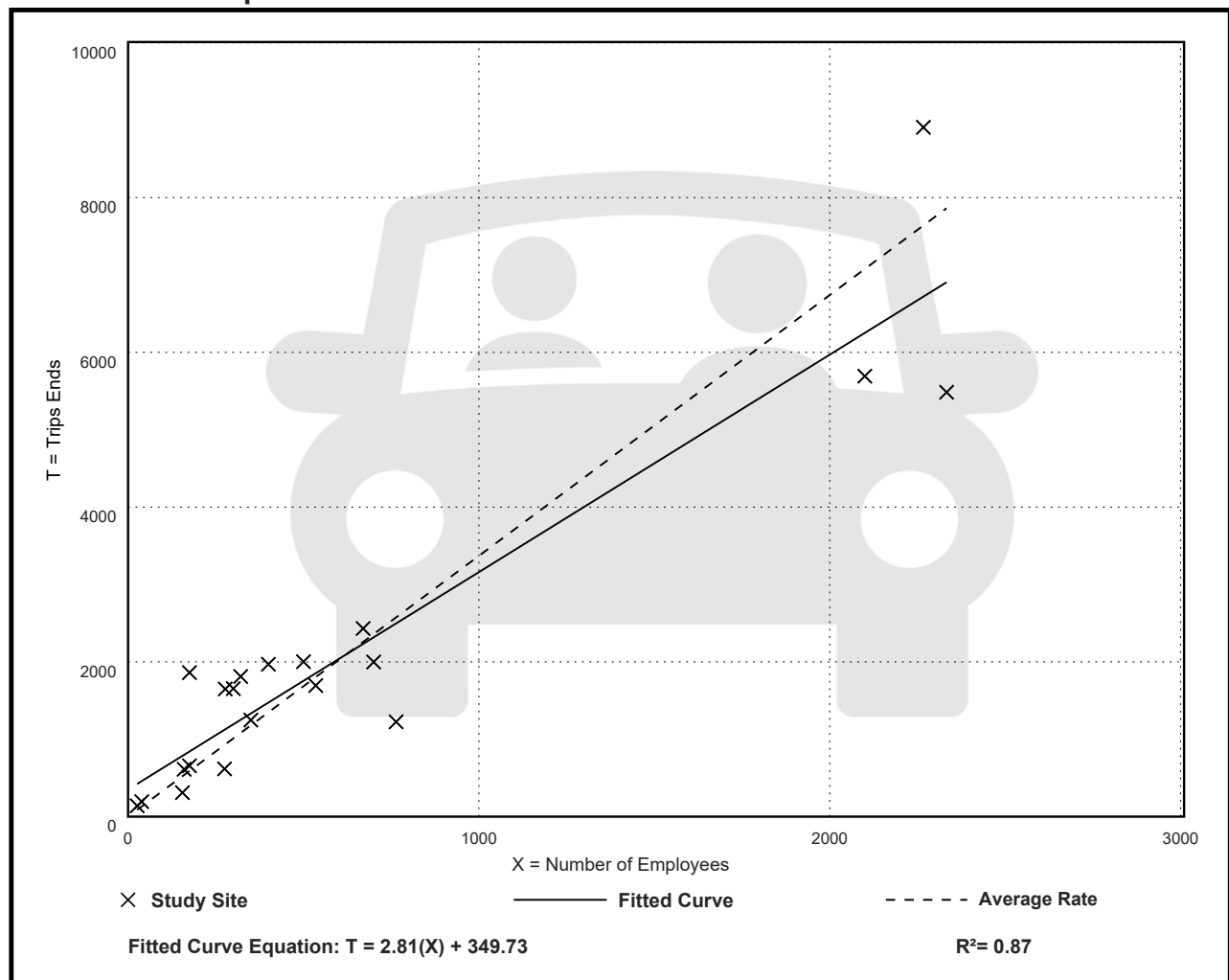
Vehicle Trip Ends vs: Employees
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 20
Avg. Num. of Employees: 626
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
3.37	1.60 - 10.63	1.39

Data Plot and Equation



Research and Development Center (760)

Vehicle Trip Ends vs: Employees

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 7 and 9 a.m.

Setting/Location: General Urban/Suburban

Number of Studies: 30

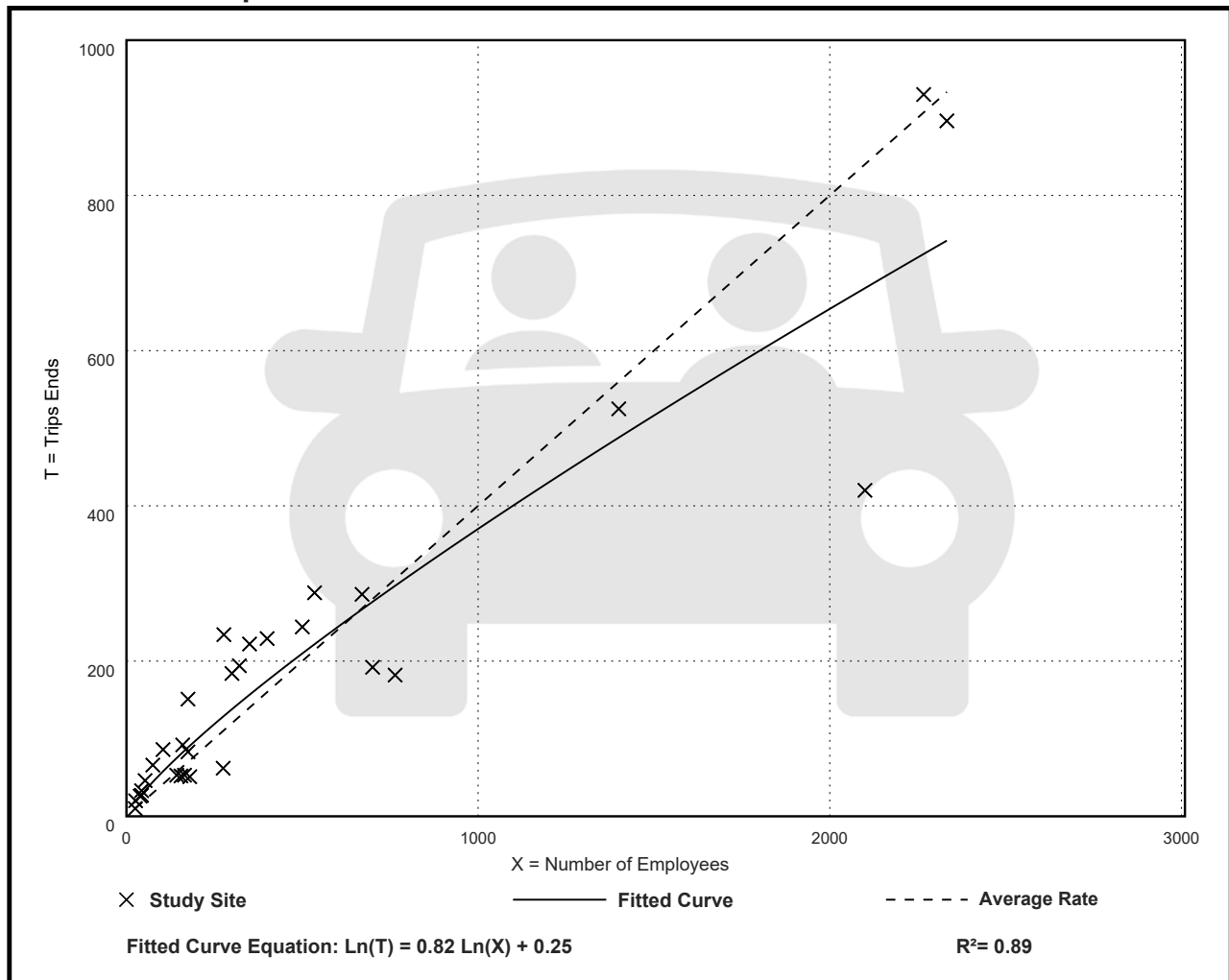
Avg. Num. of Employees: 492

Directional Distribution: 85% entering, 15% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.40	0.20 - 0.88	0.16

Data Plot and Equation



Research and Development Center (760)

Vehicle Trip Ends vs: Employees

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban

Number of Studies: 30

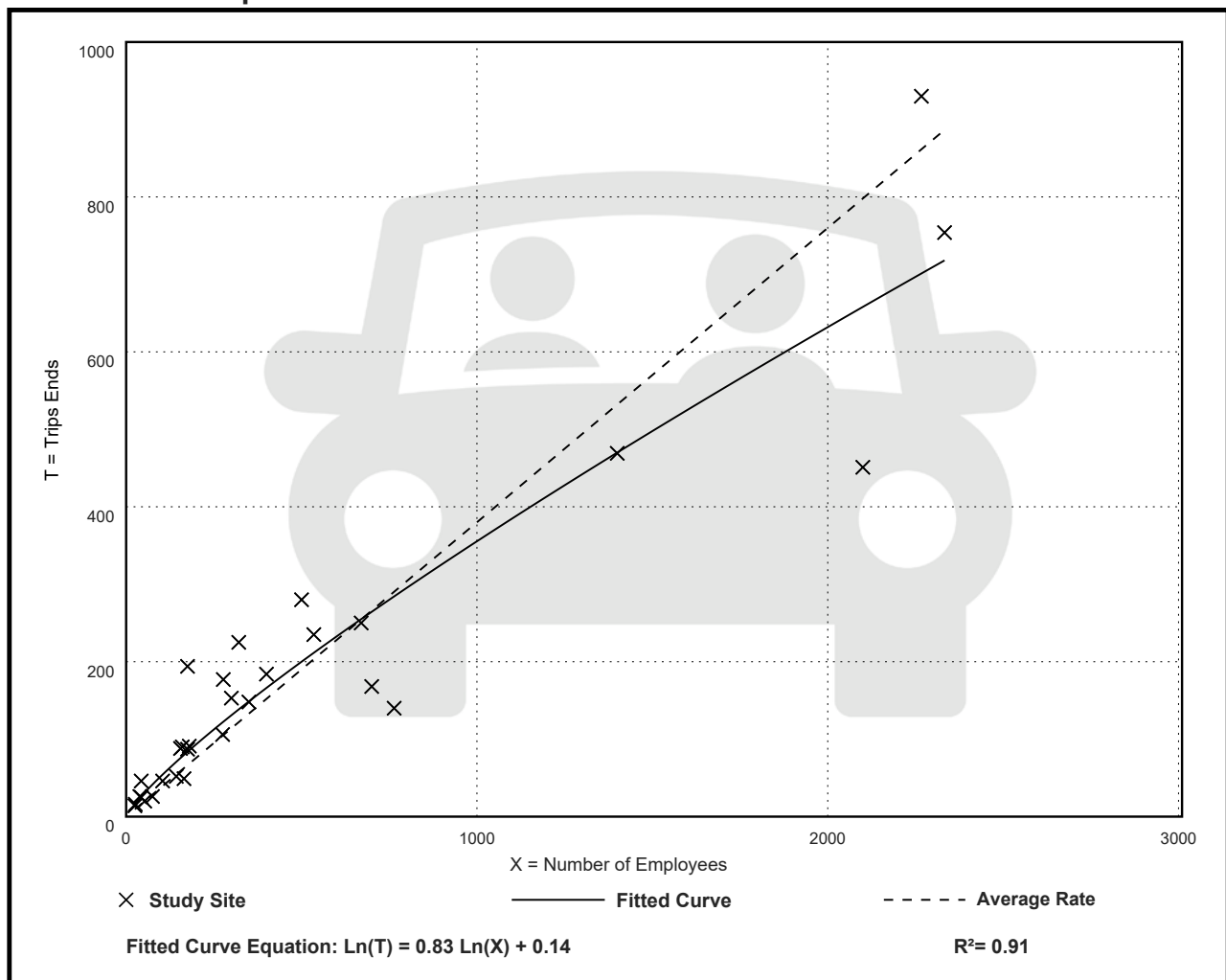
Avg. Num. of Employees: 492

Directional Distribution: 12% entering, 88% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.38	0.18 - 1.11	0.15

Data Plot and Equation



Research and Development Center (760)

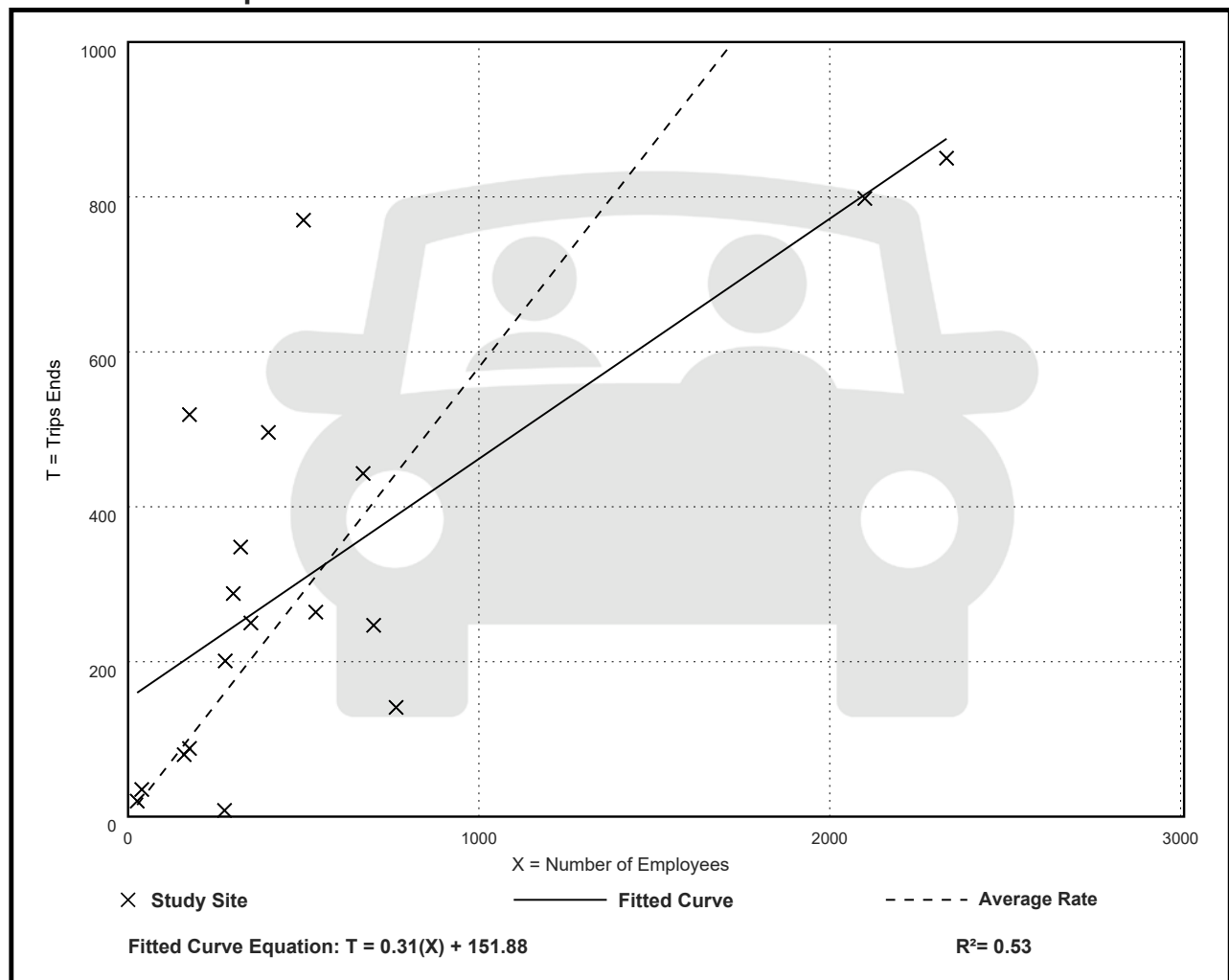
Vehicle Trip Ends vs: Employees
On a: Saturday

Setting/Location: General Urban/Suburban
Number of Studies: 18
Avg. Num. of Employees: 561
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.58	0.03 - 2.97	0.48

Data Plot and Equation



Research and Development Center (760)

Vehicle Trip Ends vs: Employees

On a: Saturday, Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 12

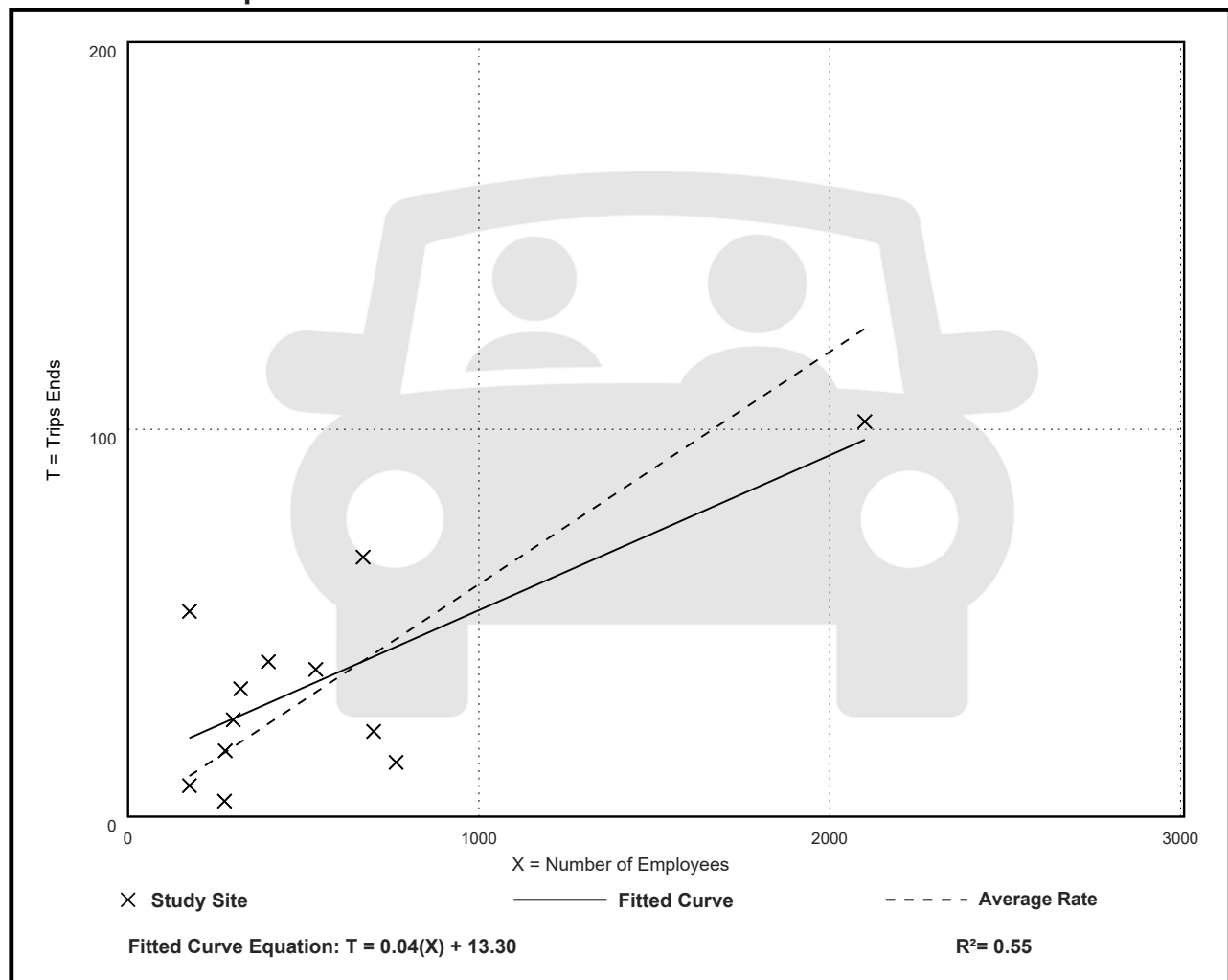
Avg. Num. of Employees: 558

Directional Distribution: Not Available

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.06	0.01 - 0.30	0.05

Data Plot and Equation



Trip Generation Assessment - Phase 1 Only

Project: Atwater Avenue RDC - Manchester-by-the-Sea, MA
 Date: 5/6/2024
 Analyst: TEC, Inc.
 Source: Institute of Transportation Engineers - Trip Generation - 11th Ed.

Proposed Development

Research and Development Center (LUC 760)											
Units:		127 1000 SF Gross Floor Area									
			Total Trips		Total Trips		New Trips		% Distribution		
	Avg. Rates	Fitted Curve					IN	OUT			
Weekday Daily	1408	1480			1480		50%	50%			
Weekday AM PH	130	138			138		82%	18%			
Weekday PM PH	124	132			132		16%	84%			
Saturday Daily	242	268			268		50%	50%			
Sat Midday PH	30	32			32		50%	50%			

TOTAL NEW DEVELOPMENT		Total Trips	Total New Trips		Total New Pass-by Trips	Total New Primary Trips	Total Pass-by Trips		Total Primary Trips
			In	Out			In	Out	
Weekday Daily		1480	740	740	0	1480	0	0	740
Weekday AM Peak Hour		138	113	25	0	138	0	0	113
Weekday PM Peak Hour		132	21	111	0	132	0	0	21
Saturday Daily		268	134	134	0	268	0	0	134
Sat Midday Peak Hour		32	16	16	0	32	0	0	16

Attachment I

Trip Distribution Calculations

Trip Distribution Gravity Model - Industrial & Office

Project: T1199 - Manchester by the Sea
Date: 2/17/2023
Analyst: TEC, Inc.
Source: U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2002-2019)

Workplace State -County- MCD Name	Residence State -County-MCD Name	Count	% of Total Manchester Workers	% of Distributed Workforce	Major Route Entering / Exiting										Major Route Entering / Exiting									
					Route 128 from East	Route 128 from West	Mill St. from East	School St. from North	School St. from South	Pleasant St. from East	Pleasant St. from West	Lincoln St. from East	Check	Route 128 from East	Route 128 from West	Mill St. from East	School St. from North	School St. from South	Pleasant St. from East	Pleasant St. from West	Lincoln St. from East	Check		
Manchester-by-the-Sea town Es Gloucester city (Essex, MA)		252	15.54%	20.11%	90%							10%	100%	18.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	20.1%		
Manchester-by-the-Sea town Es Manchester-by-the-Sea town (Essex, MA)		233	14.35%	18.57%		5%	5%			30%	5%	30%	100%	0.0%	0.9%	0.9%	0.0%	5.6%	0.9%	5.6%	4.6%	18.6%		
Manchester-by-the-Sea town Es Beverly city (Essex, MA)		229	14.10%	18.25%				90%			10%		100%	0.0%	16.4%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	18.3%		
Manchester-by-the-Sea town Es Salem city (Essex, MA)		60	3.67%	4.76%				100%					100%	0.0%	4.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%		
Manchester-by-the-Sea town Es Peabody city (Essex, MA)		57	3.49%	4.52%				100%					100%	0.0%	4.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%		
Manchester-by-the-Sea town Es Ipswich town (Essex, MA)		53	3.28%	4.25%			33%			67%			100%	0.0%	1.4%	0.0%	2.8%	0.0%	0.0%	0.0%	0.0%	4.3%		
Manchester-by-the-Sea town Es Essex town (Essex, MA)		59	3.61%	4.68%						100%			100%	0.0%	0.0%	0.0%	4.7%	0.0%	0.0%	0.0%	0.0%	4.7%		
Manchester-by-the-Sea town Es Hamilton town (Essex, MA)		49	3.02%	3.91%					50%				100%	0.0%	2.0%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%	3.9%		
Manchester-by-the-Sea town Es Rockport town (Essex, MA)		45	2.75%	3.56%	90%							10%	100%	3.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	3.6%		
Manchester-by-the-Sea town Es Danvers town (Essex, MA)		51	3.14%	4.06%			100%						100%	0.0%	4.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.1%		
Manchester-by-the-Sea town Es Lynn city (Essex, MA)		31	1.93%	2.50%				100%					100%	0.0%	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%		
Manchester-by-the-Sea town Es Boston city (Suffolk, MA)		20	1.21%	1.57%				100%					100%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%		
Manchester-by-the-Sea town Es Haverhill city (Essex, MA)		26	1.60%	2.07%			67%			33%			100%	0.0%	1.4%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	2.1%		
Manchester-by-the-Sea town Es Newburyport city (Essex, MA)		21	1.31%	1.70%				50%		50%			100%	0.0%	0.9%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	1.7%		
Manchester-by-the-Sea town Es Rowley town (Essex, MA)		23	1.40%	1.81%				33%		67%			100%	0.0%	0.6%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	1.8%		
Manchester-by-the-Sea town Es Wenham town (Essex, MA)		21	1.31%	1.70%				67%		33%			100%	0.0%	1.1%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	1.7%		
Manchester-by-the-Sea town Es Marblehead town (Essex, MA)		25	1.54%	1.99%				100%					100%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%		
TOTAL		1624	77.26%	100.00%										21.3%	44.1%	0.9%	12.8%	7.4%	0.9%	8.6%	7.9%	100.0%		
SAY														21%	44%	1%	13%	7%	1%	8%	7%	100%		

Attachment J

MUTCD All-Way Stop Warrant Analysis

Multi-Way Stop Applications

Project: T1989.00 - CST at the Quarry - Manchester By the Sea, MA
Date: April 17, 2023
Analyst: TEC Inc.

ONLY CHANGE CELLS HIGHLIGHTED IN YELLOW
ONLY YIELD TO RIGHT TURN INFORMATION

Criteria B - Five or More Preventable Crashes

At least Crashes In Last 12 Month Period = 0

Result: NO

Criteria C - Minimum Vehicular Volumes

Average Delay to Minor Street Vehicular Traffic = 23 seconds per vehicle

Condition 1 L2: Major Street 85th Percentile Speed < 40 MPH

	Average Volume	6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Street	300	0	693	609	443	458	406	540	493	633	684	608	561	343
Minor	100	NO	NO	YES	NO	NO	NO	NO	NO	YES	NO	YES	NO	NO
Minor	Met?	NO	NO	YES	NO	NO	NO	NO	NO	YES	NO	YES	NO	NO

Result: NO

OR
Condition 3: Major Street 85th Percentile Speed > 40 MPH

	Average Volume	6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Street	300	0	693	609	443	458	406	540	493	633	684	608	561	343
Minor	100	NO	NO	YES	NO	NO	NO	NO	NO	YES	NO	YES	NO	NO
Minor	Met?	NO	NO	YES	NO	NO	NO	NO	NO	YES	NO	YES	NO	NO

Result: YES

Criteria D - Minimum Volume at Saturated to 80% (Volumes, Crashes, & Delay)

80%	Average Volume	6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Street	300	0	693	609	443	458	406	540	493	633	684	608	561	343
Minor	100	NO	YES	YES	NO	NO	NO	YES	NO	YES	YES	YES	NO	NO
Minor	Met?	NO	YES	YES	NO	NO	NO	YES	NO	YES	YES	YES	NO	NO

Result: NO

School Street
Quarry Street

Time	Vehicle Volume	EBL	WB	SBLL
6-7 AM	0	0	0	0
7-8 AM	398	0	295	0
8-9 AM	398	0	398	0
9-10 AM	282	0	164	0
10-11 AM	280	0	178	0
11-12 PM	273	0	223	0
1-2 PM	223	0	223	0
2-3 PM	235	0	235	0
3-4 PM	420	0	213	0
4-5 PM	420	0	228	0
5-6 PM	334	0	227	0
6-7 PM	196	0	147	0

85th Percentile Speed = 40

Recess Range / AM / N
Quarry Street

Time	Vehicle Volumes	EBL	WB	WB
7-8 AM	187	1	0	0
8-9 AM	215	2	0	0
9-10 AM	164	1	0	0
10-11 AM	111	1	0	0
11-12 PM	131	1	0	0
1-2 PM	147	1	0	0
2-3 PM	200	1	0	0
3-4 PM	276	1	0	0
4-5 PM	228	1	0	0
5-6 PM	156	1	0	0
6-7 PM	119	1	0	0

85th Percentile Speed = 35

Readout Sheets
20
25
30
35
40
45
50
55
60

Attachment K

MUTCD Traffic Signal Warrant Analysis

Evaluation of Traffic Signal Warrants

Project: Atwater Avenue	Eval Date: Monday, March 27, 2023
Location: School Street at Atwater Avenue	Source: MUTCD 2009
Municipality: Manchester-By-The-Sea, Massachusetts	Trip Gen: ITE Trip Generation, 11th Edition
Count Date: Wednesday, January 11, 2023	Analyst: TEC Inc.
Count Time: 7:00 AM - 7:00 PM	

Minor Street Roadway 1:	Atwater Avenue	Major Street Roadway 1:	School Street
Minor Street Roadway 2:		Major Street Roadway 2:	School Street
Minor Street Direction 1:	WBL	Major Street Direction 1:	NB
Minor Street Direction 2:		Major Street Direction 2:	SB
Minor Street Lanes:	1	Major Street Lanes:	1
Major Street 85th Speed \geq 40 mph <u>OR</u> Isolated Population \leq 10,000 persons:		Y	

RAW DATA INPUT

VOLUMES				
	Minor	Minor	Major	Major
	Atwater Avenue	0	School Street	School Street
Time	WBL	0	NB	SB
6-7 AM	0		0	0
7-8 AM	31		226	292
8-9 AM	28		257	220
9-10 AM	47		188	174
10-11 AM	74		185	131
11-12 PM	55		174	151
12-1 PM	47		182	162
1-2 PM	36		164	150
2-3 PM	40		255	166
3-4 PM	42		283	193
4-5 PM	57		288	191
5-6 PM	46		258	139
6-7 PM	55		174	106

SEASONALLY ADJUSTED DATA

VOLUMES				
	Minor	Minor	Major	Major
	Atwater Avenue	0	School Street	School Street
Time	WBL	0	NB	SB
6-7 AM	0	0	0	0
7-8 AM	33	0	240	310
8-9 AM	30	0	272	233
9-10 AM	50	0	199	184
10-11 AM	78	0	196	139
11-12 PM	58	0	184	160
12-1 PM	50	0	193	172
1-2 PM	38	0	174	159
2-3 PM	42	0	270	176
3-4 PM	45	0	300	205
4-5 PM	60	0	305	202
5-6 PM	49	0	273	147
6-7 PM	58	0	184	112

Seasonal Adjustment: 6.0%

SITE-GENERATED DATA

VOLUMES				
	Minor	Minor	Major	Major
	Atwater Avenue	0	School Street	School Street
Time	WBL	0	NB	SB
6-7 AM				
7-8 AM	25		84	25
8-9 AM	42		88	27
9-10 AM	54		39	12
10-11 AM	74		34	11
11-12 PM	126		37	12
12-1 PM	124		63	19
1-2 PM	81		55	17
2-3 PM	80		51	16
3-4 PM	103		45	14
4-5 PM	187		34	10
5-6 PM	194		25	8
6-7 PM	33		11	4

OPENING YEAR DATA

VOLUMES				
	Minor	Minor	Major	Major
	Atwater Avenue	0	School Street	School Street
Time	WBL	0	NB	SB
6-7 AM	0	0	0	0
7-8 AM	58	0	324	335
8-9 AM	72	0	360	260
9-10 AM	104	0	238	196
10-11 AM	152	0	230	150
11-12 PM	184	0	221	172
12-1 PM	174	0	256	191
1-2 PM	119	0	229	176
2-3 PM	122	0	321	192
3-4 PM	148	0	345	219
4-5 PM	247	0	339	212
5-6 PM	243	0	298	155
6-7 PM	91	0	195	116

Annual Adjustment: 1.0%

Opening Year:

Years Until Opening Year: 0

Source: ITE <i>Trip Generation Manual</i> , 11th Edition				
Land Use Code	710			
Land Use	General Office Building			
Setting	General Urban/Suburban			
Time Period	Weekday			
# Data Sites	11			
	% of 24-Hour Vehicle Trips			
Time	Total	Entering	Exiting	
12:00 - 1:00 AM	0.1%	0.2%	0.1%	
1:00 - 2:00 AM	0.0%	0.0%	0.1%	
2:00 - 3:00 AM	0.0%	0.0%	0.0%	
3:00 - 4:00 AM	0.1%	0.0%	0.1%	
4:00 - 5:00 AM	0.2%	0.2%	0.2%	
5:00 - 6:00 AM	0.3%	0.4%	0.1%	
6:00 - 7:00 AM	2.6%	4.8%	0.5%	
7:00 - 8:00 AM	7.8%	13.6%	2.0%	
8:00 - 9:00 AM	8.9%	14.3%	3.4%	
9:00 - 10:00 AM	5.3%	6.3%	4.4%	
10:00 - 11:00 AM	5.7%	5.5%	6.0%	
11:00 - 12:00 PM	8.1%	6.0%	10.3%	
12:00 - 1:00 PM	10.2%	10.2%	10.1%	
1:00 - 2:00 PM	7.8%	9.0%	6.6%	
2:00 - 3:00 PM	7.4%	8.3%	6.5%	
3:00 - 4:00 PM	7.8%	7.3%	8.4%	
4:00 - 5:00 PM	10.3%	5.4%	15.2%	
5:00 - 6:00 PM	9.9%	4.0%	15.8%	
6:00 - 7:00 PM	2.1%	1.7%	2.6%	
7:00 - 8:00 PM	1.6%	0.9%	2.3%	
8:00 - 9:00 PM	1.0%	0.7%	1.3%	
9:00 - 10:00 PM	1.1%	0.5%	1.6%	
10:00 - 11:00 PM	1.2%	0.3%	2.1%	
11:00 - 12:00 AM	0.3%	0.4%	0.2%	
	100.0%	100.0%		

Entering	Exiting
1400	1400
3	2
1	1
1	1
1	2
3	3
7	3
67	8
191	28
201	48
88	62
77	84
85	144
143	142
126	93
116	91
103	118
76	214
57	222
24	37
14	33
10	19
8	22
5	30
7	4
1414	1411

Southbound					Eastbound					Northbound					Westbound				
Start Time	School Street						School Street						Awatere Avenue						
Office	Left	Thru	Right	Total			Left	Thru	Right	Total			Left	Thru	Right	Total			
	13%								87%					87%		13%			
7:00 - 8:00 AM	25			25									167		84	25	4	25	
8:00 - 9:00 AM	27			27					175	88			42		7	42			
9:00 - 10:00 AM	12			12					77	39			54		9	54			
10:00 - 11:00 AM	11			11					67	34			74		11	74			
11:00 - 12:00 PM	12			12					74	37			126		19	126			
12:00 - 1:00 PM	19			19					125	63			124		19	124			
1:00 - 2:00 PM	17			17					110	55			81		13	81			
2:00 - 3:00 PM	16			16					101	51			80		12	80			
3:00 - 4:00 PM	14			14					90	45			103		16	103			
4:00 - 5:00 PM	10			10					67	34			187		28	187			
5:00 - 6:00 PM	8			8					50	25			194		29	194			
6:00 - 7:00 PM	4			4					21	11			33		5	33			

Evaluation of Traffic Signal Warrants - Warrant #1 - 8 Hour Vehicular Traffic Volume

OPENING YEAR DATA					
VOLUMES					
Time	Minor Atwater Avenue WBL	Minor 0	Major School Street NB	Major School Street SB	Total Major Street Volume
6-7 AM	0	0	0	0	0
7-8 AM	58	0	324	335	659
8-9 AM	72	0	360	260	620
9-10 AM	104	0	238	196	434
10-11 AM	152	0	230	150	380
11-12 PM	184	0	221	172	393
12-1 PM	174	0	256	191	447
1-2 PM	119	0	229	176	405
2-3 PM	122	0	321	192	513
3-4 PM	148	0	345	219	564
4-5 PM	247	0	339	212	551
5-6 PM	243	0	298	155	453
6-7 PM	91	0	195	116	311

One of the Following Conditions Must Be Met for any 8 hours of an average day (Table 4C-1)

Condition A - Minimum Vehicular Volume

Number of Lanes		Major Street Volume (VPH)				Minor Street Volume (VPH)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of Lanes		Major Street Volume (VPH)				Minor Street Volume (VPH)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

^a Basic Minimum Hourly Volume

^b Used for Combination of Conditions A and B after adequate trial of other remedial measures

^c May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

^d May be used for combination of Conditions A and B after adequate trial of remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Individual Option:

Condition A: Minimum Vehicular Volume

70%															
Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	350	0	659	620	434	380	393	447	405	513	564	551	453	311
Minor	1	105	0	58	72	104	152	184	174	119	122	148	247	243	91
		Met?	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	NO

OR

Condition B: Interruption of Continuous Traffic

70%															
Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	525	0	659	620	434	380	393	447	405	513	564	551	453	311
Minor	1	53	0	58	72	104	152	184	174	119	122	148	247	243	91
Met?			NO	YES	YES	NO	NO	NO	NO	NO	NO	YES	YES	NO	NO

Result: YES

Combination Option:

Condition A: Minimum Vehicular Volume

Condition A: Minimum Vehicular Volume															
Street	Lanes	Minimum Volume	56% ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	280	0	659	620	434	380	393	447	405	513	564	551	453	311
Minor	1	84	0	58	72	104	152	184	174	119	122	148	247	243	91
		Met?	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

AND

Condition B: Interruption of Continuous Traffic

56%															
Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	420	0	659	620	434	380	393	447	405	513	564	551	453	311
Minor	1	42	0	58	72	104	152	184	174	119	122	148	247	243	91
Met?			NO	YES	YES	YES	NO	NO	YES	NO	YES	YES	YES	YES	NO

Result: YES

Evaluation of Traffic Signal Warrants - Warrant #2 - 4 Hour Hour Vehicular Traffic Volume

OPENING YEAR DATA					
VOLUMES					
Time	Minor Atwater Avenue WBL	Minor 0	Major School Street NB	Major School Street SB	Total Major Street Volume
6-7 AM	0	0	0	0	0
7-8 AM	58	0	324	335	659
8-9 AM	72	0	360	260	620
9-10 AM	104	0	238	196	434
10-11 AM	152	0	230	150	380
11-12 PM	184	0	221	172	393
12-1 PM	174	0	256	191	447
1-2 PM	119	0	229	176	405
2-3 PM	122	0	321	192	513
3-4 PM	148	0	345	219	564
4-5 PM	247	0	339	212	551
5-6 PM	243	0	298	155	453
6-7 PM	91	0	195	116	311

Warrant #2 - Must be met for any 4 hours of an average day

Warrant 2 - Four-Hour Volume Data from Sec 4C.03

1 Lane & 1 Lane	
Major St	Minor St
400	310
500	260
600	220
700	185
800	150
900	120
1000	95
1100	85
1200	80
1300	80
1400	80

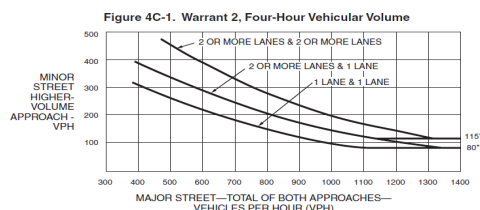
$$y = 0.0003x^2 - 0.7695x + 571.85$$

2+ Lanes & 1 Lane	
Major St	Minor St
400	390
500	335
600	290
700	245
800	205
900	170
1000	145
1100	120
1200	115
1300	115
1400	115

$$y = 0.0003x^2 - 0.8746x + 691.09$$

2+ Lanes & 2+ Lanes	
Major St	Minor St
400	455
500	390
600	330
700	280
800	235
900	195
1000	165
1100	145
1200	120
1300	115
1400	115

$$y = 0.0004x^2 - 0.9784x + 790.55$$



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	Figure 4C-1	0	659	620	434	380	393	447	405	513	564	551	453	311
Minor	1	Figure 4C-1	0	58	72	104	152	184	174	119	122	148	247	243	91
Met?															

Result: ☐

Warrant 2 - Four-Hour Volume Table 4C.02 (70%)

1 Lane & 1 Lane	
Major St	Minor St
1000	60
900	60
800	60
700	70
600	90
500	125
400	160
300	205

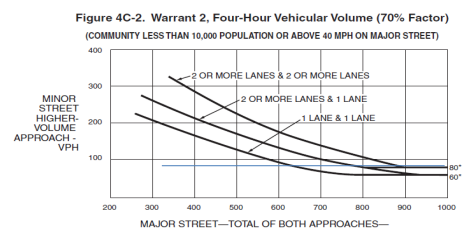
$$y = 0.0004x^2 - 0.7631x + 396.19$$

2+ Lanes & 1 Lane	
Major St	Minor St
1000	65
900	65
800	80
700	100
600	130
500	165
400	215
300	265

$$y = 0.0004x^2 - 0.8354x + 439.32$$

2+ Lanes & 2+ Lanes	
Major St	Minor St
1000	80
900	80
800	105
700	140
600	175
500	225
400	290
300	340

$$y = 0.0005x^2 - 1.1036x + 645$$



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

			ATR Data												
Street	Lanes	Minimum Volume	6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	Table 4C-2	0	659	620	434	380	393	447	405	513	564	551	453	311
Minor	1	Table 4C-2	0	58	72	104	152	184	174	119	122	148	247	243	91
Met?			NO	NO	NO	NO	NO	YES	YES	NO	YES	YES	YES	YES	NO

Result: ☒ YES

Evaluation of Traffic Signal Warrants

Project: Atwater Avenue	Eval Date: Monday, March 27, 2023
Location: School Street at Mill Street / Route 128 NB Ramp	Source: MUTCD 2009
Municipality: Manchester-By-The-Sea, Massachusetts	Trip Gen: ITE Trip Generation, 11th Edition
Count Date: Wednesday, January 11, 2023	Analyst: TEC Inc.
Count Time: 7:00 AM - 7:00 PM	

Minor Street Roadway 1:	Route 128 NB Ramp	Major Street Roadway 1:	School Street
Minor Street Roadway 2:	Mill Street	Major Street Roadway 2:	School Street
Minor Street Direction 1:	EBL	Major Street Direction 1:	NB
Minor Street Direction 2:	WB	Major Street Direction 2:	SBLT
Minor Street Lanes:	1	Major Street Lanes:	1
Major Street 85th Speed \geq 40 mph <u>OR</u> Isolated Population \leq 10,000 persons:		Y	

RAW DATA INPUT

VOLUMES				
	Minor Route 128 NB Ra	Minor Mill Street	Major School Street	Major School Street
Time	EBL	WB	NB	SBLT
6-7 AM	0	0	0	0
7-8 AM	96	78	337	272
8-9 AM	119	58	327	195
9-10 AM	88	52	248	138
10-11 AM	73	42	248	150
11-12 PM	88	50	241	179
12-1 PM	97	45	281	169
1-2 PM	86	28	244	175
2-3 PM	140	44	373	181
3-4 PM	123	48	412	187
4-5 PM	184	35	306	208
5-6 PM	123	44	304	167
6-7 PM	102	25	179	130

SEASONALLY ADJUSTED DATA

VOLUMES				
	Minor Route 128 NB Ra	Minor Mill Street	Major School Street	Major School Street
Time	EBL	WB	NB	SBLT
6-7 AM	0	0	0	0
7-8 AM	102	83	357	288
8-9 AM	126	61	347	207
9-10 AM	93	55	263	146
10-11 AM	77	45	263	159
11-12 PM	93	53	255	190
12-1 PM	103	48	298	179
1-2 PM	91	30	259	186
2-3 PM	148	47	395	192
3-4 PM	130	51	437	198
4-5 PM	195	37	324	220
5-6 PM	130	47	322	177
6-7 PM	108	27	190	138

Seasonal Adjustment: 6.0%

SITE-GENERATED DATA

VOLUMES				
	Minor Route 128 NB Ra	Minor Mill Street	Major School Street	Major School Street
Time	EBL	WB	NB	SBLT
6-7 AM				
7-8 AM	85	1	41	7
8-9 AM	89	2	43	12
9-10 AM	39	1	19	15
10-11 AM	34	1	17	19
11-12 PM	38	1	18	33
12-1 PM	63	1	31	32
1-2 PM	56	1	27	21
2-3 PM	52	1	25	21
3-4 PM	46	1	22	27
4-5 PM	34	1	16	48
5-6 PM	26	1	12	50
6-7 PM	11	1	6	9

OPENING YEAR DATA

VOLUMES				
	Minor Route 128 NB Ra	Minor Mill Street	Major School Street	Major School Street
Time	EBL	WB	NB	SBLT
6-7 AM	0	0	0	0
7-8 AM	187	84	398	295
8-9 AM	215	63	390	219
9-10 AM	132	56	282	161
10-11 AM	111	46	280	178
11-12 PM	131	54	273	223
12-1 PM	166	49	329	211
1-2 PM	147	31	286	207
2-3 PM	200	48	420	213
3-4 PM	176	52	459	225
4-5 PM	229	38	340	268
5-6 PM	156	48	334	227
6-7 PM	119	28	196	147

Annual Adjustment: 1.0%

Opening Year:

Years Until Opening Year:

Source: ITE <i>Trip Generation Manual</i> , 11th Edition			
Land Use Code	710		
Land Use	General Office Building		
Setting	General Urban/Suburban		
Time Period	Weekday		
# Data Sites	11		
	% of 24-Hour Vehicle Trips		
Time	Total	Entering	Exiting
12:00 - 1:00 AM	0.1%	0.2%	0.1%
1:00 - 2:00 AM	0.0%	0.0%	0.1%
2:00 - 3:00 AM	0.0%	0.0%	0.0%
3:00 - 4:00 AM	0.1%	0.0%	0.1%
4:00 - 5:00 AM	0.2%	0.2%	0.2%
5:00 - 6:00 AM	0.3%	0.4%	0.1%
6:00 - 7:00 AM	2.6%	4.8%	0.5%
7:00 - 8:00 AM	7.8%	13.6%	2.0%
8:00 - 9:00 AM	8.9%	14.3%	3.4%
9:00 - 10:00 AM	5.3%	6.3%	4.4%
10:00 - 11:00 AM	5.7%	5.5%	6.0%
11:00 - 12:00 PM	8.1%	6.0%	10.3%
12:00 - 1:00 PM	10.2%	10.2%	10.1%
1:00 - 2:00 PM	7.8%	9.0%	6.6%
2:00 - 3:00 PM	7.4%	8.3%	6.5%
3:00 - 4:00 PM	7.8%	7.3%	8.4%
4:00 - 5:00 PM	10.3%	5.4%	15.2%
5:00 - 6:00 PM	9.9%	4.0%	15.8%
6:00 - 7:00 PM	2.1%	1.7%	2.6%
7:00 - 8:00 PM	1.6%	0.9%	2.3%
8:00 - 9:00 PM	1.0%	0.7%	1.3%
9:00 - 10:00 PM	1.1%	0.5%	1.6%
10:00 - 11:00 PM	1.2%	0.3%	2.1%
11:00 - 12:00 AM	0.3%	0.4%	0.2%
	100.0%	100.0%	

Entering	Exiting
1400	1400
3	2
1	1
1	1
1	2
3	3
7	3
67	8
191	28
201	48
88	62
77	84
85	144
143	142
126	93
116	91
103	118
76	214
57	222
24	37
14	33
10	19
8	22
5	30
7	4
1414	1411

Southbound					Eastbound					Northbound					Westbound				
School Street					Route 128 Northbound					School Street					Mill Street				
Start Time	Left	Thru	Right	Total	Left	Thru	Right	Total		Left	Thru	Right	Total		Left	Thru	Right	Total	
Office	1%	21%	21%		44%					21%							1%		
7:00 - 8:00 AM	1	6	6	7	85			85		41			41				2	1	
8:00 - 9:00 AM	1	11	11	12	89			89		43			43				3	2	
9:00 - 10:00 AM	1	14	14	15	39			39		19			19				1	1	
10:00 - 11:00 AM	1	18	18	19	34			34		17			17				1	1	
11:00 - 12:00 PM	2	31	31	33	38			38		18			18				1	1	
12:00 - 1:00 PM	2	30	30	32	63			63		31			31				2	1	
1:00 - 2:00 PM	1	20	20	21	56			56		27			27				2	1	
2:00 - 3:00 PM	1	20	20	21	52			52		25			25				2	1	
3:00 - 4:00 PM	2	25	25	27	46			46		22			22				2	1	
4:00 - 5:00 PM	3	45	45	48	34			34		16			16				1	1	
5:00 - 6:00 PM	3	47	47	50	26			26		12			12				1	1	
6:00 - 7:00 PM	1	8	8	9	11			11		6			6				1	1	

Evaluation of Traffic Signal Warrants - Warrant #1 - 8 Hour Vehicular Traffic Volume

OPENING YEAR DATA					
VOLUMES					
Time	Minor Route 128 NB Ra EBL	Minor Mill Street WB	Major School Street NB	Major School Street SBLT	Total Major Street Volume
6-7 AM	0	0	0	0	0
7-8 AM	187	84	398	295	693
8-9 AM	215	63	390	219	609
9-10 AM	132	56	282	161	443
10-11 AM	111	46	280	178	458
11-12 PM	131	54	273	223	496
12-1 PM	166	49	329	211	540
1-2 PM	147	31	286	207	493
2-3 PM	200	48	420	213	633
3-4 PM	176	52	459	225	684
4-5 PM	229	38	340	268	608
5-6 PM	156	48	334	227	561
6-7 PM	119	28	196	147	343

One of the Following Conditions Must Be Met for any 8 hours of an average day (Table 4C-1)

Condition A - Minimum Vehicular Volume

Number of Lanes		Major Street Volume (VPH)				Minor Street Volume (VPH)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of Lanes		Major Street Volume (VPH)				Minor Street Volume (VPH)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

^a Basic Minimum Hourly Volume

^b Used for Combination of Conditions A and B after adequate trial of other remedial measures

^c May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

^d May be used for combination of Conditions A and B after adequate trial of remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Individual Option:

Condition A: Minimum Vehicular Volume

70%															
Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	350	0	693	609	443	458	496	540	493	633	684	608	561	343
Minor	1	105	0	187	215	132	111	131	166	147	200	176	229	156	119
		Met?	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO

OR

Condition B: Interruption of Continuous Traffic

70%															
Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	525	0	693	609	443	458	496	540	493	633	684	608	561	343
Minor	1	53	0	187	215	132	111	131	166	147	200	176	229	156	119
		Met?	NO	YES	YES	NO	NO	NO	YES	NO	YES	YES	YES	YES	NO

Result: YES

Combination Option:

Condition A: Minimum Vehicular Volume

Condition A: Minimum Vehicular Volume															
Street	Lanes	Minimum Volume	56% ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	280	0	693	609	443	458	496	540	493	633	684	608	561	343
Minor	1	84	0	187	215	132	111	131	166	147	200	176	229	156	119
		Met?	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

AND

Condition B: Interruption of Continuous Traffic

56%															
Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	420	0	693	609	443	458	496	540	493	633	684	608	561	343
Minor	1	42	0	187	215	132	111	131	166	147	200	176	229	156	119
		Met?	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO

Result: YES

Evaluation of Traffic Signal Warrants - Warrant #2 - 4 Hour Vehicular Traffic Volume

[EQUATIONS STILL NEED UPDATED, DO BY HAND]

OPENING YEAR DATA

Time	VOLUMES				Total Major Street Volume
	Minor Route 128 NB Ra EBL	Minor Mill Street WB	Major School Street NB	Major School Street SBLT	
6-7 AM	0	0	0	0	0
7-8 AM	187	84	398	295	693
8-9 AM	215	63	390	219	609
9-10 AM	132	56	282	161	443
10-11 AM	111	46	280	178	458
11-12 PM	131	54	273	223	496
12-1 PM	166	49	329	211	540
1-2 PM	147	31	286	207	493
2-3 PM	200	48	420	213	633
3-4 PM	176	52	459	225	684
4-5 PM	229	38	340	268	608
5-6 PM	156	48	334	227	561
6-7 PM	119	28	196	147	343

Warrant #2 - Must be met for any 4 hours of an average day

Warrant 2 - Four-Hour Volume Data from Sec 4C.03

1 Lane & 1 Lane	
Major St	Minor St
400	310
500	260
600	220
700	185
800	150
900	120
1000	95
1100	85
1200	80
1300	80
1400	80

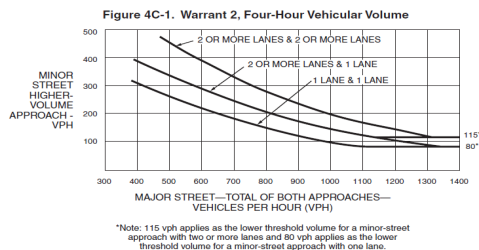
$$y = 0.0003x^2 - 0.7695x + 571.85$$

2+ Lanes & 1 Lane	
Major St	Minor St
400	390
500	335
600	290
700	245
800	205
900	170
1000	145
1100	120
1200	115
1300	115
1400	115

$$y = 0.0003x^2 - 0.8746x + 691.09$$

2+ Lanes & 2+ Lanes	
Major St	Minor St
400	455
500	390
600	330
700	280
800	235
900	195
1000	165
1100	145
1200	120
1300	115
1400	115

$$y = 0.0004x^2 - 0.9784x + 790.55$$



Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	Figure 4C-1	0	693	609	443	458	496	540	493	633	684	608	561	343
Minor	1	Figure 4C-1	0	187	215	132	111	131	166	147	200	176	229	156	119
Met?															

Result:

Warrant 2 - Four-Hour Volume Table 4C.02 (70%)

1 Lane & 1 Lane	
Major St	Minor St
1000	60
900	60
800	60
700	70
600	90
500	125
400	160
300	205

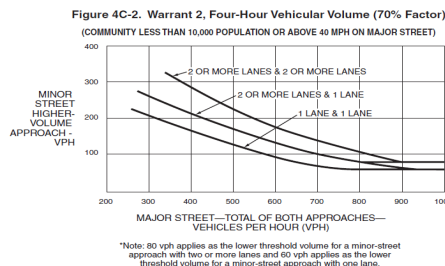
$$y = 0.0004x^2 - 0.7631x + 396.19$$

2+ Lanes & 1 Lane	
Major St	Minor St
1000	65
900	65
800	80
700	100
600	130
500	165
400	215
300	265

$$y = 0.0004x^2 - 0.8354x + 439.32$$

2+ Lanes & 2+ Lanes	
Major St	Minor St
1000	80
900	80
800	105
700	140
600	175
500	225
400	290
300	340

$$y = 0.0005x^2 - 1.1036x + 645$$



Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	Table 4C-2	0	693	609	443	458	496	540	493	633	684	608	561	343
Minor	1	Table 4C-2	0	187	215	132	111	131	166	147	200	176	229	156	119
Met?			NO	YES	YES	NO	NO	YES	YES	YES	YES	YES	YES	YES	NO

Result: YES

Evaluation of Traffic Signal Warrants - Phase 1 Only

Project:	Atwater Avenue	Eval Date:	Tuesday, May 7, 2024
Location:	School Street at Mill Street / Route 128 NB Ramp	Source:	MUTCD 2009
Municipality:	Manchester-BY-The-Sea, Massachusetts	Trip Gen:	ITE Trip Generation, 11th Edition
Count Date:	Wednesday, January 11, 2023	Analyst:	TEC Inc.
Count Time:	7:00 AM - 7:00 PM		

Minor Street Roadway 1:	Route 128 NB Ramp	Major Street Roadway 1:	School Street
Minor Street Roadway 2:	Mill Street	Major Street Roadway 2:	School Street
Minor Street Direction 1:	EBL	Major Street Direction 1:	NB
Minor Street Direction 2:	WB	Major Street Direction 2:	SBLT
Minor Street Lanes:	1	Major Street Lanes:	1

Major Street 85th Speed \geq 40 mph OR Isolated Population \leq 10,000 persons: **Y**

RAW DATA INPUT

Time	VOLUMES			
	Minor	Minor	Major	Major
	Route 128 NB Ra	Mill Street	School Street	School Street
	EBL	WB	NB	SBLT
6-7 AM	0	0	0	0
7-8 AM	96	78	337	272
8-9 AM	119	58	327	195
9-10 AM	88	52	248	138
10-11 AM	73	42	248	150
11-12 PM	88	50	241	179
12-1 PM	97	45	281	169
1-2 PM	86	28	244	175
2-3 PM	140	44	373	181
3-4 PM	123	48	412	187
4-5 PM	184	35	306	208
5-6 PM	123	44	304	167
6-7 PM	102	25	179	130

SEASONALLY ADJUSTED DATA

Time	VOLUMES			
	Minor	Minor	Major	Major
	Route 128 NB Ra	Mill Street	School Street	School Street
	EBL	WB	NB	SBLT
6-7 AM	0	0	0	0
7-8 AM	102	83	357	288
8-9 AM	126	61	347	207
9-10 AM	93	55	263	146
10-11 AM	77	45	263	159
11-12 PM	93	53	255	190
12-1 PM	103	48	298	179
1-2 PM	91	30	259	186
2-3 PM	148	47	395	192
3-4 PM	130	51	437	198
4-5 PM	195	37	324	220
5-6 PM	130	47	322	177
6-7 PM	108	27	190	138

Seasonal Adjustment: **6.0%**

SITE-GENERATED DATA

Time	VOLUMES			
	Minor	Minor	Major	Major
	Route 128 NB Ra	Mill Street	School Street	School Street
	EBL	WB	NB	SBLT
6-7 AM				
7-8 AM	45	1	22	5
8-9 AM	47	1	23	7
9-10 AM	21	1	10	8
10-11 AM	19	1	9	11
11-12 PM	20	1	10	18
12-1 PM	34	1	16	17
1-2 PM	30	1	15	12
2-3 PM	28	1	14	12
3-4 PM	25	1	12	15
4-5 PM	18	1	9	26
5-6 PM	14	1	7	27
6-7 PM	6	1	3	6

OPENING YEAR DATA

Time	VOLUMES			
	Minor	Minor	Major	Major
	Route 128 NB Ra	Mill Street	School Street	School Street
	EBL	WB	NB	SBLT
6-7 AM	0	0	0	0
7-8 AM	147	84	379	293
8-9 AM	173	62	370	214
9-10 AM	114	56	273	154
10-11 AM	96	46	272	170
11-12 PM	113	54	265	208
12-1 PM	137	49	314	196
1-2 PM	121	31	274	198
2-3 PM	176	48	409	204
3-4 PM	155	52	449	213
4-5 PM	213	38	333	246
5-6 PM	144	48	329	204
6-7 PM	114	28	193	144

Annual Adjustment: **1.0%**

Opening Year:

Years Until Opening Year:

Source: ITE <i>Trip Generation Manual</i> , 11th Edition			
Land Use Code	710		
Land Use	General Office Building		
Setting	General Urban/Suburban		
Time Period	Weekday		
# Data Sites	11		
	% of 24-Hour Vehicle Trips		
Time	Total	Entering	Exiting
12:00 - 1:00 AM	0.1%	0.2%	0.1%
1:00 - 2:00 AM	0.0%	0.0%	0.1%
2:00 - 3:00 AM	0.0%	0.0%	0.0%
3:00 - 4:00 AM	0.1%	0.0%	0.1%
4:00 - 5:00 AM	0.2%	0.2%	0.2%
5:00 - 6:00 AM	0.3%	0.4%	0.1%
6:00 - 7:00 AM	2.6%	4.8%	0.5%
7:00 - 8:00 AM	7.8%	13.6%	2.0%
8:00 - 9:00 AM	8.9%	14.3%	3.4%
9:00 - 10:00 AM	5.3%	6.3%	4.4%
10:00 - 11:00 AM	5.7%	5.5%	6.0%
11:00 - 12:00 PM	8.1%	6.0%	10.3%
12:00 - 1:00 PM	10.2%	10.2%	10.1%
1:00 - 2:00 PM	7.8%	9.0%	6.6%
2:00 - 3:00 PM	7.4%	8.3%	6.5%
3:00 - 4:00 PM	7.8%	7.3%	8.4%
4:00 - 5:00 PM	10.3%	5.4%	15.2%
5:00 - 6:00 PM	9.9%	4.0%	15.8%
6:00 - 7:00 PM	2.1%	1.7%	2.6%
7:00 - 8:00 PM	1.6%	0.9%	2.3%
8:00 - 9:00 PM	1.0%	0.7%	1.3%
9:00 - 10:00 PM	1.1%	0.5%	1.6%
10:00 - 11:00 PM	1.2%	0.3%	2.1%
11:00 - 12:00 AM	0.3%	0.4%	0.2%
	100.0%	100.0%	

Entering	Exiting
740	740
2	1
1	1
1	1
1	1
2	2
4	2
36	4
101	15
106	26
47	33
41	45
45	77
76	75
67	50
62	48
55	63
40	113
30	117
13	20
7	18
6	10
5	12
3	16
4	2
755	752

Start Time	Southbound				Eastbound				Northbound				Westbound			
	School Street				Route 128 Northbound				School Street				Mill Street			
	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total
Office	1%	21%	21%			44%				21%					1%	
7:00 - 8:00 AM	1	4	4	5		45		45		22		22			2	1
8:00 - 9:00 AM	1	6	6	7		47		47		23		23			2	1
9:00 - 10:00 AM	1	7	7	8		21		21		10		10			1	1
10:00 - 11:00 AM	1	10	10	11		19		19		9		9			1	1
11:00 - 12:00 PM	1	17	17	18		20		20		10		10			1	1
12:00 - 1:00 PM	1	16	16	17		34		34		16		16			1	1
1:00 - 2:00 PM	1	11	11	12		30		30		15		15			1	1
2:00 - 3:00 PM	1	11	11	12		28		28		14		14			1	1
3:00 - 4:00 PM	1	14	14	15		25		25		12		12			1	1
4:00 - 5:00 PM	2	24	24	26		18		18		9		9			1	1
5:00 - 6:00 PM	2	25	25	27		14		14		7		7			1	1
6:00 - 7:00 PM	1	5	5	6		6		6		3		3			1	1

Evaluation of Traffic Signal Warrants - Warrant #1 - 8 Hour Vehicular Traffic Volume

OPENING YEAR DATA					
VOLUMES					
	Minor Route 128 NB Rte	Minor Mill Street	Major School Street	Major School Street	Total Major Street Volume
Time	EBL	WB	NB	SB/LT	
6-7 AM	0	0	0	0	0
7-8 AM	147	84	379	293	672
8-9 AM	173	62	370	214	584
9-10 AM	114	56	273	154	427
10-11 AM	96	46	272	170	442
11-12 PM	113	54	265	208	473
12-1 PM	137	49	314	196	510
1-2 PM	121	31	274	198	472
2-3 PM	176	48	409	204	613
3-4 PM	155	52	449	213	662
4-5 PM	213	38	333	246	579
5-6 PM	144	48	329	204	533
6-7 PM	114	28	193	144	337

One of the Following Conditions Must Be Met for any 8 hours of an average day (Table 4C-1)

Condition A - Minimum Vehicular Volume

Number of lanes		Major Street Volume (VPH)				Minor Street Volume (VPH)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of lanes		Major Street Volume (VPH)				Minor Street Volume (VPH)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

^a Basic Minimum Hourly Volume

^b Used for Combination of Conditions A and B after adequate trial of other remedial measures

^c May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

^d May be used for combination of Conditions A and B after adequate trial of remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Individual Option:

Condition A: Minimum Vehicular Volume

70%															
Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	350	0	672	584	427	442	473	510	472	613	662	579	533	337
Minor	1	105	0	147	173	114	96	113	137	121	176	155	213	144	114
Met?			NO	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES	YES	NO

OR

Condition B: Interruption of Continuous Traffic

70%		Minimum Volume	ATR Data												
Street	Lanes		6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	525	0	672	584	427	442	473	510	472	613	662	579	533	337
Minor	1	53	0	147	173	114	96	113	137	121	176	155	213	144	114
Met?			NO	YES	YES	NO	NO	NO	NO	NO	YES	YES	YES	YES	NO

Result: YES

Combination Option:

Condition A: Minimum Vehicular Volume

56%															
Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	280	0	672	584	427	442	473	510	472	613	662	579	533	337
Minor	1	84	0	147	173	114	96	113	137	121	176	155	213	144	114
Met?			NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

AND

Condition B: Interruption of Continuous Traffic

56%		Minimum Volume	ATR Data												
Street	Lanes		6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	420	0	672	584	427	442	473	510	472	613	662	579	533	337
Minor	1	42	0	147	173	114	96	113	137	121	176	155	213	144	114
Met?		NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO

Result: YES

Evaluation of Traffic Signal Warrants - Warrant #2 - 4 Hour Vehicular Traffic Volume

[EQUATIONS STILL NEED UPDATED, DO BY HAND]

OPENING YEAR DATA

Time	VOLUMES				Total Major Street Volume
	Minor Route 128 NB Rte	Minor Mill Street WB	Major School Street NB	Major School Street SBLT	
	EBL	WB	NB	SBLT	
6-7 AM	0	0	0	0	0
7-8 AM	147	84	379	293	672
8-9 AM	173	62	370	214	584
9-10 AM	114	56	273	154	427
10-11 AM	96	46	272	170	442
11-12 PM	113	54	265	208	473
12-1 PM	137	49	314	196	510
1-2 PM	121	31	274	198	472
2-3 PM	176	48	409	204	613
3-4 PM	155	52	449	213	662
4-5 PM	213	38	333	246	579
5-6 PM	144	48	329	204	533
6-7 PM	114	28	193	144	337

Warrant #2 - Must be met for any 4 hours of an average day

Warrant 2 - Four-Hour Volume Data from Sec 4C.03

1 Lane & 1 Lane	
Major St	Minor St
400	310
500	260
600	220
700	185
800	150
900	120
1000	95
1100	85
1200	80
1300	80
1400	80

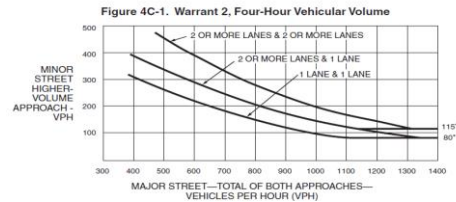
$$y = 0.0003x^2 - 0.7695x + 571.85$$

2+ Lanes & 1 Lane	
Major St	Minor St
400	390
500	335
600	290
700	245
800	205
900	170
1000	145
1100	120
1200	115
1300	115
1400	115

$$y = 0.0003x^2 - 0.8746x + 691.09$$

2+ Lanes & 2+ Lanes	
Major St	Minor St
400	455
500	390
600	330
700	280
800	235
900	195
1000	165
1100	145
1200	120
1300	115
1400	115

$$y = 0.0004x^2 - 0.9784x + 790.55$$



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	Figure 4C-1	0	672	584	427	442	473	510	472	613	862	579	533	337
Minor	1	Figure 4C-1	0	147	173	114	96	113	137	121	176	155	213	144	114
		Met?	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Result: NO

Warrant 2 - Four-Hour Volume Table 4C.02 (70%)

1 Lane & 1 Lane	
Major St	Minor St
1000	60
900	60
800	60
700	70
600	90
500	125
400	160
300	205

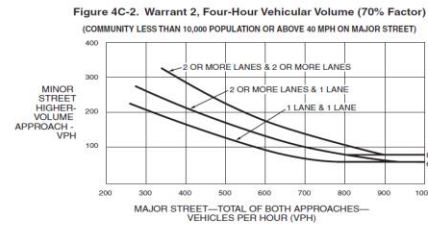
$$y = 0.0004x^2 - 0.7631x + 396.19$$

2+ Lanes & 1 Lane	
Major St	Minor St
1000	65
900	65
800	80
700	100
600	130
500	165
400	215
300	265

$$y = 0.0004x^2 - 0.8354x + 439.32$$

2+ Lanes & 2+ Lanes	
Major St	Minor St
1000	80
900	80
800	105
700	140
600	175
500	225
400	290
300	340

$$y = 0.0005x^2 - 1.1036x + 645$$



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

		Minimum	ATR Data												
Street	Lanes	Volume	6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	Table 4C-2	0	672	584	427	442	473	510	472	613	662	579	533	337
Minor	1	Table 4C-2	0	147	173	114	96	113	137	121	176	155	213	144	114
		Met?	NO	YES	YES	NO	NO	NO	YES	NO	YES	YES	YES	YES	NO

Result: YES

Evaluation of Traffic Signal Warrants

Project: Atwater Avenue	Eval Date: Monday, March 27, 2023
Location: School Street at Route 128 SB Ramp	Source: MUTCD 2009
Municipality: Manchester-By-The-Sea, Massachusetts	Trip Gen: ITE Trip Generation, 11th Edition
Count Date: Wednesday, January 11, 2023	Analyst: TEC Inc.
Count Time: 7:00 AM - 7:00 PM	

Minor Street Roadway 1:	Route 128 NB Ramp	Major Street Roadway 1:	School Street
Minor Street Roadway 2:		Major Street Roadway 2:	School Street
Minor Street Direction 1:	WBL	Major Street Direction 1:	NBT
Minor Street Direction 2:		Major Street Direction 2:	SB
Minor Street Lanes:	1	Major Street Lanes:	1
Major Street 85th Speed \geq 40 mph <u>OR</u> Isolated Population \leq 10,000 persons:		Y	

RAW DATA INPUT

VOLUMES				
	Minor	Minor	Major	Major
	Route 128 NB Ra	0	School Street	School Street
Time	WBL	Q	NBT	SB
6-7 AM	0	0	0	0
7-8 AM	70		219	301
8-9 AM	65		244	235
9-10 AM	40		172	231
10-11 AM	52		169	221
11-12 PM	54		160	226
12-1 PM	51		181	235
1-2 PM	79		157	192
2-3 PM	56		264	244
3-4 PM	68		268	246
4-5 PM	70		267	280
5-6 PM	53		245	205
6-7 PM	33		158	160

SEASONALLY ADJUSTED DATA

VOLUMES				
	Minor	Minor	Major	Major
	Route 128 NB Ra	0	School Street	School Street
Time	WBL	Q	NBT	SB
6-7 AM	0	0	0	0
7-8 AM	74	0	232	319
8-9 AM	69	0	259	249
9-10 AM	42	0	182	245
10-11 AM	55	0	179	234
11-12 PM	57	0	170	240
12-1 PM	54	0	192	249
1-2 PM	84	0	166	204
2-3 PM	59	0	280	259
3-4 PM	72	0	284	261
4-5 PM	74	0	283	297
5-6 PM	56	0	260	217
6-7 PM	35	0	167	170

Seasonal Adjustment: 6.0%

SITE-GENERATED DATA

VOLUMES				
	Minor	Minor	Major	Major
	Route 128 NB Ra	0	School Street	School Street
Time	WBL	Q	NBT	SB
6-7 AM				
7-8 AM	0		127	26
8-9 AM	0		133	43
9-10 AM	0		59	55
10-11 AM	0		51	74
11-12 PM	0		57	126
12-1 PM	0		95	125
1-2 PM	0		84	81
2-3 PM	0		77	81
3-4 PM	0		68	103
4-5 PM	0		51	188
5-6 PM	0		38	194
6-7 PM	0		16	33

OPENING YEAR DATA

VOLUMES				
	Minor	Minor	Major	Major
	Route 128 NB Ra	0	School Street	School Street
Time	WBL	Q	NBT	SB
6-7 AM	0	0	0	0
7-8 AM	74	0	359	345
8-9 AM	69	0	392	292
9-10 AM	42	0	241	300
10-11 AM	55	0	230	308
11-12 PM	57	0	227	366
12-1 PM	54	0	287	374
1-2 PM	84	0	250	285
2-3 PM	59	0	357	340
3-4 PM	72	0	352	364
4-5 PM	74	0	334	485
5-6 PM	56	0	298	411
6-7 PM	35	0	183	203

Annual Adjustment: 1.0%

Opening Year:

Years Until Opening Year:

Source: ITE <i>Trip Generation Manual</i> , 11th Edition			
Land Use Code	710		
Land Use	General Office Building		
Setting	General Urban/Suburban		
Time Period	Weekday		
# Data Sites	11		
	% of 24-Hour Vehicle Trips		
Time	Total	Entering	Exiting
12:00 - 1:00 AM	0.1%	0.2%	0.1%
1:00 - 2:00 AM	0.0%	0.0%	0.1%
2:00 - 3:00 AM	0.0%	0.0%	0.0%
3:00 - 4:00 AM	0.1%	0.0%	0.1%
4:00 - 5:00 AM	0.2%	0.2%	0.2%
5:00 - 6:00 AM	0.3%	0.4%	0.1%
6:00 - 7:00 AM	2.6%	4.8%	0.5%
7:00 - 8:00 AM	7.8%	13.6%	2.0%
8:00 - 9:00 AM	8.9%	14.3%	3.4%
9:00 - 10:00 AM	5.3%	6.3%	4.4%
10:00 - 11:00 AM	5.7%	5.5%	6.0%
11:00 - 12:00 PM	8.1%	6.0%	10.3%
12:00 - 1:00 PM	10.2%	10.2%	10.1%
1:00 - 2:00 PM	7.8%	9.0%	6.6%
2:00 - 3:00 PM	7.4%	8.3%	6.5%
3:00 - 4:00 PM	7.8%	7.3%	8.4%
4:00 - 5:00 PM	10.3%	5.4%	15.2%
5:00 - 6:00 PM	9.9%	4.0%	15.8%
6:00 - 7:00 PM	2.1%	1.7%	2.6%
7:00 - 8:00 PM	1.6%	0.9%	2.3%
8:00 - 9:00 PM	1.0%	0.7%	1.3%
9:00 - 10:00 PM	1.1%	0.5%	1.6%
10:00 - 11:00 PM	1.2%	0.3%	2.1%
11:00 - 12:00 AM	0.3%	0.4%	0.2%
	100.0%	100.0%	

Entering	Exiting
1400	1400
3	2
1	1
1	1
1	2
3	3
7	3
67	8
191	28
201	48
88	62
77	84
85	144
143	142
126	93
116	91
103	118
76	214
57	222
24	37
14	33
10	19
8	22
5	30
7	4
1414	1411

Southbound					Eastbound					Northbound					Westbound				
School Street										School Street					Route 128 Southbound				
Start Time	Left	Thru	Right	Total		Left	Thru	Right	Total		Left	Thru	Right	Total		Left	Thru	Right	Total
Office	44%	43%										66%						21%	
7:00 - 8:00 AM	13	13		26								127		127				41	0
8:00 - 9:00 AM	22	21		43								133		133				43	0
9:00 - 10:00 AM	28	27		55								59		59				19	0
10:00 - 11:00 AM	37	37		74								51		51				17	0
11:00 - 12:00 PM	64	62		126								57		57				18	0
12:00 - 1:00 PM	63	62		125								95		95				31	0
1:00 - 2:00 PM	41	40		81								84		84				27	0
2:00 - 3:00 PM	41	40		81								77		77				25	0
3:00 - 4:00 PM	52	51		103								68		68				22	0
4:00 - 5:00 PM	95	93		188								51		51				16	0
5:00 - 6:00 PM	98	96		194								38		38				12	0
6:00 - 7:00 PM	17	16		33								16		16				6	0

Evaluation of Traffic Signal Warrants - Warrant #1 - 8 Hour Vehicular Traffic Volume

OPENING YEAR DATA					
VOLUMES					
Time	Minor Route 128 NB Ra WBL	Minor 0	Major School Street NBT	Major School Street SB	Total Major Street Volume
6-7 AM	0	0	0	0	0
7-8 AM	74	0	359	345	704
8-9 AM	69	0	392	292	684
9-10 AM	42	0	241	300	541
10-11 AM	55	0	230	308	538
11-12 PM	57	0	227	366	593
12-1 PM	54	0	287	374	661
1-2 PM	84	0	250	285	535
2-3 PM	59	0	357	340	697
3-4 PM	72	0	352	364	716
4-5 PM	74	0	334	485	819
5-6 PM	56	0	298	411	709
6-7 PM	35	0	183	203	386

One of the Following Conditions Must Be Met for any 8 hours of an average day (Table 4C-1)

Condition A - Minimum Vehicular Volume

Number of Lanes		Major Street Volume (VPH)				Minor Street Volume (VPH)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of Lanes		Major Street Volume (VPH)				Minor Street Volume (VPH)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

^a Basic Minimum Hourly Volume

^b Used for Combination of Conditions A and B after adequate trial of other remedial measures

^c May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

^d May be used for combination of Conditions A and B after adequate trial of remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Individual Option:

Condition A: Minimum Vehicular Volume

		70%													
Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	350	0	704	684	541	538	593	661	535	697	716	819	709	386
Minor	1	105	0	74	69	42	55	57	54	84	59	72	74	56	35
		Met?	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

OR

Condition B: Interruption of Continuous Traffic

70%															
Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	525	0	704	684	541	538	593	661	535	697	716	819	709	386
Minor	1	53	0	74	69	42	55	57	54	84	59	72	74	56	35
		Met?	NO	YES	YES	NO	YES	YES	YES	YES	YES	YES	YES	YES	NO

Result: YES

Combination Option:

Condition A: Minimum Vehicular Volume

Condition A: Minimum Vehicular Volume															
Street	Lanes	Minimum Volume	56% ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	280	0	704	684	541	538	593	661	535	697	716	819	709	386
Minor	1	84	0	74	69	42	55	57	54	84	59	72	74	56	35
		Met?	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO

AND

Condition B: Interruption of Continuous Traffic

56%															
Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	420	0	704	684	541	538	593	661	535	697	716	819	709	386
Minor	1	42	0	74	69	42	55	57	54	84	59	72	74	56	35
		Met?	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO

Result: NO

Evaluation of Traffic Signal Warrants - Warrant #2 - 4 Hour Hour Vehicular Traffic Volume

[EQUATIONS STILL NEED UPDATED, DO BY HAND]

OPENING YEAR DATA

Time	VOLUMES				Total Major Street Volume
	Minor Route 128 NB Ra WBL	Minor 0	Major School Street NBT	Major School Street SB	
6-7 AM	0	0	0	0	0
7-8 AM	74	0	359	345	704
8-9 AM	69	0	392	292	684
9-10 AM	42	0	241	300	541
10-11 AM	55	0	230	308	538
11-12 PM	57	0	227	366	593
12-1 PM	54	0	287	374	661
1-2 PM	84	0	250	285	535
2-3 PM	59	0	357	340	697
3-4 PM	72	0	352	364	716
4-5 PM	74	0	334	485	819
5-6 PM	56	0	298	411	709
6-7 PM	35	0	183	203	386

Warrant #2 - Must be met for any 4 hours of an average day

Warrant 2 - Four-Hour Volume Data from Sec 4C.03

1 Lane & 1 Lane	
Major St	Minor St
400	310
500	260
600	220
700	185
800	150
900	120
1000	95
1100	85
1200	80
1300	80
1400	80

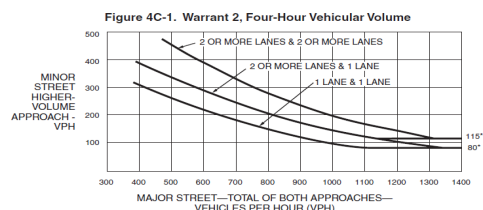
$$y = 0.0003x^2 - 0.7695x + 571.85$$

2+ Lanes & 1 Lane	
Major St	Minor St
400	390
500	335
600	290
700	245
800	205
900	170
1000	145
1100	120
1200	115
1300	115
1400	115

$$y = 0.0003x^2 - 0.8746x + 691.09$$

2+ Lanes & 2+ Lanes	
Major St	Minor St
400	455
500	390
600	330
700	280
800	235
900	195
1000	165
1100	145
1200	120
1300	115
1400	115

$$y = 0.0004x^2 - 0.9784x + 790.55$$



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	Figure 4C-1	0	704	684	541	538	593	661	535	697	716	819	709	386
Minor	1	Figure 4C-1	0	74	69	42	55	57	54	84	59	72	74	56	35
Met?															

Result:

Warrant 2 - Four-Hour Volume Table 4C.02 (70%)

1 Lane & 1 Lane	
Major St	Minor St
1000	60
900	60
800	60
700	70
600	90
500	125
400	160
300	205

$$y = 0.0004x^2 - 0.7631x + 396.19$$

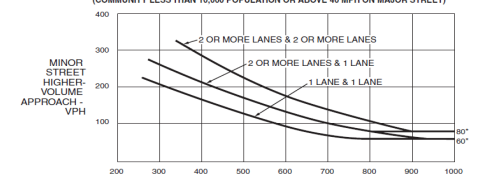
2+ Lanes & 1 Lane	
Major St	Minor St
1000	65
900	65
800	80
700	100
600	130
500	165
400	215
300	265

$$y = 0.0004x^2 - 0.8354x + 439.32$$

2+ Lanes & 2+ Lanes	
Major St	Minor St
1000	80
900	80
800	105
700	140
600	175
500	225
400	290
300	340

$$y = 0.0005x^2 - 1.1036x + 645$$

Figure 4C-2: Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Street	Lanes	Minimum Volume	ATR Data												
			6-7 AM	7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	1	Table 4C-2	0	704	684	541	538	593	661	535	697	716	819	709	386
Minor	1	Table 4C-2	0	74	69	42	55	57	54	84	59	72	74	56	35
Met?			NO	YES	YES	NO	NO	NO	NO	YES	NO	YES	YES	NO	NO










Result: YES

Attachment L

Capacity and Queue Analysis Worksheets

Lanes, Volumes, Timings
1: School Street & Atwater Avenue

2023 Existing Conditions
Weekday Morning

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	25	5	218	64	17	279
Future Volume (vph)	25	5	218	64	17	279
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	30		30			30
Link Distance (ft)	1000		1270			1000
Travel Time (s)	22.7		28.9			22.7
Peak Hour Factor	0.83	0.83	0.83	0.83	0.75	0.75
Heavy Vehicles (%)	4%	0%	3%	2%	0%	4%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

HCM 6th TWSC
1: School Street & Atwater Avenue

2023 Existing Conditions
Weekday Morning

Intersection

Int Delay, s/veh 0.9

Movement WBL WBR NBT NBR SBL SBT

Lane Configurations 

Traffic Vol, veh/h 25 5 218 64 17 279

Future Vol, veh/h 25 5 218 64 17 279

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

Sign Control Stop Stop Free Free Free Free

RT Channelized - None - None - None

Storage Length 0 - - - - -

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

Grade, % 0 - 0 - - 0

Peak Hour Factor 83 83 83 83 75 75

Heavy Vehicles, % 4 0 3 2 0 4

Mvmt Flow 30 6 263 77 23 372

Major/Minor Minor1 Major1 Major2

Conflicting Flow All 720 302 0 0 340 0

Stage 1 302 - - - - -

Stage 2 418 - - - - -

Critical Hdwy 6.44 6.2 - - 4.1 -

Critical Hdwy Stg 1 5.44 - - - - -

Critical Hdwy Stg 2 5.44 - - - - -

Follow-up Hdwy 3.536 3.3 - - 2.2 -

Pot Cap-1 Maneuver 392 742 - - 1230 -

Stage 1 745 - - - - -

Stage 2 660 - - - - -

Platoon blocked, % - - - - -

Mov Cap-1 Maneuver 383 742 - - 1230 -

Mov Cap-2 Maneuver 383 - - - - -

Stage 1 745 - - - - -

Stage 2 644 - - - - -

Approach WB NB SB

HCM Control Delay, s 14.5 0 0.5

HCM LOS B

Minor Lane/Major Mvmt NBT NBRWBLn1 SBL SBT

Capacity (veh/h) - - 417 1230 -

HCM Lane V/C Ratio - - 0.087 0.018 -












HCM Control Delay (s) - - 14.5 8 0

HCM Lane LOS - - B A A

HCM 95th %tile Q(veh) - - 0.3 0.1 -

Lanes, Volumes, Timings
2: School Street & Route 128 Southbound

2023 Existing Conditions
Weekday Morning

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	79	55	253	244	73	244
Future Volume (vph)	79	55	253	244	73	244
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	13	13
Storage Length (ft)	0	50		100	0	
Storage Lanes	1	1		1	0	
Taper Length (ft)	25				25	
Link Speed (mph)	30		30			30
Link Distance (ft)	1000		920			1270
Travel Time (s)	22.7		20.9			28.9
Confl. Peds. (#/hr)	1	1		1	1	
Peak Hour Factor	0.95	0.95	0.74	0.74	0.85	0.85
Heavy Vehicles (%)	0%	2%	3%	0%	1%	5%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary






Area Type: Other
Control Type: Unsignalized

HCM 6th TWSC
2: School Street & Route 128 Southbound

2023 Existing Conditions
Weekday Morning

Intersection

Int Delay, s/veh 2.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	79	55	253	244	73	244
Future Vol, veh/h	79	55	253	244	73	244
Conflicting Peds, #/hr	1	1	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	0	50	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	74	74	85	85
Heavy Vehicles, %	0	2	3	0	1	5
Mvmt Flow	83	58	342	330	86	287

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	803	344	0
Stage 1	343	-	-
Stage 2	460	-	-
Critical Hdwy	6.4	6.22	-
Critical Hdwy Stg 1	5.4	-	-
Critical Hdwy Stg 2	5.4	-	-
Follow-up Hdwy	3.5	3.318	-
Pot Cap-1 Maneuver	355	699	-
Stage 1	723	-	-
Stage 2	640	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	324	697	-
Mov Cap-2 Maneuver	324	-	-
Stage 1	722	-	-
Stage 2	586	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.1	0	1.9
HCM LOS	C		

















Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	324	697	1220
HCM Lane V/C Ratio	-	-	0.257	0.083	0.07
HCM Control Delay (s)	-	-	19.9	10.6	8.2
HCM Lane LOS	-	-	C	B	A
HCM 95th %tile Q(veh)	-	-	1	0.3	0.2

Lanes, Volumes, Timings

2023 Existing Conditions

3: School Street & Route 128 Northbound On-Ramp/Mill Street

Weekday Morning

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	4	7	74	0	423	18	29	269	25
Future Volume (vph)	0	0	0	4	7	74	0	423	18	29	269	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	10	10	10	12	12	12	14	14	16
Storage Length (ft)	0		0	0		0	0		0	0		150
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			150			920	
Travel Time (s)		22.7			22.7			3.4			20.9	
Peak Hour Factor	0.25	0.25	0.25	0.65	0.65	0.65	0.74	0.74	0.74	0.76	0.76	0.76
Heavy Vehicles (%)	0%	0%	0%	25%	29%	0%	0%	2%	0%	11%	3%	4%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other





Control Type: Unsignalized

HCM 6th TWSC
3: School Street & Route 128 Northbound On-Ramp/Mill Street

2023 Existing Conditions
Weekday Morning

Intersection

Int Delay, s/veh 2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	4	7	74	0	423	18	29	269	25
Future Vol, veh/h	0	0	0	4	7	74	0	423	18	29	269	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Stop	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	-	-	-	-	-	-	-	-	-	150
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	25	25	25	65	65	65	74	74	74	76	76	76
Heavy Vehicles, %	0	0	0	25	29	0	0	2	0	11	3	4
Mvmt Flow	0	0	0	6	11	114	0	572	24	38	354	33











Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1014	1014	584	-	0	0
Stage 1	584	584	-	-	-	-
Stage 2	430	430	-	-	-	-
Critical Hdwy	6.65	6.79	6.2	-	-	4.21
Critical Hdwy Stg 1	5.65	5.79	-	-	-	-
Critical Hdwy Stg 2	5.65	5.79	-	-	-	-
Follow-up Hdwy	3.725	4.261	3.3	-	-	2.299
Pot Cap-1 Maneuver	240	214	515	0	-	938
Stage 1	515	457	-	0	-	-
Stage 2	610	540	-	0	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	228	0	515	-	-	938
Mov Cap-2 Maneuver	228	0	-	-	-	-
Stage 1	515	0	-	-	-	-
Stage 2	578	0	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.2	0	0.8
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT	SBR
Capacity (veh/h)	-	-	484	938	-
HCM Lane V/C Ratio	-	-	0.27	0.041	-
HCM Control Delay (s)	-	-	15.2	9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.1	0.1	-

Lanes, Volumes, Timings
4: School Street & Route 128 Northbound Off-Ramp

2023 Existing Conditions
Weekday Morning

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	107	121	47	334	273	0
Future Volume (vph)	107	121	47	334	273	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	13	13
Storage Length (ft)	0	130	0			0
Storage Lanes	1	1	0			0
Taper Length (ft)	25		25			
Link Speed (mph)	30			30	30	
Link Distance (ft)	1000			2400	150	
Travel Time (s)	22.7			54.5	3.4	
Peak Hour Factor	0.83	0.83	0.73	0.73	0.75	0.75
Heavy Vehicles (%)	5%	4%	0%	1%	3%	0%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized





HCM 6th TWSC
4: School Street & Route 128 Northbound Off-Ramp

2023 Existing Conditions
Weekday Morning

Intersection

Int Delay, s/veh 5.3

Movement EBL EBR NBL NBT SBT SBR

Lane Configurations						
Traffic Vol, veh/h	107	121	47	334	273	0
Future Vol, veh/h	107	121	47	334	273	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	130	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	83	83	73	73	75	75
Heavy Vehicles, %	5	4	0	1	3	0
Mvmt Flow	129	146	64	458	364	0

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	950	364	364	0	-	0
Stage 1	364	-	-	-	-	-
Stage 2	586	-	-	-	-	-
Critical Hdwy	6.45	6.24	4.1	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.336	2.2	-	-	-
Pot Cap-1 Maneuver	285	676	1206	-	-	0
Stage 1	696	-	-	-	-	0
Stage 2	550	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	265	676	1206	-	-	-
Mov Cap-2 Maneuver	265	-	-	-	-	-
Stage 1	647	-	-	-	-	-
Stage 2	550	-	-	-	-	-

Approach EB NB SB


















HCM Control Delay, s	20.7	1	0
HCM LOS	C		

Minor Lane/Major Mvmt NBL NBT EBLn1 EBLn2 SBT

Capacity (veh/h)	1206	-	265	676	-
HCM Lane V/C Ratio	0.053	-	0.486	0.216	-
HCM Control Delay (s)	8.2	0	30.8	11.8	-
HCM Lane LOS	A	A	D	B	-
HCM 95th %tile Q(veh)	0.2	-	2.5	0.8	-

Lanes, Volumes, Timings
5: School Street & Pleasant Street

2023 Existing Conditions
Weekday Morning






												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	0	129	36	77	241	3	143	0	0	347	24
Future Volume (vph)	25	0	129	36	77	241	3	143	0	0	347	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	14	15	15	15	10	10	10	11	11	11
Storage Length (ft)	0		0	0		100	0		0	0		0
Storage Lanes	0		0	0		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			550			2400	
Travel Time (s)		22.7			22.7			12.5			54.5	
Confl. Peds. (#/hr)	21		8	7		20	8		7	20		21
Peak Hour Factor	0.50	0.50	0.50	0.58	0.58	0.58	0.78	0.78	0.78	0.83	0.83	0.83
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%	0%	1%	0%	0%	2%	9%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection

















Intersection Delay, s/veh 31.9
Intersection LOS D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	0	129	36	77	241	3	143	0	0	347	24
Future Vol, veh/h	25	0	129	36	77	241	3	143	0	0	347	24
Peak Hour Factor	0.50	0.50	0.50	0.58	0.58	0.58	0.78	0.78	0.78	0.83	0.83	0.83
Heavy Vehicles, %	0	0	0	0	1	1	0	1	0	0	2	9
Mvmt Flow	50	0	258	62	133	416	4	183	0	0	418	29
Number of Lanes	0	1	0	0	1	1	0	1	0	0	1	0
Approach	EB			WB			NB				SB	
Opposing Approach	WB			EB			SB				NB	
Opposing Lanes	2			1			1				1	
Conflicting Approach Left	SB			NB			EB				WB	
Conflicting Lanes Left	1			1			1				2	
Conflicting Approach Right	NB			SB			WB				EB	
Conflicting Lanes Right	1			1			2				1	
HCM Control Delay	22.6			29			17.6				48.4	
HCM LOS	C			D			C				E	

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	2%	16%	32%	0%	0%
Vol Thru, %	98%	0%	68%	0%	94%
Vol Right, %	0%	84%	0%	100%	6%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	146	154	113	241	371
LT Vol	3	25	36	0	0
Through Vol	143	0	77	0	347
RT Vol	0	129	0	241	24
Lane Flow Rate	187	308	195	416	447
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.431	0.634	0.431	0.819	0.908
Departure Headway (Hd)	8.282	7.415	7.965	7.096	7.314
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	432	484	450	507	496
Service Time	6.374	5.498	5.739	4.87	5.381
HCM Lane V/C Ratio	0.433	0.636	0.433	0.821	0.901
HCM Control Delay	17.6	22.6	16.7	34.7	48.4
HCM Lane LOS	C	C	C	D	E
HCM 95th-tile Q	2.1	4.3	2.1	8	10.4

Lanes, Volumes, Timings
6: Lincoln Avenue/Lincoln Street & School Street

2023 Existing Conditions
Weekday Morning

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	4	6	1	2	149	39	282	179	6
Future Volume (vph)	0	0	0	4	6	1	2	149	39	282	179	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	11	11	11
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			1000			550	
Travel Time (s)		22.7			22.7			22.7			12.5	
Confl. Peds. (#/hr)	8		3			5	3			5		8
Peak Hour Factor	0.55	0.55	0.55	0.92	0.92	0.92	0.80	0.80	0.80	0.71	0.71	0.71
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	2%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

HCM 6th TWSC
6: Lincoln Avenue/Lincoln Street & School Street

2023 Existing Conditions
Weekday Morning

Intersection

Int Delay, s/veh 4.5

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

Traffic Vol, veh/h	0	0	0	4	6	1	2	149	39	282	179	6
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Future Vol, veh/h	0	0	0	4	6	1	2	149	39	282	179	6
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Conflicting Peds, #/hr	8	0	3	0	0	5	3	0	0	5	0	8
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Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
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RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
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Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
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Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
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Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
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Peak Hour Factor	55	55	55	92	92	92	80	80	80	71	71	71
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Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	1	2	0
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Mvmt Flow	0	0	0	4	7	1	3	186	49	397	252	8
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Major/Minor	Minor2	Minor1	Major1	Major2
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Conflicting Flow All	1287	1304	267	1275	1284	224	268	0	0	240	0	0
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Stage 1	1058	1058	-	222	222	-	-	-	-	-	-	-
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Stage 2	229	246	-	1053	1062	-	-	-	-	-	-	-
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Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.11	-	-
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Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
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Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
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Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.209	-	-
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Pot Cap-1 Maneuver	142	162	777	145	166	820	1307	-	-	1333	-	-
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Stage 1	274	304	-	785	723	-	-	-	-	-	-	-
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Stage 2	778	706	-	276	303	-	-	-	-	-	-	-
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Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
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Mov Cap-1 Maneuver	97	104	769	105	106	810	1297	-	-	1327	-	-
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Mov Cap-2 Maneuver	97	104	-	105	106	-	-	-	-	-	-	-
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Stage 1	271	196	-	779	717	-	-	-	-	-	-	-
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Stage 2	762	700	-	179	195	-	-	-	-	-	-	-
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Approach	EB	WB	NB	SB
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HCM Control Delay, s	0	39.9	0.1	5.4
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HCM LOS	A	E		
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Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
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Capacity (veh/h)	1297	-	-	-	115	1327	-
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HCM Lane V/C Ratio	0.002	-	-	-	0.104	0.299	-
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HCM Control Delay (s)	7.8	0	-	0	39.9	8.9	0
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HCM Lane LOS	A	A	-	A	E	A	A
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HCM 95th %tile Q(veh)	0	-	-	-	0.3	1.3	-
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Lanes, Volumes, Timings
1: School Street & Atwater Avenue

2023 Existing Conditions
Weekday Evening

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	53	18	244	68	9	198
Future Volume (vph)	53	18	244	68	9	198
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	30		30			30
Link Distance (ft)	1000		1270			1000
Travel Time (s)	22.7		28.9			22.7
Confl. Peds. (#/hr)		1			1	
Peak Hour Factor	0.81	0.81	0.86	0.86	0.89	0.89
Heavy Vehicles (%)	2%	0%	1%	0%	0%	1%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

HCM 6th TWSC
1: School Street & Atwater Avenue

2023 Existing Conditions
Weekday Evening

Intersection

Int Delay, s/veh 1.8

Movement WBL WBR NBT NBR SBL SBT

Lane Configurations 

Traffic Vol, veh/h 53 18 244 68 9 198

Future Vol, veh/h 53 18 244 68 9 198

Conflicting Peds, #/hr 0 1 0 0 1 0

Sign Control Stop Stop Free Free Free Free

RT Channelized - None - None - None

Storage Length 0 - - - - -

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

Grade, % 0 - 0 - - 0

Peak Hour Factor 81 81 86 86 89 89

Heavy Vehicles, % 2 0 1 0 0 1

Mvmt Flow 65 22 284 79 10 222

Major/Minor Minor1 Major1 Major2

Conflicting Flow All 567 326 0 0 364 0

Stage 1 325 - - - - -

Stage 2 242 - - - - -

Critical Hdwy 6.42 6.2 - - 4.1 -

Critical Hdwy Stg 1 5.42 - - - - -

Critical Hdwy Stg 2 5.42 - - - - -

Follow-up Hdwy 3.518 3.3 - - 2.2 -

Pot Cap-1 Maneuver 485 720 - - 1206 -

Stage 1 732 - - - - -

Stage 2 798 - - - - -

Platoon blocked, % - - - - -

Mov Cap-1 Maneuver 480 719 - - 1205 -

Mov Cap-2 Maneuver 480 - - - - -

Stage 1 731 - - - - -

Stage 2 791 - - - - -

Approach WB NB SB

HCM Control Delay, s 13.2 0 0.3

HCM LOS B

Minor Lane/Major Mvmt NBT NBRWBLn1 SBL SBT

Capacity (veh/h) - - 524 1205 -

HCM Lane V/C Ratio - - 0.167 0.008 -












HCM Control Delay (s) - - 13.2 8 0

HCM Lane LOS - - B A A

HCM 95th %tile Q(veh) - - 0.6 0 -

Lanes, Volumes, Timings
2: School Street & Route 128 Southbound

2023 Existing Conditions
Weekday Evening

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	76	30	294	192	100	177
Future Volume (vph)	76	30	294	192	100	177
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	13	13
Storage Length (ft)	0	50		100	0	
Storage Lanes	1	1		1	0	
Taper Length (ft)	25				25	
Link Speed (mph)	30		30			30
Link Distance (ft)	1000		920			1270
Travel Time (s)	22.7		20.9			28.9
Peak Hour Factor	0.81	0.81	0.91	0.91	0.88	0.88
Heavy Vehicles (%)	1%	7%	2%	1%	0%	1%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other






Control Type: Unsignalized

HCM 6th TWSC
2: School Street & Route 128 Southbound

2023 Existing Conditions
Weekday Evening

Intersection

Int Delay, s/veh 3.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	76	30	294	192	100	177
Future Vol, veh/h	76	30	294	192	100	177
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	0	50	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	81	81	91	91	88	88
Heavy Vehicles, %	1	7	2	1	0	1
Mvmt Flow	94	37	323	211	114	201

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	752	323	0
Stage 1	323	-	-
Stage 2	429	-	-
Critical Hdwy	6.41	6.27	-
Critical Hdwy Stg 1	5.41	-	-
Critical Hdwy Stg 2	5.41	-	-
Follow-up Hdwy	3.509	3.363	-
Pot Cap-1 Maneuver	379	707	-
Stage 1	736	-	-
Stage 2	659	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	340	707	-
Mov Cap-2 Maneuver	340	-	-
Stage 1	736	-	-
Stage 2	591	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17	0	3
HCM LOS	C		

















Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	340	707	1248
HCM Lane V/C Ratio	-	-	0.276	0.052	0.091
HCM Control Delay (s)	-	-	19.6	10.4	8.2
HCM Lane LOS	-	-	C	B	A
HCM 95th %tile Q(veh)	-	-	1.1	0.2	0.3

Lanes, Volumes, Timings

2023 Existing Conditions

3: School Street & Route 128 Northbound On-Ramp/Mill Street

Weekday Evening

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	2	0	41	0	445	39	8	197	48
Future Volume (vph)	0	0	0	2	0	41	0	445	39	8	197	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	10	10	10	12	12	12	14	14	16
Storage Length (ft)	0		0	0		0	0		0	0		150
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			150			920	
Travel Time (s)		22.7			22.7			3.4			20.9	
Peak Hour Factor	0.78	0.78	0.78	0.63	0.63	0.63	0.92	0.92	0.92	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	3%	0%	2%	0%	0%	2%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other





Control Type: Unsignalized

HCM 6th TWSC
3: School Street & Route 128 Northbound On-Ramp/Mill Street

2023 Existing Conditions
Weekday Evening

Intersection

Int Delay, s/veh 1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	2	0	41	0	445	39	8	197	48
Future Vol, veh/h	0	0	0	2	0	41	0	445	39	8	197	48
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Stop	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	-	-	-	-	-	-	-	-	-	150
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	63	63	63	92	92	92	95	95	95
Heavy Vehicles, %	0	0	0	0	0	3	0	2	0	0	2	0
Mvmt Flow	0	0	0	3	0	65	0	484	42	8	207	51











Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	728	728	505	-	0	0
Stage 1	505	505	-	-	-	-
Stage 2	223	223	-	-	-	-
Critical Hdwy	6.4	6.5	6.23	-	-	4.1
Critical Hdwy Stg 1	5.4	5.5	-	-	-	-
Critical Hdwy Stg 2	5.4	5.5	-	-	-	-
Follow-up Hdwy	3.5	4	3.327	-	-	2.2
Pot Cap-1 Maneuver	393	353	565	0	-	1051
Stage 1	610	544	-	0	-	-
Stage 2	819	723	-	0	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	389	0	565	-	-	1051
Mov Cap-2 Maneuver	389	0	-	-	-	-
Stage 1	610	0	-	-	-	-
Stage 2	812	0	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.4	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT	SBR
Capacity (veh/h)	-	-	553	1051	-
HCM Lane V/C Ratio	-	-	0.123	0.008	-
HCM Control Delay (s)	-	-	12.4	8.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0	-

Lanes, Volumes, Timings
4: School Street & Route 128 Northbound Off-Ramp

2023 Existing Conditions
Weekday Evening

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	156	204	80	328	199	0
Future Volume (vph)	156	204	80	328	199	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	13	13
Storage Length (ft)	0	130	0			0
Storage Lanes	1	1	0			0
Taper Length (ft)	25		25			
Link Speed (mph)	30			30	30	
Link Distance (ft)	1000			2400	150	
Travel Time (s)	22.7			54.5	3.4	
Peak Hour Factor	0.78	0.78	0.92	0.92	0.95	0.95
Heavy Vehicles (%)	1%	2%	0%	2%	2%	0%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized





HCM 6th TWSC
4: School Street & Route 128 Northbound Off-Ramp

2023 Existing Conditions
Weekday Evening

Intersection

Int Delay, s/veh 8.1

Movement EBL EBR NBL NBT SBT SBR

Lane Configurations						
Traffic Vol, veh/h	156	204	80	328	199	0
Future Vol, veh/h	156	204	80	328	199	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	130	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	78	78	92	92	95	95
Heavy Vehicles, %	1	2	0	2	2	0
Mvmt Flow	200	262	87	357	209	0

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	740	209	209	0	-	0
Stage 1	209	-	-	-	-	-
Stage 2	531	-	-	-	-	-
Critical Hdwy	6.41	6.22	4.1	-	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.318	2.2	-	-	-
Pot Cap-1 Maneuver	386	831	1374	-	-	0
Stage 1	828	-	-	-	-	0
Stage 2	592	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	356	831	1374	-	-	-
Mov Cap-2 Maneuver	356	-	-	-	-	-
Stage 1	763	-	-	-	-	-
Stage 2	592	-	-	-	-	-

Approach EB NB SB


















HCM Control Delay, s	18.2	1.5	0
HCM LOS	C		

Minor Lane/Major Mvmt NBL NBT EBLn1 EBLn2 SBT

Capacity (veh/h)	1374	-	356	831	-
HCM Lane V/C Ratio	0.063	-	0.562	0.315	-
HCM Control Delay (s)	7.8	0	27.3	11.3	-
HCM Lane LOS	A	A	D	B	-
HCM 95th %tile Q(veh)	0.2	-	3.3	1.4	-

Lanes, Volumes, Timings
5: School Street & Pleasant Street

2023 Existing Conditions
Weekday Evening






												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	0	53	12	33	180	17	180	0	0	335	46
Future Volume (vph)	38	0	53	12	33	180	17	180	0	0	335	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	14	15	15	15	10	10	10	11	11	11
Storage Length (ft)	0		0	0		100	0		0	0		0
Storage Lanes	0		0	0		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			550			2400	
Travel Time (s)		22.7			22.7			12.5			54.5	
Confl. Peds. (#/hr)	30		7	2		25	7		2	25		30
Peak Hour Factor	0.80	0.80	0.80	0.87	0.87	0.87	0.78	0.78	0.78	0.89	0.89	0.89
Heavy Vehicles (%)	6%	0%	0%	0%	3%	3%	0%	1%	0%	0%	1%	2%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection

















Intersection Delay, s/veh 14.1
Intersection LOS B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	38	0	53	12	33	180	17	180	0	0	335	46
Future Vol, veh/h	38	0	53	12	33	180	17	180	0	0	335	46
Peak Hour Factor	0.80	0.80	0.80	0.87	0.87	0.87	0.78	0.78	0.78	0.89	0.89	0.89
Heavy Vehicles, %	6	0	0	0	3	3	0	1	0	0	1	2
Mvmt Flow	48	0	66	14	38	207	22	231	0	0	376	52
Number of Lanes	0	1	0	0	1	1	0	1	0	0	1	0
Approach	EB			WB			NB				SB	
Opposing Approach	WB			EB			SB				NB	
Opposing Lanes	2			1			1				1	
Conflicting Approach Left	SB			NB			EB				WB	
Conflicting Lanes Left	1			1			1				2	
Conflicting Approach Right	NB			SB			WB				EB	
Conflicting Lanes Right	1			1			2				1	
HCM Control Delay	10.9			11.4			12.6				17.5	
HCM LOS	B			B			B				C	

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	9%	42%	27%	0%	0%
Vol Thru, %	91%	0%	73%	0%	88%
Vol Right, %	0%	58%	0%	100%	12%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	197	91	45	180	381
LT Vol	17	38	12	0	0
Through Vol	180	0	33	0	335
RT Vol	0	53	0	180	46
Lane Flow Rate	253	114	52	207	428
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.401	0.197	0.096	0.339	0.638
Departure Headway (Hd)	5.709	6.232	6.696	5.898	5.366
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	626	571	532	606	668
Service Time	3.78	4.323	4.471	3.673	3.426
HCM Lane V/C Ratio	0.404	0.2	0.098	0.342	0.641
HCM Control Delay	12.6	10.9	10.2	11.7	17.5
HCM Lane LOS	B	B	B	B	C
HCM 95th-tile Q	1.9	0.7	0.3	1.5	4.6

Lanes, Volumes, Timings
6: Lincoln Avenue/Lincoln Street & School Street

2023 Existing Conditions
Weekday Evening

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	3	0	0	0	0	0	158	25	244	179	6
Future Volume (vph)	5	3	0	0	0	0	0	158	25	244	179	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	11	11	11
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			1000			550	
Travel Time (s)		22.7			22.7			22.7			12.5	
Confl. Peds. (#/hr)	7		5	4		6	5		4	6		7
Peak Hour Factor	0.67	0.67	0.67	0.25	0.25	0.25	0.94	0.94	0.94	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

HCM 6th TWSC
6: Lincoln Avenue/Lincoln Street & School Street

2023 Existing Conditions
Weekday Evening

Intersection

Int Delay, s/veh 3.6

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

Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	5	3	0	0	0	0	0	158	25	244	179	6
Future Vol, veh/h	5	3	0	0	0	0	0	158	25	244	179	6
Conflicting Peds, #/hr	7	0	5	4	0	6	5	0	4	6	0	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	67	67	67	25	25	25	94	94	94	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	7	4	0	0	0	0	0	168	27	257	188	6










Major/Minor	Minor2		Minor1		Major1		Major2	
Conflicting Flow All	901	913	203	900	903	195	201	0
Stage 1	712	712	-	188	188	-	-	-
Stage 2	189	201	-	712	715	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-
Pot Cap-1 Maneuver	261	276	843	262	279	851	1383	-
Stage 1	427	439	-	818	748	-	-	-
Stage 2	817	739	-	427	438	-	-	-
Platoon blocked, %								-
Mov Cap-1 Maneuver	216	215	833	214	218	841	1374	-
Mov Cap-2 Maneuver	216	215	-	214	218	-	-	-
Stage 1	424	344	-	813	744	-	-	-
Stage 2	812	735	-	331	343	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	22.6	0	0	4.7
HCM LOS	C	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1374	-	-	216	-	1375	-
HCM Lane V/C Ratio	-	-	-	0.055	-	0.187	-
HCM Control Delay (s)	0	-	-	22.6	0	8.2	0
HCM Lane LOS	A	-	-	C	A	A	A
HCM 95th %tile Q(veh)	0	-	-	0.2	-	0.7	-

Lanes, Volumes, Timings
1: School Street & Atwater Avenue

2033 No-Build Conditions
Weekday Morning

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	25	5	256	64	18	354
Future Volume (vph)	25	5	256	64	18	354
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	30		30			30
Link Distance (ft)	1000		1270			1000
Travel Time (s)	22.7		28.9			22.7
Peak Hour Factor	0.83	0.83	0.83	0.83	0.75	0.75
Heavy Vehicles (%)	4%	0%	3%	2%	0%	4%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection

Int Delay, s/veh 0.9

Movement WBL WBR NBT NBR SBL SBT

Lane Configurations 

Traffic Vol, veh/h 25 5 256 64 18 354

Future Vol, veh/h 25 5 256 64 18 354

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

Sign Control Stop Stop Free Free Free Free

RT Channelized - None - None - None

Storage Length 0 - - - - -

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

Grade, % 0 - 0 - - 0

Peak Hour Factor 83 83 83 83 75 75

Heavy Vehicles, % 4 0 3 2 0 4

Mvmt Flow 30 6 308 77 24 472

Major/Minor Minor1 Major1 Major2

Conflicting Flow All 867 347 0 0 385 0

Stage 1 347 - - - - -

Stage 2 520 - - - - -

Critical Hdwy 6.44 6.2 - - 4.1 -

Critical Hdwy Stg 1 5.44 - - - - -

Critical Hdwy Stg 2 5.44 - - - - -

Follow-up Hdwy 3.536 3.3 - - 2.2 -

Pot Cap-1 Maneuver 321 701 - - 1185 -

Stage 1 711 - - - - -

Stage 2 593 - - - - -

Platoon blocked, % - - - - -

Mov Cap-1 Maneuver 312 701 - - 1185 -

Mov Cap-2 Maneuver 312 - - - - -

Stage 1 711 - - - - -

Stage 2 577 - - - - -

Approach WB NB SB

HCM Control Delay, s 16.7 0 0.4

HCM LOS C

Minor Lane/Major Mvmt NBT NBRWBLn1 SBL SBT

Capacity (veh/h) - - 344 1185 -

HCM Lane V/C Ratio - - 0.105 0.02 -












HCM Control Delay (s) - - 16.7 8.1 0

HCM Lane LOS - - C A A

HCM 95th %tile Q(veh) - - 0.3 0.1 -

Lanes, Volumes, Timings
2: School Street & Route 128 Southbound

2033 No-Build Conditions
Weekday Morning

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	87	62	293	270	112	285
Future Volume (vph)	87	62	293	270	112	285
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	13	13
Storage Length (ft)	0	50		100	0	
Storage Lanes	1	1		1	0	
Taper Length (ft)	25				25	
Link Speed (mph)	30		30			30
Link Distance (ft)	1000		920			1270
Travel Time (s)	22.7		20.9			28.9
Confl. Peds. (#/hr)	1	1		1	1	
Peak Hour Factor	0.95	0.95	0.74	0.74	0.85	0.85
Heavy Vehicles (%)	0%	2%	3%	0%	1%	5%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary






Area Type: Other
Control Type: Unsignalized

HCM 6th TWSC
2: School Street & Route 128 Southbound

2033 No-Build Conditions
Weekday Morning

Intersection

Int Delay, s/veh 3.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	87	62	293	270	112	285
Future Vol, veh/h	87	62	293	270	112	285
Conflicting Peds, #/hr	1	1	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	0	50	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	74	74	85	85
Heavy Vehicles, %	0	2	3	0	1	5
Mvmt Flow	92	65	396	365	132	335

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	997	398	0
Stage 1	397	-	-
Stage 2	600	-	-
Critical Hdwy	6.4	6.22	-
Critical Hdwy Stg 1	5.4	-	-
Critical Hdwy Stg 2	5.4	-	-
Follow-up Hdwy	3.5	3.318	-
Pot Cap-1 Maneuver	273	652	-
Stage 1	683	-	-
Stage 2	552	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	235	651	-
Mov Cap-2 Maneuver	235	-	-
Stage 1	682	-	-
Stage 2	475	-	-

Approach	WB	NB	SB
HCM Control Delay, s	22	0	2.4
HCM LOS	C		

















Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	235	651	1166
HCM Lane V/C Ratio	-	-	0.39	0.1	0.113
HCM Control Delay (s)	-	-	29.8	11.1	8.5
HCM Lane LOS	-	-	D	B	A
HCM 95th %tile Q(veh)	-	-	1.7	0.3	0.4

Lanes, Volumes, Timings

2033 No-Build Conditions

3: School Street & Route 128 Northbound On-Ramp/Mill Street

Weekday Morning

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	4	8	82	0	482	20	32	310	30
Future Volume (vph)	0	0	0	4	8	82	0	482	20	32	310	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	10	10	10	12	12	12	14	14	16
Storage Length (ft)	0		0	0		0	0		0	0		150
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			150			920	
Travel Time (s)		22.7			22.7			3.4			20.9	
Peak Hour Factor	0.25	0.25	0.25	0.65	0.65	0.65	0.74	0.74	0.74	0.76	0.76	0.76
Heavy Vehicles (%)	0%	0%	0%	25%	29%	0%	0%	2%	0%	11%	3%	4%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other





Control Type: Unsignalized

HCM 6th TWSC
3: School Street & Route 128 Northbound On-Ramp/Mill Street

2033 No-Build Conditions
Weekday Morning

Intersection

Int Delay, s/veh 2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	4	8	82	0	482	20	32	310	30
Future Vol, veh/h	0	0	0	4	8	82	0	482	20	32	310	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Stop	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	-	-	-	-	-	-	-	-	-	150
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	25	25	25	65	65	65	74	74	74	76	76	76
Heavy Vehicles, %	0	0	0	25	29	0	0	2	0	11	3	4
Mvmt Flow	0	0	0	6	12	126	0	651	27	42	408	39











Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1157	1157	665	-	0	0
Stage 1	665	665	-	-	-	-
Stage 2	492	492	-	-	-	-
Critical Hdwy	6.65	6.79	6.2	-	-	4.21
Critical Hdwy Stg 1	5.65	5.79	-	-	-	-
Critical Hdwy Stg 2	5.65	5.79	-	-	-	-
Follow-up Hdwy	3.725	4.261	3.3	-	-	2.299
Pot Cap-1 Maneuver	196	175	464	0	-	873
Stage 1	471	419	-	0	-	-
Stage 2	570	505	-	0	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	183	0	464	-	-	873
Mov Cap-2 Maneuver	183	0	-	-	-	-
Stage 1	471	0	-	-	-	-
Stage 2	534	0	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.4	0	0.8
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT	SBR
Capacity (veh/h)	-	-	433	873	-
HCM Lane V/C Ratio	-	-	0.334	0.048	-
HCM Control Delay (s)	-	-	17.4	9.3	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.4	0.2	-

Lanes, Volumes, Timings
4: School Street & Route 128 Northbound Off-Ramp

2033 No-Build Conditions
Weekday Morning

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	129	134	52	373	314	0
Future Volume (vph)	129	134	52	373	314	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	13	13
Storage Length (ft)	0	130	0			0
Storage Lanes	1	1	0			0
Taper Length (ft)	25		25			
Link Speed (mph)	30			30	30	
Link Distance (ft)	1000			2400	150	
Travel Time (s)	22.7			54.5	3.4	
Peak Hour Factor	0.83	0.83	0.73	0.73	0.75	0.75
Heavy Vehicles (%)	5%	4%	0%	1%	3%	0%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized





HCM 6th TWSC
4: School Street & Route 128 Northbound Off-Ramp

2033 No-Build Conditions
Weekday Morning

Intersection

Int Delay, s/veh 8.3

Movement EBL EBR NBL NBT SBT SBR

Lane Configurations						
Traffic Vol, veh/h	129	134	52	373	314	0
Future Vol, veh/h	129	134	52	373	314	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	130	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	83	83	73	73	75	75
Heavy Vehicles, %	5	4	0	1	3	0
Mvmt Flow	155	161	71	511	419	0

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	1072	419	419	0	-	0
Stage 1	419	-	-	-	-	-
Stage 2	653	-	-	-	-	-
Critical Hdwy	6.45	6.24	4.1	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.336	2.2	-	-	-
Pot Cap-1 Maneuver	241	630	1151	-	-	0
Stage 1	657	-	-	-	-	0
Stage 2	512	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	220	630	1151	-	-	-
Mov Cap-2 Maneuver	220	-	-	-	-	-
Stage 1	600	-	-	-	-	-
Stage 2	512	-	-	-	-	-

Approach EB NB SB


















HCM Control Delay, s	32.5	1	0
HCM LOS	D		

Minor Lane/Major Mvmt NBL NBT EBLn1 EBLn2 SBT

Capacity (veh/h)	1151	-	220	630	-
HCM Lane V/C Ratio	0.062	-	0.706	0.256	-
HCM Control Delay (s)	8.3	0	53.1	12.7	-
HCM Lane LOS	A	A	F	B	-
HCM 95th %tile Q(veh)	0.2	-	4.6	1	-

Lanes, Volumes, Timings
5: School Street & Pleasant Street

2033 No-Build Conditions
Weekday Morning






												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	0	142	40	85	268	3	160	0	0	395	28
Future Volume (vph)	28	0	142	40	85	268	3	160	0	0	395	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	14	15	15	15	10	10	10	11	11	11
Storage Length (ft)	0		0	0		100	0		0	0		0
Storage Lanes	0		0	0		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			550			2400	
Travel Time (s)		22.7			22.7			12.5			54.5	
Confl. Peds. (#/hr)	21		8	7		20	8		7	20		21
Peak Hour Factor	0.50	0.50	0.50	0.58	0.58	0.58	0.78	0.78	0.78	0.83	0.83	0.83
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%	0%	1%	0%	0%	2%	9%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection

















Intersection Delay, s/veh 58.2
Intersection LOS F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	28	0	142	40	85	268	3	160	0	0	395	28
Future Vol, veh/h	28	0	142	40	85	268	3	160	0	0	395	28
Peak Hour Factor	0.50	0.50	0.50	0.58	0.58	0.58	0.78	0.78	0.78	0.83	0.83	0.83
Heavy Vehicles, %	0	0	0	0	1	1	0	1	0	0	2	9
Mvmt Flow	56	0	284	69	147	462	4	205	0	0	476	34
Number of Lanes	0	1	0	0	1	1	0	1	0	0	1	0
Approach	EB			WB			NB				SB	
Opposing Approach	WB			EB			SB				NB	
Opposing Lanes	2			1			1				1	
Conflicting Approach Left	SB			NB			EB				WB	
Conflicting Lanes Left	1			1			1				2	
Conflicting Approach Right	NB			SB			WB				EB	
Conflicting Lanes Right	1			1			2				1	
HCM Control Delay	31.9			48.5			21.7				103.7	
HCM LOS	D			E			C				F	

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	2%	16%	32%	0%	0%
Vol Thru, %	98%	0%	68%	0%	93%
Vol Right, %	0%	84%	0%	100%	7%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	163	170	125	268	423
LT Vol	3	28	40	0	0
Through Vol	160	0	85	0	395
RT Vol	0	142	0	268	28
Lane Flow Rate	209	340	216	462	510
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.512	0.743	0.5	0.964	1.111
Departure Headway (Hd)	9.329	8.379	8.827	7.951	7.848
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	389	435	412	457	459
Service Time	7.329	6.379	6.527	5.651	5.941
HCM Lane V/C Ratio	0.537	0.782	0.524	1.011	1.111
HCM Control Delay	21.7	31.9	20	61.8	103.7
HCM Lane LOS	C	D	C	F	F
HCM 95th-tile Q	2.8	6	2.7	11.8	17.2

Lanes, Volumes, Timings
6: Lincoln Avenue/Lincoln Street & School Street

2033 No-Build Conditions
Weekday Morning

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	4	6	1	2	167	43	319	203	6
Future Volume (vph)	0	0	0	4	6	1	2	167	43	319	203	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	11	11	11
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			1000			550	
Travel Time (s)		22.7			22.7			22.7			12.5	
Confl. Peds. (#/hr)	8		3			5	3			5		8
Peak Hour Factor	0.55	0.55	0.55	0.92	0.92	0.92	0.80	0.80	0.80	0.71	0.71	0.71
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	2%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other





Control Type: Unsignalized

HCM 6th TWSC
6: Lincoln Avenue/Lincoln Street & School Street

2033 No-Build Conditions
Weekday Morning

Intersection

Int Delay, s/veh 4.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	4	6	1	2	167	43	319	203	6
Future Vol, veh/h	0	0	0	4	6	1	2	167	43	319	203	6
Conflicting Peds, #/hr	8	0	3	0	0	5	3	0	0	5	0	8
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	55	55	55	92	92	92	80	80	80	71	71	71
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	1	2	0
Mvmt Flow	0	0	0	4	7	1	3	209	54	449	286	8










Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1450	1470	301	1438	1447	249	302	0	0	268	0	0
Stage 1	1196	1196	-	247	247	-	-	-	-	-	-	-
Stage 2	254	274	-	1191	1200	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.209	-	-
Pot Cap-1 Maneuver	110	129	743	112	133	795	1270	-	-	1302	-	-
Stage 1	229	262	-	761	706	-	-	-	-	-	-	-
Stage 2	755	687	-	231	261	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	69	74	735	75	77	786	1260	-	-	1296	-	-
Mov Cap-2 Maneuver	69	74	-	75	77	-	-	-	-	-	-	-
Stage 1	226	152	-	755	700	-	-	-	-	-	-	-
Stage 2	739	682	-	135	151	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	55.5	0.1	5.6
HCM LOS	A	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1260	-	-	- 83	1296	-	-
HCM Lane V/C Ratio	0.002	-	-	- 0.144	0.347	-	-
HCM Control Delay (s)	7.9	0	-	0 55.5	9.2	0	-
HCM Lane LOS	A	A	-	A F	A	A	-
HCM 95th %tile Q(veh)	0	-	-	- 0.5	1.6	-	-

Lanes, Volumes, Timings
1: School Street & Atwater Avenue

2033 No-Build Conditions
Weekday Evening




						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	53	19	317	68	10	246
Future Volume (vph)	53	19	317	68	10	246
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	30		30			30
Link Distance (ft)	1000		1270			1000
Travel Time (s)	22.7		28.9			22.7
Confl. Peds. (#/hr)		1			1	
Peak Hour Factor	0.81	0.81	0.86	0.86	0.89	0.89
Heavy Vehicles (%)	2%	0%	1%	0%	0%	1%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

HCM 6th TWSC
1: School Street & Atwater Avenue

2033 No-Build Conditions
Weekday Evening

Intersection

Int Delay, s/veh 1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	53	19	317	68	10	246
Future Vol, veh/h	53	19	317	68	10	246
Conflicting Peds, #/hr	0	1	0	0	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	81	81	86	86	89	89
Heavy Vehicles, %	2	0	1	0	0	1
Mvmt Flow	65	23	369	79	11	276












Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	708	411	0
Stage 1	410	-	-
Stage 2	298	-	-
Critical Hdwy	6.42	6.2	-
Critical Hdwy Stg 1	5.42	-	-
Critical Hdwy Stg 2	5.42	-	-
Follow-up Hdwy	3.518	3.3	-
Pot Cap-1 Maneuver	401	645	-
Stage 1	670	-	-
Stage 2	753	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	396	644	-
Mov Cap-2 Maneuver	396	-	-
Stage 1	669	-	-
Stage 2	744	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.2	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	441	1121
HCM Lane V/C Ratio	-	-	0.202	0.01
HCM Control Delay (s)	-	-	15.2	8.2
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	0.7	0

Lanes, Volumes, Timings
2: School Street & Route 128 Southbound

2033 No-Build Conditions
Weekday Evening

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	84	34	371	212	128	205
Future Volume (vph)	84	34	371	212	128	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	13	13
Storage Length (ft)	0	50		100	0	
Storage Lanes	1	1		1	0	
Taper Length (ft)	25				25	
Link Speed (mph)	30		30			30
Link Distance (ft)	1000		920			1270
Travel Time (s)	22.7		20.9			28.9
Peak Hour Factor	0.81	0.81	0.91	0.91	0.88	0.88
Heavy Vehicles (%)	1%	7%	2%	1%	0%	1%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other






Control Type: Unsignalized

HCM 6th TWSC
2: School Street & Route 128 Southbound

2033 No-Build Conditions
Weekday Evening

Intersection

Int Delay, s/veh 4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	84	34	371	212	128	205
Future Vol, veh/h	84	34	371	212	128	205
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	0	50	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	81	81	91	91	88	88
Heavy Vehicles, %	1	7	2	1	0	1
Mvmt Flow	104	42	408	233	145	233

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	931	408	0
Stage 1	408	-	-
Stage 2	523	-	-
Critical Hdwy	6.41	6.27	-
Critical Hdwy Stg 1	5.41	-	-
Critical Hdwy Stg 2	5.41	-	-
Follow-up Hdwy	3.509	3.363	-
Pot Cap-1 Maneuver	297	633	-
Stage 1	673	-	-
Stage 2	597	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	255	633	-
Mov Cap-2 Maneuver	255	-	-
Stage 1	673	-	-
Stage 2	512	-	-

Approach	WB	NB	SB
HCM Control Delay, s	23.5	0	3.3
HCM LOS	C		

















Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	255	633	1162
HCM Lane V/C Ratio	-	-	0.407	0.066	0.125
HCM Control Delay (s)	-	-	28.5	11.1	8.5
HCM Lane LOS	-	-	D	B	A
HCM 95th %tile Q(veh)	-	-	1.9	0.2	0.4

Lanes, Volumes, Timings

2033 No-Build Conditions

3: School Street & Route 128 Northbound On-Ramp/Mill Street

Weekday Evening

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	2	0	45	0	538	43	9	226	54
Future Volume (vph)	0	0	0	2	0	45	0	538	43	9	226	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	10	10	10	12	12	12	14	14	16
Storage Length (ft)	0		0	0		0	0		0	0		150
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			150			920	
Travel Time (s)		22.7			22.7			3.4			20.9	
Peak Hour Factor	0.78	0.78	0.78	0.63	0.63	0.63	0.92	0.92	0.92	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	3%	0%	2%	0%	0%	2%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other





Control Type: Unsignalized

HCM 6th TWSC
3: School Street & Route 128 Northbound On-Ramp/Mill Street

2033 No-Build Conditions
Weekday Evening

Intersection

Int Delay, s/veh 1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	2	0	45	0	538	43	9	226	54
Future Vol, veh/h	0	0	0	2	0	45	0	538	43	9	226	54
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Stop	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	-	-	-	-	-	-	-	-	-	150
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	63	63	63	92	92	92	95	95	95
Heavy Vehicles, %	0	0	0	0	0	3	0	2	0	0	2	0
Mvmt Flow	0	0	0	3	0	71	0	585	47	9	238	57











Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	865	865	609	-	0	0
Stage 1	609	609	-	-	-	-
Stage 2	256	256	-	-	-	-
Critical Hdwy	6.4	6.5	6.23	-	-	4.1
Critical Hdwy Stg 1	5.4	5.5	-	-	-	-
Critical Hdwy Stg 2	5.4	5.5	-	-	-	-
Follow-up Hdwy	3.5	4	3.327	-	-	2.2
Pot Cap-1 Maneuver	327	294	493	0	-	960
Stage 1	547	488	-	0	-	-
Stage 2	791	699	-	0	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	323	0	493	-	-	960
Mov Cap-2 Maneuver	323	0	-	-	-	-
Stage 1	547	0	-	-	-	-
Stage 2	782	0	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.8	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT	SBR
Capacity (veh/h)	-	-	482	960	-
HCM Lane V/C Ratio	-	-	0.155	0.01	-
HCM Control Delay (s)	-	-	13.8	8.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0	-

Lanes, Volumes, Timings
4: School Street & Route 128 Northbound Off-Ramp

2033 No-Build Conditions
Weekday Evening

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	204	225	88	377	228	0
Future Volume (vph)	204	225	88	377	228	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	13	13
Storage Length (ft)	0	130	0			0
Storage Lanes	1	1	0			0
Taper Length (ft)	25		25			
Link Speed (mph)	30			30	30	
Link Distance (ft)	1000			2400	150	
Travel Time (s)	22.7			54.5	3.4	
Peak Hour Factor	0.78	0.78	0.92	0.92	0.95	0.95
Heavy Vehicles (%)	1%	2%	0%	2%	2%	0%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized





HCM 6th TWSC
4: School Street & Route 128 Northbound Off-Ramp

2033 No-Build Conditions
Weekday Evening

Intersection

Int Delay, s/veh 15.3

Movement EBL EBR NBL NBT SBT SBR

Lane Configurations						
Traffic Vol, veh/h	204	225	88	377	228	0
Future Vol, veh/h	204	225	88	377	228	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	130	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	78	78	92	92	95	95
Heavy Vehicles, %	1	2	0	2	2	0
Mvmt Flow	262	288	96	410	240	0

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	842	240	240	0	-	0
Stage 1	240	-	-	-	-	-
Stage 2	602	-	-	-	-	-
Critical Hdwy	6.41	6.22	4.1	-	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.318	2.2	-	-	-
Pot Cap-1 Maneuver	336	799	1339	-	-	0
Stage 1	802	-	-	-	-	0
Stage 2	549	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	305	799	1339	-	-	-
Mov Cap-2 Maneuver	305	-	-	-	-	-
Stage 1	727	-	-	-	-	-
Stage 2	549	-	-	-	-	-

Approach EB NB SB


















HCM Control Delay, s	34.6	1.5	0
HCM LOS	D		

Minor Lane/Major Mvmt NBL NBT EBLn1 EBLn2 SBT

Capacity (veh/h)	1339	-	305	799	-
HCM Lane V/C Ratio	0.071	-	0.858	0.361	-
HCM Control Delay (s)	7.9	0	59.5	12	-
HCM Lane LOS	A	A	F	B	-
HCM 95th %tile Q(veh)	0.2	-	7.6	1.7	-

Lanes, Volumes, Timings
5: School Street & Pleasant Street

2033 No-Build Conditions
Weekday Evening






												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	0	59	13	36	207	19	204	0	0	377	52
Future Volume (vph)	43	0	59	13	36	207	19	204	0	0	377	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	14	15	15	15	10	10	10	11	11	11
Storage Length (ft)	0		0	0		100	0		0	0		0
Storage Lanes	0		0	0		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			550			2400	
Travel Time (s)		22.7			22.7			12.5			54.5	
Confl. Peds. (#/hr)	30		7	2		25	7		2	25		30
Peak Hour Factor	0.80	0.80	0.80	0.87	0.87	0.87	0.78	0.78	0.78	0.89	0.89	0.89
Heavy Vehicles (%)	6%	0%	0%	0%	3%	3%	0%	1%	0%	0%	1%	2%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection

















Intersection Delay, s/veh 18.8
Intersection LOS C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	43	0	59	13	36	207	19	204	0	0	377	52
Future Vol, veh/h	43	0	59	13	36	207	19	204	0	0	377	52
Peak Hour Factor	0.80	0.80	0.80	0.87	0.87	0.87	0.78	0.78	0.78	0.89	0.89	0.89
Heavy Vehicles, %	6	0	0	0	3	3	0	1	0	0	1	2
Mvmt Flow	54	0	74	15	41	238	24	262	0	0	424	58
Number of Lanes	0	1	0	0	1	1	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	2			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			2		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			2			1		
HCM Control Delay	12.1			13.2			15.1			26.2		
HCM LOS	B			B			C			D		

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	9%	42%	27%	0%	0%
Vol Thru, %	91%	0%	73%	0%	88%
Vol Right, %	0%	58%	0%	100%	12%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	223	102	49	207	429
LT Vol	19	43	13	0	0
Through Vol	204	0	36	0	377
RT Vol	0	59	0	207	52
Lane Flow Rate	286	128	56	238	482
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.492	0.243	0.112	0.422	0.778
Departure Headway (Hd)	6.194	6.859	7.188	6.387	5.808
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	580	521	497	562	627
Service Time	4.247	4.932	4.947	4.146	3.808
HCM Lane V/C Ratio	0.493	0.246	0.113	0.423	0.769
HCM Control Delay	15.1	12.1	10.9	13.8	26.2
HCM Lane LOS	C	B	B	B	D
HCM 95th-tile Q	2.7	0.9	0.4	2.1	7.4

Lanes, Volumes, Timings
6: Lincoln Avenue/Lincoln Street & School Street

2033 No-Build Conditions
Weekday Evening

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	3	0	0	0	0	0	180	28	274	201	7
Future Volume (vph)	5	3	0	0	0	0	0	180	28	274	201	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	11	11	11
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			1000			550	
Travel Time (s)		22.7			22.7			22.7			12.5	
Confl. Peds. (#/hr)	7		5	4		6	5		4	6		7
Peak Hour Factor	0.67	0.67	0.67	0.25	0.25	0.25	0.94	0.94	0.94	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other





Control Type: Unsignalized

HCM 6th TWSC
6: Lincoln Avenue/Lincoln Street & School Street

2033 No-Build Conditions
Weekday Evening

Intersection

Int Delay, s/veh 3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	3	0	0	0	0	0	180	28	274	201	7
Future Vol, veh/h	5	3	0	0	0	0	0	180	28	274	201	7
Conflicting Peds, #/hr	7	0	5	4	0	6	5	0	4	6	0	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	67	67	67	25	25	25	94	94	94	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	7	4	0	0	0	0	0	191	30	288	212	7










Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1012	1026	228	1011	1014	219	226	0	0	227	0	0
Stage 1	799	799	-	212	212	-	-	-	-	-	-	-
Stage 2	213	227	-	799	802	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	220	237	816	220	240	826	1354	-	-	1353	-	-
Stage 1	382	401	-	795	731	-	-	-	-	-	-	-
Stage 2	794	720	-	382	399	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	176	177	807	174	179	816	1345	-	-	1345	-	-
Mov Cap-2 Maneuver	176	177	-	174	179	-	-	-	-	-	-	-
Stage 1	379	301	-	790	727	-	-	-	-	-	-	-
Stage 2	789	716	-	283	300	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	26.9	0	0	4.8
HCM LOS	D	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1345	-	-	176	1345	-	-
HCM Lane V/C Ratio	-	-	-	0.068	0.214	-	-
HCM Control Delay (s)	0	-	-	26.9	0	8.4	0
HCM Lane LOS	A	-	-	D	A	A	A
HCM 95th %tile Q(veh)	0	-	-	0.2	-	0.8	-

Lanes, Volumes, Timings
1: School Street & Atwater Avenue

2033 Build Conditions
Weekday Morning

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	66	11	256	248	46	354
Future Volume (vph)	66	11	256	248	46	354
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	30		30			30
Link Distance (ft)	1000		1270			1000
Travel Time (s)	22.7		28.9			22.7
Peak Hour Factor	0.83	0.83	0.83	0.83	0.75	0.75
Heavy Vehicles (%)	4%	0%	3%	2%	0%	4%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other

Control Type: Unsignalized

HCM 6th TWSC
1: School Street & Atwater Avenue

2033 Build Conditions
Weekday Morning

Intersection

Int Delay, s/veh 2.5

Movement WBL WBR NBT NBR SBL SBT

Lane Configurations 

Traffic Vol, veh/h 66 11 256 248 46 354

Future Vol, veh/h 66 11 256 248 46 354

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

Sign Control Stop Stop Free Free Free Free

RT Channelized - None - None - None

Storage Length 0 - - - - -

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

Grade, % 0 - 0 - - 0

Peak Hour Factor 83 83 83 83 75 75

Heavy Vehicles, % 4 0 3 2 0 4

Mvmt Flow 80 13 308 299 61 472

Major/Minor Minor1 Major1 Major2

Conflicting Flow All 1052 458 0 0 607 0

Stage 1 458 - - - - -

Stage 2 594 - - - - -

Critical Hdwy 6.44 6.2 - - 4.1 -

Critical Hdwy Stg 1 5.44 - - - - -

Critical Hdwy Stg 2 5.44 - - - - -

Follow-up Hdwy 3.536 3.3 - - 2.2 -

Pot Cap-1 Maneuver 249 607 - - 981 -

Stage 1 633 - - - - -

Stage 2 548 - - - - -

Platoon blocked, % - - - - -

Mov Cap-1 Maneuver 228 607 - - 981 -

Mov Cap-2 Maneuver 228 - - - - -

Stage 1 633 - - - - -

Stage 2 502 - - - - -

Approach WB NB SB

HCM Control Delay, s 27.7 0 1

HCM LOS D

Minor Lane/Major Mvmt NBT NBRWBLn1 SBL SBT

Capacity (veh/h) - - 250 981 -

HCM Lane V/C Ratio - - 0.371 0.063 -












HCM Control Delay (s) - - 27.7 8.9 0

HCM Lane LOS - - D A A

HCM 95th %tile Q(veh) - - 1.6 0.2 -

Lanes, Volumes, Timings
2: School Street & Route 128 Southbound

2033 Build Conditions
Weekday Morning

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	87	107	432	270	132	306
Future Volume (vph)	87	107	432	270	132	306
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	13	13
Storage Length (ft)	0	50		100	0	
Storage Lanes	1	1		1	0	
Taper Length (ft)	25				25	
Link Speed (mph)	30		30			30
Link Distance (ft)	1000		920			1270
Travel Time (s)	22.7		20.9			28.9
Confl. Peds. (#/hr)	1	1		1	1	
Peak Hour Factor	0.95	0.95	0.74	0.74	0.85	0.85
Heavy Vehicles (%)	0%	2%	3%	0%	1%	5%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary






Area Type: Other
Control Type: Unsignalized

HCM 6th TWSC
2: School Street & Route 128 Southbound

2033 Build Conditions
Weekday Morning

Intersection

Int Delay, s/veh 5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	87	107	432	270	132	306
Future Vol, veh/h	87	107	432	270	132	306
Conflicting Peds, #/hr	1	1	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	0	50	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	74	74	85	85
Heavy Vehicles, %	0	2	3	0	1	5
Mvmt Flow	92	113	584	365	155	360

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1256	586	0	0	585
Stage 1	585	-	-	-	-
Stage 2	671	-	-	-	-
Critical Hdwy	6.4	6.22	-	-	4.11
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.318	-	-	2.209
Pot Cap-1 Maneuver	191	510	-	-	995
Stage 1	561	-	-	-	-
Stage 2	512	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	153	509	-	-	994
Mov Cap-2 Maneuver	153	-	-	-	-
Stage 1	560	-	-	-	-
Stage 2	412	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	34.1	0	2.8
HCM LOS	D		

















Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	153	509	994
HCM Lane V/C Ratio	-	-	0.599	0.221	0.156
HCM Control Delay (s)	-	-	58.6	14.1	9.3
HCM Lane LOS	-	-	F	B	A
HCM 95th %tile Q(veh)	-	-	3.2	0.8	0.6

Lanes, Volumes, Timings

2033 Build Conditions

3: School Street & Route 128 Northbound On-Ramp/Mill Street

Weekday Morning

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	4	8	85	0	618	20	33	320	40
Future Volume (vph)	0	0	0	4	8	85	0	618	20	33	320	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	10	10	10	12	12	12	14	14	16
Storage Length (ft)	0		0	0		0	0		0	0		150
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			150			920	
Travel Time (s)		22.7			22.7			3.4			20.9	
Peak Hour Factor	0.25	0.25	0.25	0.65	0.65	0.65	0.74	0.74	0.74	0.76	0.76	0.76
Heavy Vehicles (%)	0%	0%	0%	25%	29%	0%	0%	2%	0%	11%	3%	4%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other





Control Type: Unsignalized

HCM 6th TWSC
3: School Street & Route 128 Northbound On-Ramp/Mill Street

2033 Build Conditions
Weekday Morning

Intersection

Int Delay, s/veh 2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	4	8	85	0	618	20	33	320	40
Future Vol, veh/h	0	0	0	4	8	85	0	618	20	33	320	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Stop	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	-	-	-	-	-	-	-	-	-	150
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	25	25	25	65	65	65	74	74	74	76	76	76
Heavy Vehicles, %	0	0	0	25	29	0	0	2	0	11	3	4
Mvmt Flow	0	0	0	6	12	131	0	835	27	43	421	53











Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1356	1356	849	-	0	0
Stage 1	849	849	-	-	-	-
Stage 2	507	507	-	-	-	-
Critical Hdwy	6.65	6.79	6.2	-	-	4.21
Critical Hdwy Stg 1	5.65	5.79	-	-	-	-
Critical Hdwy Stg 2	5.65	5.79	-	-	-	-
Follow-up Hdwy	3.725	4.261	3.3	-	-	2.299
Pot Cap-1 Maneuver	147	131	364	0	-	743
Stage 1	383	342	-	0	-	-
Stage 2	560	497	-	0	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	135	0	364	-	-	743
Mov Cap-2 Maneuver	135	0	-	-	-	-
Stage 1	383	0	-	-	-	-
Stage 2	516	0	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	23.8	0	0.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT	SBR
Capacity (veh/h)	-	-	338	743	-
HCM Lane V/C Ratio	-	-	0.442	0.058	-
HCM Control Delay (s)	-	-	23.8	10.1	0
HCM Lane LOS	-	-	C	B	A
HCM 95th %tile Q(veh)	-	-	2.2	0.2	-

Lanes, Volumes, Timings
4: School Street & Route 128 Northbound Off-Ramp

2033 Build Conditions
Weekday Morning

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	223	134	52	415	324	0
Future Volume (vph)	223	134	52	415	324	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	13	13
Storage Length (ft)	0	130	0			0
Storage Lanes	1	1	0			0
Taper Length (ft)	25		25			
Link Speed (mph)	30			30	30	
Link Distance (ft)	1000			2400	150	
Travel Time (s)	22.7			54.5	3.4	
Peak Hour Factor	0.83	0.83	0.73	0.73	0.75	0.75
Heavy Vehicles (%)	5%	4%	0%	1%	3%	0%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized





HCM 6th TWSC
4: School Street & Route 128 Northbound Off-Ramp

2033 Build Conditions
Weekday Morning

Intersection

Int Delay, s/veh 43.5

Movement EBL EBR NBL NBT SBT SBR

Lane Configurations						
Traffic Vol, veh/h	223	134	52	415	324	0
Future Vol, veh/h	223	134	52	415	324	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	130	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	83	83	73	73	75	75
Heavy Vehicles, %	5	4	0	1	3	0
Mvmt Flow	269	161	71	568	432	0

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	1142	432	432	0	-	0
Stage 1	432	-	-	-	-	-
Stage 2	710	-	-	-	-	-
Critical Hdwy	6.45	6.24	4.1	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.336	2.2	-	-	-
Pot Cap-1 Maneuver	~ 219	619	1138	-	-	0
Stage 1	648	-	-	-	-	0
Stage 2	482	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 199	619	1138	-	-	-
Mov Cap-2 Maneuver	~ 199	-	-	-	-	-
Stage 1	589	-	-	-	-	-
Stage 2	482	-	-	-	-	-

Approach EB NB SB

HCM Control Delay, s	150.4	0.9	0
HCM LOS	F		

Minor Lane/Major Mvmt NBL NBT EBLn1 EBLn2 SBT


















Capacity (veh/h)	1138	-	199	619	-
HCM Lane V/C Ratio	0.063	-	1.35	0.261	-
HCM Control Delay (s)	8.4	0	233	12.9	-
HCM Lane LOS	A	A	F	B	-
HCM 95th %tile Q(veh)	0.2	-	15.3	1	-

Notes

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

Lanes, Volumes, Timings
5: School Street & Pleasant Street

2033 Build Conditions
Weekday Morning

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	0	142	40	85	284	3	174	0	0	402	31
Future Volume (vph)	40	0	142	40	85	284	3	174	0	0	402	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	14	15	15	15	10	10	10	11	11	11
Storage Length (ft)	0		0	0		100	0		0	0		0
Storage Lanes	0		0	0		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			550			2400	
Travel Time (s)		22.7			22.7			12.5			54.5	
Confl. Peds. (#/hr)	21		8	7		20	8		7	20		21
Peak Hour Factor	0.50	0.50	0.50	0.58	0.58	0.58	0.78	0.78	0.78	0.83	0.83	0.83
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%	0%	1%	0%	0%	2%	9%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized






HCM 6th AWSC
5: School Street & Pleasant Street

2033 Build Conditions

Weekday Morning

Intersection

















Intersection Delay, s/veh 72.8
Intersection LOS F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	40	0	142	40	85	284	3	174	0	0	402	31
Future Vol, veh/h	40	0	142	40	85	284	3	174	0	0	402	31
Peak Hour Factor	0.50	0.50	0.50	0.58	0.58	0.58	0.78	0.78	0.78	0.83	0.83	0.83
Heavy Vehicles, %	0	0	0	0	1	1	0	1	0	0	2	9
Mvmt Flow	80	0	284	69	147	490	4	223	0	0	484	37
Number of Lanes	0	1	0	0	1	1	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	2			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			2		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			2			1		
HCM Control Delay	41.3			66.6			25.1			123.9		
HCM LOS	E			F			D			F		

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	2%	22%	32%	0%	0%
Vol Thru, %	98%	0%	68%	0%	93%
Vol Right, %	0%	78%	0%	100%	7%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	177	182	125	284	433
LT Vol	3	40	40	0	0
Through Vol	174	0	85	0	402
RT Vol	0	142	0	284	31
Lane Flow Rate	227	364	216	490	522
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.572	0.82	0.514	1.052	1.164
Departure Headway (Hd)	9.795	8.818	9.204	8.326	8.327
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	370	415	394	441	438
Service Time	7.795	6.818	6.904	6.026	6.327
HCM Lane V/C Ratio	0.614	0.877	0.548	1.111	1.192
HCM Control Delay	25.1	41.3	21.2	86.6	123.9
HCM Lane LOS	D	E	C	F	F
HCM 95th-tile Q	3.4	7.5	2.8	14.5	18.9

Lanes, Volumes, Timings
6: Lincoln Avenue/Lincoln Street & School Street

2033 Build Conditions
Weekday Morning

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	4	6	1	2	181	43	323	206	6
Future Volume (vph)	0	0	0	4	6	1	2	181	43	323	206	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	11	11	11
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			1000			550	
Travel Time (s)		22.7			22.7			22.7			12.5	
Confl. Peds. (#/hr)	8		3			5	3			5		8
Peak Hour Factor	0.55	0.55	0.55	0.92	0.92	0.92	0.80	0.80	0.80	0.71	0.71	0.71
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	2%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other





Control Type: Unsignalized

HCM 6th TWSC
6: Lincoln Avenue/Lincoln Street & School Street

2033 Build Conditions
Weekday Morning

Intersection

Int Delay, s/veh 4.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	4	6	1	2	181	43	323	206	6
Future Vol, veh/h	0	0	0	4	6	1	2	181	43	323	206	6
Conflicting Peds, #/hr	8	0	3	0	0	5	3	0	0	5	0	8
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	55	55	55	92	92	92	80	80	80	71	71	71
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	1	2	0
Mvmt Flow	0	0	0	4	7	1	3	226	54	455	290	8










Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1483	1503	305	1471	1480	266	306	0	0	285	0	0
Stage 1	1212	1212	-	264	264	-	-	-	-	-	-	-
Stage 2	271	291	-	1207	1216	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.209	-	-
Pot Cap-1 Maneuver	104	123	740	106	127	778	1266	-	-	1283	-	-
Stage 1	225	257	-	746	694	-	-	-	-	-	-	-
Stage 2	739	675	-	226	256	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	64	69	732	70	72	769	1256	-	-	1277	-	-
Mov Cap-2 Maneuver	64	69	-	70	72	-	-	-	-	-	-	-
Stage 1	223	146	-	740	688	-	-	-	-	-	-	-
Stage 2	724	670	-	129	145	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	59.3	0.1	5.7
HCM LOS	A	F		




Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1256	-	-	- 78	1277	-	-
HCM Lane V/C Ratio	0.002	-	-	- 0.153	0.356	-	-
HCM Control Delay (s)	7.9	0	-	0 59.3	9.4	0	-
HCM Lane LOS	A	A	-	A F	A	A	-
HCM 95th %tile Q(veh)	0	-	-	- 0.5	1.6	-	-

Lanes, Volumes, Timings
1: School Street & Atwater Avenue

2033 Build Conditions
Weekday Evening

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	234	45	317	102	15	246
Future Volume (vph)	234	45	317	102	15	246
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	30		30			30
Link Distance (ft)	1000		1270			1000
Travel Time (s)	22.7		28.9			22.7
Confl. Peds. (#/hr)		1			1	
Peak Hour Factor	0.81	0.81	0.86	0.86	0.89	0.89
Heavy Vehicles (%)	2%	0%	1%	0%	0%	1%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					

Intersection

Int Delay, s/veh	15.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	234	45	317	102	15	246
Future Vol, veh/h	234	45	317	102	15	246
Conflicting Peds, #/hr	0	1	0	0	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	81	81	86	86	89	89
Heavy Vehicles, %	2	0	1	0	0	1
Mvmt Flow	289	56	369	119	17	276












Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	740	431	0
Stage 1	430	-	-
Stage 2	310	-	-
Critical Hdwy	6.42	6.2	-
Critical Hdwy Stg 1	5.42	-	-
Critical Hdwy Stg 2	5.42	-	-
Follow-up Hdwy	3.518	3.3	-
Pot Cap-1 Maneuver	384	629	-
Stage 1	656	-	-
Stage 2	744	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	376	628	-
Mov Cap-2 Maneuver	376	-	-
Stage 1	655	-	-
Stage 2	730	-	-

Approach	WB	NB	SB
HCM Control Delay, s	48.8	0	0.5
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	402	1084
HCM Lane V/C Ratio	-	-	0.857	0.016
HCM Control Delay (s)	-	-	48.8	8.4
HCM Lane LOS	-	-	E	A
HCM 95th %tile Q(veh)	-	-	8.3	0

Lanes, Volumes, Timings
2: School Street & Route 128 Southbound

2033 Build Conditions
Weekday Evening

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	84	43	396	212	219	295
Future Volume (vph)	84	43	396	212	219	295
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	13	13
Storage Length (ft)	0	50		100	0	
Storage Lanes	1	1		1	0	
Taper Length (ft)	25				25	
Link Speed (mph)	30		30			30
Link Distance (ft)	1000		920			1270
Travel Time (s)	22.7		20.9			28.9
Peak Hour Factor	0.81	0.81	0.91	0.91	0.88	0.88
Heavy Vehicles (%)	1%	7%	2%	1%	0%	1%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other






Control Type: Unsignalized

HCM 6th TWSC
2: School Street & Route 128 Southbound

2033 Build Conditions
Weekday Evening

Intersection

Int Delay, s/veh 8.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	84	43	396	212	219	295
Future Vol, veh/h	84	43	396	212	219	295
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	0	50	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	81	81	91	91	88	88
Heavy Vehicles, %	1	7	2	1	0	1
Mvmt Flow	104	53	435	233	249	335

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1268	435	0	0	435
Stage 1	435	-	-	-	-
Stage 2	833	-	-	-	-
Critical Hdwy	6.41	6.27	-	-	4.1
Critical Hdwy Stg 1	5.41	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-
Follow-up Hdwy	3.509	3.363	-	-	2.2
Pot Cap-1 Maneuver	187	611	-	-	1135
Stage 1	655	-	-	-	-
Stage 2	428	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	137	611	-	-	1135
Mov Cap-2 Maneuver	137	-	-	-	-
Stage 1	655	-	-	-	-
Stage 2	312	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	60.7	0	3.9
HCM LOS	F		

















Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	137	611	1135	-
HCM Lane V/C Ratio	-	-	0.757	0.087	0.219	-
HCM Control Delay (s)	-	-	85.9	11.5	9.1	0
HCM Lane LOS	-	-	F	B	A	A
HCM 95th %tile Q(veh)	-	-	4.5	0.3	0.8	-

Lanes, Volumes, Timings

2033 Build Conditions

3: School Street & Route 128 Northbound On-Ramp/Mill Street

Weekday Evening

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	2	0	46	0	562	43	12	269	98
Future Volume (vph)	0	0	0	2	0	46	0	562	43	12	269	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	10	10	10	12	12	12	14	14	16
Storage Length (ft)	0		0	0		0	0		0	0		150
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			150			920	
Travel Time (s)		22.7			22.7			3.4			20.9	
Peak Hour Factor	0.78	0.78	0.78	0.63	0.63	0.63	0.92	0.92	0.92	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	3%	0%	2%	0%	0%	2%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other





Control Type: Unsignalized

HCM 6th TWSC
3: School Street & Route 128 Northbound On-Ramp/Mill Street

2033 Build Conditions
Weekday Evening

Intersection

Int Delay, s/veh 1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	2	0	46	0	562	43	12	269	98
Future Vol, veh/h	0	0	0	2	0	46	0	562	43	12	269	98
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Stop	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	-	-	-	-	-	-	-	-	-	150
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	63	63	63	92	92	92	95	95	95
Heavy Vehicles, %	0	0	0	0	0	3	0	2	0	0	2	0
Mvmt Flow	0	0	0	3	0	73	0	611	47	13	283	103











Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	944	944	635	-	0	0
Stage 1	635	635	-	-	-	-
Stage 2	309	309	-	-	-	-
Critical Hdwy	6.4	6.5	6.23	-	-	4.1
Critical Hdwy Stg 1	5.4	5.5	-	-	-	-
Critical Hdwy Stg 2	5.4	5.5	-	-	-	-
Follow-up Hdwy	3.5	4	3.327	-	-	2.2
Pot Cap-1 Maneuver	293	264	477	0	-	939
Stage 1	532	476	-	0	-	-
Stage 2	749	663	-	0	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	288	0	477	-	-	939
Mov Cap-2 Maneuver	288	0	-	-	-	-
Stage 1	532	0	-	-	-	-
Stage 2	736	0	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.3	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT	SBR
Capacity (veh/h)	-	-	464	939	-
HCM Lane V/C Ratio	-	-	0.164	0.013	-
HCM Control Delay (s)	-	-	14.3	8.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.6	0	-

Lanes, Volumes, Timings
4: School Street & Route 128 Northbound Off-Ramp

2033 Build Conditions
Weekday Evening

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	221	225	88	384	271	0
Future Volume (vph)	221	225	88	384	271	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	13	13
Storage Length (ft)	0	130	0			0
Storage Lanes	1	1	0			0
Taper Length (ft)	25		25			
Link Speed (mph)	30			30	30	
Link Distance (ft)	1000			2400	150	
Travel Time (s)	22.7			54.5	3.4	
Peak Hour Factor	0.78	0.78	0.92	0.92	0.95	0.95
Heavy Vehicles (%)	1%	2%	0%	2%	2%	0%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized





HCM 6th TWSC
4: School Street & Route 128 Northbound Off-Ramp

2033 Build Conditions
Weekday Evening

Intersection

Int Delay, s/veh 22.6

Movement EBL EBR NBL NBT SBT SBR

Lane Configurations						
Traffic Vol, veh/h	221	225	88	384	271	0
Future Vol, veh/h	221	225	88	384	271	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	130	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	78	78	92	92	95	95
Heavy Vehicles, %	1	2	0	2	2	0
Mvmt Flow	283	288	96	417	285	0

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	894	285	285	0	-	0
Stage 1	285	-	-	-	-	-
Stage 2	609	-	-	-	-	-
Critical Hdwy	6.41	6.22	4.1	-	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.318	2.2	-	-	-
Pot Cap-1 Maneuver	313	754	1289	-	-	0
Stage 1	766	-	-	-	-	0
Stage 2	545	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 283	754	1289	-	-	-
Mov Cap-2 Maneuver	~ 283	-	-	-	-	-
Stage 1	692	-	-	-	-	-
Stage 2	545	-	-	-	-	-

Approach EB NB SB

HCM Control Delay, s	52.8	1.5	0
HCM LOS	F		

Minor Lane/Major Mvmt NBL NBT EBLn1 EBLn2 SBT


















Capacity (veh/h)	1289	-	283	754	-
HCM Lane V/C Ratio	0.074	-	1.001	0.383	-
HCM Control Delay (s)	8	0	93.7	12.7	-
HCM Lane LOS	A	A	F	B	-
HCM 95th %tile Q(veh)	0.2	-	10.3	1.8	-

Notes

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

Lanes, Volumes, Timings
5: School Street & Pleasant Street

2033 Build Conditions
Weekday Evening






												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	0	59	13	36	210	19	206	0	0	407	65
Future Volume (vph)	45	0	59	13	36	210	19	206	0	0	407	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	14	14	14	15	15	15	10	10	10	11	11	11
Storage Length (ft)	0		0	0		100	0		0	0		0
Storage Lanes	0		0	0		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			550			2400	
Travel Time (s)		22.7			22.7			12.5			54.5	
Confl. Peds. (#/hr)	30		7	2		25	7		2	25		30
Peak Hour Factor	0.80	0.80	0.80	0.87	0.87	0.87	0.78	0.78	0.78	0.89	0.89	0.89
Heavy Vehicles (%)	6%	0%	0%	0%	3%	3%	0%	1%	0%	0%	1%	2%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection

















Intersection Delay, s/veh 23.1
Intersection LOS C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	45	0	59	13	36	210	19	206	0	0	407	65
Future Vol, veh/h	45	0	59	13	36	210	19	206	0	0	407	65
Peak Hour Factor	0.80	0.80	0.80	0.87	0.87	0.87	0.78	0.78	0.78	0.89	0.89	0.89
Heavy Vehicles, %	6	0	0	0	3	3	0	1	0	0	1	2
Mvmt Flow	56	0	74	15	41	241	24	264	0	0	457	73
Number of Lanes	0	1	0	0	1	1	0	1	0	0	1	0
Approach	EB			WB			NB				SB	
Opposing Approach	WB			EB			SB				NB	
Opposing Lanes	2			1			1				1	
Conflicting Approach Left	SB			NB			EB				WB	
Conflicting Lanes Left	1			1			1				2	
Conflicting Approach Right	NB			SB			WB				EB	
Conflicting Lanes Right	1			1			2				1	
HCM Control Delay	12.7			13.9			16				34.7	
HCM LOS	B			B			C				D	

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	8%	43%	27%	0%	0%
Vol Thru, %	92%	0%	73%	0%	86%
Vol Right, %	0%	57%	0%	100%	14%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	225	104	49	210	472
LT Vol	19	45	13	0	0
Through Vol	206	0	36	0	407
RT Vol	0	59	0	210	65
Lane Flow Rate	288	130	56	241	530
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.511	0.257	0.116	0.442	0.861
Departure Headway (Hd)	6.372	7.111	7.39	6.588	5.843
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	562	503	484	546	620
Service Time	4.434	5.189	5.151	4.349	3.894
HCM Lane V/C Ratio	0.512	0.258	0.116	0.441	0.855
HCM Control Delay	16	12.7	11.1	14.5	34.7
HCM Lane LOS	C	B	B	B	D
HCM 95th-tile Q	2.9	1	0.4	2.2	9.7

Lanes, Volumes, Timings
6: Lincoln Avenue/Lincoln Street & School Street

2033 Build Conditions
Weekday Evening

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	3	0	0	0	0	0	182	28	290	215	6
Future Volume (vph)	5	3	0	0	0	0	0	182	28	290	215	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	11	11	11
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			1000			550	
Travel Time (s)		22.7			22.7			22.7			12.5	
Confl. Peds. (#/hr)	7		5	4		6	5		4	6		7
Peak Hour Factor	0.67	0.67	0.67	0.25	0.25	0.25	0.94	0.94	0.94	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

HCM 6th TWSC
6: Lincoln Avenue/Lincoln Street & School Street

2033 Build Conditions
Weekday Evening

Intersection

Int Delay, s/veh 3.8

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

Lane Configurations

Traffic Vol, veh/h	5	3	0	0	0	0	0	182	28	290	215	6
Future Vol, veh/h	5	3	0	0	0	0	0	182	28	290	215	6
Conflicting Peds, #/hr	7	0	5	4	0	6	5	0	4	6	0	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	67	67	67	25	25	25	94	94	94	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	7	4	0	0	0	0	0	194	30	305	226	6

Major/Minor	Minor2		Minor1		Major1		Major2	
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Conflicting Flow All	1062	1076	241	1061	1064	222	239	0	0	230	0	0
Stage 1	846	846	-	215	215	-	-	-	-	-	-	-
Stage 2	216	230	-	846	849	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	203	221	803	203	225	823	1340	-	-	1350	-	-
Stage 1	360	381	-	792	729	-	-	-	-	-	-	-
Stage 2	791	718	-	360	380	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	160	161	794	157	164	813	1331	-	-	1342	-	-
Mov Cap-2 Maneuver	160	161	-	157	164	-	-	-	-	-	-	-
Stage 1	357	280	-	787	725	-	-	-	-	-	-	-
Stage 2	786	714	-	261	279	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
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HCM Control Delay, s	29.3	0	0	4.8
HCM LOS	D	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
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














Capacity (veh/h)	1331	-	-	160	-	1342	-
HCM Lane V/C Ratio	-	-	-	0.075	-	0.227	-
HCM Control Delay (s)	0	-	-	29.3	0	8.5	0
HCM Lane LOS	A	-	-	D	A	A	A
HCM 95th %tile Q(veh)	0	-	-	0.2	-	0.9	-

Lanes, Volumes, Timings

2033 Build Mitigation Conditions

3: School Street & Route 128 Northbound On-Ramp/Mill Street

Weekday Morning

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	4	8	85	0	618	20	33	320	40
Future Volume (vph)	0	0	0	4	8	85	0	618	20	33	320	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	10	10	10	12	12	12	14	14	16
Storage Length (ft)	0		0	0		0	0		0	0		150
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			150			920	
Travel Time (s)		22.7			22.7			3.4			20.9	
Peak Hour Factor	0.25	0.25	0.25	0.65	0.65	0.65	0.74	0.74	0.74	0.76	0.76	0.76
Heavy Vehicles (%)	0%	0%	0%	25%	29%	0%	0%	2%	0%	11%	3%	4%
Shared Lane Traffic (%)												
Turn Type				Split	NA			NA		pm+pt	NA	Perm
Protected Phases				4	4			2 3		1	2	
Permitted Phases										2		2
Detector Phase				4	4			2 3		1	2	2
Switch Phase												
Minimum Initial (s)				4.0	4.0					6.0	10.0	10.0
Minimum Split (s)				10.0	10.0					12.0	16.0	16.0
Total Split (s)				11.0	11.0					12.0	34.0	34.0
Total Split (%)				14.7%	14.7%					16.0%	45.3%	45.3%
Maximum Green (s)				5.0	5.0					7.0	28.0	28.0
Yellow Time (s)				3.5	3.5					3.5	3.5	3.5
All-Red Time (s)				2.5	2.5					1.5	2.5	2.5
Lost Time Adjust (s)					0.0						0.0	0.0
Total Lost Time (s)					6.0						6.0	6.0
Lead/Lag				Lag	Lag					Lead	Lag	Lag
Lead-Lag Optimize?				Yes	Yes					Yes	Yes	Yes
Vehicle Extension (s)				2.0	2.0					2.0	3.0	3.0
Recall Mode				None	None					Min	Min	Min

Intersection Summary

Area Type: Other

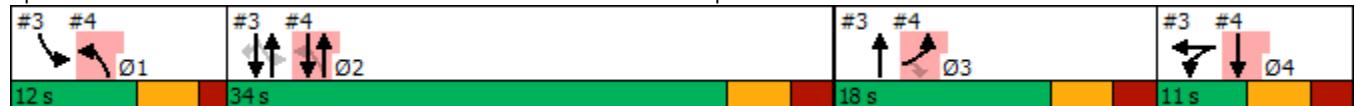
Cycle Length: 75

Actuated Cycle Length: 73.9

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

Splits and Phases: 3: School Street & Route 128 Northbound On-Ramp/Mill Street



Lane Group Ø3

Lane Configurations

Traffic Volume (vph)

Future Volume (vph)

Ideal Flow (vphpl)

Lane Width (ft)

Storage Length (ft)

Storage Lanes

Taper Length (ft)

Right Turn on Red

Link Speed (mph)

Link Distance (ft)

Travel Time (s)

Peak Hour Factor

Heavy Vehicles (%)

Shared Lane Traffic (%)

Turn Type

Protected Phases 3

Permitted Phases

Detector Phase

Switch Phase

Minimum Initial (s) 6.0

Minimum Split (s) 12.0

Total Split (s) 18.0

Total Split (%) 24%

Maximum Green (s) 12.0

Yellow Time (s) 3.5

All-Red Time (s) 2.5

Lost Time Adjust (s)

Total Lost Time (s)

Lead/Lag Lead

Lead-Lag Optimize? Yes

Vehicle Extension (s) 2.0

Recall Mode None





Intersection Summary

Queues

2033 Build Mitigation Conditions

3: School Street & Route 128 Northbound On-Ramp/Mill Street

Weekday Morning

















				
Lane Group	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	149	862	464	53
v/c Ratio	0.67	0.75	0.83	0.07
Control Delay	25.2	7.7	30.5	0.2
Queue Delay	1.2	18.5	2.9	0.0
Total Delay	26.5	26.2	33.4	0.2
Queue Length 50th (ft)	8	91	123	0
Queue Length 95th (ft)	26	96	151	0
Internal Link Dist (ft)	920	70	840	
Turn Bay Length (ft)				150
Base Capacity (vph)	224	1157	559	793
Starvation Cap Reductn	0	305	0	0
Spillback Cap Reductn	13	0	38	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.71	1.01	0.89	0.07
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

2033 Build Mitigation Conditions

3: School Street & Route 128 Northbound On-Ramp/Mill Street











Weekday Morning

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	4	8	85	0	618	20	33	320	40
Future Volume (vph)	0	0	0	4	8	85	0	618	20	33	320	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	10	10	10	12	12	12	14	14	16
Total Lost time (s)					6.0			6.0			6.0	6.0
Lane Util. Factor					1.00			1.00			1.00	1.00
Frt					0.88			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					1509			1856			1945	1760
Flt Permitted					1.00			1.00			0.58	1.00
Satd. Flow (perm)					1509			1856			1129	1760
Peak-hour factor, PHF	0.25	0.25	0.25	0.65	0.65	0.65	0.74	0.74	0.74	0.76	0.76	0.76
Adj. Flow (vph)	0	0	0	6	12	131	0	835	27	43	421	53
RTOR Reduction (vph)	0	0	0	0	122	0	0	2	0	0	0	33
Lane Group Flow (vph)	0	0	0	0	27	0	0	860	0	0	464	20
Heavy Vehicles (%)	0%	0%	0%	25%	29%	0%	0%	2%	0%	11%	3%	4%
Turn Type				Split	NA			NA		pm+pt	NA	Perm
Protected Phases				4	4			2 3		1	2	
Permitted Phases										2		2
Actuated Green, G (s)					5.0			45.9			34.0	28.0
Effective Green, g (s)					5.0			45.9			34.0	28.0
Actuated g/C Ratio					0.07			0.62			0.46	0.38
Clearance Time (s)					6.0						6.0	6.0
Vehicle Extension (s)					2.0						3.0	3.0
Lane Grp Cap (vph)					102			1152			585	666
v/s Ratio Prot					c0.02			c0.46			c0.06	
v/s Ratio Perm											0.30	0.01
v/c Ratio					0.26			0.75			0.79	0.03
Uniform Delay, d1					32.7			9.9			17.0	14.4
Progression Factor					1.00			0.50			1.00	1.00
Incremental Delay, d2					0.5			1.4			7.3	0.0
Delay (s)					33.2			6.4			24.2	14.4
Level of Service					C			A			C	B
Approach Delay (s)		0.0			33.2			6.4			23.2	
Approach LOS		A			C			A			C	
Intersection Summary												
HCM 2000 Control Delay			14.7									
HCM 2000 Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			73.9									
Intersection Capacity Utilization			60.2%									
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
4: School Street & Route 128 Northbound Off-Ramp

2033 Build Mitigation Conditions

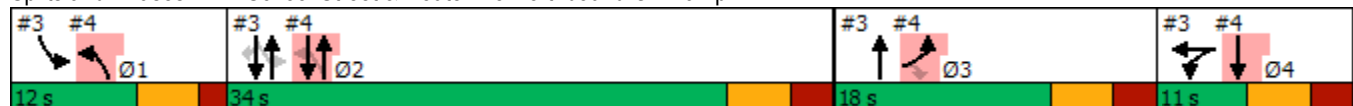
Weekday Morning

							
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø4
Lane Configurations							
Traffic Volume (vph)	223	134	52	415	324	0	
Future Volume (vph)	223	134	52	415	324	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	16	16	12	12	13	13	
Storage Length (ft)	0	130	0			0	
Storage Lanes	1	1	0			0	
Taper Length (ft)	25		25				
Right Turn on Red		Yes				Yes	
Link Speed (mph)	30			30	30		
Link Distance (ft)	1000			2400	150		
Travel Time (s)	22.7			54.5	3.4		
Peak Hour Factor	0.83	0.83	0.73	0.73	0.75	0.75	
Heavy Vehicles (%)	5%	4%	0%	1%	3%	0%	
Shared Lane Traffic (%)							
Turn Type	Prot	Perm	pm+pt	NA	NA		
Protected Phases	3		1	2	2 4		4
Permitted Phases		3	2				
Detector Phase	3	3	1	2	2 4		
Switch Phase							
Minimum Initial (s)	6.0	6.0	6.0	10.0			4.0
Minimum Split (s)	12.0	12.0	12.0	16.0			10.0
Total Split (s)	18.0	18.0	12.0	34.0			11.0
Total Split (%)	24.0%	24.0%	16.0%	45.3%			15%
Maximum Green (s)	12.0	12.0	7.0	28.0			5.0
Yellow Time (s)	3.5	3.5	3.5	3.5			3.5
All-Red Time (s)	2.5	2.5	1.5	2.5			2.5
Lost Time Adjust (s)	0.0	0.0		0.0			
Total Lost Time (s)	6.0	6.0		6.0			
Lead/Lag	Lead	Lead	Lead	Lag			Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes
Vehicle Extension (s)	2.0	2.0	2.0	3.0			2.0
Recall Mode	None	None	Min	Min			None

Intersection Summary





Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 73.9
Natural Cycle: 75
Control Type: Actuated-Uncoordinated

Splits and Phases: 4: School Street & Route 128 Northbound Off-Ramp



Queues
4: School Street & Route 128 Northbound Off-Ramp

2033 Build Mitigation Conditions
Weekday Morning

				
Lane Group	EBL	EBR	NBT	SBT
Lane Group Flow (vph)	269	161	639	432
v/c Ratio	0.86	0.39	0.86	0.51
Control Delay	57.9	8.1	31.4	5.1
Queue Delay	2.8	0.0	19.0	3.3
Total Delay	60.8	8.1	50.4	8.4
Queue Length 50th (ft)	122	0	195	63
Queue Length 95th (ft)	#215	39	214	61
Internal Link Dist (ft)	920		2320	70
Turn Bay Length (ft)		130		
Base Capacity (vph)	316	420	741	850
Starvation Cap Reductn	0	0	0	314
Spillback Cap Reductn	13	0	111	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.89	0.38	1.01	0.81

Intersection Summary











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

HCM Signalized Intersection Capacity Analysis

4: School Street & Route 128 Northbound Off-Ramp

2033 Build Mitigation Conditions

Weekday Morning

















						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	223	134	52	415	324	0
Future Volume (vph)	223	134	52	415	324	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	12	12	13	13
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		0.99	1.00	
Satd. Flow (prot)	1948	1760		1873	1906	
Flt Permitted	0.95	1.00		0.86	1.00	
Satd. Flow (perm)	1948	1760		1623	1906	
Peak-hour factor, PHF	0.83	0.83	0.73	0.73	0.75	0.75
Adj. Flow (vph)	269	161	71	568	432	0
RTOR Reduction (vph)	0	135	0	0	0	0
Lane Group Flow (vph)	269	26	0	639	432	0
Heavy Vehicles (%)	5%	4%	0%	1%	3%	0%
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	3		1	2	2 4	
Permitted Phases		3	2			
Actuated Green, G (s)	11.9	11.9		34.0	33.0	
Effective Green, g (s)	11.9	11.9		34.0	33.0	
Actuated g/C Ratio	0.16	0.16		0.46	0.45	
Clearance Time (s)	6.0	6.0		6.0		
Vehicle Extension (s)	2.0	2.0		3.0		
Lane Grp Cap (vph)	313	283		767	851	
v/s Ratio Prot	c0.14			c0.07	c0.23	
v/s Ratio Perm		0.01		c0.32		
v/c Ratio	0.86	0.09		0.83	0.51	
Uniform Delay, d1	30.2	26.4		17.5	14.6	
Progression Factor	1.00	1.00		1.00	0.38	
Incremental Delay, d2	19.6	0.1		7.7	0.3	
Delay (s)	49.8	26.4		25.2	5.8	
Level of Service	D	C		C	A	
Approach Delay (s)	41.0			25.2	5.8	
Approach LOS	D			C	A	
Intersection Summary						
HCM 2000 Control Delay			24.1		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.81			
Actuated Cycle Length (s)			73.9		Sum of lost time (s)	23.0
Intersection Capacity Utilization			69.1%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

Lanes, Volumes, Timings

2033 Build Mitigation Conditions

3: School Street & Route 128 Northbound On-Ramp/Mill Street

Weekday Evening

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	2	0	46	0	562	43	12	269	98
Future Volume (vph)	0	0	0	2	0	46	0	562	43	12	269	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	10	10	10	12	12	12	14	14	16
Storage Length (ft)	0		0	0		0	0		0	0		150
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			150			920	
Travel Time (s)		22.7			22.7			3.4			20.9	
Peak Hour Factor	0.78	0.78	0.78	0.63	0.63	0.63	0.92	0.92	0.92	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	3%	0%	2%	0%	0%	2%	0%
Shared Lane Traffic (%)												
Turn Type				Split	NA			NA		pm+pt	NA	Perm
Protected Phases				4	4			2 3		1	2	
Permitted Phases										2		2
Detector Phase				4	4			2 3		1	2	2
Switch Phase												
Minimum Initial (s)				4.0	4.0					6.0	10.0	10.0
Minimum Split (s)				10.0	10.0					11.0	16.0	16.0
Total Split (s)				10.0	10.0					11.0	23.0	23.0
Total Split (%)				16.7%	16.7%					18.3%	38.3%	38.3%
Maximum Green (s)				4.0	4.0					6.0	17.0	17.0
Yellow Time (s)				3.5	3.5					3.5	3.5	3.5
All-Red Time (s)				2.5	2.5					1.5	2.5	2.5
Lost Time Adjust (s)					0.0						0.0	0.0
Total Lost Time (s)					6.0						6.0	6.0
Lead/Lag				Lag	Lag					Lead	Lag	Lag
Lead-Lag Optimize?				Yes	Yes					Yes	Yes	Yes
Vehicle Extension (s)				2.0	2.0					2.0	3.0	3.0
Recall Mode				None	None					Min	Min	Min

Intersection Summary

Area Type: Other

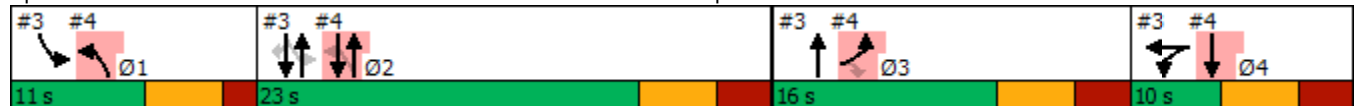
Cycle Length: 60

Actuated Cycle Length: 60

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Splits and Phases: 3: School Street & Route 128 Northbound On-Ramp/Mill Street



Lane Group Ø3

Lane Configurations

Traffic Volume (vph)

Future Volume (vph)

Ideal Flow (vphpl)

Lane Width (ft)

Storage Length (ft)

Storage Lanes

Taper Length (ft)

Right Turn on Red

Link Speed (mph)

Link Distance (ft)

Travel Time (s)

Peak Hour Factor

Heavy Vehicles (%)

Shared Lane Traffic (%)

Turn Type

Protected Phases 3

Permitted Phases

Detector Phase

Switch Phase

Minimum Initial (s) 6.0

Minimum Split (s) 12.0

Total Split (s) 16.0

Total Split (%) 27%

Maximum Green (s) 10.0

Yellow Time (s) 3.5

All-Red Time (s) 2.5

Lost Time Adjust (s)

Total Lost Time (s)

Lead/Lag Lead

Lead-Lag Optimize? Yes

Vehicle Extension (s) 2.0

Recall Mode None

Intersection Summary

Queues

2033 Build Mitigation Conditions

3: School Street & Route 128 Northbound On-Ramp/Mill Street

Weekday Evening

	←	↑	↓	↙
Lane Group	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	76	658	296	103
v/c Ratio	0.23	0.65	0.42	0.15
Control Delay	1.5	7.2	13.5	0.4
Queue Delay	0.1	38.6	0.1	0.0
Total Delay	1.7	45.8	13.7	0.4
Queue Length 50th (ft)	0	2	63	0
Queue Length 95th (ft)	0	m96	109	0
Internal Link Dist (ft)	920	70	840	
Turn Bay Length (ft)				150
Base Capacity (vph)	337	984	714	701
Starvation Cap Reductn	0	366	0	0
Spillback Cap Reductn	31	0	50	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.25	1.06	0.45	0.15

Intersection Summary

















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

HCM Signalized Intersection Capacity Analysis

2033 Build Mitigation Conditions

3: School Street & Route 128 Northbound On-Ramp/Mill Street











Weekday Evening

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	2	0	46	0	562	43	12	269	98
Future Volume (vph)	0	0	0	2	0	46	0	562	43	12	269	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	16	16	16	10	10	10	12	12	12	14	14	16
Total Lost time (s)					6.0			6.0			6.0	6.0
Lane Util. Factor					1.00			1.00			1.00	1.00
Frt					0.87			0.99			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					1497			1847			1984	1830
Flt Permitted					1.00			1.00			0.97	1.00
Satd. Flow (perm)					1497			1847			1937	1830
Peak-hour factor, PHF	0.78	0.78	0.78	0.63	0.63	0.63	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	3	0	73	0	611	47	13	283	103
RTOR Reduction (vph)	0	0	0	0	71	0	0	5	0	0	0	74
Lane Group Flow (vph)	0	0	0	0	5	0	0	654	0	0	296	29
Heavy Vehicles (%)	0%	0%	0%	0%	0%	3%	0%	2%	0%	0%	2%	0%
Turn Type				Split	NA			NA		pm+pt	NA	Perm
Protected Phases				4	4			2 3		1	2	
Permitted Phases										2		2
Actuated Green, G (s)					4.0			33.0			23.0	17.0
Effective Green, g (s)					4.0			33.0			23.0	17.0
Actuated g/C Ratio					0.07			0.55			0.38	0.28
Clearance Time (s)					6.0						6.0	6.0
Vehicle Extension (s)					2.0						3.0	3.0
Lane Grp Cap (vph)					99			1015			747	518
v/s Ratio Prot					c0.00			c0.35			c0.04	
v/s Ratio Perm											0.11	0.02
v/c Ratio					0.05			0.64			0.40	0.06
Uniform Delay, d1					26.2			9.4			13.5	15.7
Progression Factor					1.00			0.57			1.00	1.00
Incremental Delay, d2					0.1			0.7			0.3	0.0
Delay (s)					26.3			6.1			13.8	15.7
Level of Service					C			A			B	B
Approach Delay (s)		0.0			26.3			6.1			14.3	
Approach LOS		A			C			A			B	
Intersection Summary												
HCM 2000 Control Delay			10.3									B
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			60.0									
Intersection Capacity Utilization			45.5%									A
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
4: School Street & Route 128 Northbound Off-Ramp

2033 Build Mitigation Conditions

Weekday Evening

							
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø4
Lane Configurations							
Traffic Volume (vph)	221	225	88	384	271	0	
Future Volume (vph)	221	225	88	384	271	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	16	16	12	12	13	13	
Storage Length (ft)	0	130	0			0	
Storage Lanes	1	1	0			0	
Taper Length (ft)	25		25				
Right Turn on Red		Yes				Yes	
Link Speed (mph)	30			30	30		
Link Distance (ft)	1000			2400	150		
Travel Time (s)	22.7			54.5	3.4		
Peak Hour Factor	0.78	0.78	0.92	0.92	0.95	0.95	
Heavy Vehicles (%)	1%	2%	0%	2%	2%	0%	
Shared Lane Traffic (%)							
Turn Type	Prot	Perm	pm+pt	NA	NA		
Protected Phases	3		1	2	2 4		4
Permitted Phases		3	2				
Detector Phase	3	3	1	2	2 4		
Switch Phase							
Minimum Initial (s)	6.0	6.0	6.0	10.0			4.0
Minimum Split (s)	12.0	12.0	11.0	16.0			10.0
Total Split (s)	16.0	16.0	11.0	23.0			10.0
Total Split (%)	26.7%	26.7%	18.3%	38.3%			17%
Maximum Green (s)	10.0	10.0	6.0	17.0			4.0
Yellow Time (s)	3.5	3.5	3.5	3.5			3.5
All-Red Time (s)	2.5	2.5	1.5	2.5			2.5
Lost Time Adjust (s)	0.0	0.0		0.0			
Total Lost Time (s)	6.0	6.0		6.0			
Lead/Lag	Lead	Lead	Lead	Lag			Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes
Vehicle Extension (s)	2.0	2.0	2.0	3.0			2.0
Recall Mode	None	None	Min	Min			None

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Natural Cycle: 60
Control Type: Actuated-Uncoordinated

Splits and Phases: 4: School Street & Route 128 Northbound Off-Ramp







Queues

2033 Build Mitigation Conditions

4: School Street & Route 128 Northbound Off-Ramp

Weekday Evening

				
Lane Group	EBL	EBR	NBT	SBT
Lane Group Flow (vph)	283	288	513	285
v/c Ratio	0.84	0.53	0.84	0.42
Control Delay	48.9	7.6	30.5	7.1
Queue Delay	2.2	0.0	5.9	0.3
Total Delay	51.2	7.6	36.4	7.4
Queue Length 50th (ft)	101	0	128	66
Queue Length 95th (ft)	#171	34	#274	66
Internal Link Dist (ft)	920		2320	70
Turn Bay Length (ft)		130		
Base Capacity (vph)	337	539	613	674
Starvation Cap Reductn	0	0	0	95
Spillback Cap Reductn	13	0	63	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.87	0.53	0.93	0.49

Intersection Summary











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

HCM Signalized Intersection Capacity Analysis

4: School Street & Route 128 Northbound Off-Ramp











2033 Build Mitigation Conditions

Weekday Evening

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	221	225	88	384	271	0
Future Volume (vph)	221	225	88	384	271	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	16	12	12	13	13
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		0.99	1.00	
Satd. Flow (prot)	2025	1794		1852	1925	
Flt Permitted	0.95	1.00		0.87	1.00	
Satd. Flow (perm)	2025	1794		1622	1925	
Peak-hour factor, PHF	0.78	0.78	0.92	0.92	0.95	0.95
Adj. Flow (vph)	283	288	96	417	285	0
RTOR Reduction (vph)	0	240	0	0	0	0
Lane Group Flow (vph)	283	48	0	513	285	0
Heavy Vehicles (%)	1%	2%	0%	2%	2%	0%
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	3		1	2	2 4	
Permitted Phases		3	2			
Actuated Green, G (s)	10.0	10.0		23.0	21.0	
Effective Green, g (s)	10.0	10.0		23.0	21.0	
Actuated g/C Ratio	0.17	0.17		0.38	0.35	
Clearance Time (s)	6.0	6.0		6.0		
Vehicle Extension (s)	2.0	2.0		3.0		
Lane Grp Cap (vph)	337	299		644	673	
v/s Ratio Prot	c0.14			c0.08	c0.15	
v/s Ratio Perm		0.03		c0.23		
v/c Ratio	0.84	0.16		0.80	0.42	
Uniform Delay, d1	24.2	21.4		16.4	14.9	
Progression Factor	1.00	1.00		1.00	0.57	
Incremental Delay, d2	15.9	0.1		6.8	0.4	
Delay (s)	40.1	21.5		23.2	8.9	
Level of Service	D	C		C	A	
Approach Delay (s)	30.7			23.2	8.9	
Approach LOS	C			C	A	
Intersection Summary						
HCM 2000 Control Delay			23.4		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.77			
Actuated Cycle Length (s)			60.0		Sum of lost time (s)	23.0
Intersection Capacity Utilization			66.6%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

Lanes, Volumes, Timings
4: School Street & Route 128 Northbound Off-Ramp

2033 Build Conditions - PH1
Weekday Morning

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	179	134	52	395	319	0
Future Volume (vph)	179	134	52	395	319	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	13	13
Storage Length (ft)	0	130	0			0
Storage Lanes	1	1	0			0
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				
Flt Protected	0.950			0.994		
Satd. Flow (prot)	1948	1760	0	1872	1906	0
Flt Permitted	0.950			0.994		
Satd. Flow (perm)	1948	1760	0	1872	1906	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	1000			2400	150	
Travel Time (s)	22.7			54.5	3.4	
Peak Hour Factor	0.83	0.83	0.73	0.73	0.75	0.75
Heavy Vehicles (%)	5%	4%	0%	1%	3%	0%
Adj. Flow (vph)	216	161	71	541	425	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	216	161	0	612	425	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	16			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	0.85	0.85	1.00	1.00	0.96	0.96
Turning Speed (mph)	15	9	15			9
Sign Control	Stop			Free	Free	

Intersection Summary





Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 60.4%
Analysis Period (min) 15

ICU Level of Service B

Intersection

Int Delay, s/veh 20.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
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Lane Configurations						
Traffic Vol, veh/h	179	134	52	395	319	0
Future Vol, veh/h	179	134	52	395	319	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	130	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	83	83	73	73	75	75
Heavy Vehicles, %	5	4	0	1	3	0
Mvmt Flow	216	161	71	541	425	0

Major/Minor	Minor2	Major1	Major2
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Conflicting Flow All	1108	425	425	0	-	0
Stage 1	425	-	-	-	-	-
Stage 2	683	-	-	-	-	-
Critical Hdwy	6.45	6.24	4.1	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.336	2.2	-	-	-
Pot Cap-1 Maneuver	229	625	1145	-	-	0
Stage 1	653	-	-	-	-	0
Stage 2	496	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 209	625	1145	-	-	-
Mov Cap-2 Maneuver	~ 209	-	-	-	-	-
Stage 1	595	-	-	-	-	-
Stage 2	496	-	-	-	-	-

Approach	EB	NB	SB
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HCM Control Delay, s	73.6	1	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT
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Capacity (veh/h)	1145	-	209	625	-
HCM Lane V/C Ratio	0.062	-	1.032	0.258	-
HCM Control Delay (s)	8.4	0	119.1	12.8	-
HCM Lane LOS	A	A	F	B	-
HCM 95th %tile Q(veh)	0.2	-	9.4	1	-

Notes

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

Lanes, Volumes, Timings
4: School Street & Route 128 Northbound Off-Ramp

2033 Build Conditions - PH1
Weekday Evening

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	213	225	88	380	250	0
Future Volume (vph)	213	225	88	380	250	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	13	13
Storage Length (ft)	0	130	0			0
Storage Lanes	1	1	0			0
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				
Flt Protected	0.950			0.991		
Satd. Flow (prot)	2025	1794	0	1853	1925	0
Flt Permitted	0.950			0.991		
Satd. Flow (perm)	2025	1794	0	1853	1925	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	1000			2400	150	
Travel Time (s)	22.7			54.5	3.4	
Peak Hour Factor	0.78	0.78	0.92	0.92	0.95	0.95
Heavy Vehicles (%)	1%	2%	0%	2%	2%	0%
Adj. Flow (vph)	273	288	96	413	263	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	273	288	0	509	263	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	16			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	0.85	0.85	1.00	1.00	0.96	0.96
Turning Speed (mph)	60	60	60			60
Sign Control	Stop			Free	Free	

Intersection Summary





Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 59.8%
Analysis Period (min) 15

ICU Level of Service B

Intersection

Int Delay, s/veh 18.7

Movement EBL EBR NBL NBT SBT SBR

Lane Configurations						
Traffic Vol, veh/h	213	225	88	380	250	0
Future Vol, veh/h	213	225	88	380	250	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	130	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	78	78	92	92	95	95
Heavy Vehicles, %	1	2	0	2	2	0
Mvmt Flow	273	288	96	413	263	0

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	868	263	263	0	-	0
Stage 1	263	-	-	-	-	-
Stage 2	605	-	-	-	-	-
Critical Hdwy	6.41	6.22	4.1	-	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.318	2.2	-	-	-
Pot Cap-1 Maneuver	324	776	1313	-	-	0
Stage 1	783	-	-	-	-	0
Stage 2	547	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	293	776	1313	-	-	-
Mov Cap-2 Maneuver	293	-	-	-	-	-
Stage 1	709	-	-	-	-	-
Stage 2	547	-	-	-	-	-

Approach EB NB SB

HCM Control Delay, s	43	1.5	0
HCM LOS	E		

Minor Lane/Major Mvmt NBL NBT EBLn1 EBLn2 SBT

Capacity (veh/h)	1313	-	293	776	-
HCM Lane V/C Ratio	0.073	-	0.932	0.372	-
HCM Control Delay (s)	8	0	75.4	12.4	-
HCM Lane LOS	A	A	F	B	-
HCM 95th %tile Q(veh)	0.2	-	9	1.7	-

Attachment M

Parking Demand Calculations

Land Use: 760 Research and Development Center

Description

A research and development center is a facility or group of facilities devoted almost exclusively to research and development activities. The range of specific types of businesses contained in this land use category varies significantly. Research and development centers may contain offices and light fabrication areas. General office building (Land Use 710), corporate headquarters building (Land Use 714), single tenant office building (Land Use 715), and office park (Land Use 750) are related uses.

Time of Day Distribution for Parking Demand

The following table presents a time-of-day distribution of parking demand on a weekday at two study sites in a general urban/suburban setting.

Hour Beginning	Percent of Weekday Peak Parking Demand
12:00–4:00 a.m.	—
5:00 a.m.	—
6:00 a.m.	—
7:00 a.m.	—
8:00 a.m.	91
9:00 a.m.	98
10:00 a.m.	100
11:00 a.m.	93
12:00 p.m.	84
1:00 p.m.	90
2:00 p.m.	97
3:00 p.m.	92
4:00 p.m.	75
5:00 p.m.	31
6:00 p.m.	—
7:00 p.m.	—
8:00 p.m.	—
9:00 p.m.	—
10:00 p.m.	—
11:00 p.m.	—

Additional Data

The average parking supply ratios for the study sites with parking supply information are 3.5 spaces per 1,000 square feet GFA (13 sites) and 1.0 spaces per employee (10 sites).

The sites were surveyed in the 1980s, the 1990s, and the 2000s in California and Montana.

Source Numbers

158, 313, 399, 518

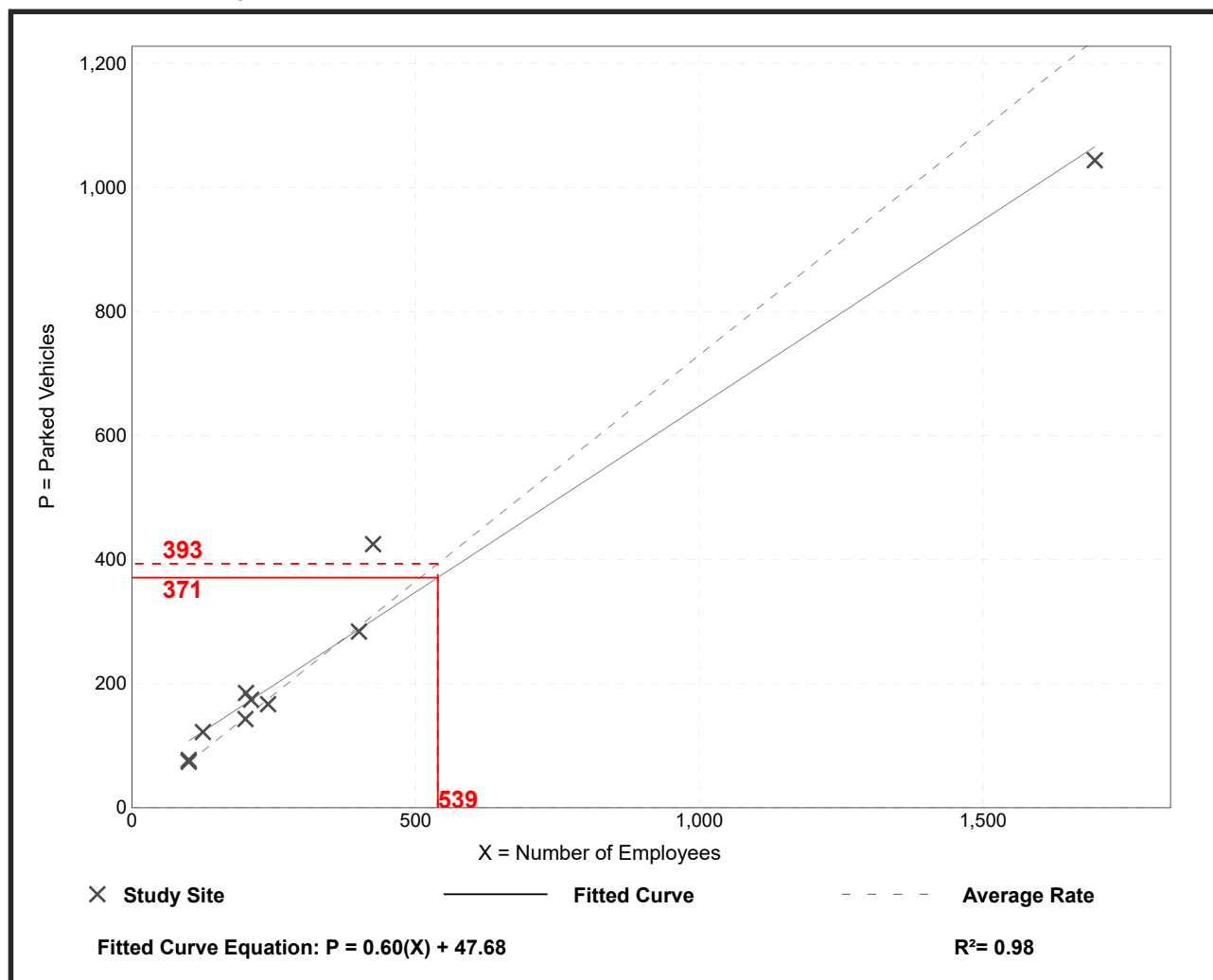
Research and Development Center (760)

Peak Period Parking Demand vs: **Employees**
 On a: **Weekday (Monday - Friday)**
 Setting/Location: **General Urban/Suburban**
 Peak Period of Parking Demand: **8:00 a.m. - 4:00 p.m.**
 Number of Studies: 10
 Avg. Num. of Employees: 370

Peak Period Parking Demand per Employee

Average Rate	Range of Rates	33rd / 85th Percentile	95% Confidence Interval	Standard Deviation (Coeff. of Variation)
0.73	0.62 - 1.00	0.71 / 0.98	***	0.15 (21%)

Data Plot and Equation



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