

TECHNICAL MEMORANDUM

TO: JLB Realty, LLC
Attn: Mark Seck, Development Partner
2310 Washington Street, 3rd Floor
Newton, Massachusetts 02462

REV DATE: February 13, 2026

FROM: Samuel W. Gregorio, PE, PTOE, RSP₁, Senior Project Manager
Rana Eslamifard, Transportation Designer

PROJECT #: T1757

RE: Proposed 1 & 2 Federal Street Redevelopment – Billerica, Massachusetts
Traffic Impact & Parking Assessment- **Revision 2**



- *Original Document – October 31, 2025*
- *Revision 1 – January 24, 2026 [Responds to Kimley-Horn peer review of January 12, 2026]*
- *Revision 2 – February 11, 2026 [Responds to Kimley-Horn peer review of February 9, 2026 and provides analysis of eleven (11) additional multifamily residential units]*

EXECUTIVE SUMMARY

TEC, Inc. (TEC) prepared this Traffic Impact and Parking Assessment (TIPA) on behalf of JLB Realty, LLC (“the Applicant”) for the proposed redevelopment of the properties located at #1 and #2 Federal Street (“the Project”) in Billerica, Massachusetts (the “Town”). The Project proposes to demolish two (2) existing office buildings totaling approximately 158,000 square feet (SF) and redeveloping the site with up to 266 multifamily residential units within two (2) three-story residential buildings, along with 456 off-street parking spaces. The properties are located within the Industrial (I) Zoning District and the Massachusetts Bay Transportation Authority (MBTA) Communities Multi-Family Overlay District (MCMOD) – Federal Street Subdistrict (Subdistrict C).

The Project site abuts Massachusetts Department of Transportation (MassDOT) jurisdiction as part of the State Highway Layout (SHLO) along the US Route 3 Northbound (NB) ramp. The redevelopment project is therefore subject to an “Indirect” Permit to Access State Highway with MassDOT District 4. Access to #1 Federal Street will be provided via two (2) full access/egress driveways along the southerly side of Federal Street. Access to #2 Federal Street will be provided via two (2) full access/egress driveways along the northerly side of Federal Street. The easternmost driveway for #2 Federal Street is shared with the neighboring #4 Federal Street.

Study Area and Analysis Parameters

The study area presented in the TIPA includes the intersections of Concord Road / Middlesex Turnpike and Concord Road / Federal Street / Brightview Concord River Driveway, as well as an examination of the four (4) driveway locations along Federal Street. Existing traffic conditions were documented using traffic volumes as collected in July 2025 with the future year No-Build and Build conditions evaluated for a 7-year planning horizon (2032) from the date of original project permitting. Three (3) specific developments by others, identified by the Town, have been included within the TIPA

including off-site mitigation conditioned to be implemented as part of the nearby #161 Concord Road project at Concord Road / Middlesex Turnpike. In addition, this TIPA includes the reoccupancy of ±18,000 SF of vacant (at the time of traffic counts) office space at #3 Federal Street. Traffic volumes associated with these three (3) developments and reoccupancy along Federal Street have been included in both the future year No-Build and Build conditions.

Safety Evaluation

Sight distance evaluations confirm that stopping sight distance (SSD) and intersection sight distances (ISD) along Concord Road at Federal Street exceed the American Association of State Highway and Transportation Officials (AASHTO)¹ minimum requirements. Crash analyses indicate that both study intersections experience crash rates below statewide and districtwide averages. The Applicant is committed to providing clearing / trimming of seasonal vegetation, including future maintenance as necessary, along the easterly side of Concord Road along the site's frontage to maintenance sight lines to/from Federal Street. The Applicant will keep and maintain new plantings / landscaping along the site frontage for Concord Road and Federal Street, near the site driveways, to a maximum height of 3.5-feet within the sight triangles.

Projected Site Generated Traffic

The proposed 266-unit multifamily residential redevelopment is anticipated to generate fewer vehicle trips during the typical weekday and the typical weekday commuter peak hours as compared to the existing office use when fully occupied. Specifically, as compared to the existing office use on-site which could be reoccupied with no additional permitting, the Project is expected to result in a net reduction of approximately 143 vehicle trips during the weekday morning peak hour and 108 vehicle trips during the weekday evening peak hour. Peak-hour traffic volume changes along adjacent roadway segments are minimal, with increases of less than 0.6% along Middlesex Turnpike and overall reductions along Concord Road.

Traffic Operational Analysis

Traffic operations analyses indicate that study area intersections will generally operate at acceptable levels of service under future conditions. Existing congestion during the weekday evening peak hour at the Concord Road / Middlesex Turnpike intersection is anticipated to persist independent of the Project and is consistent with the mitigation evaluation previously approved for the nearby #161 Concord Road development. The Project is expected to improve delay and volume-to-capacity ratios overall due to reduced commuter-period traffic that will accompany the change-in-use. A traffic signal warrant analysis confirmed that a traffic signal is not warranted at the Concord Road / Federal Street intersection following project occupancy in addition to reoccupancy of other vacancies along Federal Street.

¹ A Policy on Geometric Design of Highways and Streets (the "Green Book"); American Association of State Highway and Transportation Officials; Washington DC; 2018

Off-Street Parking

The Project seeks to provide 456 off-street parking spaces and 266 266 secure, weather-protected, long-term bicycle parking for residents at designated locations within the proposed project area. Specifically, 156 off-street parking spaces at #1 Federal Street and 300 off-street parking spaces #2 Federal Street. The Project is expected to generate a demand for approximately 397 parking spaces for the proposed 266 residential units (388 bedrooms) based on industry standard projections for 85th percentile peak parking demand. The Applicant does meet the zoning parking requirements of 455 off-street parking spaces. Fifty-nine (59) parking spaces within the #2 Federal Street parcel will be banked and developed upon demand in order to protect green space on site and reduce impervious areas. In addition, the applicant will provide forty-five (45) electric vehicle parking spaces with connections to charging stations with an additional forty-four (44) parking spaces to be EV-ready.

Project Related Commitments

The Applicant has committed to targeted off-site transportation and safety improvements, including sight-line maintenance along the site frontage, updated pavement markings and signage for a crosswalk across Federal Street between the two (2) parcels, installation of a Rectangular Rapid Flashing Beacon (RRFB) for this Federal Street crosswalk, implementing driveway stop control, pedestrian and bicycle connectivity enhancements to the adjacent designed Yankee Doodle Bike Path, and dedication of an easement for the proposed Yankee Doodle Bike Path. The Project also incorporates a robust Transportation Demand Management (TDM) program emphasizing walking, bicycling, and transit use.

Based on the findings of this assessment, the proposed redevelopment of #1 and #2 Federal Street can be accommodated safely and efficiently within the surrounding roadway network. The Project is anticipated to reduce peak-period traffic demand compared to the existing office use and does not warrant additional traffic mitigation beyond the improvements and commitments outlined in this TIPA.

INTRODUCTION

TEC, Inc. (TEC) prepared this Traffic Impact and Parking Assessment (TIPA) on behalf of JLB Realty, LLC (“the Applicant”) for the proposed redevelopment of the properties located at #1 Federal Street (Map 77 | Block 0 | Lot 162) and #2 Federal Street (Map 68 | Block 4 | Map 8) parcels (“the Project”) in Billerica, Massachusetts (the “Town”). Both parcels are located in the Industrial (I) Zoning District, as well as within the new Massachusetts Bay Transportation Authority (MBTA) Communities Multi-family Overlay District (MCMOD) – Federal Street Subdistrict (Subdistrict C).

The Project site abuts Massachusetts Department of Transportation (MassDOT) jurisdiction as part of the State Highway Layout (SHLO) along the US Route 3 Northbound (NB) ramp. The redevelopment project is therefore subject to an “Indirect” Permit to Access State Highway with MassDOT District 4. Access to #1 Federal Street will be provided via two (2) full access/egress driveways along the southerly side of Federal Street. Access to #2 Federal Street will be provided via two (2) full access/egress driveways along the northerly side of Federal Street. The easternmost driveway for #2 Federal Street is shared with the neighboring #4 Federal Street.

Change in Site Building Program

The existing site currently consists of a two-story ±60,000 SF office building with ±195 off-street parking spaces at #1 Federal Street and a two-story ±98,000 SF office building with ±316 off-street parking spaces at #2 Federal Street. Overall, the two parcels consist of ±158,000 SF of office space with ±511 off-street parking spaces. The #1 Federal Street property is accessed via two (2) full access/egress driveway along the southerly side of Federal Street with cross-access capabilities (25-foot all-access easement) from the easterly driveway to the adjacent office parcel (#3 Federal Street). The #2 Federal Street property is accessed via two (2) full access/egress driveway along the northerly side of Federal Street with cross-access capabilities (25-foot all-access easement) from the easterly driveway to the adjacent office parcel (#4 Federal Street).

The Project seeks to raze the existing building structures and fully redevelop each property to include a total of up to 266 multifamily residential units with associated tenant amenity space and 456 off-street parking spaces. Specifically, a three-story residential building with 88 residential units and 156 off-street parking spaces at #1 Federal Street and a three-story building with 178 residential units and 300 off-street parking spaces at #2 Federal Street.

The Project will also reconfigure the pavement and open space area within the site to provide newly reconstructed driveways, including two (2) full access/egress driveways for #1 Federal Street along the southerly side of Federal Street with access to neighboring properties eliminated; and two (2) full access/egress driveways for #2 Federal Street along the north side of Federal Street with cross-access and shared parking capabilities maintained between the adjacent parcels along Federal Street. The 25-foot all-access easements recorded between each of the neighboring parcels will be maintained. A copy of the noted easement documentation from the Middlesex County North Registry of Deeds is provided in Attachment N.

Methodology

TEC has evaluated the traffic operations and safety characteristics of the study intersection under base year and future year conditions consistent with the *Transportation Impact Assessment (TIA) Guidelines* issued by MassDOT², the Town of Billerica Zoning Bylaw, and the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports. The future year examines traffic operations under a 7-year planning horizon (2032) from the initial project permitting date for traffic volume projections, which includes an evaluation of the future year conditions with and without recommended improvements. The findings and recommendations for the improvements are based on the detailed traffic analyses included in this report.

EXISTING CONDITIONS

Study Area Intersections

The study area was selected to contain the major roadways and intersections providing local access to the Project site. This includes an evaluation of intersection(s) in which the site-generated trips increase the peak hour traffic volume by more than 5% and/or by more than 100 *new* vehicles per hour per MassDOT's *TIA Guidelines* (Section 3.1.C). The following intersections were included in the study area:

1. Concord Road / Middlesex Turnpike
2. Concord Road / Federal Street / Brightview Concord River Driveway
3. Federal Street / #3 Federal Street Driveway [West]
4. Federal Street / #1 Federal Street Driveway [West]
5. Federal Street / #3 Federal Street Driveway [East]
6. Federal Street / #1 Federal Street Driveway [East]

The study area intersections are shown graphically in Figure 1.

US Route 3 Ramp Terminal Intersections

The Applicant has coordinated with MassDOT regarding the proposed redevelopment project since the inception of the TIPA and permitting process. This coordination with MassDOT included the applicability of a Permit to Access State Highway (both “Direct” and “Indirect”). An “Indirect” Permit to Access State Highway will be necessary as the site directly abuts SHLO along the US Route 3 NB Off-Ramp. This coordination has also included discussions as to the scope of the proposed redevelopment project and the relative trip generation projections for the drop in site-related traffic converting from the existing office use to the proposed residential use. During these discussions, MassDOT District 4 has not requested that the Applicant include the Concord Road ramp terminal intersections with either the US Route 3 NB and/or Southbound (SB) ramps signalized intersections,

² *Transportation Impact Assessment (TIA) Guidelines*; Massachusetts Department of Transportation; March 13, 2014.

which are both under MassDOT’s jurisdiction, within a reviewable study area as the redevelopment’s TIPA.

Beyond the discussions with MassDOT, TEC and the Applicant have reviewed the recent traffic operational analyses documented in the *Transportation Impact Assessment (TIA)* prepared by Vanasse & Associates, Inc. (VAI)³ in May 2022 for the #161 Concord Road project, as approved by the Town. This TIA showed the Concord Road / US Route 3 NB Ramp terminal intersection operating at an acceptable level of service (LOS B or better) on all movements during both the weekday morning and weekday evening peak hours. This TIA also showed the Concord Road / US Route 3 SB Ramp terminal intersection operating at acceptable levels of service (LOS C or better) on all movements during both the weekday morning and weekday evening peak hours; except for the Concord Road SB left-turn movement which operated at LOS E during only the weekday morning peak hour. Whereas the proposed redevelopment project is projected to lower the historical trip generation permitted to/from the site and the #161 Concord Road project is now approved for even a lower proposed trip generation of January 2026, the general operations denoted above did not merit additional traffic operational evaluation.

Geometry

A field inventory of existing traffic conditions at the study area intersection was conducted by TEC staff in July 2025 to obtain information related to intersection geometry, operating characteristics, and lane usage. A description of the existing roadway and intersection inventory is provided below.

Roadway – Concord Road

Concord Road is a southwest-northeast urban minor arterial roadway under the jurisdiction of the Town of Billerica except for the segment between the US Route 3 northbound and southbound ramp terminals. For the purpose of this memorandum, the cardinal direction of Concord Road is defined as north-south. The roadway provides a local connection between Route 4 to the south in Bedford and Route 3A / Billerica Center to the north. For a majority of the corridor, Concord Road consists of a single travel lane in each direction which expands up to six-lanes. In the vicinity of the Project, Concord Road consists of two (2) travel lanes in each direction. Pedestrian accommodation is provided along the corridor and alternates sides of the roadway with the study area. There is no formal bicycle accommodation provided along the Concord Road corridor; however, combined shoulder and travel lanes provide shared travel-way configuration to accommodate biking. Land uses along Concord Road are a mix of commercial, industrial, and residential. The posted speed limit along the corridor in the vicinity of the study area is 35 miles per hour (mph).

³ *Transportation Impact Assessment; Proposed Lab/cGMP Building, 0 & 161 Concord Road, Billerica MA*; prepared by Vanasse and Associates, Inc.; Andover, MA; dated May 2022.



1" = 250'



- Study Area Intersections:**
1. Concord Road / Middlesex Turnpike
 2. Concord Road / Federal Street / Brightview Concord River Driveway

Figure 1

Locus Map



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Roadway – Federal Street

Federal Street is a northwest–southeast oriented local subdivision / cul-de-sac roadway under the jurisdiction of the Town of Billerica. For the purpose of this memorandum, the cardinal direction of Federal Street is defined as east–west. The roadway provides access to six (6) commercial buildings, including the subject redevelopment parcels at #1 and #2 Federal Street. Federal Street consists of a single travel lane in each direction, expanding to two (2) unmarked lanes at its intersection with Concord Road. Sidewalks are provided along the south side of Federal Street; however, no crosswalk markings are present across the internal driveways intersecting the roadway. There is no formal bicycle accommodation along Federal Street. Since no MassDOT Special Speed Regulation is documented, the roadway is subject to a statutory speed limit of 30 miles per hour (mph) per Massachusetts General Law (MGL) Chapter 90, Section 17.

Intersection – Concord Road / Federal Street / Brightview Concord River Driveway

Federal Street and the Brightview Concord River Driveway intersect Concord Road to form a four-legged unsignalized intersection. The Federal Street westbound and the Brightview Concord River Driveway eastbound approaches are under stop-control; however, no stop sign is provided for the Brightview Concord River Driveway. Both the Concord Road northbound and southbound approaches are free flowing. The Federal Street westbound approach provides two unmarked lanes typically utilized as an exclusive left-turn lane and an exclusive right-turn lane (negligible cross traffic to the Brightview Concord River Driveway) with directional flow separated by a raised landscaped median. The Brightview Concord River Driveway eastbound approach consists of a single general-purpose travel lane with directional flow separated by a marked centerline. Both the Concord Road northbound and southbound approaches each consist of two general-purpose travel lanes with directional flow separated by a marked centerline. A sidewalk is provided along the southerly side of Federal Street and Brightview Concord River Driveway, and along the westerly side of Concord Road. There is no crosswalk provided across the Brightview Concord River Driveway eastbound approach; however, pedestrian curb ramps are present. There is no formal bicycle accommodation at the intersection.

Intersection – Concord Road / Middlesex Turnpike

Middlesex Turnpike intersects Concord Road to form a four-legged signalized intersection. The Middlesex Turnpike eastbound approach consists of an exclusive left-turn lane and a shared through / right-turn lane which is, and has been, barricaded since the discontinuation of the Middlesex Turnpike section between Concord Road and the Concord River. Traffic signals facing this approach are not operational and the intersection effectively operates as a three-legged intersection. The Middlesex Turnpike westbound approach consists of an exclusive left-turn lane and a general-purpose travel lane with directional flow separated by a marked centerline. The Concord Road northbound and southbound approaches each consist of an exclusive left-turn lane, a through lane, and a shared through / right-turn lane with directional flow separated by a marked centerline. A sidewalk is provided along the southerly side of Middlesex Turnpike east of the intersection, along the westerly side of the Concord Road south of Middlesex Turnpike, and along the easterly side of the Concord Road north of Middlesex Turnpike. Crosswalks are present across all approaches at the intersection. Pedestrian curb ramps are provided at the ends of each crosswalk; all of which appear

to still be in compliance with Americans with Disabilities Act (ADA) / Architectural Access Board (AAB) standards. There is no formal bicycle accommodation at the intersection.

Existing Public Transportation

Lowell Regional Transit Authority

Public transportation services within the study area are provided by the Lowell Regional Transit Authority (LRTA), including fixed-route bus service along Concord Road and the Middlesex Turnpike via Route 14 (Burlington Mall/Lahey Clinic).

- *LRTA Bus Route 14* - Route 14 connects the Lahey Clinic in Burlington with the Kennedy Transportation Center in Lowell, offering transfer opportunities to other LRTA routes and the MBTA Commuter Rail system. An outbound bus stop (Bus Stop #313) is located along Middlesex Turnpike just south of Concord Road, approximately a three-minute walk from the redevelopment site when accounting for the future Yankee Doodle Bike Path which runs along the northerly edge of the site. Additionally, LRTA buses operate in a flag stop mode, allowing passengers to request pick-up or drop-off at any safe location along the route by signaling to the driver. LRTA also offers Road Runner ADA paratransit services for individuals with disabilities who are unable to use the fixed-route bus system. A schedule outline for the bus route is provided below:
 - Monday to Friday: Inbound 7:00 AM to 7:00 PM & Outbound 6:00 AM to 6:00 PM | Headways – 60 minutes
 - Saturday: Inbound 8:00 AM to 6:00 PM & Outbound 7:00 AM to 5:00 PM | Headways – 60 minutes

LRTA Route 14 schedule information is provided in Attachment A.

Existing Traffic Volumes

Traffic volume data was obtained from Turning Movement Counts (TMCs) at study area intersections and supplemented with Automatic Traffic Recorder (ATR) counts conducted along Concord Road near Federal Street. The details of the data collection effort are described below.

Turning Movement Counts

To establish existing traffic-volume conditions within the study area, manual TMCs were conducted at the study area intersections during a typical weekday (7:00 AM – 7:00 PM) on Wednesday, July 23, 2025. Area schools were not in regular session during the period of traffic counts. The weekday morning peak hour occurred from 7:30 to 8:30 AM and the weekday evening peak hour generally occurred from 4:30 to 5:30 PM at the intersection of Federal Street / Concord Road and 4:45 to 5:45 PM at the intersection of Concord Road / Middlesex Turnpike. A detailed summary of the TMCs, partitioned into 15-minute intervals, is provided within Attachment B.

Automatic Traffic Recorder Counts

An ATR was conducted for a continuous 48-hour mid-week period on Concord Road, north of Federal Street, and along Middlesex Turnpike, east of Concord Road, from Wednesday, July 23, 2025, through Thursday, July 24, 2025, concurrently with the TMCs. The ATRs were obtained to gather additional daily traffic volume data, vehicle speeds, and vehicle classification with 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
Concord Road, north of Federal Street	14,856	979	6.6%	51.7% SB	1,312	8.8%	59.0% NB
Middlesex Turnpike, east of Concord Road	7,422	586	7.9%	64.7% EB	1,017	13.7%	75.4% WB

^a Daily traffic expressed in vehicles per day.
^b Hourly traffic expressed in vehicles per hour.
^c Percent of daily traffic volumes which occur during the peak hour.
^d Percent of peak hour volume in the predominant direction of travel.

Concord Road carries approximately 14,860 vehicles per day (vpd) on an average weekday. Directional distribution along the roadway is nearly even during the weekday morning peak hour and more prominent in the northbound direction during the weekday evening hour. The average and 85th percentile speeds along Concord Road were measured at 37 mph and 41 mph, respectively, in the northbound direction. The average and 85th percentile speeds along Concord Road were measured at 33 mph and 38 mph, respectively, in the southbound direction. The average speeds are generally consistent with the posted 35 mph speed limit with the 85th percentile speed higher than the posted speed.

Middlesex Turnpike carries approximately 7,420 vpd on an average weekday. Directional distribution along the roadway is more prominent in the eastbound direction during the weekday morning peak hour and in the westbound direction during the weekday evening peak hour which is generally consistent with commuter flows towards/from US Route 3. The average and 85th percentile speeds along Middlesex Turnpike were measured at 29 mph and 32 mph, respectively, in the eastbound direction. The average and 85th percentile speeds along Middlesex Turnpike were measured at 26 mph and 32 mph, respectively, in the westbound direction. Both the average and 85th percentile speeds appear to be below the posted 35 mph speed limit; however, this may be somewhat the result of proximity to the signalized intersection with Concord Road.

Seasonal Adjustments

No seasonal adjustment factor was applied to the traffic volumes per MassDOT guidance as published 2025 seasonal data is not available, although July is typically considered an above-average month on similar roadways and typical would not be further adjusted. TEC understands that school was not in session during the time of traffic counts; however, TEC does not expect school

activities to have a major impact on traffic volume levels within the study area. MassDOT 2024 (most recent year of data) weekday seasonal adjustment factors are provided in Attachment D. The resulting 2025 Existing Conditions weekday morning and weekday evening peak hour traffic volume network is illustrated in Figure 2.

Consideration of July vs. School Year Traffic Volumes

In order to confirm that closure of school did not impact or underestimate the July 2025 counts, TEC reviewed traffic volumes along Concord Road, east of Middlesex Turnpike, collected in May 2025 (two-months prior to the TIPA traffic volumes while school was in session) published by MassDOT on their Traffic Count Database System (TCDS) portal. The traffic counts had been collected on Tuesday, May 13, 2025 through Thursday, May 15, 2025 for Temporary Count Station #4066. The July 2025 TMCs for the intersection of Concord Road / Middlesex Turnpike provided in the TIPA does include movement-specific data which directly overlaps the MassDOT location east of Middlesex Turnpike. This overlapping data includes the weekday time period from 6:00 AM to 7:00 PM (13-hours of comparable / overlapping time-of-day data). In comparing the May 2025 to July 2025 data for this 13-hour period, the following is noted:

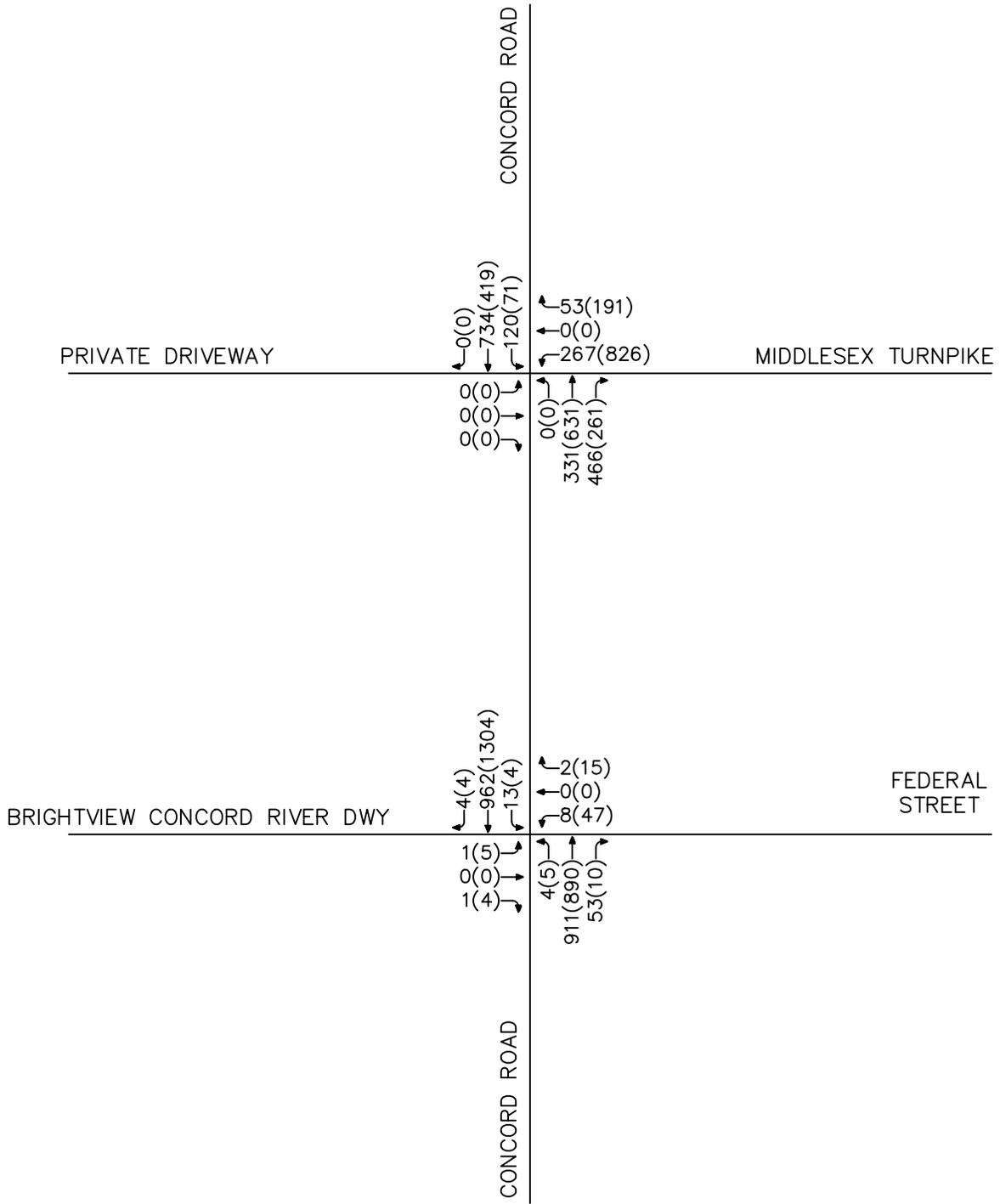
- Weekday Daily
 - May 2025 (MassDOT) 13-hour volume = 13,611 veh, 13,658 veh, & 13,858 veh (3-days of data)
 - July 2025 (TIPA) 13-hour volume = 14,172 veh
- Weekday Morning Peak Hour
 - May 2025 (MassDOT) AM peak hour = 1,238 veh, 1,259 veh, 1,324 veh (3-days of data)
 - July 2025 (TIPA) AM peak hour = 1,237 veh
- Weekday Evening Peak Hour:
 - May 2025 (MassDOT) PM peak hour = 1,266 veh, 1,281 veh, 1,284 veh (3-days of data)
 - July 2025 (TIPA) PM peak hour = 1,312 veh

The data for the location along Concord Road, east of Middlesex Turnpike, indicates that July conditions represent a comparable, if not higher, traffic volume condition than many school months, such as May. This is similar to the seasonal adjustment factor section originally noted in the TIPA. July 2025 traffic volumes were higher than May 2025 during the key 13-hour daytime block. July 2025 traffic volumes were comparable or slightly lower than May 2025 during the weekday morning peak hour; however, the minimal difference in traffic volume is not significant considering the fluctuations on the day-by-day basis of the May traffic volumes alone. July 2025 traffic volumes were higher than May 2025 during the weekday evening peak hour.

Nearly identical results and the interpretive outcome were examined for counts published by MassDOT at the same Temporary Count Station #4066 along Concord Road, east of Middlesex Turnpike in September 2024.



Not to Scale



XXX(XXX) = WEEKDAY MORNING PEAK HOUR(WEEKDAY EVENING PEAK HOUR)

Figure 2

2025 Existing Year Conditions
Weekday Morning & Weekday Evening
Peak Hour Traffic Volumes



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Existing Safety Conditions

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

Sight Distance Evaluation

TEC visited the site and measured the available sight lines along Concord Road to/from Federal Street in July 2025. The available sight lines were compared to minimum requirements established by 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 a 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% 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.”

Sight distances as typically reported utilize the 85th percentile speed, which were collected in July 2025, to account for the roadway operating speed. Tables 2 and 3 provide a summary of the available

sight distances from Federal Street at the intersection of Concord Road / Federal Street / Brightview Concord River Driveway.

Table 2 – Existing Stopping Sight Distance Measurements

Approach / Direction	Operating Speed	AASHTO Recommended Minimum	Measured Stopping Sight Distance
Concord Road at Federal Street <i>Concord Road Northbound</i>	41 MPH	305 FT	500+ FT
<i>Concord Road Southbound</i>	38 MPH	280 FT	500+ FT

^a Actual measured 85th percentile operating speed along Concord Road

As shown in Table 2, the SSD along both Concord Road northbound and southbound exceeds AASHTO minimum recommendations for safe operations under ideal conditions.

Table 3 – Existing Intersection Sight Distance Measurements

Approach / Direction	Operating Speed ^(a)	AASHTO Desired Minimum	AASHTO Recommended Minimum	Measured Intersection Sight Distance
Federal Street at Concord Road: <i>Federal Street looking left [South]</i>	41 MPH	455 FT	305 FT	500+ FT
<i>Federal Street looking right [North]</i>	38 MPH	420 FT	280 FT	500+ FT

^a Actual measured 85th percentile operating speed along Concord Road

Similar to the SSD, the ISD sight lines looking left towards Concord Road northbound and looking right towards southbound exceed AASHTO minimum recommendations for safe operations under ideal conditions. Seasonal vegetation along the easterly side of Concord Road, north of Federal Street, may reduce the sight line for vehicles travelling along Federal Street and should be maintained. This area of vegetation, although not currently an obstruction, is within the Town Right-of-Way (ROW) and/or within the site frontage of #2 Federal Street.

Crash History Analysis

Crash reports at the study intersections were compiled and analyzed from MassDOT’s Interactive Mapping Portal for Analysis and Crash Tracking (IMPACT) system for the most recent five full years (2019 – 2023) of crash data including the most recent three years of complete data (2019 – 2021). A summary of the vehicle crash data and intersection crash rates is provided in Table 4. Detailed descriptions of the crash data are provided in Attachment E.

Crash Rates

In addition to examining the number of crashes at the study area intersections, an intersection crash rate was calculated to compare the occurrence of crashes to the volume of traffic passing through the study area intersection. The crash rate per million entering vehicles (MEV) was calculated using the evening peak hour volumes from the TMCs and K-factor factors (relation of peak hour traffic to daily traffic) in Table 1. The crash rate at the intersections was compared to the statewide and

district-wide averages published by MassDOT in June 2018 to determine the significance of the crash occurrence. The statewide and District 4 average for signalized intersections is 0.78 and 0.75 crashes per MEV, respectively, with the statewide and District average for unsignalized intersections both as 0.57 crashes per MEV.

Table 4 – Crash Data Summary

Parameter		Concord Road / Middlesex Turnpike	Concord Road / Federal Street
Crash Year	2019	7	0
	2020	4	0
	2021	6	1
	2022	2	2
	2023	3	1
	TOTAL	22	4
<i>Average Annual Crashes</i>		<i>4.4</i>	<i>0.8</i>
<i>Crash Rate</i>		<i>0.44</i>	<i>0.08</i>
Manner of Collision	Angle	4	2
	Rear-end	11	2
	Sideswipe	2	0
	Single Vehicle	0	0
	Ped / Bike	0	0
	Head-On	4	0
	Other / Not Reported	1	0
	TOTAL	22	4
Road Surface Conditions	Dry	17	3
	Wet	4	1
	Not Reported	1	0
	TOTAL	22	4
Injury Status (Crash Severity)	Property Damage	17	1
	Non-Fatal Injury	5	3
	Not Reported	0	0
	TOTAL	22	4
Day of Week	Monday-Friday	17	4
	Saturday-Sunday	5	0
	TOTAL	22	4
Time of Day	6:00AM-9:00AM	4	0
	9:00AM-12:00PM	1	0
	12:00PM-3:00PM	5	1
	3:00PM-6:00PM	4	1
	6:00PM-9:00PM	6	1
	9:00PM-6:00AM	2	1
	TOTAL	22	4

Crash Data Summary

Concord Road / Middlesex Turnpike

The intersection of Concord Road / Middlesex Turnpike experienced a total of twenty-two (22) crashes, or an average of 4.4 crashes per year, over the five-year period. A total of five (5) crashes resulted in injuries, while the majority of crashes resulted in property damage only. The intersection has a crash rate of 0.44 per MEV, which is below the statewide and districtwide averages for signalized intersections. Half of the crashes (11 of 22) at this location were rear-end crashes. The IMPACT database provides information as to the vehicle approach direction; however, the skewed off-compass nature of the roadways does not allow for the specific decipher of travel direction on a crash report on a crash report basis. There were an additional four (4) angle crashes, two (2) sideswipe crashes, and four (4) head-on crashes. Four (4) crashes occurred both during the morning and evening peak periods while six (6) crashes occurred shortly after the evening peak period.

Concord Road / Federal Street / Brightview Concord River Driveway

The intersection of Concord Road / Federal Street / Brightview Concord River Driveway experienced a total of four (4) crashes, or an average of 0.8 crashes per year, over the five-year period. The intersection has a crash rate of 0.08 per MEV, which is well below the statewide and districtwide averages for unsignalized intersections. Half of the crashes (2 of 4) at this location were angled crashes, and the remaining two (2) crashes were reported as rear-end crashes. Most (3 of 4) of the crashes occurred during periods of dry pavement. All (4 of 4) of the crashes occurred on a weekday, where two (2) crashes occurred during the evening period between 3:00 PM and 6:00 PM.

Crash Data Summary – Concord Road at Federal Street (Pre-COVID Condition)

TEC reviewed pre-COVID crash data to identify any safety concerns or crash trends at the intersection of Concord Road / Federal Street as directed by the Town's independent peer review consultant, Kimley-Horn. A cursory examination of the crash history pre-COVID from 2013–2019 indicates that the intersection experienced a total of twenty (20) crashes, averaging approximately 2.86 crashes per year. The majority of reported crashes resulted in property damage only, consisting of eleven (11) angle crashes, six (6) rear-end crashes, two (2) sideswipe crashes, and one (1) head-on collision.

This crash frequency corresponds to a crash rate of 0.30 crashes per MEV, based on 2025 traffic volumes. This rate is below the current statewide and districtwide averages for unsignalized intersections (0.57 crashes per MEV) and is likely consistent with past averages. Given the limited crash frequency and low crash rate, there is no indication of a notable crash trend or systemic safety concern at this location. Detailed descriptions of the crash data and crash rate worksheet for this pre-COVID condition are provided in Attachment E.

FUTURE CONDITIONS

Traffic volumes in the study area were projected to the year 2032, which reflects a 7-year planning horizon in accordance with MassDOT standards for TIAs. The traffic conditions for the year 2032 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 Project were superimposed upon the No-Build traffic networks to reflect the Build conditions with the proposed project.

Background 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. A procedure frequently employed estimates an ambient growth rate for the area roadways and applies that percentage to all mainline and side street traffic volumes. The drawback to such a procedure is that some turning volumes may grow at either a higher or a lower 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 drawback of this procedure is that the potential growth in population and development external to the Project area would not be accounted for in the traffic projections.

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

General Ambient Growth

To determine future traffic growth projections, TEC utilized the Northern Middlesex Council of Governments (NMCOG), Northern Middlesex Regional Traffic Volume Report published in 2022 evaluating growth rate data at over 200 locations throughout the region between 2012-2022 documenting traffic growth rates for the region's communities is important in the determination of impacts from transportation improvements or new developments on the existing system. The data indicates that in 2022 the highest annual growth in traffic volume occurred in Billerica. This represents an approximate 0.85% increase in traffic per year. The NMCOG annual growth data is provided in Attachment F.

Specific Development by Others

TEC coordinated with the Town of Billerica Planning and Community Development Department to identify any nearby private / public development properties in the vicinity of the study area that are either in the planning process or were recently approved but not yet occupied. The following developments were identified to potentially generate new traffic in the vicinity of the study area:

- *#161 Concord Road, Proposed Lab/cGMP Building* – This project entails the construction of a ±203,000 SF laboratory/cGMP building. Primary access to the Project site will be provided by the discontinued Middlesex Turnpike spur at Concord Road with secondary access to be provided by way of a new right-in/right-out driveway that will intersect the west side of Concord Road. Traffic projections related to this project were obtained from the previously mentioned TIA prepared by VAI⁴ in May 2022. The project recently resubmitted plans and documentation to the Town for a site plan modification to reduce the overall square footage to 147,400 SF and changed the land use to a flex / light industrial use. A new *Transportation Impact Evaluation* was prepared by VAI⁵ in September 2025 was submitted to the Town which documented a projected reduction in proposed site generated traffic. The application was approved in January 2026. All Conditions of Approval from the original 2022/2023 approval are still applicable including traffic signal timing / phasing modifications to the intersection of Concord Road / Middlesex Turnpike. Where the off-site mitigation is still applicable and the traffic volumes have dropped significantly, TEC has utilized the original trip generation and distribution from 2022/2023 in the TIPA for conservatism. There is currently no status update as to the expectation of construction.

A copy of the August 8, 2022 Site Plan Special Permit Certificate of Decisions for the #161 Concord Road project are provided in Attachment G. Whereas the project's off-site mitigation to traffic signal timings / phasing are included in the subject No-Build and Build conditions of this TIPA, the Synchro worksheets and TIA commitment notation depicting these signal timing / phasing modifications included in the TIA as prepared by VAI are also provided in Attachment G.

- *#195 Concord Road, Veteran's Educational Facility* – The project entails construction of an education/residence building to be located at #195 Concord Road. The project will include twenty-three (23) units with other resident amenities within the existing Brightview Concord River senior housing complex. Access to the site will be maintained through the existing driveway along Concord Road opposite Federal Street. It is not anticipated that the project will significantly increase traffic volumes in the area and therefore has been assumed to be part of the documented background growth rate. The development team currently has no funding for the project and therefore has no current date for opening. Since Town approval, no permits have been issued as to the construction on this site.
- *#300 Concord Road, Proposed Lab* - The Concord Road Corporate Center currently consists of three (3) office buildings located at #296, #298, and #300 Concord Road, totaling approximately ±353,708 SF of office space. The proposed project includes the construction of a two-story, ±151,700 SF laboratory building on a portion of the existing parking lot. A *Traffic Assessment*⁶ conducted for the proposed lab project

⁴ *Transportation Impact Assessment; Proposed Lab/cGMP Building, 0 & 161 Concord Road, Billerica MA*; prepared by Vanasse and Associates, Inc.; Andover, MA; dated May 2022.

⁵ *Transportation Impact Evaluation; Proposed Industrial Building, 0 & 161 Concord Road, Billerica MA*; prepared by Vanasse and Associates, Inc.; Andover, MA; dated September 22, 2025.

⁶ *Traffic Assessment – 300 Concord Road – Proposed Lab*; prepared by McMahon and Associates; Boston, MA; dated May 14, 2021.

indicates approximately 48% ($\pm 169,780$ SF) of the office space within the Corporate Center is vacant which results in the generation of fewer trips within the study area compared to full occupancy of the office buildings. This is redocumented in a supplemental Traffic Assessment completed by McMahon and Associates in January 2023. With the anticipated reduction in traffic, TEC did not consider this reduction in occupancy in its evaluation of traffic within the study area. Since Town approval, no permits have been issued as to the construction on this site. Discussions have occurred about the potential to change the land use in the area to retail / commercial activities; however, no site plan applications for this have been filed.

Specific site trip generation information for the above-mentioned developments by others is provided in Attachment G.

Federal Street Vacancies

The Applicant has coordinated with the various property owners along Federal Street. Occupancy / vacancies for the other properties on Federal Street in July 2025 at the time of traffic volume counts were:

- #3 Federal Street - $\pm 80\%$ occupied or $\pm 18,000$ SF vacant
- #4 Federal Street – No longer serves as office use; but used as a religious assembly (Onnuri Mission Alliance) use with very minimal draw of traffic volumes during peak hour conditions. This new use was under construction in July 2025 (39,888 SF). May not necessitate traffic volume projections based on limited church use.
- #5 Federal Street- $\pm 100\%$ occupied
- #8 Federal Street- $\pm 100\%$ occupied

TEC estimated the number of vehicle trips that are estimated to be generated by the $\pm 18,000$ SF of reoccupancy for the #3 Federal Street office building using the industry standard trip rates published in the Institute of Transportation Engineers (ITE) publication *Trip Generation, 11th Edition* for Land Use Code (LUC) 710 – General Office Building. A summary of the estimated trip generation for the reoccupancy for the #3 Federal Street office building is shown in Table 5. Detailed trip generation calculation worksheets related to the full reoccupancy are provided in Attachment G.

**Table 5 – Peak Hour Trip Generation
 Summary for #3 Federal Street Reoccupancy**

Time Period	Existing General Office (LUC 710) ^(a)
<i>Weekday Morning</i>	
IN	24
OUT	3
TOTAL	27
<i>Weekday Evening</i>	
IN	4
OUT	22
TOTAL	26

^a ITE LUC 710- General Office – 18,000 SF (Average Rate)

It is projected that this space may generate up to 27 additional weekday morning peak hour trips (24 entering and 3 exiting) and 26 additional weekday evening peak hour trips (4 entering and 22 exiting). These additional traffic volumes were included in both the 2032 No-Build and 2032 Build Conditions of the capacity and queue analysis. The resulting Specific Developments by Others & Non-Site Reoccupancy weekday morning and weekday evening peak hour traffic volume networks are illustrated in Figures G-1 and G-2, respectively.

Note that the 2032 No-Build and 2032 Build Conditions capacity and queue analysis do not include the reoccupancy of #4 Federal Street (where it is included in the traffic signal warrant analysis for conservatism purposes) as the parcel no longer serves as an office use; but used as a religious assembly use with very minimal draw of traffic volumes during peak hour conditions.

Trip Distribution for Reoccupied Office Space at #3 Federal Street

The distribution of the reoccupancy site-generated traffic volumes at #3 Federal Street was based on gravity models using 2022 U.S. Census Bureau Origin-Destination Employment Statistics “On the Map” data for the Town of Billerica. The journey-to-work distribution models the commutes of workers from Billerica to the top twenty-three (23) resident communities, which represent approximately 54% of the total Billerica workforce. Communities contributing less than 0.9% have been deemed to not change the distribution of traffic calculations significantly. The resulting primary trip distributions are shown in Table 6. The trip distribution gravity model information is provided in Attachment J. The resulting office related trip distribution is graphically depicted in Figure J-2.

**Table 6 – Trip Distribution Summary for #3 Federal Street
 Office Reoccupancy**

Direction	Entering/Exiting
Concord Road to/from North	22%
Middlesex Turnpike to/from East	5%
Concord Street to/from South	73%
Total	100%

Roadway Infrastructure Projects

The Town of Billerica Planning and Community Development Department identified the following public infrastructure projects in the vicinity of the study area:

- *Yankee Doodle Bike Path* – The Town of Billerica’s proposed Yankee Doodle Bike Path will be constructed along the northern edge of the Project site. The construction of Phase 1 of the bikeway will connect the Town of Billerica regionally from the center of town to the Minuteman Bikeway in Bedford, via the Narrow-Gauge Bikeway. The completion of this section would provide an alternative mode transportation corridor from Billerica to Arlington, with connections to many other surrounding communities. The addition of this approximately 4-mile bike path to the community will provide a handicapped accessible link between educational, recreational and conservation areas in the southern portion of the Town. As of August 09, 2025, his project has been advertised for construction bids.

The public infrastructure projects are not anticipated to alter the traffic volume characteristics within the study area. A general plan sheet for the Yankee Doodle Bike Path has been included in Attachment G.

Reoccupancy of Existing #1 & #2 Federal Street Office Space

The existing site currently consists of a two-story ±60,000 SF office building at #1 Federal Street and a two-story ±98,000 SF office building at #2 Federal Street. These office buildings became fully vacant on June 30, 2025. It is reasonable to anticipate that these two (2) buildings could be fully reoccupied at a future date. As such, a projection of the fully occupied site has been included in the No-Build scenario. To determine the future operation of the site driveways and adjacent roadway system with the full reoccupation of the building, traffic volumes were projected for a general office building use which would be a typical traffic generator for the site under the current building footprints and internal layouts. TEC estimated the number of vehicle trips to be generated by the office building using the industry standard trip rates published in the ITE publication *Trip Generation, 11th Edition* for LUC 710 – General Office Building. A summary of the estimated trip generation for the reoccupancy for the #1 and #2 Federal Street office buildings is shown in Table 7. Detailed trip generation calculation worksheets related to the full reoccupancy are provided in Attachment H.

Table 7 – Peak Hour Trip Generation Summary for #1 Federal Street Reoccupancy

Time Period	Existing General Office (LUC 710) ^(a)
<i>Weekday Daily</i>	
IN	864
OUT	<u>864</u>
TOTAL	1,728
<i>Weekday Morning</i>	
IN	218
OUT	<u>30</u>
TOTAL	248
<i>Weekday Evening</i>	
IN	41
OUT	<u>202</u>
TOTAL	243

^a ITE LUC 710- General Office – 158,000 SF (Fitted Curve)

As shown in Table 7, the reoccupancy for the #1 and #2 Federal Street office buildings would be anticipated to generate 1,728 vehicle trips during the average weekday, with 248 vehicle trips (218 entering and 30 exiting) during the weekday morning peak hour and 243 new vehicle trips (41 entering and 202 exiting) during the weekday evening peak hour.

Trip Distribution for Reoccupied Office Space at #3 Federal Street

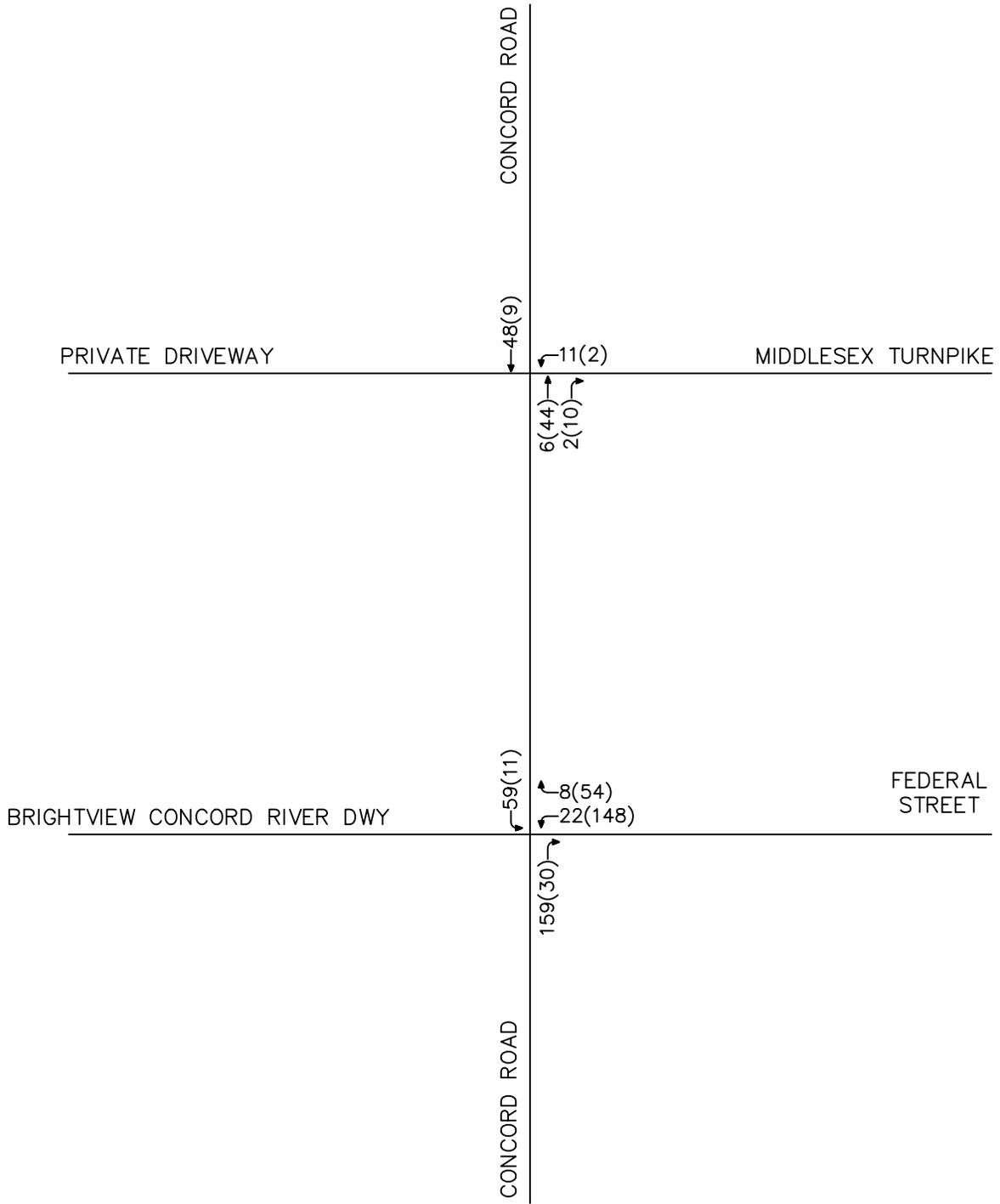
The distribution of the site reoccupancy site-generated traffic volumes at #3 Federal Street was based on gravity models using 2022 U.S. Census Bureau Origin-Destination Employment Statistics “On the Map” data for the Town of Billerica. The journey-to-work distribution models the commutes of workers from Billerica to the top twenty-three (23) resident communities, which represent approximately 54% of the total Billerica workforce. Communities contributing less than 0.9% have been deemed to not change the distribution of traffic calculations significantly. The resulting primary trip distributions are the same as shown in the previous Table 6 [Reoccupancy of #3 Federal Street]. Trip distribution gravity model information is provided in Attachment J. The office related trip distribution is graphically depicted in Figure J-2. The resulting Site Reoccupancy weekday morning and weekday evening peak hour traffic volume networks are illustrated in Figure 3.

No-Build Traffic Volumes

The 2032 No-Build weekday morning and weekday evening peak hour traffic volume networks were developed by applying the 0.85% per year compounded annual background traffic growth rate to the 2025 Existing Conditions peak hour traffic volumes over the 7-year design horizon and adding traffic generated by the nearby proposed developments, the full reoccupancy of the neighboring #3 Federal Street, and the full reoccupancy of the existing office buildings on-site. The resulting 2032 No-Build weekday morning and weekday evening peak hour traffic volume networks are illustrated in Figure 4.



Not to Scale



XXX(XXX) = WEEKDAY MORNING PEAK HOUR(WEEKDAY EVENING PEAK HOUR)

Figure 3

Site Generated Trips
Reoccupancy of #1 Federal Office
Weekday Morning & Weekday Evening
Peak Hour Traffic Volumes

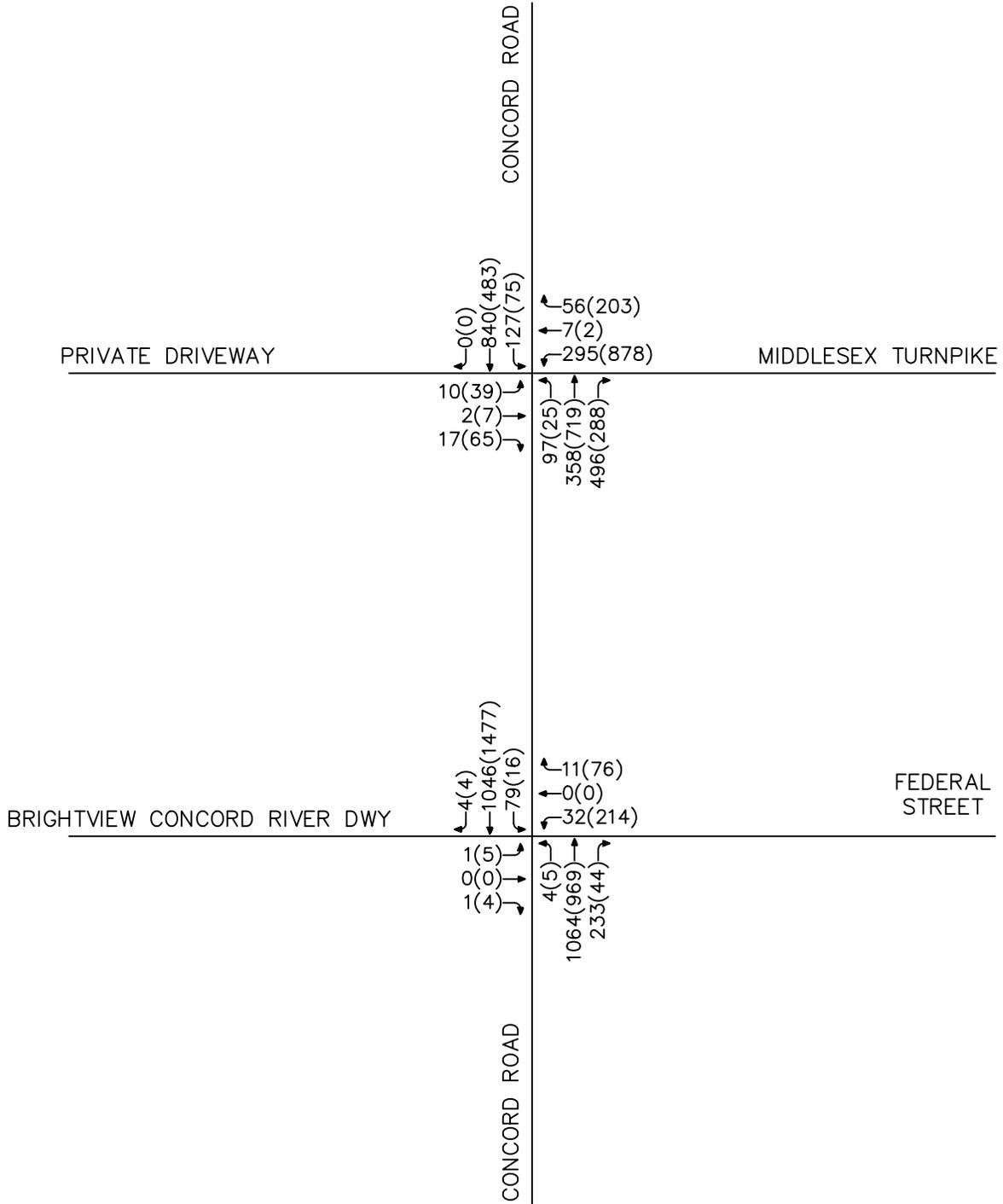
[Used in No-Build Only]



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Not to Scale



XXX(XXX) = WEEKDAY MORNING PEAK HOUR(WEEKDAY EVENING PEAK HOUR)

Figure 4

2032 No-Build Conditions
Weekday Morning & Weekday Evening
Peak Hour Traffic Volumes



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Site Generated Traffic

The Project seeks to fully redevelop each property to include a total of up to 266 multifamily residential units with associated tenant amenity space. Specifically, a three-story residential building with 88 residential units at #1 Federal Street and a three-story building with 178 residential units at #2 Federal Street. TEC estimated the site-generated traffic based on industry standard trip rates published in the ITE publication, *Trip Generation, 11th Edition* for LUC 220 – Multifamily Housing (Low-Rise). No credit will be taken in the TIPAs for the Project’s close proximity to public transportation (LRTA Bus Route 14) and walkable/bikeable destinations (Yankee Doodle Bike Path) resulting in a conservative trip generation projection for the Project. Table 8 provides a summary of the resulting site trip generation characteristics, a comparison to the full reoccupancy of the existing office use (from Table 7), and calculation of the net increase in site generated traffic. The detailed trip generation calculation worksheets are provided in Attachment I.

Table 7 – Trip Generation Summary

Time Period	Proposed Multifamily Housing (LUC 220) ^(a)	Existing General Office (LUC 710) ^(b)	Net Difference
<i>Weekday Daily</i>			
IN	890	864	+ 36
OUT	890	864	+ 36
TOTAL	1,780	1,728	+ 72
<i>Weekday Morning</i>			
IN	25	218	- 193
OUT	80	30	+ 50
TOTAL	105	248	- 143
<i>Weekday Evening</i>			
IN	85	41	+ 44
OUT	50	202	- 152
TOTAL	135	243	- 108

^a ITE LUC 220-Multifamily Housing (Low-Rise) – 266 Units (Fitted Curve)

^b From Table 6

As shown in Table 7, the Project is anticipated to generate 1,780 vehicle trips during the average weekday, with 105 vehicle trips (25 entering and 80 exiting) during the weekday morning peak hour and 135 new vehicle trips (85 entering and 50 exiting) during the weekday evening peak hour. In comparison to the vacant existing office use if fully reoccupied, the proposed Project is anticipated to generate 72 more vehicle trips during the average 24-hour weekday; however, the Project will significantly reduce the peak hour site generated traffic by 143 fewer vehicle trips during the weekday morning peak hour and 108 fewer vehicle trips during the weekday evening peak hour.

Trip Distribution

The distribution of the site-generated traffic volumes was based on gravity models using 2022 U.S. Census Bureau Origin-Destination Employment Statistics “On the Map” data for the Town of Billerica. The journey-to-work distribution models the commutes of residents from Billerica to the top twenty-five (25) workplace communities, which represent approximately 67% of the total

Billerica working residents. Communities contributing less than 0.7% have been deemed to not change the distribution of traffic calculations significantly. The resulting primary trip distributions are shown in Table 8. Trip distribution gravity model information is provided in Attachment J. The residential related trip distribution is graphically depicted in Figure J-1. The resulting site-generated traffic volume network is presented in Figure 5.

Table 8 – Trip Distribution Summary

Direction	Entering/Exiting
Concord Road to/from North	15%
Middlesex Turnpike to/from East	15%
Concord Street to/from South	70%
Total	100%

2032 Build Traffic Volumes

The 2032 Build Condition traffic-volume networks consist of the 2032 No-Build traffic volumes with the addition of the site-generated traffic associated with the proposed development and the corresponding subtraction of the site reoccupancy trips from #1 & #2 Federal Street. Essentially, the proposed trips take the place of the potential office reoccupancy trips on-site. The resulting 2032 Build weekday morning and weekday evening peak hour traffic volume networks are presented in Figure 6. 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 9.

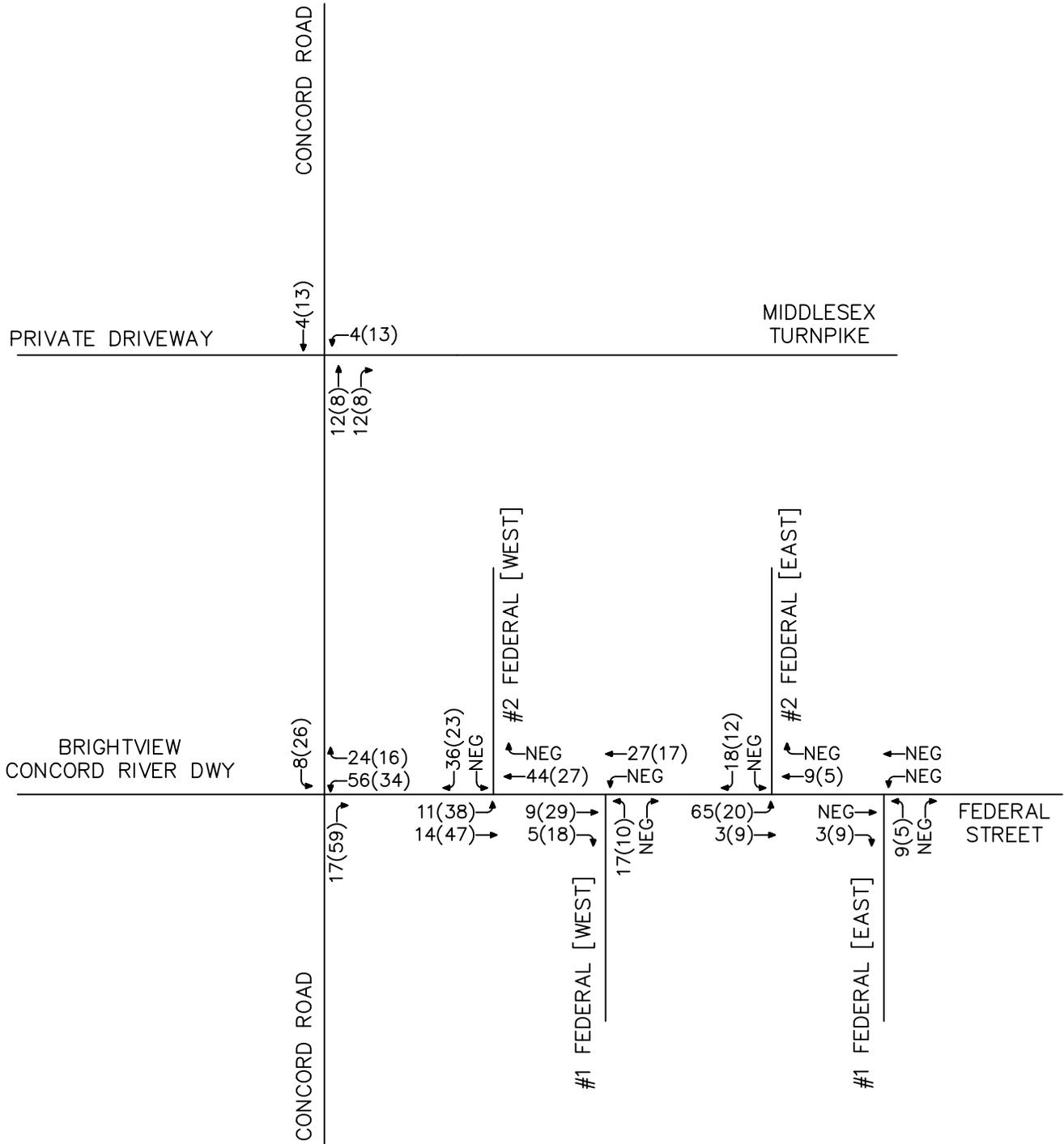
Table 9 – Peak Hour Traffic Volume Increases

Location/Peak Hour	2032 No-Build	2032 Build	Traffic Volume Difference Over No-Build	% Increase Over No-Build
Middlesex Tpk, east of Concord Rd				
<i>Weekday Morning</i>	983	986	+3	0.3%
<i>Weekday Evening</i>	1,453	1,462	+9	0.6%
Concord Rd, north of Middlesex Tpk				
<i>Weekday Morning</i>	1,391	1,353	-38	-2.8%
<i>Weekday Evening</i>	1,519	1,487	-32	-2.2%
Concord Rd, south of Federal St				
<i>Weekday Morning</i>	2,380	2,272	-108	-4.8%
<i>Weekday Evening</i>	2,713	2,628	-85	-3.2%

As shown in Table 9, site generated traffic volume increases along Middlesex Turnpike are anticipated to be less than 0.6% during any given peak hour. A reduction in traffic volumes is expected along Concord Road up to 2.8% north of Middlesex Turnpike and up to 4.8% south of Federal Street. Overall, the Project will generate less traffic compared to the existing office use during the peak commuter periods, and the additional traffic expected on Middlesex Turnpike as a result of the Project is anticipated to be negligible.



Not to Scale



XXX(XXX) = WEEKDAY MORNING PEAK HOUR(WEEKDAY EVENING PEAK HOUR)

Figure 5

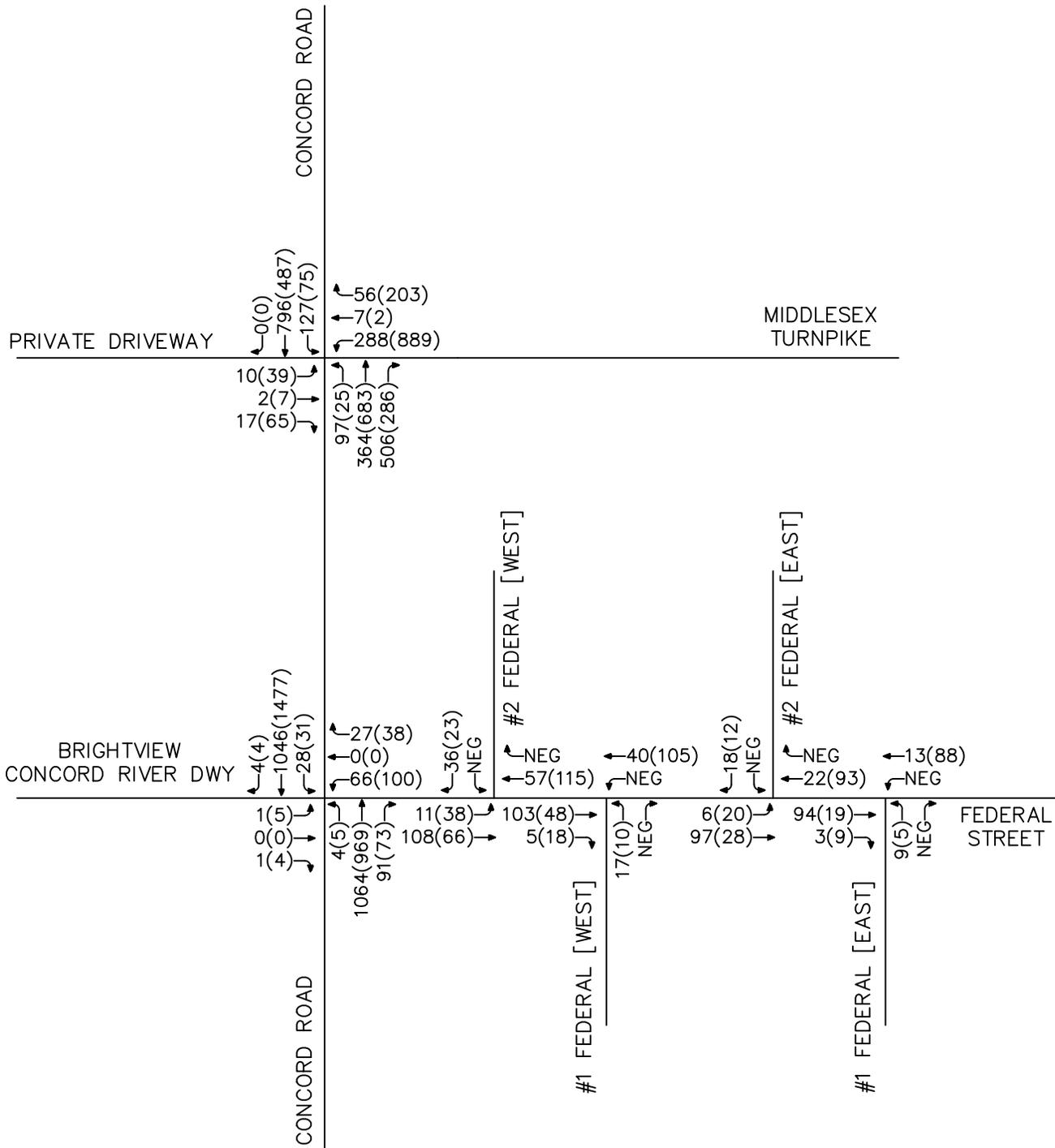
Site Generation Trips
Proposed Residential Development
Weekday Morning & Weekday Evening
Peak Hour Traffic Volumes



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Not to Scale



XXX(XXX) = WEEKDAY MORNING PEAK HOUR(WEEKDAY EVENING PEAK HOUR)

Figure 6

2032 Build Conditions
Weekday Morning & Weekday Evening
Peak Hour Traffic Volumes



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TRAFFIC CONTROL WARRANTS

Signal Warrant Analysis

A traffic signal warrant analysis was conducted for the intersection of Concord Road / Federal Street using traffic volumes from the July 2025 TMCs. No seasonal adjustment factor was applied to the traffic volumes as July traffic volumes are typically higher than the average. The *Manual on Uniform Traffic Control Devices* (MUTCD) contains eight warrants for evaluating justifications for the installation of a traffic signal. In accordance with MassDOT guidelines, Warrant 1 must be satisfied at minimum before a new traffic signal installation is considered. As part of this study, only Warrant 1 (Eight-Hour Vehicular Volume) and Warrant 2 (Four-Hour Vehicular Volume) were evaluated, as the remaining MUTCD warrants were not applicable and/or reasonably approaching the corresponding warranting thresholds.

Site-generated trip projections were superimposed on the July 2025 traffic volumes to represent conditions following building occupancy. To ensure a conservative analysis, full occupancy of #3 Federal Street (an additional 18,000 SF not occupied as of July 2025) and the 39,888 SF office building at #4 Federal Street, prior to its conversion to a religious assembly use (Onnuri Mission Alliance), were included in the warrant analysis which resulting in total of 57,888 SF of additional office use that is currently not in place and/or proposed. Note that the #4 Federal Street parcel is not intended to revert back to office use and the religious assembly use draws negligible traffic during non-service hours. The hour-by-hour distribution of these residential and reoccupancy office trips was assessed based on time-of-day distribution data published in the ITE publication *Trip Generation, 11th Edition* for LUC 220 – Multifamily Housing (Low-Rise) and LUC 710 -General Office Building.

Warrant Adjustments

Right-Turn Side-Street Traffic Volumes – Right-turns are a prominent movement for the Federal Street westbound approach. Most of the right-turns would normally be expected to exit out of the minor-street (Federal Street) with minimal conflict because an exclusive right-turn lane exists, sight lines are generally clear, and sufficient gaps are expected in traffic from the upstream traffic signals along Concord Road near the US Route 3 ramps. For this approach geometry, the *MUTCD* states:

“The study should consider the effects of the right-turning vehicles from the minor-street approaches. Engineering judgment should be used to determine what, if any, portion of the right-turning traffic is subtracted from the minor-street traffic count when evaluating the count against the signal warrants listed in Paragraph 2 of this Section.” (MUTCD - Sect 4C.01 ¶8)

For these traffic signal warrants, a full 100% reduction was applied to the right-turning movements along Federal Street based on the potential for insignificant vehicle conflict for right-turning vehicles. Note that the introduction of the right-turn volumes on the approach would necessitate evaluating the Federal as a two (2) lane roadway for the warrant purposes which raises the volume thresholds to satisfy the warrants.

Warrant Results

Based on the existing traffic volumes and the addition of the projected site-generated trips and reoccupancy trips for 57,888 SF of office space, the intersection of Concord Road / Federal Street / Brightview Concord River Driveway does not meet the MUTCD's traffic signal warranting criteria for Warrant 1 or Warrant 2. The traffic signal warrant analysis worksheets are provided in Attachment K.

TRAFFIC IMPACT ANALYSIS

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, and Build 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.

Methodology

Synchro Methodology for Signalized Intersections

The signalized intersection capacity and queue analysis was conducted using methodology from the *Highway Capacity Manual (HCM) 2000* methodology due to the restrictions posed on signalized intersection analysis using *HCM 7th Edition*. This includes the inability of *HCM 7th Edition* and Synchro software to correctly analyze both an exclusive pedestrian phase and atypical lane movement geometrics (left turns from both an exclusive lane and an adjacent general-purpose travel lane) which are present at the study area signalized intersection.

MassDOT has recognized significant errors and deficiencies in the *HCM 7th Edition* methodology and traffic impact software such as Synchro 12 when attempting to analyze traffic signals. Based on conversations with the MassDOT – Highway Division's Traffic Section, alternate methodologies to analyze capacity, delays, and queues can be conducted as long as the models are properly calibrated.

Levels of Service

A primary result of a capacity analysis is the assignment of level-of-service under various traffic-flow conditions⁷. 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. Although Synchro software does not fully adhere to methodologies posed in the *HCM 7th Edition*, the LOS scale A-F was utilized to present a representation of traffic operations intersection

⁷ The capacity analysis methodology is based on the concepts and procedures presented in the *Highway Capacity Manual 7th Edition*; Transportation Research Board; Washington, DC; 2022.

by intersection within the network. 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 simulation software which is also based upon the methodology and procedures presented in the *HCM 7th Edition*. Synchro reports both the 50th (average) and 95th percentile vehicle queues for unsignalized and signalized intersections, which are based on the number of vehicles that experience a delay of six 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 exceed only 5% of the time; or approximately three minutes out of sixty minutes during the peak one hour of the day. During the remaining fifty-seven minutes, the vehicle queue length will be less than the 95th percentile queue length.

Parameters for Traffic Impact Analysis

Signalized Intersections

LOS for signalized intersections is calculated using the operational analysis methodology of the *HCM 2000*. 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 10 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 10 – Level of Service Criteria for Signalized Intersections^(a)

Level of Service V/C ≤ 1.00	Average Control Delay (s/veh)	Description
A	≤10.0	LOS A describes operations with exceptionally low control delay; most vehicles do not stop at all.
B	10.1 to 20.0	LOS B describes operations with relatively low control delay. However, more vehicles stop than LOS A.
C	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	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	55.1 to 80.0	LOS E describes operations with high control delay values. Individual cycle failures are frequent occurrences.
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 2000*; Transportation Research Board; Washington D.C.; 2000

Unsignalized Intersections

The levels of service of two-way stop-controlled unsignalized intersections are determined by application of a procedure described in the *HCM 7th Edition*. The 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 7th Edition*. Table 11 summarizes the relationship between level of service and average control delay for unsignalized intersections.

Table 11 – Level of Service Criteria for Unsignalized Intersections^(a)

Level of Service V/C ≤ 1.00	Level of Service V/C > 1.00	Average Control Delay (s/veh)	Description
A	F	≤10.0	LOS A describes operations with exceptionally 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.; 2022

Intersection Capacity and Queue Analysis Results

The capacity and queue analysis worksheets are provided in Attachment L. The results of the capacity and queue analysis are described in Table 12.

Concord Road at Middlesex Turnpike

Under both 2032 No-Build and Build Condition, the Middlesex Turnpike westbound movements and the Concord Road left-turn movements are anticipated to operate at a degraded level of service (LOS F) during the weekday evening peak hour. Independent of the Project, the Middlesex Turnpike westbound movements are also anticipated to operate with volume-to-capacity (v/c) ratios above 1.00 during the weekday evening peak hour. This condition is consistent with the Build Condition reported in the TIA for the #161 Concord Road project which introduces new traffic volumes along the discontinued Middlesex Turnpike eastbound approach and provides modifications to the traffic signal timings and phasing as off-site mitigation outlined in their Conditions of Approval. Although the conditions at this location remain degraded, the Project is anticipated to decrease overall traffic volumes and reduce the delay per vehicle and v/c ratios at the intersection. All movements at the intersection are expected to operate at acceptable levels of service (LOS D or better) during the weekday morning peak hour with v/c ratios well below 1.00 indicating that the intersection is expected to accommodate the existing and proposed demand.

Note that traffic signal timings and phasing modifications that are anticipated as part of the #161 Concord Road project will result in optimized operational conditions over existing conditions. Considering this project’s recent January 2026 approved resubmission, the overall traffic at this intersection would be reduced from the projected traffic volumes.

Concord Road / Federal Street / Brightview Concord River Driveway

The Federal Street westbound left-turn movement is anticipated to operate at a degraded level of service (LOS F) during both the weekday morning and evening peak hours under both No-Build and Build Conditions. It should be noted that the Project is expected to reduce overall traffic at the intersection as a result of the proposed change in use from office to residential, whereas the Build condition improves over No-Build Conditions. The description of vehicle delay in Table 10 for the Federal Street westbound left-turn movement is well overstated as the analysis software and HCM do not take into account the upstream traffic signals in each direction which will create gaps in traffic to allow for a more reasonable flow from the Federal Street stop control.

The anticipated 2032 Build Condition traffic volumes exiting left from the Federal Street westbound approach (movement of degraded operations) are only 66 vehicles and 100 vehicles for the weekday morning and weekday evening peak hours, respectively. This equates to between 1.0 to 1.7 vehicles per minute on average approaching the stop control which represents a nominal amount of traffic for a typical side-street approach along a mainline roadway. The same reoccupied No-Build condition depicted upwards of 214 vehicles on the Federal Street westbound left-turn in the weekday evening peak hour (2.1x times the expected Build condition) which would simulate the pre-COVID condition. It can reasonably be expected that the pre-COVID condition of Federal Street will not materialize with a more balanced land use mix along the roadway.

Queuing along the Federal Street westbound approach may temporarily block the westerly Site driveways; however, this condition is expected to occur only for short durations, primarily during the peak hours where the Build condition denotes a 238 foot (10 cars) and 413 foot (17 cars) 95th percentile queue (exceeded three-minutes of peak hour or 5% of peak hour). The Applicant is committed to provide 'Do Not Block the Intersection' pavement markings and traffic signs along Federal Street westbound adjacent to the #2 Federal Street driveways along the northerly side of the roadway.

Federal Street / Easterly and Westerly Site Driveways

All the movements at the proposed Site Driveways at Federal Street are expected to operate at LOS B or better with negligible delay and queuing expected along Federal Street or along the site internal parking aisles.

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Table 12 – Intersection Capacity and Queue Analysis Summary

Intersection / Lane Group	2025 Existing Condition					2032 No Build Condition					2032 Build Condition				
	V/C ^a	Delay ^b	LOS ^c	Bay ^d	Queue ^e	V/C	Delay	LOS	Bay	Queue	V/C	Delay	LOS	Bay	Queue
Concord Road / Middlesex Turnpike															
<i>Weekday AM Peak Period</i>															
Middlesex Turnpike EBL	-	-	-	100	-	0.29	36.8	D	100	<25/<25	0.31	38.1	D	100	<25/<25
Middlesex Turnpike EBTR	-	-	-	-	-	0.13	36.2	D	-	<25/<25	0.13	36.3	D	-	<25/<25
Middlesex Turnpike WBL	0.51	22.8	C	310	61/149	0.87	55.0	E	310	66/293	0.85	52.1	D	310	61/285
Middlesex Turnpike WBLTR	0.25	20.6	C	-	<25/82	0.78	43.1	D	-	55/263	0.77	42.3	D	-	51/257
Concord Road NBL	-	-	-	90	-	0.78	52.9	D	90	36/171	0.78	54.2	D	90	34/171
Concord Road NBTR	0.64	19.1	B	-	91/155	0.87	33.3	C	-	93/377	0.81	27.6	C	-	96/387
Concord Road SBL	0.44	24.1	C	350	45/103	0.51	27.6	C	350	41/131	0.62	32.7	C	350	39/131
Concord Road SBTR	0.38	6.8	A	-	75/102	0.77	22.8	C	-	116/392	0.72	21.5	C	-	108/360
Overall Intersection	0.60	15.3	B	-	-	0.74	32.5	C	-	-	0.73	30.0	C	-	-
<i>Weekday PM Peak Period</i>															
Middlesex Turnpike EBL	-	-	-	100	-	0.14	46.7	D	100	<25/65	0.14	45.5	D	100	<25/65
Middlesex Turnpike EBTR	-	-	-	-	-	0.13	59.9	E	-	<25/80	0.13	58.6	E	-	<25/80
Middlesex Turnpike WBL	1.57	296.6	F	310	345/663	1.17	143.4	F	310	560/1056	1.16	138.1	F	310	549/1082
Middlesex Turnpike WBLTR	1.30	155.7	F	-	249/541	1.14	129.4	F	-	510/1001	1.12	121.6	F	-	493/1008
Concord Road NBL	-	-	-	90	-	0.69	106.2	F	90	<25/66	0.71	110.5	F	90	<25/66
Concord Road NBTR	0.70	18.9	B	-	155/231	0.86	45.3	D	-	388/622	0.85	45.5	D	-	365/580
Concord Road SBL	0.34	27.2	C	350	29/75	0.87	115.9	F	350	65/202	0.85	109.1	F	350	63/202
Concord Road SBTR	0.21	6.0	A	-	38/55	0.38	28.9	C	-	155/261	0.39	29.5	C	-	156/263
Overall Intersection	0.93	111.0	F	-	-	0.90	80.8	F	-	-	0.90	78.9	E	-	-

^a Volume-to-capacity ratio

^b Delay expressed in seconds per vehicle (average)

^c Level of service

^d Turn bay length in feet

^e 50th Percentile Queue / 95th Percentile Queue [95th Percentile Queue only for unsignalized intersections]

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Table 12 – Intersection Capacity and Queue Analysis Summary (Continued)

Intersection / Lane Group	2025 Existing Condition					2032 No Build Condition					2032 Build Condition				
	V/C ^a	Delay ^b	LOS ^c	Bay ^d	Queue ^e	V/C	Delay	LOS	Bay	Queue	V/C	Delay	LOS	Bay	Queue
Concord Road / Federal Street / Brightview Driveway															
<i>Weekday AM Peak Period</i>															
Brightview Driveway EB	0.03	36.9	E	-	<25	0.08	80.4	F	-	<25	0.05	56.3	F	-	<25
Federal Street WBL*	0.19	92.6	F	70	<25	>2.0	>999	F	70	138	>2.0	>999	F	70	238
Federal Street WBTR	0.01	12.1	B	-	<25	0.03	14.6	B	-	<25	0.08	13.9	B	-	<25
Concord Road NB	0.01	10.6	B	-	<25	0.01	11.1	B	-	<25	0.01	11.1	B	-	<25
Concord Road SB	0.02	10.4	B	-	<25	0.18	13.8	B	-	<25	0.06	11.7	A	-	<25
<i>Weekday PM Peak Period</i>															
Brightview Driveway EB	0.28	91.0	F	-	25	0.56	239.4	F	-	45	0.57	238.7	F	-	38
Federal Street WBL*	1.23	332.0	F	70	143	>2.0	>999	F	70	880	>2.0	>999	F	70	413
Federal Street WBTR	0.04	12.4	B	-	<25	0.22	14.9	B	-	<25	0.11	14.0	B	-	<25
Concord Road NB	0.01	13.0	B	-	<25	0.01	14.5	B	-	<25	0.01	14.5	B	-	<25
Concord Road SB	0.01	10.8	B	-	<25	0.03	11.7	B	-	<25	0.07	12.1	B	-	<25

^a Volume-to-capacity ratio

^b Delay expressed in seconds per vehicle (average)

^c Level of service

^d Turn bay length in feet

^e 50th Percentile Queue / 95th Percentile Queue [95th Percentile Queue only for unsignalized intersections]

*Note: The description of vehicle delay in Table 10 for the Federal Street westbound left-turn movement is well overstated as the analysis software and HCM does not take into account the upstream traffic signals in each direction which will create gaps in traffic to allow for a more reasonable flow from the Federal Street stop control approach:

Table 12 – Intersection Capacity and Queue Analysis Summary (Continued)

Intersection / Lane Group	2025 Existing Condition					2032 No Build Condition					2032 Build Condition				
	V/C ^a	Delay ^b	LOS ^c	Bay ^d	Queue ^e	V/C	Delay	LOS	Bay	Queue	V/C	Delay	LOS	Bay	Queue
Federal Street / #2 Federal Street [West]															
<i>Weekday AM Peak Period</i>															
Federal Street EBL	-	-	-	-	-	-	-	-	-	-	0.01	7.4	A	-	<25
Site Driveway SB	-	-	-	-	-	-	-	-	-	-	0.04	8.7	A	-	<25
<i>Weekday PM Peak Period</i>															
Federal Street EBL	-	-	-	-	-	-	-	-	-	-	0.03	7.5	A	-	<25
Site Driveway SB	-	-	-	-	-	-	-	-	-	-	0.03	9.0	A	-	<25
Federal Street / #1 Federal Street [West]															
<i>Weekday AM Peak Period</i>															
Site Driveway NB	-	-	-	-	-	-	-	-	-	-	0.02	9.4	A	-	<25
<i>Weekday PM Peak Period</i>															
Site Driveway NB	-	-	-	-	-	-	-	-	-	-	0.01	9.5	A	-	<25
Federal Street / #2 Federal Street [East]															
<i>Weekday AM Peak Period</i>															
Federal Street EBL	-	-	-	-	-	-	-	-	-	-	0.01	7.3	A	-	<25
Site Driveway SB	-	-	-	-	-	-	-	-	-	-	0.02	8.5	A	-	<25
<i>Weekday PM Peak Period</i>															
Federal Street EBL	-	-	-	-	-	-	-	-	-	-	0.02	7.4	A	-	<25
Site Driveway SB	-	-	-	-	-	-	-	-	-	-	0.01	8.8	A	-	<25
Federal Street / #1 Federal Street [East]															
<i>Weekday AM Peak Period</i>															
Site Driveway NB	-	-	-	-	-	-	-	-	-	-	0.01	9.1	A	-	<25
<i>Weekday PM Peak Period</i>															
Site Driveway NB	-	-	-	-	-	-	-	-	-	-	0.01	9.1	A	-	<25

^a Volume-to-capacity ratio

^b Delay expressed in seconds per vehicle (average)

^c Level of service

^d Turn bay length in feet

^e 50th Percentile Queue / 95th Percentile Queue [95th Percentile Queue only for unsignalized intersections]

PARKING DEMAND

The Project seeks to provide 456 off-street parking spaces. Specifically, 156 off-street parking spaces at #1 Federal Street and 300 off-street parking spaces #2 Federal Street. A summary of the off-street parking breakdown by bedroom is as follows:

- #1 Federal Street (88 units)
 - 49 one-bedroom / studios
 - 39 two-bedrooms / three-bedrooms
- #2 Federal Street (178 units)
 - 106 one-bedroom / studios
 - 72 two-bedrooms / three-bedrooms

TEC assessed the projected parking demand for the land use to confirm the adequacy of the parking supply provided. The following section details the review of parking supply and anticipated demand.

ITE Parking Demand Analysis

TEC assessed the future parking demands from the project with a review of the 85th percentile peak parking demand rates established in the industry standard ITE publication *Parking Generation, 6th Edition*. The analysis assumes the 85th percentile peak parking demand rates associated with the following land uses:

- LUC 217 - Multifamily Housing 1 Bedrooms (Low-Rise) – 155 Units (includes studios)
- LUC 220 - Multifamily Housing 2+ Bedrooms (Low-Rise) – 111 Units

The site is anticipated to include 155 one-bedroom units, 100 two-bedroom units, and eleven (11) three-bedroom units for a total of 388 bedrooms. Table 11 provides a summary of the resulting 85th percentile peak parking demand estimates. Detailed parking generation worksheets and a copy of the Town of Billerica’s bylaw for off-street parking are provided in Attachment M.

Table 11 – ITE Parking Demand Summary

Day	Land Use Description	Peak Parking Demand Rate	Bedroom Count	Parking Demand
Weekday	Multifamily Housing 1 BR (Low-Rise)	1.27 per Unit / Bedroom	155	197
Weekday	Multifamily Housing 2+ BR (Low-Rise)	0.86 per Bedroom	233	200
TOTALS			388	397

No Saturday data used.

The Project is expected to generate a demand for approximately 397 parking spaces for the proposed 266 residential units (388 bedrooms). As the site offers 456 off-street parking spaces, the parking supply is expected to meet the 85th percentile peak parking demand.

Town of Billerica Zoning Bylaw – MCMOD (Federal Street Subdistrict)

Under the Town of Billerica Zoning Bylaw Section 5.E.12(F)(1) for the new MCMOD Federal Street Subdistrict, number of off-street parking spaces required are 1.5 spaces per unit for one-bedroom / studio units and 2.0 spaces per unit for two-bedrooms or more units. Table 12 provides a summary of the proposed parking supply in relation to the Zoning Bylaw.

Table 12 – Billerica MCMOD Zoning – Off-Street Parking Requirements

Land Use Description	Peak Parking Demand Rate	Unit Count	Parking Required
#1 Federal Street			
MCMOD-C: Multifamily Housing 1 BR	1.5 per Unit	49	74
MCMOD-C: Multifamily Housing 2+ BR	2.0 per Unit	39	78
#2 Federal Street			
MCMOD-C: Multifamily Housing 1 BR	1.5 per Unit	106	159
MCMOD-C: Multifamily Housing 2+ BR	2.0 per Unit	72	144
TOTALS		266	455

The Applicant meets the zoning parking requirements of 455 off-street parking spaces. In addition, based on the ITE projections for peak parking demand, the Applicant is confident that the proposed parking supply is adequate to accommodate the demand expected on the site. Fifty-nine (59) parking spaces within the #2 Federal Street parcel will be banked and developed upon demand in order to protect green space on site.

CONCLUSIONS AND RECOMMENDATIONS

Summary of Traffic Impact & Parking Assessment

TEC has examined the potential traffic impacts associated with the proposed redevelopment of #1 & #2 Federal Street in Billerica, Massachusetts. The following is a summary of the results and conclusions of this effort:

- The existing site currently consists of two (2) building structures including a two-story ±60,000 SF office building at #1 Federal Street and a two-story ±98,000 SF office building at #2 Federal Street. The buildings will be razed as part of the project.
- The Project will fully redevelop each property to include a total of up to 266 multifamily residential units with associated amenity space and 456 off-street parking spaces. Specifically, a three-story residential building with 88 residential units and 156 off-street parking spaces at #1 Federal Street and a three-story building with 178 residential units and 300 off-street parking spaces at #2 Federal Street.
- The Project will also reconfigure the pavement and open space area within the site to provide newly reconstructed driveways, including two (2) full-access driveways for #1 Federal Street along the south side of Federal Street with access to neighboring

properties eliminated; and two (2) full-access driveways for #2 Federal Street along the north side of Federal Street.

- The SSD and ISD along Concord Road at its intersection with Federal Street exceeds AASHTO minimum recommendations for safe operations. Seasonal vegetation along the easterly side of Concord Road, north of Federal Street, may reduce the sight line for vehicles travelling along Concord Road and will be maintained by the Applicant.
- The proposed Project is anticipated to generate 1,780 vehicle trips during the average weekday, with 105 vehicle trips (25 entering and 80 exiting) during the weekday morning peak hour and 135 new vehicle trips (85 entering and 50 exiting) during the weekday evening peak hour.
- In comparison to existing office space use, which could be reoccupied in full, the proposed Project is anticipated to generate 143 fewer vehicle trips during the weekday morning peak hour and 108 fewer vehicle trips during the weekday evening peak hour. Overall, the Project is anticipated to decrease the overall traffic volumes at the study area intersections as a result of the proposed change in use from office to residential.
- Based on the existing traffic volumes, the addition of the projected site-generated trips and reoccupancy trips for 57,888 SF of office space, the intersection of Concord Road / Federal Street / Brightview Concord River Driveway does not meet the MUTCD's traffic signal warranting criteria for Warrant 1 or Warrant 2.
- Independent of the Project, the Middlesex Turnpike westbound movements are also anticipated to operate with v/c ratios above 1.00 during the weekday evening peak hour. This condition is consistent with the Build Condition reported in the TIA for the #161 Concord Road project which introduces new traffic volumes along the discontinued Middlesex Turnpike eastbound approach and provides modifications to the traffic signal timings and phasing. Although the conditions at this location remain degraded, the Project is anticipated to decrease overall traffic volumes and reduce the delay per vehicle and v/c ratios. All movements at the intersection are expected to operate at acceptable levels of service (LOS D or better) during the weekday morning peak hour with v/c ratios well below 1.00 indicating that the intersection is expected to accommodate the existing and proposed demand.
- The Federal Street westbound left-turn movement is anticipated to operate at a degraded level of service (LOS F) during both the weekday morning and evening peak hours under both No-Build and Build Conditions. It is important to note that the description of vehicle delay in Table 12 for the Federal Street westbound left-turn movement is well overstated as the analysis software and HCM does not take into account the upstream traffic signals in each direction which will create gaps in traffic to allow for a more reasonable flow from Federal Street's stop control.

Applicants' Off-Site Mitigation Commitments

The Applicant will commit to the following transportation improvement measures in the vicinity of the site:

- The Applicant will provide clearing / trimming of seasonal vegetation, including future maintenance as necessary, along the easterly side of Concord Road along the site's frontage to maintenance sight lines to/from Federal Street. The Applicant will keep and maintain new plantings / landscaping along the site frontage for Concord Road and Federal Street, near the site driveways, to a maximum height of 3.5-feet within the sight triangles.
- The property owner will provide a permanent easement along the northerly edge of the property for the establishment of the proposed Yankee Doodle Bike Path.
- The Applicant will provide direct internal sidewalk network connection to the proposed Yankee Doodle Bike Path passing through the northerly portion of the property at #2 Federal Street. Note that this will facilitate nearby access to the dedicated LRTA bus stop that exists along Middlesex Turnpike to the north of the site.
- The Applicant will reapply pavement markings and install appropriate lane configuration traffic signage along the Federal Street westbound approach to Concord Road to denote the shared left-turn / through lane and exclusive right-turn lane.
- The Applicant will reapply a new stop line and install a new stop sign (R1-1) along the Federal Street westbound approach to Concord Road. The Applicant will also add the necessary stop line and stop signs to each Site Driveway approaching Federal Street.
- The Applicant will provide a crosswalk across Federal Street between #1 and #2 Federal Street with high-visibility crosswalk markings, a solar-powered RRFB, and pedestrian crossing warning signs (W11-2, W16-7p, and W16-9p).
- The Applicant will apply 'Do Not Block the Intersection' measures along Federal Street at the driveway(s) location within the expected queue distance from Concord Road.

The above-mentioned improvements represent a considerable financial investment from the Applicant, through both design and construction, to improve traffic operational and safety conditions adjacent to the site.

Transportation Demand Management Measures

The Applicant has a commitment to research and provide a dynamic Transportation Demand Management (TDM) program to reduce SOV trips to/from the site. Currently, the Applicant is committed to providing the following TDM measures:

Bicycle and Pedestrian Measures

- On-Site Pedestrian Accommodations – The Applicant will provide internal pedestrian connections within each parcel and between the two (2) parcels of the

redevelopment. The Applicant will also provide direct connection to the Yankee Doodle Bike Path within the site. In addition, a crosswalk will be provided to connect the two properties across Federal Street as well as crossing signs to be posted for the crosswalks on Federal Street.

- Bicycle Racks – The Applicant will provide 266 secure, weather-protected, long-term bicycle parking for residents at designated locations within the proposed project area.

Public Transportation Measures

- Maps / Schedules - Public transportation schedules with transit maps for LRTA Bus Route 14, the MBTA Commuter Rail (connection from LRTA Bus Route 14), as well as for all nearby routes will be provided to each resident upon move-in and will be posted within each floor of the residential buildings. Schedules and maps will also be provided in the lobby and near doorways in all other on-site buildings.

LRTA Route Extension - The Applicant is currently discussing extension of LRTA bus service to the site. These discussions are ongoing and are generally dependent on the LRTA's agreement that the site provides adequate boarding / alighting potential to/from the site.

Other Measures

- Electric Vehicle Charging Stations – The site will include forty-five (45) electric vehicle parking spaces with connection to charging stations. An additional forty-four (44) parking spaces will also be EV-ready.
- Banked Parking Supply – The Applicant is incorporating fifty-nine (59) banked parking spaces on-site to only be developed upon demand; thereby reducing impervious area and adding green space to the project.
- Transportation Management Association – The Applicant will evaluate opportunities to work with and/or join the TMA for the subject area (Middlesex 3) to assist with transportation demand management measures.
- Marketing of Transportation Options and Benefits - A welcome packet for all tenants will be distributed at move-in which includes information for all transportation related benefits, promotions, and local transportation options; including location of LRTA stops, transit schedules, maps of the Yankee Doodle Bike Path, and any other emerging new mobility locations.
- In-Unit Laundry Services - The Applicant will provide in-unit laundry that allows for the reduction of trips to/from the site of nearby laundromats.
- Site Amenities – The site includes several on-site amenities, such as a work from home office space area, a fitness center, storage, a pool, and open space. This location will assist in reducing vehicular demand and increase multi-use trips, which

include parking capacity sized to meet minimum local requirements without providing excessive parking.

With implementation of the proposed improvements and the minimal daily increase / significant reduction of commuter peak period traffic volumes from the redevelopment of #1 & #2 Federal Street properties, the Project will safely and efficiently be accommodated within the study area corridors and intersections. The level of impact on traffic operations and safety does not warrant any additional project-specific mitigation beyond the commitments outlined in this TIPA.

Attachment A - Public Transportation Data

RIDER POLICY FOR FARE FREE PROGRAM

- 1 You must have a destination when boarding the bus. Riding the bus without a destination will create bus overcrowding.
- 2 You may be asked to disembark at the end of the line.
- 3 You are only allowed to bring on the bus what you can carry in one trip.



LRTA ROAD RUNNER OFFICE

(978-459-0152)
 113 THORNDIKE STREET, LOWELL, MA 01852
 (LOCATED NEXT TO THE KENNEDY CENTER)
 Monday - Friday: 9 AM to Noon
 Issues CharlieCards for Persons with Disabilities/TAP.

THREE WAYS TO GET YOUR CHARLIECARD FOR PERSONS WITH DISABILITIES/TAP

1) IN PERSON AT LRTA ROAD RUNNER OFFICE

- First time applicants for the TAP ID, or applicants with expired TAP ID Cards need to fill out an application. Applications are available at the LRTA Road Runner Office or online at LRTA.com
- The LRTA will process your application within 14 days of receipt.
- Once approved, you will need to bring a photo ID.

2) APPLY ONLINE AT MBTA.COM

3) MAIL YOUR APPLICATION TO THE LRTA ROAD RUNNER OFFICE 113 THORNDIKE STREET LOWELL, MA 01852

For More Detailed Info visit LRTA.com

BLIND ACCESS CHARLIECARD

These cards are issued by the MBTA.

For more information visit www.mbta.com/fares/reduced/blind-access-charliecard

THE LOWELL REGIONAL TRANSIT AUTHORITY

Announces

A Temporary Fare Free Pilot Program Commencing

December 1, 2024

And Continues Through September 30, 2025

(Fares may resume 10/1/2025
 Subject to State Funding)

The LRTA wants to Thank
 Governor Maura Healey and
 Lieutenant Governor Kim Driscoll,
 as well as the Massachusetts State Legislature
 for funding this
 Fare Free Transportation Pilot Program
 that will greatly benefit our communities.

TO CATCH A BUS...

1

USE A DESIGNATED LRTA BUS STOP

The bus will pick you up and take you to your destination. Please raise your hand to alert driver.



Outbound
 Inbound

2

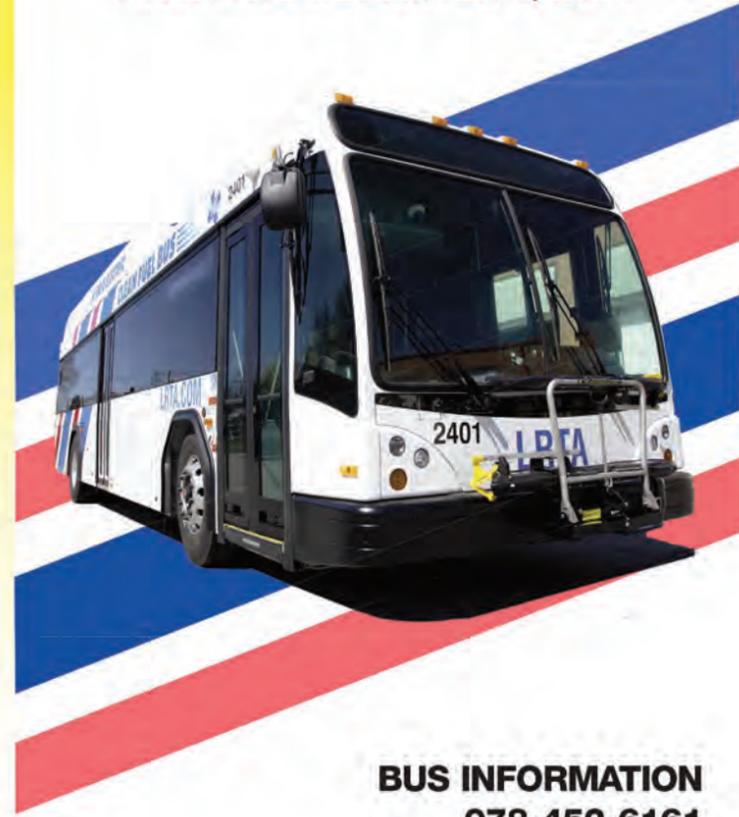
WAVE YOUR HAND ALONG ANY LRTA BUS ROUTE

Simply wave your hand in order to alert the driver to stop. You need to be at a safe location on the same side of the street as the bus. We encourage you to be at a bus stop.



BUS SCHEDULES

EFFECTIVE DECEMBER 1, 2024



BUS INFORMATION
 978-452-6161
WWW.LRTA.COM

Service updates and changes will be posted on LRTA.com

DOWNTOWN SHUTTLE



The LRTA offers a Shuttle between

**DOWNTOWN LOWELL
 (JOHN & MERRIMACK STREETS)
 &
 ROBERT B. KENNEDY
 BUS TRANSFER CENTER**

Monday - Friday:

5:45 am - 7:00 pm Every 30 minutes
 First Shuttle departs Downtown Lowell at 6:00 AM
 Last Shuttle departs Downtown Lowell at 7:00 PM

Saturday

7:15 am - 7:00 pm Every 30 minutes
 First Shuttle departs Downtown Lowell at 7:30 AM
 Last Shuttle departs Downtown Lowell at 7:00 PM

LRTA MONDAY THROUGH FRIDAY SCHEDULE

		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	20
		CHRISTIAN HILL	BELVIDERE	SOUTH LOWELL	HIGHLANDS VIA STEVENS	WESTFORD STREET/ DRUM HILL	BROADWAY/ UMASS SOUTH	PAWTUCKETVILLE/ UMASS NORTH	CENTRALVILLE	LOWELL CIRCULATOR	DRACUT/ TYNGSBORO	IRS/ RAYTHEON VIA RTE. 133	TEWKSBURY VIA RTE. 38	BILLERICA VIA EDSON	BURLINGTON MALL/ LAHEY CLINIC	CHELMSFORD/ WESTFORD VIA RTES. 129/110	CHELMSFORD VIA CHELMSFORD STREET	NORTH CHELMSFORD VIA MIDDLESEX	DOWNTOWN SHUTTLE	WARREN ST/ KENNEDY CENTER
OUTBOUND LEAVING KENNEDY CENTER		B2	A1	B2	A2	C2	C1	PASSENGER BOARDING LOCATIONS AT KENNEDY CENTER					B4	B4	A4	A4	A1	SH	A3	
	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM
	5:55 M	6:15	6:00	6:10	5:50 BR	6:00	5:50	6:15	6:50	6:35	6:00	6:00	6:30	6:00	6:45	6:15 C	6:20	5:45	7:30	
	6:40	6:45	7:00	6:35	7:00	7:00	6:25	6:45	7:50	7:35	7:00	7:00	7:30	7:00	8:15	6:40 C	7:25			
	7:40	7:15	8:00	7:15	6:30	8:00	6:55	7:15	8:50	8:40	8:00	8:00	8:20	8:00	9:45	7:10	8:30	SHUTTLE SERVICE EVERY 30 MINUTES FROM KENNEDY CENTER TO DOWNTOWN	SERVICE EVERY 20 MINUTES FROM KENNEDY CENTER	
	8:40	7:45	9:00	7:40	7:00	9:00	7:25	8:15	9:50	9:40	9:00	9:00	9:20	9:00	11:15	8:30	9:25			
	9:40	8:15	10:00	8:10	7:30	10:00	7:50	9:20	10:50	10:40	10:00	10:00	10:20	10:00		10:00	10:25			
	10:40	8:45	11:00	8:40	8:00	11:00	8:25	10:20	11:50	11:40			11:00	11:20		11:30	11:25			
	11:40	9:15		9:40	8:30		8:50		11:20											
		9:45		10:40	9:00		9:25													
	10:15		11:40	9:30		9:55														
	10:45			10:00		10:25														
	11:15			10:30		10:55														
	11:45			11:00		11:25														
				11:30		11:55														
	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	
	12:40	12:15	12:00	12:40	12:00	12:00	12:25	12:20	12:50	12:40	3:00	12:00	12:20	12:00	12:45	1:00	12:25	PM	PM	
	1:40	12:45	1:00	1:40	12:30	1:00	12:55	1:20	1:50	1:40	4:00	1:00	1:20	1:00	2:15	2:30	1:25	LAST SHUTTLE DEPARTS FROM KENNEDY CENTER 6:45 PM	NO SERVICE	
	2:40	1:15	2:00	2:35	1:00	2:00	1:25	2:25	2:50	2:40		2:00	2:20	2:00	3:45	2:40 SPE	2:25			
	3:40	1:45	2:40 SPE	2:40 SP	1:30	3:00	1:55	3:25	3:50	3:40		3:00	2:40 SPE	3:00	5:15	3:20	2:40 SPE			
	4:40	2:15	3:15	2:40 SP	2:00	4:00	2:25	4:15	4:50	4:30		4:10	3:10	4:00	6:15	4:00	3:30			
	5:45	2:40 SPE1	3:50	3:15	2:30	5:00	2:40 SP5	4:40	5:50	5:50		5:10	4:40	5:00		4:50	4:00			
	7:00	2:40 SPE2	4:15	3:35	2:40 SPE3	6:00	2:40 SP6	5:20	6:50	6:50		6:10	5:30	6:00		5:30	4:30			
		2:45	5:00	4:00	2:40 SPE4		2:55	5:50					6:35			7:00	5:35			
		3:15	5:30	4:40	3:00		3:20	6:35									6:40			
		3:45	6:35	5:00	3:40		3:55	7:10												
		4:15		5:50	4:10		4:25													
		4:45		6:30	4:40		4:55													
		5:15			5:10		5:25													
		5:45			5:40		5:55													
		6:20			6:10 R		6:25													
		6:50			6:50 R		6:55													
					7:20 R															

1 Starts at Andover St/Ends at River Rd 4 Starts at Chelmsford St & Westford St/Ends at Stevens St B Starts at Princeton Blvd & Baldwin St D Drop Students at Washington Savings Bank M Departs from Market Basket S Supplemental Service on School Days Only (Does Not Service Kennedy Center)
 2 Starts at High St/Ends at Wentworth Ave 5 Starts at Woodward Ave/Ends at G Lowell Vokes C Starts/Terminates at the Radisson E Starts/Terminates at Lowell Line P On School Days Leaves from Paige & Kirk T Does not Service Target on Plain St
 3 Starts at Stevens St/Ends at Technology Dr 6 Starts at University Ave/Ends at McAvenue School (Does Not Service Meadow Brook Center) I Service on Innovation Academy School Days Only R No Service to Research Place W Service Wednesday School Days Only

LRTA SATURDAY SCHEDULE

		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	20	
OUTBOUND LEAVING KENNEDY CENTER		B2	A1	B1	A2	C2	C1	A2	A3	B1	B3		B3	B4	B4	C2	A4	A1	SH		
	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	
	8:00	7:45	8:00	8:20	7:45 R	8:00	7:45	8:00	7:45	8:00	8:30	AM	7:00	7:30	7:00	6:45	8:00	8:00	7:15	NO SERVICE	
	9:00	8:45	9:00	9:20	8:45 R	9:00	8:45	9:00	8:45	9:00	9:30	NO SERVICE	8:00	8:30	8:00	8:00	9:00	9:00	SERVICE EVERY 30 MINS	NO SERVICE	
	10:00	9:45	10:00	10:20	9:45 R	10:00	9:45	10:00	9:45	10:00	10:30		9:00	9:30	9:00	9:30	10:00	10:00			
	11:00	10:45	11:00	11:20	10:45 R	11:00	10:45	11:00	10:45	11:00	11:30		10:00	10:30	10:00	11:00	11:00	11:00			
					11:45 R		11:45		11:45												
	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM
	12:00	12:45	12:00	12:20	12:45 R	12:00	12:45	12:00	12:45	12:30	12:30	NO SERVICE	12:00	12:30	12:00	12:30	12:00	12:00	LAST SHUTTLE DEPARTS FROM KENNEDY CENTER 6:45 PM	NO SERVICE	
	1:00	1:45	1:00	1:20	1:45 R	1:00	1:45	1:00	1:45	1:30	1:30	NO SERVICE	1:00	1:30	1:00	2:00	1:00	1:00			
2:00	2:45	2:00	2:20	2:45 R	2:00	2:45	2:00	2:45	2:30	2:30		2:00	2:30	2:00	3:30	2:00	2:00				
3:00	3:45	3:00	3:20	3:45 R	3:00	3:45	3:00	3:45	3:30	3:30		3:00	3:30	3:00	5:00	3:00	3:00				
4:00	4:45	4:00	4:20	4:45 R	4:00	4:45	4:00	4:45	4:30	4:30		4:00	4:30	4:00		4:00	4:00				
5:00	5:45	5:00	5:20	5:55 R	5:00	5:50	5:00	5:50	5:30	5:30		5:00	5:00	5:00		5:00	5:00				

DEPARTING FROM:		SCOLA'S RESTAURANT DRACUT	WHITE DOVE	N. BILLERICA TRAIN STATION	VA CLINIC	WALMART DRUM HILL PLAZA	UMASS SOUTH PARKING LOT	GREATER LOWELL TECH.	HANNAFORD SUPERMARKET DRACUT	FOX HALL	AYOTTES MARKET	IRS FACILITY	WILMINGTON TRAIN STATION	LACASCIA'S BAKERY BURLINGTON	LAHEY CLINIC BURLINGTON	OLD IBM 550 KING STREET	WALMART DRUM HILL PLAZA	CHELMSFORD SENIOR CENTER	MERRIMACK & JOHN ST	50 WARREN STREET LOWELL
INBOUND TO KENNEDY CENTER	AM	8:20	8:20	8:20	8:40	8:05	8:15	8:20	8:25	8:05	9:15	AM	8:00	8:10	8:00	7:30	8:45	8:40	AM SERVICE EVERY 30 MINS	AM
	9:20	9:20	9:20	9:40	9:05	9:15	9:25	9:20	9:25	9:05	10:15	NO SERVICE	9:00	9:10	9:00	8:45	9:45	9:40		NO SERVICE
	10:20	10:20	10:20	10:40	10:05	10:15	10:20	10:25	10:20	10:25	11:15		10:00	10:10	10:00	10:15	10:45	10:40		
	11:20	11:20	11:20	11:40	11:05	11:15	11:20	11:20	11:25	11:05			11:00	11:10	11:00	11:45	11:45	11:40		
	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM
	12:20	12:20	12:20	12:40	12:05	12:15	12:20	12:20	12:25	12:05	12:15	NO SERVICE	12:00	12:10	12:00	1:15	12:45	12:40	LAST SHUTTLE DEPARTS FROM DOWNTOWN 7:00 PM	NO SERVICE
	1:20	1:20	1:20	1:40	1:05	1:15	1:20	1:20	1:25	1:05	1:15		1:00	1:10	1:00	2:45	1:45	1:40		
	2:20	2:20	2:20	2:40	2:05	2:15	2:20	2:20	2:25	2:05	2:15		2:00	2:10	2:00	4:15	2:45	2:40		
	3:20	3:20	3:20	3:40	3:05	3:15	3:20	3:20	3:25	3:05	3:15		3:00	3:10	3:00	5:45	3:45	3:40		
	4:20	4:20	4:20	4:40	4:05	4:15	4:20	4:20	4:25	4:05	4:15		4:00	4:10	4:00		4:45	4:40		
	5:20	5:20	5:20	5:40	5:05	5:15	5:20	5:20	5:25	5:05	5:15		5:00	5:10	5:00		5:45	5:40		
		6:20			6:15		6:25		6:25	6:05	6:15		6:00	6:00	6:00					

Attachment B – Turning Movement Counts (TMCs)

National Data & Surveying Services

Intersection Turning Movement Count

Location: Federal St/Brightview Concord River Assisted Living Access Dwy & Concord Rd
 City: Billerica
 Control: 1-Way Stop(NB)

Project ID: 25-430106-002
 Date: 7/23/2025

Data - Total

NS/EW Streets:	Federal St/Brightview Concord River Assisted Living Access Dwy				Federal St/Brightview Concord River Assisted Living Access Dwy				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
AM	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	0	0	1	0	0	0	0	0	0	120	3	0	1	146	1	0	272
6:15 AM	1	1	0	0	0	0	0	0	1	82	0	0	2	172	1	0	260
6:30 AM	0	0	0	0	0	0	0	0	0	114	4	0	3	218	2	0	341
6:45 AM	2	0	1	0	0	0	2	0	1	135	4	0	0	214	3	0	362
7:00 AM	1	0	0	0	0	0	3	0	2	153	4	0	2	210	2	0	377
7:15 AM	2	0	0	0	1	0	2	0	1	155	6	0	3	229	1	0	400
7:30 AM	2	0	0	0	0	0	0	0	2	192	9	0	5	272	0	0	482
7:45 AM	1	0	2	0	0	0	0	0	0	245	15	0	1	223	0	0	487
8:00 AM	2	0	0	0	0	0	1	0	1	248	10	0	4	240	1	0	507
8:15 AM	3	0	0	0	1	0	0	0	1	226	19	0	3	227	3	0	483
8:30 AM	4	0	0	0	2	0	0	0	3	211	11	1	3	188	1	0	424
8:45 AM	1	0	1	0	0	0	3	0	7	240	15	0	6	193	0	0	466
9:00 AM	2	0	0	0	0	0	1	0	1	180	18	0	3	188	0	0	393
9:15 AM	2	0	4	0	0	0	0	0	1	182	12	0	1	159	3	0	364
9:30 AM	4	0	1	0	0	1	1	0	3	145	9	0	1	183	0	0	348
9:45 AM	0	0	0	0	0	0	1	0	2	138	3	0	2	178	4	0	328
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	27	1	10	0	4	1	14	0	26	2766	142	1	40	3240	22	0	6294
	71.05%	2.63%	26.32%	0.00%	21.05%	5.26%	73.68%	0.00%	0.89%	94.24%	4.84%	0.03%	1.21%	98.12%	0.67%	0.00%	
PEAK HR :	07:30 AM - 08:30 AM																TOTAL
PEAK HR VOL :	8	0	2	0	1	0	1	0	4	911	53	0	13	962	4	0	1959
PEAK HR FACTOR :	0.667	0.000	0.250	0.000	0.250	0.000	0.250	0.000	0.500	0.918	0.697	0.000	0.650	0.884	0.333	0.000	0.966
			0.833			0.500				0.931				0.884			
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				TOTAL
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	
10:00 AM	2	0	3	0	1	0	2	0	2	110	4	0	1	132	1	0	258
10:15 AM	1	0	2	0	1	0	0	0	1	111	4	0	4	127	0	0	251
10:30 AM	1	0	4	0	0	1	0	0	2	148	7	0	3	143	1	0	310
10:45 AM	7	0	4	0	1	0	3	0	2	148	6	0	2	116	4	0	293
11:00 AM	2	0	0	0	0	0	1	0	1	138	1	0	1	121	2	0	267
11:15 AM	3	0	1	0	0	0	4	0	0	130	2	0	1	140	2	0	283
11:30 AM	2	0	2	0	2	0	3	0	3	176	2	0	0	152	3	0	345
11:45 AM	4	0	3	0	2	0	3	0	3	206	1	0	0	149	1	0	372
12:00 PM	1	0	7	0	3	0	3	0	2	169	5	0	2	167	2	0	361
12:15 PM	5	0	1	0	1	0	2	0	0	164	4	0	6	157	0	0	340
12:30 PM	6	0	4	0	0	0	3	0	2	173	2	0	1	172	1	0	364
12:45 PM	4	1	3	0	1	0	0	0	3	166	4	0	3	147	1	0	333
1:00 PM	10	0	1	0	0	0	1	0	6	155	3	0	0	157	0	0	333
1:15 PM	9	0	2	0	2	0	2	0	1	160	1	0	2	168	1	0	348
1:30 PM	4	0	0	0	2	0	2	0	0	207	3	0	0	163	2	0	383
1:45 PM	2	0	1	0	0	0	2	0	4	166	1	1	0	143	0	0	320
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	63	1	38	0	16	1	31	0	32	2527	50	1	26	2354	21	0	5161
	61.76%	0.98%	37.25%	0.00%	33.33%	2.08%	64.58%	0.00%	1.23%	96.82%	1.92%	0.04%	1.08%	98.04%	0.87%	0.00%	
PEAK HR :	11:45 AM - 12:45 PM																TOTAL
PEAK HR VOL :	16	0	15	0	6	0	11	0	7	712	12	0	9	645	4	0	1437
PEAK HR FACTOR :	0.667	0.000	0.536	0.000	0.500	0.000	0.917	0.000	0.583	0.864	0.600	0.000	0.375	0.938	0.500	0.000	0.966
			0.775			0.708				0.870				0.945			
PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				TOTAL
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	
2:00 PM	1	0	2	0	4	0	3	0	0	162	1	0	2	192	0	0	367
2:15 PM	5	0	2	0	2	0	3	0	2	177	0	0	2	210	3	0	406
2:30 PM	9	0	2	0	2	0	2	0	0	190	3	0	1	286	3	0	498
2:45 PM	2	0	2	0	0	0	2	0	0	165	4	0	3	183	2	0	363
3:00 PM	5	0	3	0	4	0	5	0	1	190	2	0	1	221	6	0	438
3:15 PM	3	0	3	0	2	0	7	0	3	181	1	0	3	245	1	0	449
3:30 PM	6	0	3	0	2	0	1	0	1	223	3	0	0	274	1	0	514
3:45 PM	2	0	1	0	0	0	1	0	1	215	0	0	0	242	1	0	463
4:00 PM	6	0	3	0	0	0	3	0	2	236	3	0	0	270	1	0	524
4:15 PM	13	0	3	0	0	0	2	0	1	237	1	0	1	274	0	0	532
4:30 PM	12	0	2	0	2	0	0	0	2	240	6	0	0	296	1	0	561
4:45 PM	10	0	2	0	1	0	0	0	2	215	0	0	0	313	1	0	544
5:00 PM	9	0	6	0	1	0	1	0	0	200	3	0	3	326	1	0	550
5:15 PM	16	0	5	0	1	0	3	0	1	235	1	0	1	369	1	1	634
5:30 PM	9	0	2	0	0	0	1	0	0	202	0	0	0	311	0	0	525
5:45 PM	12	0	5	0	0	0	0	0	0	189	0	0	2	310	0	0	518
6:00 PM	8	0	2	0	0	0	2	0	0	187	1	0	0	208	2	0	410
6:15 PM	5	0	2	0	2	0	2	0	1	176	0	1	0	174	0	0	363
6:30 PM	1	0	0	0	0	0	0	0	1	162	2	0	0	144	1	0	311
6:45 PM	3	0	1	0	0	0	2	0	1	162	1	0	0	142	0	0	312
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	137	0	51	0	23	0	40	0	19	3944	32	1	19	4990	25	1	9282
	72.87%	0.00%	27.13%	0.00%	36.51%	0.00%	63.49%	0.00%	0.48%	98.70%	0.80%	0.03%	0.38%	99.11%	0.50%	0.02%	
PEAK HR :	04:30 PM - 05:30 PM																TOTAL
PEAK HR VOL :	47	0	15	0	5	0	4	0	5	890	10	0	4	1304	4	1	2289
PEAK HR FACTOR :	0.734	0.000	0.625	0.000	0.625	0.000	0.333	0.000	0.625	0.927	0.417	0.000	0.333	0.883	1.000	0.250	0.903
			0.738			0.563				0.912				0.882			

National Data & Surveying Services

Intersection Turning Movement Count

Location: Federal St/Brightview Concord River Assisted Living Access Dwy & Concord Rd
 City: Billerica
 Control: 1-Way Stop(NB)

Project ID: 25-430106-002
 Date: 7/23/2025

Data - Cars

NS/EW Streets:	Federal St/Brightview Concord River Assisted Living Access Dwy				Federal St/Brightview Concord River Assisted Living Access Dwy				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
AM	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	
6:00 AM	0	0	0	0	0	0	0	0	0	113	3	0	0	138	1	0	255
6:15 AM	1	1	0	0	0	0	0	0	1	80	0	0	2	161	1	0	247
6:30 AM	0	0	0	0	0	0	0	0	0	113	3	0	2	209	2	0	329
6:45 AM	1	0	0	0	0	0	2	0	1	134	4	0	0	207	3	0	352
7:00 AM	1	0	0	0	0	0	3	0	2	149	3	0	2	200	2	0	362
7:15 AM	1	0	0	0	1	0	2	0	1	145	6	0	3	222	1	0	382
7:30 AM	1	0	0	0	0	0	0	0	2	187	9	0	5	263	0	0	467
7:45 AM	1	0	2	0	0	0	0	0	0	238	15	0	1	210	0	0	467
8:00 AM	2	0	0	0	0	0	1	0	1	239	10	0	4	235	1	0	493
8:15 AM	3	0	0	0	1	0	0	0	1	222	19	0	3	217	2	0	468
8:30 AM	4	0	0	0	1	0	0	0	3	205	11	1	3	183	1	0	412
8:45 AM	1	0	1	0	0	0	3	0	7	228	15	0	6	185	0	0	446
9:00 AM	2	0	0	0	0	0	1	0	1	175	18	0	3	181	0	0	381
9:15 AM	2	0	4	0	0	0	0	0	1	170	11	0	1	143	2	0	334
9:30 AM	3	0	1	0	0	0	1	0	2	135	9	0	1	174	0	0	326
9:45 AM	0	0	0	0	0	0	1	0	2	132	3	0	1	168	4	0	311
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	23	1	8	0	3	0	14	0	25	2665	139	1	37	3096	20	0	6032
	71.88%	3.13%	25.00%	0.00%	17.65%	0.00%	82.35%	0.00%	0.88%	94.17%	4.91%	0.04%	1.17%	98.19%	0.63%	0.00%	
PEAK HR :	07:30 AM - 08:30 AM																TOTAL
PEAK HR VOL :	7	0	2	0	1	0	1	0	4	886	53	0	13	925	3	0	1895
PEAK HR FACTOR :	0.583	0.000	0.250	0.000	0.250	0.000	0.250	0.000	0.500	0.927	0.697	0.000	0.650	0.879	0.375	0.000	0.961
			0.750				0.500			0.932				0.878			

NS/EW Streets:	Federal St/Brightview Concord River Assisted Living Access Dwy				Federal St/Brightview Concord River Assisted Living Access Dwy				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
NOON	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	
10:00 AM	2	0	2	0	0	0	2	0	2	101	4	0	0	116	1	0	230
10:15 AM	1	0	2	0	1	0	0	0	1	103	4	0	4	120	0	0	236
10:30 AM	1	0	3	0	0	0	0	0	2	133	6	0	2	132	0	0	279
10:45 AM	5	0	3	0	1	0	3	0	2	139	6	0	2	113	4	0	278
11:00 AM	2	0	0	0	0	0	1	0	1	130	1	0	1	113	2	0	251
11:15 AM	3	0	1	0	0	0	4	0	0	121	2	0	1	128	2	0	262
11:30 AM	1	0	2	0	2	0	3	0	3	168	2	0	0	144	3	0	328
11:45 AM	4	0	3	0	2	0	3	0	3	197	1	0	0	140	1	0	354
12:00 PM	1	0	7	0	3	0	3	0	2	158	5	0	2	161	2	0	344
12:15 PM	5	0	1	0	1	0	2	0	0	157	4	0	6	146	0	0	322
12:30 PM	6	0	4	0	0	0	3	0	2	164	2	0	1	163	1	0	346
12:45 PM	4	1	3	0	1	0	0	0	3	157	4	0	3	137	1	0	314
1:00 PM	10	0	1	0	0	0	1	0	6	144	3	0	0	147	0	0	312
1:15 PM	9	0	2	0	2	0	2	0	1	151	1	0	2	159	1	0	330
1:30 PM	4	0	0	0	2	0	2	0	0	198	3	0	0	154	2	0	365
1:45 PM	2	0	1	0	0	0	2	0	4	153	1	1	0	136	0	0	300
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	60	1	35	0	15	0	31	0	32	2374	49	1	24	2209	20	0	4851
	62.50%	1.04%	36.46%	0.00%	32.61%	0.00%	67.39%	0.00%	1.30%	96.66%	2.00%	0.04%	1.07%	98.05%	0.89%	0.00%	
PEAK HR :	11:45 AM - 12:45 PM																TOTAL
PEAK HR VOL :	16	0	15	0	6	0	11	0	7	676	12	0	9	610	4	0	1366
PEAK HR FACTOR :	0.667	0.000	0.536	0.000	0.500	0.000	0.917	0.000	0.583	0.858	0.600	0.000	0.375	0.936	0.500	0.000	0.965
			0.775				0.708			0.864				0.944			

NS/EW Streets:	Federal St/Brightview Concord River Assisted Living Access Dwy				Federal St/Brightview Concord River Assisted Living Access Dwy				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
PM	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	
2:00 PM	1	0	2	0	4	0	3	0	0	150	1	0	2	182	0	0	345
2:15 PM	5	0	2	0	2	0	3	0	2	164	0	0	1	206	3	0	388
2:30 PM	9	0	1	0	2	0	2	0	0	181	3	0	1	278	3	0	480
2:45 PM	2	0	2	0	0	0	2	0	0	160	4	0	2	181	2	0	355
3:00 PM	5	0	3	0	4	0	5	0	1	181	2	0	1	219	6	0	427
3:15 PM	2	0	2	0	2	0	7	0	3	175	0	0	1	237	1	0	430
3:30 PM	6	0	2	0	2	0	1	0	1	219	3	0	0	270	1	0	505
3:45 PM	2	0	1	0	0	0	1	0	1	199	0	0	0	236	1	0	441
4:00 PM	6	0	3	0	0	0	3	0	2	227	3	0	0	263	0	0	507
4:15 PM	13	0	2	0	0	0	1	0	1	231	1	0	1	272	0	0	522
4:30 PM	12	0	2	0	2	0	0	0	2	233	5	0	0	293	1	0	550
4:45 PM	9	0	2	0	1	0	0	0	2	211	0	0	0	307	1	0	533
5:00 PM	8	0	5	0	1	0	1	0	0	196	2	0	2	319	1	0	535
5:15 PM	16	0	5	0	1	0	3	0	1	233	1	0	1	365	1	0	627
5:30 PM	9	0	2	0	0	0	1	0	0	198	0	0	0	307	0	0	517
5:45 PM	12	0	5	0	0	0	0	0	0	187	0	0	2	307	0	0	513
6:00 PM	8	0	2	0	0	0	2	0	0	184	0	0	0	208	2	0	406
6:15 PM	5	0	1	0	2	0	2	0	1	174	0	1	0	172	0	0	358
6:30 PM	1	0	0	0	0	0	0	0	1	160	1	0	0	143	1	0	307
6:45 PM	3	0	1	0	0	0	2	0	1	162	1	0	0	141	0	0	311
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	134	0	45	0	23	0	39	0	19	3825	27	1	14	4906	24	0	9057
	74.86%	0.00%	25.14%	0.00%	37.10%	0.00%	62.90%	0.00%	0.49%	98.79%	0.70%	0.03%	0.28%	99.23%	0.49%	0.00%	
PEAK HR :	04:30 PM - 05:30 PM																TOTAL
PEAK HR VOL :	45	0	14	0	5	0	4	0	5	873	8	0	3	1284	4	0	2245
PEAK HR FACTOR :	0.703	0.000	0.700	0.000	0.625	0.000	0.333	0.000	0.625	0.937	0.400	0.000	0.375	0.879	1.000	0.000	0.895
			0.702				0.563			0.923				0.879			

National Data & Surveying Services

Intersection Turning Movement Count

Location: Federal St/Brightview Concord River Assisted Living Access Dwy & Concord Rd
 City: Billerica
 Control: 1-Way Stop(NB)

Project ID: 25-430106-002
 Date: 7/23/2025

Data - Buses

NS/EW Streets:	Federal St/Brightview Concord River Assisted Living Access Dwy				Federal St/Brightview Concord River Assisted Living Access Dwy				Concord Rd				Concord Rd				TOTAL		
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND						
AM	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1		
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
7:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2		
8:00 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	2		
8:15 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2		
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1		
8:45 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2		
9:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1		
9:15 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3		
9:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2		
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	7		
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL		
APPROACH %'s :	0	0	0	0	0	0	0	0	0.00%	8	0.00%	0.00%	0.00%	15	100.00%	0.00%	0.00%	23	
PEAK HR :	07:30 AM - 08:30 AM																TOTAL		
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	3	0	0	0	3	0	0	6		
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.375	0.000	0.000	0.000	0.375	0.000	0.000	0.750		
										0.375				0.375					
NOON	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL		
10:00 AM	0	0	0	0	0	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	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	1	0	0	0	0	0	0	1		
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
11:15 AM	0	0	0	0	0	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	3	0	0	0	3		
11:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1		
12:00 PM	0	0	0	0	0	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	0	0	0	0	0		
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1		
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2		
1:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1		
1:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1:30 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2		
1:45 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3		
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL		
APPROACH %'s :	0	0	0	0	0	0	0	0	0.00%	7	100.00%	0.00%	0.00%	0.00%	7	100.00%	0.00%	0.00%	14
PEAK HR :	11:45 AM - 12:45 PM																TOTAL		
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2		
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.250	0.000	0.000	0.500		
										0.250				0.250					
PM	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL		
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2		
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
2:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1		
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3:15 PM	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	3		
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3:45 PM	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	6		
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1		
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
4:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1		
5:00 PM	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	2		
5:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	2		
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
6:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1		
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1		
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL		
APPROACH %'s :	0.00%	0.00%	100.00%	0.00%	0	0	0	0	0.00%	10	90.91%	9.09%	0.00%	14.29%	71.43%	0.00%	14.29%	20	
PEAK HR :	04:30 PM - 05:30 PM																TOTAL		
PEAK HR VOL :	0	0	1	0	0	0	0	0	0	2	0	0	1	0	0	1	5		
PEAK HR FACTOR :	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.250	0.000	0.000	0.250	0.625		
			0.250							0.500				0.500					

National Data & Surveying Services

Intersection Turning Movement Count

Location: Federal St/Brightview Concord River Assisted Living Access Dwy & Concord Rd
 City: Billerica
 Control: 1-Way Stop(NB)

Project ID: 25-430106-002
 Date: 7/23/2025

Data - Duals

NS/EW Streets:	Federal St/Brightview Concord River Assisted Living Access Dwy				Federal St/Brightview Concord River Assisted Living Access Dwy				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
AM	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	
6:00 AM	0	0	1	0	0	0	0	0	0	7	0	0	1	7	0	0	16
6:15 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	8	0	0	9
6:30 AM	0	0	0	0	0	0	0	0	0	1	1	0	1	8	0	0	11
6:45 AM	1	0	1	0	0	0	0	0	0	1	0	0	0	7	0	0	10
7:00 AM	0	0	0	0	0	0	0	0	0	1	1	0	0	8	0	0	10
7:15 AM	1	0	0	0	0	0	0	0	0	8	0	0	0	6	0	0	15
7:30 AM	1	0	0	0	0	0	0	0	0	4	0	0	0	8	0	0	13
7:45 AM	0	0	0	0	0	0	0	0	0	5	0	0	0	10	0	0	15
8:00 AM	0	0	0	0	0	0	0	0	0	8	0	0	0	2	0	0	10
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	9	1	0	10
8:30 AM	0	0	0	0	1	0	0	0	0	4	0	0	0	3	0	0	8
8:45 AM	0	0	0	0	0	0	0	0	0	10	0	0	0	6	0	0	16
9:00 AM	0	0	0	0	0	0	0	0	0	4	0	0	0	7	0	0	11
9:15 AM	0	0	0	0	0	0	0	0	0	8	1	0	0	14	1	0	24
9:30 AM	1	0	0	0	0	1	0	0	0	7	0	0	0	6	0	0	16
9:45 AM	0	0	0	0	0	0	0	0	0	5	0	0	1	3	0	0	9
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	66.67%	0.00%	33.33%	0.00%	50.00%	50.00%	0.00%	0.00%	1.28%	94.87%	3.85%	0.00%	2.56%	95.73%	1.71%	0.00%	203
PEAK HR :	07:30 AM - 08:30 AM				0				0				0				TOTAL
PEAK HR VOL :	1	0	0	0	0	0	0	0	0	17	0	0	0	29	1	0	48
PEAK HR FACTOR :	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.531	0.000	0.000	0.000	0.725	0.250	0.000	0.800

NS/EW Streets:	Federal St/Brightview Concord River Assisted Living Access Dwy				Federal St/Brightview Concord River Assisted Living Access Dwy				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
NOON	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	
10:00 AM	0	0	1	0	1	0	0	0	0	8	0	0	1	14	0	0	25
10:15 AM	0	0	0	0	0	0	0	0	0	8	0	0	0	6	0	0	14
10:30 AM	0	0	1	0	0	1	0	0	0	13	1	0	1	8	1	0	26
10:45 AM	2	0	1	0	0	0	0	0	0	7	0	0	0	3	0	0	13
11:00 AM	0	0	0	0	0	0	0	0	0	4	0	0	0	7	0	0	11
11:15 AM	0	0	0	0	0	0	0	0	0	7	0	0	0	10	0	0	17
11:30 AM	1	0	0	0	0	0	0	0	0	8	0	0	0	4	0	0	13
11:45 AM	0	0	0	0	0	0	0	0	0	6	0	0	0	9	0	0	15
12:00 PM	0	0	0	0	0	0	0	0	0	8	0	0	0	6	0	0	14
12:15 PM	0	0	0	0	0	0	0	0	0	5	0	0	0	7	0	0	12
12:30 PM	0	0	0	0	0	0	0	0	0	7	0	0	0	6	0	0	13
12:45 PM	0	0	0	0	0	0	0	0	0	6	0	0	0	7	0	0	13
1:00 PM	0	0	0	0	0	0	0	0	0	9	0	0	0	5	0	0	14
1:15 PM	0	0	0	0	0	0	0	0	0	7	0	0	0	7	0	0	14
1:30 PM	0	0	0	0	0	0	0	0	0	6	0	0	0	9	0	0	15
1:45 PM	0	0	0	0	0	0	0	0	0	8	0	0	0	5	0	0	13
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	50.00%	0.00%	50.00%	0.00%	50.00%	50.00%	0.00%	0.00%	0.00%	99.15%	0.85%	0.00%	1.72%	97.41%	0.86%	0.00%	242
PEAK HR :	11:45 AM - 12:45 PM				0				0				0				TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	26	0	0	0	28	0	0	54
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.813	0.000	0.000	0.000	0.778	0.000	0.000	0.900

NS/EW Streets:	Federal St/Brightview Concord River Assisted Living Access Dwy				Federal St/Brightview Concord River Assisted Living Access Dwy				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
PM	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	
2:00 PM	0	0	0	0	0	0	0	0	0	9	0	0	0	6	0	0	15
2:15 PM	0	0	0	0	0	0	0	0	0	11	0	0	1	3	0	0	15
2:30 PM	0	0	1	0	0	0	0	0	0	5	0	0	0	7	0	0	13
2:45 PM	0	0	0	0	0	0	0	0	0	5	0	0	1	2	0	0	8
3:00 PM	0	0	0	0	0	0	0	0	0	5	0	0	0	2	0	0	7
3:15 PM	1	0	0	0	0	0	0	0	0	6	0	0	2	5	0	0	14
3:30 PM	0	0	1	0	0	0	0	0	0	3	0	0	0	4	0	0	8
3:45 PM	0	0	0	0	0	0	0	0	0	7	0	0	0	5	0	0	12
4:00 PM	0	0	0	0	0	0	0	0	0	6	0	0	0	4	1	0	11
4:15 PM	0	0	1	0	0	0	1	0	0	6	0	0	0	2	0	0	10
4:30 PM	0	0	0	0	0	0	0	0	0	6	0	0	0	3	0	0	9
4:45 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	4	0	0	7
5:00 PM	1	0	0	0	0	0	0	0	0	4	1	0	0	5	0	0	11
5:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	4	0	0	5
5:30 PM	0	0	0	0	0	0	0	0	0	4	0	0	0	2	0	0	6
5:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3
6:00 PM	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
6:15 PM	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	3
6:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	33.33%	0.00%	66.67%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	97.70%	2.30%	0.00%	5.88%	92.65%	1.47%	0.00%	162
PEAK HR :	04:30 PM - 05:30 PM				0				0				0				TOTAL
PEAK HR VOL :	1	0	0	0	0	0	0	0	0	14	1	0	0	16	0	0	32
PEAK HR FACTOR :	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.583	0.250	0.000	0.000	0.800	0.000	0.000	0.727

National Data & Surveying Services

Intersection Turning Movement Count

Location: Federal St/Brightview Concord River Assisted Living Access Dwy & Concord Rd
 City: Billerica
 Control: 1-Way Stop(NB)

Project ID: 25-430106-002
 Date: 7/23/2025

Data - TTST

NS/EW Streets:	Federal St/Brightview Concord River Assisted Living Access Dwy				Federal St/Brightview Concord River Assisted Living Access Dwy				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
AM	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6:15 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	5
7:15 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
7:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
7:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3
8:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
8:15 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
8:30 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3
9:30 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	4
9:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	0	0	0	0	0	0	0	0	0	19	0	0	0	17	0	0	36
									0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	
PEAK HR :	07:30 AM - 08:30 AM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	5	0	0	0	5	0	0	10
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.625	0.000	0.000	0.000	0.625	0.000	0.000	0.833
										0.625				0.625			
NOON	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
10:30 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	3	0	0	5
10:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
11:00 AM	0	0	0	0	0	0	0	0	0	4	0	0	0	1	0	0	5
11:15 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	4
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
11:45 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
12:00 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3
12:15 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	4	0	0	6
12:30 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	4
12:45 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	4
1:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	5	0	0	6
1:15 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	4
1:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
1:45 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	4
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	0	0	0	0	0	0	0	0	0	29	0	0	0	25	0	0	54
									0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	
PEAK HR :	11:45 AM - 12:45 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	9	0	0	0	6	0	0	15
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.750	0.000	0.000	0.000	0.375	0.000	0.000	0.625
										0.750				0.375			
PM	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
2:00 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	5
2:15 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
2:30 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	4
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	4
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
3:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
3:45 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	4
4:00 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	5
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
4:45 PM	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
5:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
6:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
6:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
6:30 PM	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	1	0	0	0	0	0	0	0	0	24	2	0	0	16	0	0	43
	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	92.31%	7.69%	0.00%	0.00%	100.00%	0.00%	0.00%	
PEAK HR :	04:30 PM - 05:30 PM																TOTAL
PEAK HR VOL :	1	0	0	0	0	0	0	0	0	1	1	0	0	4	0	0	7
PEAK HR FACTOR :	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.250	0.000	0.000	0.500	0.000	0.000	0.583
										0.250				0.500			

National Data & Surveying Services

Intersection Turning Movement Count

Location: Federal St/Brightview Concord River Assisted Living Access Dwy & Concord Rd
 City: Billerica
 Control: 1-Way Stop(NB)

Project ID: 25-430106-002
 Date: 7/23/2025

Data - Bikes

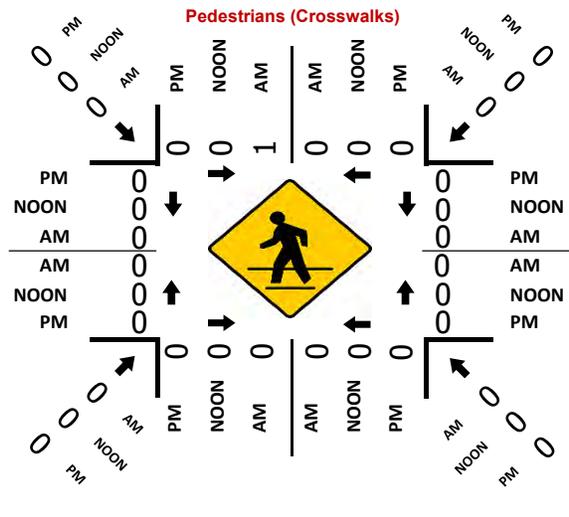
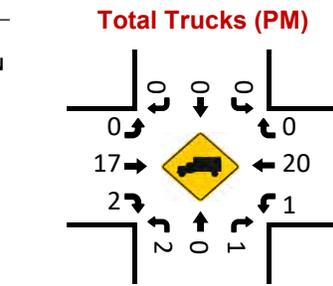
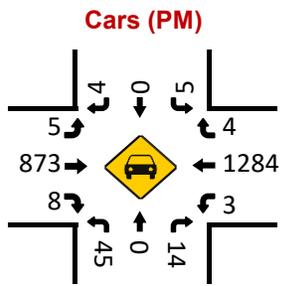
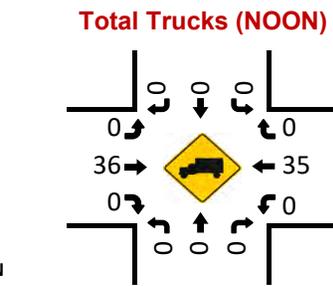
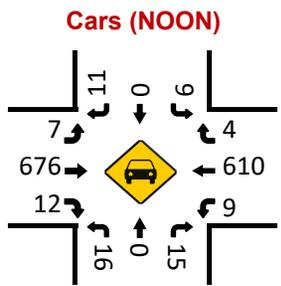
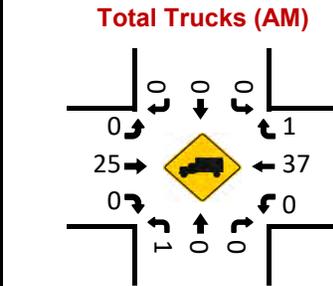
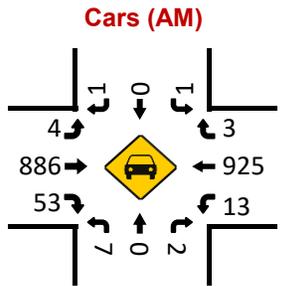
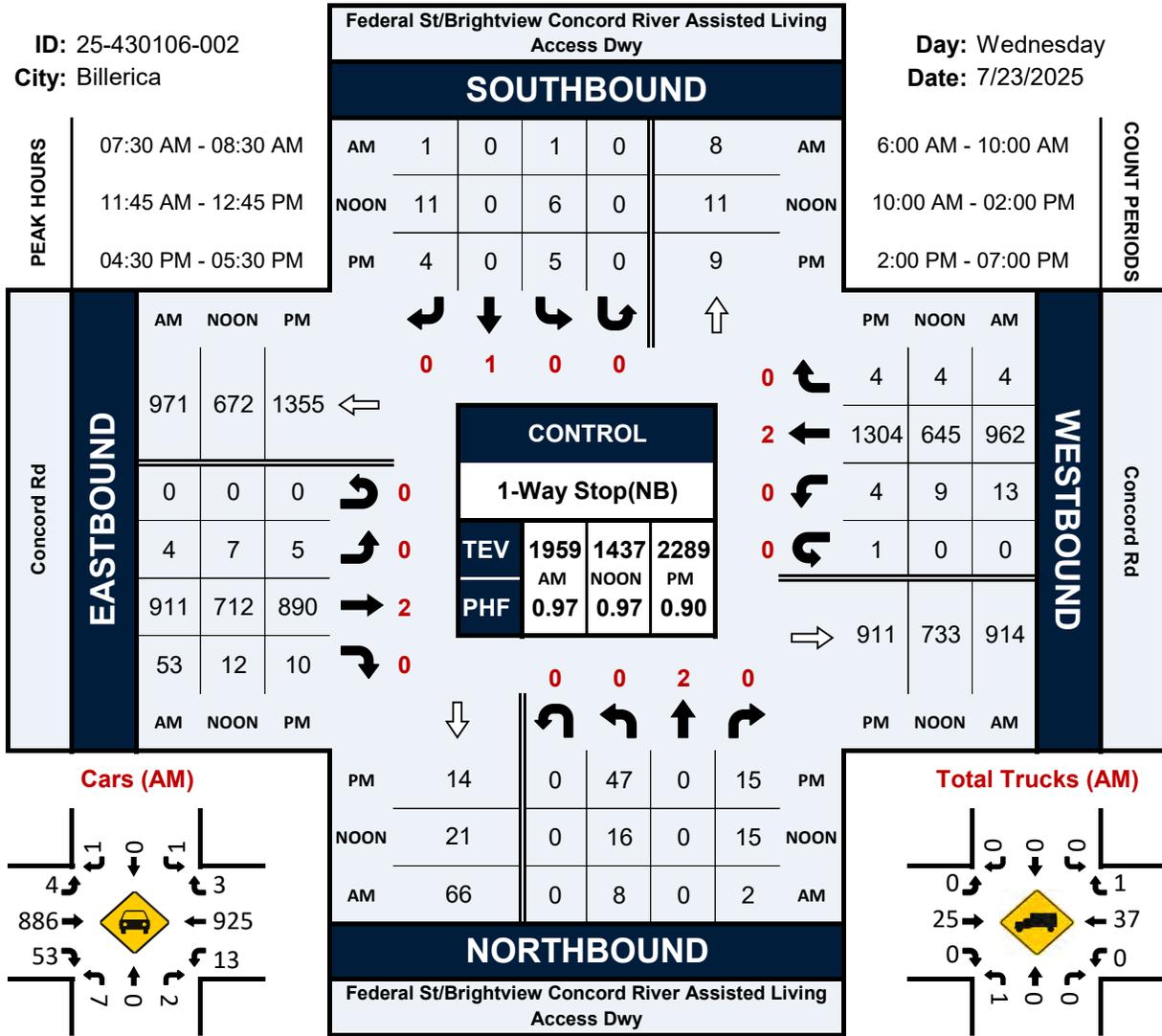
NS/EW Streets:	Federal St/Brightview Concord River Assisted Living Access Dwy				Federal St/Brightview Concord River Assisted Living Access Dwy				Concord Rd				Concord Rd					
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				TOTAL	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
7:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL	
APPROACH %'s :	0	0	0	0	0	0	0	0	0	2	0	0	1	4	0	0	7	
									0.00%	100.00%	0.00%	0.00%	20.00%	80.00%	0.00%	0.00%		
PEAK HR :	07:30 AM - 08:30 AM																TOTAL	
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2	
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.250	0.000	0.000	0.500	
										0.250				0.250				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				TOTAL	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU		
10:00 AM	0	0	0	0	0	0	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	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	0
10:45 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	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	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
12:30 PM	0	0	0	0	0	0	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	2	0	0	0	0	2
1:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL	
APPROACH %'s :	0	0	0	0	0	0	0	0	0	3	0	0	0	4	0	0	7	
									0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%		
PEAK HR :	11:45 AM - 12:45 PM																TOTAL	
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3	
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.250	0.000	0.000	0.375	
										0.250				0.250				
PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				TOTAL	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU		
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL	
APPROACH %'s :	0	0	0	0	0	0	0	0	0	2	0	0	0	4	0	0	6	
									0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%		
PEAK HR :	04:30 PM - 05:30 PM																TOTAL	
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.250	
										0.250								

Federal St/Brightview Concord River Assisted Living Access Dwy & Concord Rd

Peak Hour Turning Movement Count

ID: 25-430106-002
City: Billerica

Day: Wednesday
Date: 7/23/2025



Groups Printed - Cars, PU, Vans - Heavy Trucks

Start Time	Brightview Concord River Assisted Living Northbound					Brightview Concord River Assisted Living Southbound					Concord Rd Eastbound					Concord Rd Westbound					Int.	Total			
	Left	Thru	Rgt	Utum	Peds	App. Total	Left	Thru	Rgt	Utum	Peds	App. Total	Left	Thru	Rgt	Utum	Peds	App. Total	Left	Thru			Rgt	Utum	Peds
6:00 AM	0	0	1	0	0	1	0	0	0	0	0	0	0	120	3	0	0	123	1	146	1	0	0	148	272
6:15 AM	1	1	0	0	0	2	0	0	0	0	0	0	1	82	0	0	83	2	172	1	0	0	175	260	
6:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	114	4	0	0	118	3	218	2	0	0	223	341
6:45 AM	2	0	1	0	0	3	0	0	2	0	0	2	1	135	4	0	0	140	0	214	3	0	0	217	362
Total	3	1	2	0	0	6	0	0	2	0	1	2	2	451	11	0	0	464	6	750	7	0	0	763	1235
7:00 AM	1	0	0	0	0	1	0	0	3	0	1	3	2	153	4	0	0	159	2	210	2	0	0	214	377
7:15 AM	2	0	0	0	0	2	1	0	2	0	0	3	1	155	6	0	0	162	3	229	1	0	0	233	400
7:30 AM	2	0	0	0	0	2	0	0	0	0	1	0	2	192	9	0	0	203	5	272	0	0	0	277	482
7:45 AM	1	0	2	0	0	3	0	0	0	0	0	0	0	245	15	0	0	260	1	223	0	0	0	224	487
Total	6	0	2	0	0	8	1	0	5	0	2	6	5	745	34	0	0	784	11	934	3	0	0	948	1746
8:00 AM	2	0	0	0	0	2	0	0	1	0	0	1	1	248	10	0	0	259	4	240	1	0	0	245	507
8:15 AM	3	0	0	0	0	3	1	0	0	0	0	1	1	226	19	0	0	246	3	227	3	0	0	233	483
8:30 AM	4	0	0	0	0	4	2	0	0	0	0	2	3	211	11	1	1	226	3	188	1	0	0	192	424
8:45 AM	1	0	1	0	0	2	0	0	3	0	0	3	7	240	15	0	1	262	6	193	0	0	0	199	466
Total	10	0	1	0	0	11	3	0	4	0	0	7	12	925	55	1	2	993	16	848	5	0	0	869	1580
9:00 AM	2	0	0	0	0	2	0	0	1	0	0	1	1	180	18	0	0	199	3	188	0	0	0	191	393
9:15 AM	2	0	4	0	0	6	0	0	0	0	0	0	1	182	12	0	0	195	1	159	3	0	0	163	364
9:30 AM	4	0	1	0	0	5	0	1	1	0	1	2	3	145	9	0	0	157	1	183	0	0	1	184	348
9:45 AM	0	0	0	0	0	0	0	0	1	0	1	1	2	138	3	0	0	143	2	178	4	0	0	184	328
Total	8	0	5	0	0	13	0	1	3	0	2	4	7	645	42	0	0	694	7	708	7	0	1	722	1433
BREAK																									
10:00 AM	2	0	3	0	2	5	1	0	2	0	0	3	2	110	4	0	0	116	1	132	1	0	0	134	258
10:15 AM	1	0	2	0	0	3	1	0	0	0	2	1	1	111	4	0	0	116	4	127	0	0	0	131	251
10:30 AM	1	0	4	0	0	5	0	1	0	0	0	1	2	148	7	0	0	157	3	143	1	0	0	147	310
10:45 AM	7	0	4	0	0	11	1	0	3	0	0	4	2	148	6	0	0	156	2	116	4	0	0	122	293
Total	11	0	13	0	2	24	3	1	5	0	2	9	7	517	21	0	0	545	10	518	6	0	0	534	1112
11:00 AM	2	0	0	0	0	2	0	0	1	0	0	1	1	138	1	0	0	140	1	121	2	0	0	124	267
11:15 AM	3	0	1	0	0	4	0	0	4	0	0	4	0	130	2	0	0	132	1	140	2	0	0	143	283
11:30 AM	2	0	2	0	0	4	2	0	3	0	0	5	3	176	2	0	0	181	0	152	3	0	0	155	345
11:45 AM	4	0	3	0	0	7	2	0	3	0	0	5	3	206	1	0	0	210	0	149	1	0	0	150	372
Total	11	0	6	0	0	17	4	0	11	0	0	15	7	650	6	0	0	663	2	562	8	0	0	572	1267
12:00 PM	1	0	7	0	0	8	3	0	3	0	0	6	2	169	5	0	0	176	2	167	2	0	0	171	361
12:15 PM	5	0	1	0	0	6	1	0	2	0	0	3	0	164	4	0	0	168	6	157	0	0	0	163	340
12:30 PM	6	0	4	0	0	10	0	0	3	0	0	3	2	173	2	0	0	177	1	172	1	0	0	174	364
12:45 PM	4	1	3	0	0	8	1	0	0	0	0	1	3	166	4	0	0	173	3	147	1	0	0	151	333
Total	16	1	15	0	0	32	5	0	8	0	0	13	7	672	15	0	0	694	12	643	4	0	0	659	1398
1:00 PM	10	0	1	0	0	11	0	0	1	0	0	1	6	155	3	0	0	164	0	157	0	0	0	157	333
1:15 PM	9	0	2	0	0	11	2	0	2	0	1	4	1	160	1	0	0	162	2	168	1	0	0	171	348
1:30 PM	4	0	0	0	0	4	2	0	2	0	0	4	0	207	3	0	0	210	0	163	2	0	0	165	383
1:45 PM	2	0	1	0	0	3	0	0	2	0	0	2	4	166	1	1	0	172	0	143	0	0	0	143	320
Total	25	0	4	0	0	29	4	0	7	0	1	11	11	688	8	1	0	708	2	631	3	0	0	636	1394
BREAK																									
2:00 PM	1	0	2	0	0	3	4	0	3	0	0	7	0	162	1	0	0	163	2	192	0	0	0	194	367
2:15 PM	5	0	2	0	0	7	2	0	3	0	0	5	2	177	0	0	0	179	2	210	3	0	0	215	406
2:30 PM	9	0	2	0	0	11	2	0	2	0	0	4	0	190	3	0	0	193	1	286	3	0	0	290	498
2:45 PM	2	0	2	0	0	4	0	0	2	0	0	2	0	165	4	0	0	169	3	183	2	0	0	188	363
Total	17	0	8	0	0	25	8	0	10	0	0	18	2	694	8	0	0	704	8	871	8	0	0	887	1634
3:00 PM	5	0	3	0	0	8	4	0	5	0	0	9	1	190	2	0	0	193	1	221	6	0	0	228	438
3:15 PM	3	0	3	0	0	6	2	0	7	0	0	9	3	181	1	0	0	185	3	245	1	0	0	249	449
3:30 PM	6	0	3	0	0	9	2	0	1	0	0	3	1	223	3	0	0	227	0	274	1	0	0	275	514
3:45 PM	2	0	1	0	0	3	0	0	1	0	0	1	1	215	0	0	0	216	0	242	1	0	0	243	463
Total	16	0	10	0	0	26	8	0	14	0	0	22	6	809	6	0	0	821	4	982	9	0	0	995	1864
4:00 PM	6	0	3	0	0	9	0	0	3	0	0	3	2	236	3	0	0	241	0	270	1	0	0	271	524
4:15 PM	13	0	3	0	0	16	0	0	2	0	0	2	1	237	1	0	0	239	1	274	0	0	0	275	532
4:30 PM	12	0	2	0	0	14	2	0	0	0	0	2	2	240	6	0	0	248	0	296	1	0	0	297	561
4:45 PM	10	0	2	0	0	12	1	0	0	0	0	1	2	215	0	0	0	217	0	313	1	0	0	314	544
Total	41	0	10	0	0	51	3	0	5	0	0	8	7	928	10	0	0	945	1	1153	3	0	0	1157	2161
5:00 PM	9	0	6	0	0	15	1	0	1	0	0	2	0	200	3	0	0	203	3	326	1	0	0	330	550
5:15 PM	16	0	5	0	0	21	1	0	3	0	0	4	1	235	1	0	0	237	1	369	1	1	0	372	634
5:30 PM	9	0	2	0	0	11	0	0	1	0	0	1	0	202	0	0	0	202	0	311	0	0	0	311	525
5:45 PM	12	0	5	0	0	17	0	0	0	0	0	0	0	189	0	0	0	189	2	310	0	0	0	312	518
Total	46	0	18	0	0	64	2	0	5	0	1	7	1	826	4	0	0	831	6	1316	2	1	0	1325	2227
6:00 PM	8	0	2	0	0	10	0	0	2	0	0	2	0	187	1	0	0	188	0	208	2	0	0	210	410
6:15 PM	5	0	2	0	0	7	2	0	2	0	0	4	1	176	0	1	0	178	0	174	0	0	0	174	363
6:30 PM	1	0	0	0	0	1	0	0	0	0	0	0	1	162	2	0	0	165	0	144	1	0	0	145	311
6:45 PM	3	0	1	0	0	4	0	0	2	0	1	2	1	162	1	0	0	164	0	142	0	0	0	142	312
Total	17	0	5	0	0	22	2	0	6																

Project ID: 25-430106-002

Location: Federal St/Brightview Concord River Assisted Liv
City: Billerica

PEAK HOURS

Day: Wednesday
Date: 7/23/2025

AM

Start Time	htview Concord River Assisted Liv Northbound					htview Concord River Assisted Liv Southbound					Concord Rd Eastbound					Concord Rd Westbound					Int. Total
	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	
Peak Hour Analysis from 08:00 AM - 10:00 AM																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
7:30 AM	2	0	0	0	2	0	0	0	0	0	2	192	9	0	203	5	272	0	0	277	482
7:45 AM	1	0	2	0	3	0	0	0	0	0	0	245	15	0	260	1	223	0	0	224	487
8:00 AM	2	0	0	0	2	0	0	1	0	1	1	248	10	0	259	4	240	1	0	245	507
8:15 AM	3	0	0	0	3	1	0	0	0	1	1	226	19	0	246	3	227	3	0	233	483
Total Volume	8	0	2	0	10	1	0	1	0	2	4	911	53	0	968	13	962	4	0	979	1959
% App. Total	80.0	0.0	20.0	0.0	100	50.0	0.0	50.0	0.0	100	0.4	94.1	5.5	0.0	100	1.3	98.3	0.4	0.0	100	
PHF	0.833					0.500					0.931					0.884					0.966
Cars, PU, Vans	7	0	2	0	9	1	0	1	0	2	4	886	53	0	943	13	925	3	0	941	1895
% Cars, PU, Vans	87.5	0.0	100.0	0.0	90.0	100.0	0.0	100.0	0.0	100.0	100.0	97.3	100.0	0.0	97.4	100.0	96.2	75.0	0.0	96.1	96.7
Buses	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	3	0	0	3	6
%Buses	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.3	0.3
Duals	1	0	0	0	1	0	0	0	0	0	0	17	0	0	17	0	29	1	0	30	48
%Duals	12.5	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	1.8	0.0	3.0	25.0	0.0	3.1	2.5
TTST	0	0	0	0	0	0	0	0	0	0	0	5	0	0	5	0	5	0	0	5	10
%TTST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.5	0.0	0.0	0.5	0.5

NOON

Start Time	htview Concord River Assisted Liv Northbound					htview Concord River Assisted Liv Southbound					Concord Rd Eastbound					Concord Rd Westbound					Int. Total
	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	
Peak Hour Analysis from 10:00 AM - 02:00 PM																					
Peak Hour for Entire Intersection Begins at 11:45 AM																					
11:45 AM	4	0	3	0	7	2	0	3	0	5	3	206	1	0	210	0	149	1	0	150	372
12:00 PM	1	0	7	0	8	3	0	3	0	6	2	169	5	0	176	2	167	2	0	171	361
12:15 PM	5	0	1	0	6	1	0	2	0	3	0	164	4	0	168	6	157	0	0	163	340
12:30 PM	6	0	4	0	10	0	0	3	0	3	2	173	2	0	177	1	172	1	0	174	364
Total Volume	16	0	15	0	31	6	0	11	0	17	7	712	12	0	731	9	645	4	0	658	1437
% App. Total	51.6	0.0	48.4	0.0	100	35.3	0.0	64.7	0.0	100	1.0	97.4	1.6	0.0	100	1.4	98.0	0.6	0.0	100	
PHF	0.775					0.708					0.870					0.945					0.966
Cars, PU, Vans	16	0	15	0	31	6	0	11	0	17	7	676	12	0	695	9	610	4	0	623	1366
% Cars, PU, Vans	100.0	0.0	100.0	0.0	100.0	100.0	0.0	100.0	0.0	100.0	100.0	94.9	100.0	0.0	95.1	100.0	94.6	100.0	0.0	94.7	95.1
Buses	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	2
%Buses	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.2	0.1
Duals	0	0	0	0	0	0	0	0	0	0	0	26	0	0	26	0	28	0	0	28	54
%Duals	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.0	0.0	3.6	0.0	4.3	0.0	0.0	4.3	3.8
TTST	0	0	0	0	0	0	0	0	0	0	0	9	0	0	9	0	6	0	0	6	15
%TTST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	1.2	0.0	0.9	0.0	0.0	0.9	1.0

PM

Start Time	htview Concord River Assisted Liv Northbound					htview Concord River Assisted Liv Southbound					Concord Rd Eastbound					Concord Rd Westbound					Int. Total
	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	
Peak Hour Analysis from 02:00 PM - 07:00 PM																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
4:30 PM	12	0	2	0	14	2	0	0	0	2	2	240	6	0	248	0	296	1	0	297	561
4:45 PM	10	0	2	0	12	1	0	0	0	1	2	215	0	0	217	0	313	1	0	314	544
5:00 PM	9	0	6	0	15	1	0	1	0	2	0	200	3	0	203	3	326	1	0	330	550
5:15 PM	16	0	5	0	21	1	0	3	0	4	1	235	1	0	237	1	369	1	1	372	634
Total Volume	47	0	15	0	62	5	0	4	0	9	5	890	10	0	905	4	1304	4	1	1313	2289
% App. Total	75.8	0.0	24.2	0.0	100	55.6	0.0	44.4	0.0	100	0.6	98.3	1.1	0.0	100	0.3	99.3	0.3	0.1	100	
PHF	0.738					0.563					0.912					0.882					0.903
Cars, PU, Vans	45	0	14	0	59	5	0	4	0	9	5	873	8	0	886	3	1284	4	0	1291	2245
% Cars, PU, Vans	95.7	0.0	93.3	0.0	95.2	100.0	0.0	100.0	0.0	100.0	100.0	98.1	80.0	0.0	97.9	75.0	98.5	100.0	0.0	98.3	98.1
Buses	0	0	1	0	1	0	0	0	0	0	0	2	0	0	2	1	0	0	1	2	5
%Buses	0.0	0.0	6.7	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.2	25.0	0.0	0.0	100.0	0.2	0.2
Duals	1	0	0	0	1	0	0	0	0	0	0	14	1	0	15	0	16	0	0	16	32
%Duals	2.1	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	1.6	10.0	0.0	1.7	0.0	1.2	0.0	0.0	1.2	1.4
TTST	1	0	0	0	1	0	0	0	0	0	0	1	1	0	2	0	4	0	0	4	7
%TTST	2.1	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.1	10.0	0.0	0.2	0.0	0.3	0.0	0.0	0.3	0.3

National Data & Surveying Services

Intersection Turning Movement Count

Location: Middlesex Turnpike & Concord Rd
 City: Billerica
 Control: Signalized

Project ID: 25-430106-001
 Date: 7/23/2025

Data - Total

NS/EW Streets:	Middlesex Turnpike				Middlesex Turnpike				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
AM	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
6:00 AM	27	0	9	0	0	0	0	0	0	35	66	0	19	114	0	0	270
6:15 AM	29	0	6	0	0	0	0	0	0	37	43	0	37	146	0	0	298
6:30 AM	51	0	2	0	0	0	0	0	0	42	75	0	44	155	0	0	369
6:45 AM	51	0	3	0	0	0	0	0	0	45	74	0	46	169	0	0	388
7:00 AM	44	0	7	0	0	0	0	0	0	49	99	0	36	169	0	0	404
7:15 AM	50	0	7	0	0	0	0	0	0	58	87	0	37	182	0	0	421
7:30 AM	76	0	5	0	0	0	0	0	0	74	89	0	33	211	0	0	488
7:45 AM	61	0	15	0	0	0	0	0	0	88	124	0	39	158	0	0	485
8:00 AM	64	0	18	0	0	0	0	0	0	85	120	0	19	190	0	0	496
8:15 AM	66	0	15	0	0	0	0	0	0	84	133	0	29	175	0	0	502
8:30 AM	45	0	12	0	0	0	0	0	0	100	90	0	26	148	0	0	421
8:45 AM	58	0	8	0	0	0	0	0	0	111	102	0	17	140	0	0	436
9:00 AM	45	0	14	0	0	0	0	0	0	82	85	0	19	153	0	0	398
9:15 AM	42	0	20	0	0	0	0	0	0	88	83	0	19	115	0	0	367
9:30 AM	54	0	14	0	0	0	0	0	0	81	54	0	23	135	0	0	361
9:45 AM	43	0	12	0	0	0	0	0	0	78	51	0	11	142	0	0	337
TOTAL VOLUMES :	NL 806	NT 0	NR 167	NU 0	SL 0	ST 0	SR 0	SU 0	EL 0	ET 1137	ER 1375	EU 0	WL 454	WT 2502	WR 0	WU 0	TOTAL 6441
APPROACH %'s :	82.84%	0.00%	17.16%	0.00%					0.00%	45.26%	54.74%	0.00%	15.36%	84.64%	0.00%	0.00%	
PEAK HR :	07:30 AM - 08:30 AM																TOTAL
PEAK HR VOL :	267	0	53	0	0	0	0	0	0	331	466	0	120	734	0	0	1971
PEAK HR FACTOR :	0.878	0.000	0.736	0.000	0.000	0.000	0.000	0.000	0.000	0.940	0.876	0.000	0.769	0.870	0.000	0.000	0.982
			0.976							0.918				0.875			
NOON	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
10:00 AM	32	0	12	0	0	0	0	0	0	67	41	0	11	97	0	0	260
10:15 AM	34	0	13	0	0	0	0	0	0	71	40	0	17	96	0	0	271
10:30 AM	43	0	11	0	0	0	0	0	0	101	48	0	14	106	0	0	323
10:45 AM	38	0	24	0	0	0	0	0	0	107	44	0	20	79	0	0	312
11:00 AM	33	0	20	0	0	0	0	0	0	89	47	0	22	84	0	0	295
11:15 AM	40	0	25	0	0	0	0	0	0	89	44	0	14	102	0	0	314
11:30 AM	46	0	14	0	0	0	0	0	0	114	46	0	22	107	0	0	349
11:45 AM	48	0	21	0	0	0	0	0	0	155	67	0	14	91	0	0	396
12:00 PM	67	0	25	0	0	0	0	0	0	127	57	0	25	95	0	0	396
12:15 PM	64	0	21	0	0	0	0	0	0	117	57	0	20	99	0	0	378
12:30 PM	61	0	24	0	0	0	0	0	0	96	78	0	20	123	0	0	402
12:45 PM	51	0	18	0	0	0	0	0	0	112	44	0	20	99	0	0	344
1:00 PM	57	0	24	0	0	0	0	0	0	106	48	0	18	91	0	0	344
1:15 PM	60	0	23	0	0	0	0	0	0	104	52	1	22	105	0	0	367
1:30 PM	64	0	23	0	0	0	0	0	0	130	65	0	18	105	0	0	405
1:45 PM	55	0	18	0	0	0	0	0	0	102	54	0	21	77	0	0	327
TOTAL VOLUMES :	NL 793	NT 0	NR 316	NU 0	SL 0	ST 0	SR 0	SU 0	EL 0	ET 1687	ER 832	EU 1	WL 298	WT 1556	WR 0	WU 0	TOTAL 5483
APPROACH %'s :	71.51%	0.00%	28.49%	0.00%					0.00%	66.94%	33.02%	0.04%	16.07%	83.93%	0.00%	0.00%	
PEAK HR :	11:45 AM - 12:45 PM																TOTAL
PEAK HR VOL :	240	0	91	0	0	0	0	0	0	495	259	0	79	408	0	0	1572
PEAK HR FACTOR :	0.896	0.000	0.910	0.000	0.000	0.000	0.000	0.000	0.000	0.798	0.830	0.000	0.790	0.829	0.000	0.000	0.978
			0.899							0.849				0.851			
PM	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
2:00 PM	104	0	24	0	0	0	0	0	0	105	52	1	9	74	0	0	369
2:15 PM	101	0	25	0	0	0	0	0	0	147	44	0	9	98	0	0	424
2:30 PM	143	0	29	0	0	0	0	0	0	143	52	0	10	112	0	0	489
2:45 PM	81	0	36	0	0	0	0	0	0	140	35	0	11	92	0	0	395
3:00 PM	136	0	33	0	0	0	0	0	0	137	52	0	19	92	0	0	469
3:15 PM	120	0	34	0	0	0	0	0	0	146	48	0	22	109	0	0	479
3:30 PM	186	0	44	0	0	0	0	0	0	163	62	0	16	87	0	0	558
3:45 PM	160	0	47	0	0	0	0	0	0	185	41	0	9	67	0	0	509
4:00 PM	154	0	50	0	0	0	0	0	0	171	53	0	11	93	0	0	532
4:15 PM	134	0	50	0	0	0	0	0	0	200	52	0	29	127	0	0	592
4:30 PM	164	0	50	0	0	0	0	0	0	190	54	0	22	100	0	0	580
4:45 PM	196	0	42	0	0	0	0	0	0	144	75	0	18	98	0	0	573
5:00 PM	216	0	38	0	0	0	0	0	0	140	62	0	19	114	0	0	589
5:15 PM	216	0	60	0	0	0	0	0	0	175	64	0	19	115	0	0	649
5:30 PM	198	0	51	0	0	0	0	0	0	172	60	0	15	92	0	0	588
5:45 PM	202	0	49	0	0	0	0	0	0	124	50	0	19	101	0	0	545
6:00 PM	104	0	37	0	0	0	0	0	0	157	47	0	16	92	0	0	453
6:15 PM	82	0	36	0	0	0	0	0	0	136	40	0	13	92	0	0	399
6:30 PM	57	0	24	0	0	0	0	0	0	130	30	0	20	80	0	0	341
6:45 PM	48	0	25	0	0	0	0	0	0	127	32	0	10	88	0	0	330
TOTAL VOLUMES :	NL 2802	NT 0	NR 784	NU 0	SL 0	ST 0	SR 0	SU 0	EL 0	ET 3032	ER 1005	EU 1	WL 316	WT 1923	WR 0	WU 0	TOTAL 9863
APPROACH %'s :	78.14%	0.00%	21.86%	0.00%					0.00%	75.09%	24.89%	0.02%	14.11%	85.89%	0.00%	0.00%	
PEAK HR :	04:45 PM - 05:45 PM																TOTAL
PEAK HR VOL :	826	0	191	0	0	0	0	0	0	631	261	0	71	419	0	0	2399
PEAK HR FACTOR :	0.956	0.000	0.796	0.000	0.000	0.000	0.000	0.000	0.000	0.901	0.870	0.000	0.934	0.911	0.000	0.000	0.924
			0.921							0.933				0.914			

National Data & Surveying Services

Intersection Turning Movement Count

Location: Middlesex Turnpike & Concord Rd
 City: Billerica
 Control: Signalized

Project ID: 25-430106-001
 Date: 7/23/2025

Data - Cars

NS/EW Streets:	Middlesex Turnpike				Middlesex Turnpike				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
AM	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
6:00 AM	26	0	9	0	0	0	0	0	0	28	64	0	19	107	0	0	253
6:15 AM	27	0	6	0	0	0	0	0	0	35	43	0	36	139	0	0	286
6:30 AM	49	0	2	0	0	0	0	0	0	41	75	0	43	147	0	0	357
6:45 AM	49	0	3	0	0	0	0	0	0	43	74	0	45	164	0	0	378
7:00 AM	41	0	6	0	0	0	0	0	0	48	98	0	36	162	0	0	391
7:15 AM	47	0	6	0	0	0	0	0	0	51	83	0	34	178	0	0	399
7:30 AM	73	0	5	0	0	0	0	0	0	71	89	0	32	204	0	0	474
7:45 AM	58	0	15	0	0	0	0	0	0	86	119	0	37	151	0	0	466
8:00 AM	59	0	17	0	0	0	0	0	0	81	117	0	19	189	0	0	482
8:15 AM	61	0	13	0	0	0	0	0	0	80	132	0	28	170	0	0	484
8:30 AM	44	0	10	0	0	0	0	0	0	97	87	0	25	143	0	0	406
8:45 AM	54	0	7	0	0	0	0	0	0	102	99	0	17	137	0	0	416
9:00 AM	44	0	12	0	0	0	0	0	0	80	83	0	17	147	0	0	383
9:15 AM	37	0	17	0	0	0	0	0	0	84	77	0	17	105	0	0	337
9:30 AM	53	0	12	0	0	0	0	0	0	75	51	0	23	128	0	0	342
9:45 AM	40	0	12	0	0	0	0	0	0	76	47	0	11	132	0	0	318
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	762	0	152	0	0	0	0	0	0	1078	1338	0	439	2403	0	0	6172
	83.37%	0.00%	16.63%	0.00%					0.00%	44.62%	55.38%	0.00%	15.45%	84.55%	0.00%	0.00%	
PEAK HR :	07:30 AM - 08:30 AM																TOTAL
PEAK HR VOL :	251	0	50	0	0	0	0	0	0	318	457	0	116	714	0	0	1906
PEAK HR FACTOR :	0.860	0.000	0.735	0.000	0.000	0.000	0.000	0.000	0.000	0.924	0.866	0.000	0.784	0.875	0.000	0.000	0.985
	0.965								0.914				0.879				
NOON	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
10:00 AM	27	0	11	0	0	0	0	0	0	58	37	0	11	87	0	0	231
10:15 AM	33	0	11	0	0	0	0	0	0	68	37	0	14	89	0	0	252
10:30 AM	40	0	11	0	0	0	0	0	0	90	43	0	13	97	0	0	294
10:45 AM	36	0	23	0	0	0	0	0	0	99	41	0	18	78	0	0	295
11:00 AM	32	0	18	0	0	0	0	0	0	85	44	0	22	78	0	0	279
11:15 AM	37	0	21	0	0	0	0	0	0	85	40	0	13	93	0	0	289
11:30 AM	43	0	14	0	0	0	0	0	0	108	43	0	22	100	0	0	330
11:45 AM	45	0	20	0	0	0	0	0	0	150	64	0	14	88	0	0	381
12:00 PM	64	0	24	0	0	0	0	0	0	120	53	0	24	91	0	0	376
12:15 PM	60	0	20	0	0	0	0	0	0	112	56	0	19	93	0	0	360
12:30 PM	59	0	24	0	0	0	0	0	0	92	75	0	18	117	0	0	385
12:45 PM	46	0	18	0	0	0	0	0	0	107	40	0	19	94	0	0	324
1:00 PM	55	0	23	0	0	0	0	0	0	97	47	0	16	83	0	0	321
1:15 PM	53	0	21	0	0	0	0	0	0	99	48	1	21	103	0	0	346
1:30 PM	62	0	22	0	0	0	0	0	0	127	59	0	16	97	0	0	383
1:45 PM	51	0	18	0	0	0	0	0	0	94	50	0	20	76	0	0	309
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	743	0	299	0	0	0	0	0	0	1591	777	1	280	1464	0	0	5155
	71.31%	0.00%	28.69%	0.00%					0.00%	67.16%	32.80%	0.04%	16.06%	83.94%	0.00%	0.00%	
PEAK HR :	11:45 AM - 12:45 PM																TOTAL
PEAK HR VOL :	228	0	88	0	0	0	0	0	0	474	248	0	75	389	0	0	1502
PEAK HR FACTOR :	0.891	0.000	0.917	0.000	0.000	0.000	0.000	0.000	0.000	0.790	0.827	0.000	0.781	0.831	0.000	0.000	0.975
	0.898								0.843				0.859				
PM	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
2:00 PM	100	0	24	0	0	0	0	0	0	99	48	1	8	69	0	0	349
2:15 PM	96	0	21	0	0	0	0	0	0	134	42	0	7	97	0	0	397
2:30 PM	140	0	29	0	0	0	0	0	0	136	49	0	9	109	0	0	472
2:45 PM	79	0	36	0	0	0	0	0	0	138	33	0	11	90	0	0	387
3:00 PM	135	0	32	0	0	0	0	0	0	130	49	0	19	90	0	0	455
3:15 PM	116	0	33	0	0	0	0	0	0	141	46	0	21	105	0	0	462
3:30 PM	184	0	44	0	0	0	0	0	0	160	58	0	15	85	0	0	546
3:45 PM	154	0	45	0	0	0	0	0	0	176	34	0	9	67	0	0	485
4:00 PM	149	0	49	0	0	0	0	0	0	164	51	0	10	90	0	0	513
4:15 PM	133	0	48	0	0	0	0	0	0	196	49	0	28	126	0	0	580
4:30 PM	160	0	49	0	0	0	0	0	0	185	51	0	21	98	0	0	564
4:45 PM	192	0	41	0	0	0	0	0	0	143	73	0	17	96	0	0	562
5:00 PM	210	0	38	0	0	0	0	0	0	135	61	0	19	113	0	0	576
5:15 PM	214	0	58	0	0	0	0	0	0	173	64	0	18	113	0	0	640
5:30 PM	196	0	51	0	0	0	0	0	0	170	59	0	15	91	0	0	582
5:45 PM	200	0	48	0	0	0	0	0	0	123	49	0	19	101	0	0	540
6:00 PM	104	0	37	0	0	0	0	0	0	156	46	0	16	92	0	0	451
6:15 PM	81	0	34	0	0	0	0	0	0	132	40	0	12	91	0	0	390
6:30 PM	57	0	24	0	0	0	0	0	0	129	29	0	20	79	0	0	338
6:45 PM	48	0	25	0	0	0	0	0	0	127	32	0	10	87	0	0	329
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	2748	0	766	0	0	0	0	0	0	2947	963	1	304	1889	0	0	9618
	78.20%	0.00%	21.80%	0.00%					0.00%	75.35%	24.62%	0.03%	13.86%	86.14%	0.00%	0.00%	
PEAK HR :	04:45 PM - 05:45 PM																TOTAL
PEAK HR VOL :	812	0	188	0	0	0	0	0	0	621	257	0	69	413	0	0	2360
PEAK HR FACTOR :	0.949	0.000	0.810	0.000	0.000	0.000	0.000	0.000	0.000	0.897	0.880	0.000	0.908	0.914	0.000	0.000	0.922
	0.919								0.926				0.913				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Middlesex Turnpike & Concord Rd
 City: Billerica
 Control: Signalized

Project ID: 25-430106-001
 Date: 7/23/2025

Data - Buses

NS/EW Streets:	Middlesex Turnpike				Middlesex Turnpike				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
AM	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	2
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
8:00 AM	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
8:15 AM	0	0	1	0	0	0	0	0	0	2	0	0	1	0	0	0	4
8:30 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	2
8:45 AM	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	3
9:00 AM	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
9:15 AM	0	0	1	0	0	0	0	0	0	0	2	0	1	2	0	0	6
9:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	2
9:45 AM	1	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	7
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	5	0	7	0	0	0	0	0	0	3	5	0	4	10	0	0	34
	41.67%	0.00%	58.33%	0.00%					0.00%	37.50%	62.50%	0.00%	28.57%	71.43%	0.00%	0.00%	
PEAK HR :	07:30 AM - 08:30 AM																TOTAL
PEAK HR VOL :	3	0	1	0	0	0	0	0	0	2	1	0	1	0	0	0	8
PEAK HR FACTOR :	0.375	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.250	0.000	0.250	0.000	0.000	0.000	0.500
			0.500							0.375	0.250			0.250			
NOON	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	3
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	1	0	0	0	0	0	0	1
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	2
11:30 AM	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3
11:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	2
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
12:45 PM	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
1:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
1:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1:30 PM	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	3
1:45 PM	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	3
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	3	0	4	0	0	0	0	0	0	3	4	0	5	4	0	0	23
	42.86%	0.00%	57.14%	0.00%					0.00%	42.86%	57.14%	0.00%	55.56%	44.44%	0.00%	0.00%	
PEAK HR :	11:45 AM - 12:45 PM																TOTAL
PEAK HR VOL :	0	0	1	0	0	0	0	0	0	0	1	0	1	1	0	0	4
PEAK HR FACTOR :	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.250	0.000	0.000	0.500
			0.250								0.250			0.500			
PM	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
2:00 PM	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
2:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	2
2:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	3
3:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
3:45 PM	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	6
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
4:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	2
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
5:00 PM	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
5:15 PM	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	3
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
6:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	3
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	4	0	5	0	0	0	0	0	0	8	4	0	5	2	0	0	28
	44.44%	0.00%	55.56%	0.00%					0.00%	66.67%	33.33%	0.00%	71.43%	28.57%	0.00%	0.00%	
PEAK HR :	04:45 PM - 05:45 PM																TOTAL
PEAK HR VOL :	1	0	1	0	0	0	0	0	0	2	1	0	1	0	0	0	6
PEAK HR FACTOR :	0.250	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.250	0.000	0.250	0.000	0.000	0.000	0.500
			0.500							0.750	0.250			0.250			

National Data & Surveying Services

Intersection Turning Movement Count

Location: Middlesex Turnpike & Concord Rd
 City: Billerica
 Control: Signalized

Project ID: 25-430106-001
 Date: 7/23/2025

Data - Duals

NS/EW Streets:	Middlesex Turnpike				Middlesex Turnpike				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
AM	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
6:00 AM	1	0	0	0	0	0	0	0	0	7	2	0	0	6	0	0	16
6:15 AM	1	0	0	0	0	0	0	0	0	1	0	0	0	6	0	0	8
6:30 AM	2	0	0	0	0	0	0	0	0	1	0	0	0	7	0	0	11
6:45 AM	2	0	0	0	0	0	0	0	0	2	0	0	0	5	0	0	10
7:00 AM	3	0	1	0	0	0	0	0	0	0	0	0	0	6	0	0	10
7:15 AM	2	0	0	0	0	0	0	0	0	6	3	0	0	4	0	0	16
7:30 AM	2	0	0	0	0	0	0	0	0	2	0	0	0	7	0	0	12
7:45 AM	1	0	0	0	0	0	0	0	0	2	3	0	0	6	0	0	14
8:00 AM	2	0	1	0	0	0	0	0	0	3	3	0	0	1	0	0	10
8:15 AM	5	0	1	0	0	0	0	0	0	0	1	0	0	4	0	0	11
8:30 AM	1	0	1	0	0	0	0	0	0	3	1	0	0	3	0	0	10
8:45 AM	3	0	0	0	0	0	0	0	0	8	2	0	0	2	0	0	15
9:00 AM	1	0	0	0	0	0	0	0	0	2	2	0	0	6	0	0	13
9:15 AM	5	0	1	0	0	0	0	0	0	4	2	0	0	8	0	0	21
9:30 AM	0	0	0	0	0	0	0	0	0	4	1	0	0	5	0	0	10
9:45 AM	1	0	0	0	0	0	0	0	0	1	4	0	0	4	0	0	10
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	32	0	5	0	0	0	0	0	0	46	24	0	10	80	0	0	197
	86.49%	0.00%	13.51%	0.00%					0.00%	65.71%	34.29%	0.00%	11.11%	88.89%	0.00%	0.00%	
PEAK HR :	07:30 AM - 08:30 AM																TOTAL
PEAK HR VOL :	10	0	2	0	0	0	0	0	0	7	7	0	3	18	0	0	47
PEAK HR FACTOR :	0.500	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.583	0.583	0.000	0.375	0.643	0.000	0.000	0.839
			0.500							0.583				0.656			

NS/EW Streets:	Middlesex Turnpike				Middlesex Turnpike				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
NOON	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
10:00 AM	5	0	1	0	0	0	0	0	0	9	3	0	0	9	0	0	27
10:15 AM	1	0	0	0	0	0	0	0	0	3	3	0	0	6	0	0	14
10:30 AM	2	0	0	0	0	0	0	0	0	9	5	0	0	7	0	0	24
10:45 AM	2	0	1	0	0	0	0	0	0	6	3	0	0	1	0	0	15
11:00 AM	1	0	2	0	0	0	0	0	0	2	1	0	0	5	0	0	11
11:15 AM	2	0	3	0	0	0	0	0	0	2	4	0	0	8	0	0	19
11:30 AM	2	0	0	0	0	0	0	0	0	6	3	0	0	4	0	0	15
11:45 AM	3	0	1	0	0	0	0	0	0	4	2	0	0	3	0	0	13
12:00 PM	2	0	0	0	0	0	0	0	0	5	3	0	0	4	0	0	14
12:15 PM	2	0	0	0	0	0	0	0	0	4	1	0	0	5	0	0	12
12:30 PM	2	0	0	0	0	0	0	0	0	3	2	0	0	4	0	0	13
12:45 PM	4	0	0	0	0	0	0	0	0	2	4	0	0	3	0	0	14
1:00 PM	1	0	0	0	0	0	0	0	0	7	1	0	0	5	0	0	15
1:15 PM	6	0	1	0	0	0	0	0	0	4	3	0	0	1	0	0	16
1:30 PM	1	0	1	0	0	0	0	0	0	3	3	0	0	8	0	0	17
1:45 PM	3	0	0	0	0	0	0	0	0	5	2	0	0	1	0	0	12
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	39	0	10	0	0	0	0	0	0	74	43	0	11	74	0	0	251
	79.59%	0.00%	20.41%	0.00%					0.00%	63.25%	36.75%	0.00%	12.94%	87.06%	0.00%	0.00%	
PEAK HR :	11:45 AM - 12:45 PM																TOTAL
PEAK HR VOL :	9	0	1	0	0	0	0	0	0	16	8	0	2	16	0	0	52
PEAK HR FACTOR :	0.750	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.800	0.667	0.000	0.250	0.800	0.000	0.000	0.929
			0.625							0.750				0.750			

NS/EW Streets:	Middlesex Turnpike				Middlesex Turnpike				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
PM	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
2:00 PM	2	0	0	0	0	0	0	0	0	5	3	0	0	4	0	0	15
2:15 PM	3	0	2	0	0	0	0	0	0	11	1	0	0	1	0	0	19
2:30 PM	3	0	0	0	0	0	0	0	0	4	2	0	0	3	0	0	12
2:45 PM	2	0	0	0	0	0	0	0	0	2	2	0	0	2	0	0	8
3:00 PM	1	0	1	0	0	0	0	0	0	4	2	0	0	2	0	0	10
3:15 PM	2	0	0	0	0	0	0	0	0	5	2	0	0	3	0	0	12
3:30 PM	2	0	0	0	0	0	0	0	0	2	3	0	0	2	0	0	9
3:45 PM	5	0	2	0	0	0	0	0	0	3	4	0	0	0	0	0	14
4:00 PM	4	0	1	0	0	0	0	0	0	6	0	0	0	1	0	0	13
4:15 PM	1	0	1	0	0	0	0	0	0	4	3	0	0	1	0	0	10
4:30 PM	3	0	1	0	0	0	0	0	0	5	2	0	0	2	0	0	14
4:45 PM	3	0	1	0	0	0	0	0	0	1	1	0	0	2	0	0	8
5:00 PM	3	0	0	0	0	0	0	0	0	4	1	0	0	1	0	0	9
5:15 PM	2	0	1	0	0	0	0	0	0	1	0	0	0	2	0	0	6
5:30 PM	0	0	0	0	0	0	0	0	0	2	1	0	0	1	0	0	4
5:45 PM	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
6:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
6:15 PM	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	3
6:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	38	0	10	0	0	0	0	0	0	63	28	0	4	29	0	0	172
	79.17%	0.00%	20.83%	0.00%					0.00%	69.23%	30.77%	0.00%	12.12%	87.88%	0.00%	0.00%	
PEAK HR :	04:45 PM - 05:45 PM																TOTAL
PEAK HR VOL :	8	0	2	0	0	0	0	0	0	8	3	0	0	6	0	0	27
PEAK HR FACTOR :	0.667	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.750	0.000	0.000	0.750	0.000	0.000	0.750
			0.625							0.550				0.750			

National Data & Surveying Services

Intersection Turning Movement Count

Location: Middlesex Turnpike & Concord Rd
 City: Billerica
 Control: Signalized

Project ID: 25-430106-001
 Date: 7/23/2025

Data - TTST

NS/EW Streets:	Middlesex Turnpike				Middlesex Turnpike				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
AM	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
6:15 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	3
7:15 AM	1	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	4
7:30 AM	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
7:45 AM	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	3
8:00 AM	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
8:15 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
8:30 AM	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	3
8:45 AM	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	3
9:30 AM	1	0	2	0	0	0	0	0	0	2	1	0	0	1	0	0	7
9:45 AM	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	7	0	3	0	0	0	0	0	0	10	8	0	1	9	0	0	38
	70.00%	0.00%	30.00%	0.00%					0.00%	55.56%	44.44%	0.00%	10.00%	90.00%	0.00%	0.00%	
PEAK HR :	07:30 AM - 08:30 AM																TOTAL
PEAK HR VOL :	3	0	0	0	0	0	0	0	0	4	1	0	0	2	0	0	10
PEAK HR FACTOR :	0.750	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.250	0.000	0.000	0.500	0.000	0.000	0.833
	0.750																
	0.625																
	0.500																

NS/EW Streets:	Middlesex Turnpike				Middlesex Turnpike				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
NOON	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
10:00 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	2
10:15 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	2
10:30 AM	1	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	5
10:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
11:00 AM	0	0	0	0	0	0	0	0	0	2	2	0	0	1	0	0	5
11:15 AM	1	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	4
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
11:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
12:00 PM	1	0	1	0	0	0	0	0	0	2	1	0	0	1	0	0	6
12:15 PM	2	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	4
12:30 PM	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	3
12:45 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	4
1:00 PM	1	0	1	0	0	0	0	0	0	1	0	0	0	3	0	0	7
1:15 PM	1	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	4
1:30 PM	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
1:45 PM	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	3
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	8	0	3	0	0	0	0	0	0	19	8	0	2	14	0	0	54
	72.73%	0.00%	27.27%	0.00%					0.00%	70.37%	29.63%	0.00%	12.50%	87.50%	0.00%	0.00%	
PEAK HR :	11:45 AM - 12:45 PM																TOTAL
PEAK HR VOL :	3	0	1	0	0	0	0	0	0	5	2	0	1	2	0	0	14
PEAK HR FACTOR :	0.375	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.625	0.500	0.000	0.250	0.500	0.000	0.000	0.583
	0.500																
	0.583																
	0.750																

NS/EW Streets:	Middlesex Turnpike				Middlesex Turnpike				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
PM	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
2:00 PM	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	3
2:15 PM	2	0	1	0	0	0	0	0	0	2	1	0	0	0	0	0	6
2:30 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	4
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	4
3:15 PM	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
3:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
3:45 PM	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	4
4:00 PM	1	0	0	0	0	0	0	0	0	1	2	0	0	1	0	0	5
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
4:45 PM	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
5:00 PM	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
5:45 PM	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	3
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	3
6:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	12	0	3	0	0	0	0	0	0	14	10	0	3	3	0	0	45
	80.00%	0.00%	20.00%	0.00%					0.00%	58.33%	41.67%	0.00%	50.00%	50.00%	0.00%	0.00%	
PEAK HR :	04:45 PM - 05:45 PM																TOTAL
PEAK HR VOL :	5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	6
PEAK HR FACTOR :	0.625	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.750
	0.625																
	0.250																

National Data & Surveying Services

Intersection Turning Movement Count

Location: Middlesex Turnpike & Concord Rd
 City: Billerica
 Control: Signalized

Project ID: 25-430106-001
 Date: 7/23/2025

Data - Bikes

NS/EW Streets:	Middlesex Turnpike				Middlesex Turnpike				Concord Rd				Concord Rd				TOTAL
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
AM	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	0	0	0	0	0	0	0	0	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	5
PEAK HR :	07:30 AM - 08:30 AM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.250	0.000	0.000	0.375
										0.250				0.250			
NOON	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
10:00 AM	0	0	0	0	0	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	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	2	0	0	0	0	0	0	2
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	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	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
1:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	100.00%	0.00%	0.00%	0.00%	0	0	0	0	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	7
PEAK HR :	11:45 AM - 12:45 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.250	0.000	0.000	0.375
										0.250				0.250			
PM	1.3 NL	0.3 NT	0.3 NR	0 NU	1 SL	1 ST	0 SR	0 SU	1 EL	1.5 ET	0.5 ER	0 EU	1 WL	2 WT	0 WR	0 WU	TOTAL
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES :	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
APPROACH %'s :	0	0	0	0	0	0	0	0	0.00%	100.00%	0.00%	0.00%	50.00%	50.00%	0.00%	0.00%	4
PEAK HR :	04:45 PM - 05:45 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0

National Data & Surveying Services
Intersection Turning Movement Count

Location: Middlesex Turnpike & Concord Rd
 City: Billerica

Project ID: 25-430106-001
 Date: 7/23/2025

Data - Pedestrians (Crosswalks)

NS/EW Streets:	Middlesex Turnpike	Middlesex Turnpike	Concord Rd	Concord Rd					
AM	NORTH LEG		SOUTH LEG		EAST LEG	WEST LEG	TOTAL		
	EB	WB	EB	WB	NB	SB		NB	SB
6:00 AM	0	0	0	0	0	0	0	0	
6:15 AM	0	0	1	0	0	0	0	1	
6:30 AM	0	1	0	0	0	0	0	1	
6:45 AM	0	0	0	0	0	0	0	0	
7:00 AM	1	0	0	0	0	0	0	1	
7:15 AM	0	0	0	0	0	0	0	0	
7:30 AM	1	0	0	1	0	0	0	2	
7:45 AM	0	0	0	0	0	0	0	0	
8:00 AM	0	0	0	0	0	0	0	0	
8:15 AM	0	0	0	0	0	0	0	0	
8:30 AM	0	0	0	0	0	0	0	0	
8:45 AM	0	0	0	0	0	0	0	0	
9:00 AM	0	0	0	2	0	0	0	2	
9:15 AM	0	0	0	0	0	0	0	0	
9:30 AM	0	0	0	1	0	0	0	1	
9:45 AM	1	0	0	0	0	1	0	2	
TOTAL VOLUMES :	EB 3	WB 1	EB 1	WB 4	NB 0	SB 1	NB 0	SB 0	TOTAL 10
APPROACH %'s :	75.00%	25.00%	20.00%	80.00%	0.00%	100.00%			
PEAK HR :	07:30 AM - 08:30 AM								
PEAK HR VOL :	1	0	0	1	0	0	0	0	TOTAL 2
PEAK HR FACTOR :	0.250			0.250					0.250
	0.250		0.250						
NOON	NORTH LEG		SOUTH LEG		EAST LEG	WEST LEG	TOTAL		
	EB	WB	EB	WB	NB	SB		NB	SB
10:00 AM	0	1	0	0	1	0	0	0	2
10:15 AM	1	0	0	0	0	1	0	0	2
10:30 AM	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0
11:30 AM	1	0	0	0	0	1	0	0	2
11:45 AM	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0
12:15 PM	0	2	0	0	0	0	0	1	3
12:30 PM	0	0	0	1	0	0	0	0	1
12:45 PM	0	0	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0	0	0
1:15 PM	0	0	0	0	0	0	0	0	0
1:30 PM	1	0	0	0	0	1	0	0	2
1:45 PM	0	1	0	0	1	0	0	0	2
TOTAL VOLUMES :	EB 3	WB 4	EB 0	WB 1	NB 2	SB 3	NB 0	SB 1	TOTAL 14
APPROACH %'s :	42.86%	57.14%	0.00%	100.00%	40.00%	60.00%	0.00%	100.00%	
PEAK HR :	11:45 AM - 12:45 PM								
PEAK HR VOL :	0	2	0	1	0	0	0	1	TOTAL 4
PEAK HR FACTOR :	0.250	0.250	0.250	0.250			0.250	0.250	0.333
	0.250		0.250				0.250		
PM	NORTH LEG		SOUTH LEG		EAST LEG	WEST LEG	TOTAL		
	EB	WB	EB	WB	NB	SB		NB	SB
2:00 PM	0	0	0	0	0	0	1	1	
2:15 PM	0	0	1	2	0	0	0	3	
2:30 PM	0	0	0	0	0	0	0	0	
2:45 PM	0	0	0	0	0	0	0	0	
3:00 PM	0	0	0	1	0	0	0	1	
3:15 PM	0	0	0	0	0	0	0	0	
3:30 PM	0	0	0	0	0	0	0	0	
3:45 PM	0	0	0	0	0	0	0	0	
4:00 PM	0	0	0	0	0	0	0	0	
4:15 PM	0	0	0	0	0	0	0	0	
4:30 PM	0	0	0	0	0	0	0	0	
4:45 PM	0	0	0	0	0	0	0	0	
5:00 PM	0	0	1	0	0	0	0	1	
5:15 PM	0	0	0	0	0	0	0	0	
5:30 PM	0	1	0	0	1	0	0	2	
5:45 PM	0	0	0	0	0	0	0	0	
6:00 PM	0	0	0	0	0	0	0	0	
6:15 PM	0	0	0	0	0	0	0	0	
6:30 PM	0	0	0	0	0	0	0	0	
6:45 PM	0	1	0	0	1	0	0	2	
TOTAL VOLUMES :	EB 0	WB 2	EB 2	WB 3	NB 2	SB 0	NB 0	SB 1	TOTAL 10
APPROACH %'s :	0.00%	100.00%	40.00%	60.00%	100.00%	0.00%	0.00%	100.00%	
PEAK HR :	04:45 PM - 05:45 PM								
PEAK HR VOL :	0	1	1	0	1	0	0	0	TOTAL 3
PEAK HR FACTOR :	0.250	0.250	0.250	0.250	0.250				0.375
	0.250		0.250		0.250				

Project ID: 25-430106-001
 Location: Middlesex Turnpike & Concord Rd
 City: Billerica

Day: Wednesday
 Date: 7/23/2025

Groups Printed - Cars, PU, Vans - Heavy Trucks

Start Time	Middlesex Turnpike Northbound					Middlesex Turnpike Southbound					Concord Rd Eastbound					Concord Rd Westbound					Int.	Total				
	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru			Rgt	Uturn	Peds	App. Total
6:00 AM	27	0	9	0	0	36	0	0	0	0	0	0	0	35	66	0	0	101	19	114	0	0	0	133	270	
6:15 AM	29	0	6	0	1	35	0	0	0	0	0	0	0	37	43	0	0	80	37	146	0	0	0	183	298	
6:30 AM	51	0	2	0	0	53	0	0	0	0	1	0	0	42	75	0	0	117	44	155	0	0	0	199	369	
6:45 AM	51	0	3	0	0	54	0	0	0	0	0	0	0	45	74	0	0	119	46	169	0	0	0	215	388	
Total	158	0	20	0	1	178	0	0	0	0	1	0	0	159	258	0	0	417	146	584	0	0	0	730	1325	
7:00 AM	44	0	7	0	0	51	0	0	0	0	1	0	0	49	99	0	0	148	36	169	0	0	0	205	404	
7:15 AM	50	0	7	0	0	57	0	0	0	0	0	0	0	58	87	0	0	145	37	182	0	0	0	219	421	
7:30 AM	76	0	5	0	1	81	0	0	0	0	1	0	0	74	89	0	0	163	33	211	0	0	0	244	488	
7:45 AM	61	0	15	0	0	76	0	0	0	0	0	0	0	88	124	0	0	212	39	158	0	0	0	197	485	
Total	231	0	34	0	1	265	0	0	0	0	2	0	0	269	399	0	0	668	145	720	0	0	0	865	1798	
8:00 AM	64	0	18	0	0	82	0	0	0	0	0	0	0	85	120	0	0	205	19	190	0	0	0	209	496	
8:15 AM	66	0	15	0	0	81	0	0	0	0	0	0	0	84	133	0	0	217	29	175	0	0	0	204	502	
8:30 AM	45	0	12	0	0	57	0	0	0	0	0	0	0	100	90	0	0	190	26	148	0	0	0	174	421	
8:45 AM	58	0	8	0	0	66	0	0	0	0	0	0	0	111	102	0	0	213	17	140	0	0	0	157	436	
Total	233	0	53	0	0	286	0	0	0	0	0	0	0	380	445	0	0	825	91	653	0	0	0	744	1855	
9:00 AM	45	0	14	0	2	59	0	0	0	0	0	0	0	82	85	0	0	167	19	153	0	0	0	172	398	
9:15 AM	42	0	20	0	0	62	0	0	0	0	0	0	0	88	83	0	0	171	19	115	0	0	0	134	367	
9:30 AM	54	0	14	0	1	68	0	0	0	0	0	0	0	81	54	0	0	135	23	135	0	0	0	158	361	
9:45 AM	43	0	12	0	0	55	0	0	0	0	1	0	0	78	51	0	0	129	11	142	0	0	1	153	337	
Total	184	0	60	0	3	244	0	0	0	0	1	0	0	329	273	0	0	602	72	545	0	0	1	617	1463	
BREAK																										
10:00 AM	32	0	12	0	0	44	0	0	0	0	1	0	0	67	41	0	0	108	11	97	0	0	1	108	260	
10:15 AM	34	0	13	0	0	47	0	0	0	0	1	0	0	71	40	0	0	111	17	86	0	0	1	113	271	
10:30 AM	43	0	11	0	0	54	0	0	0	0	0	0	0	101	48	0	0	149	14	106	0	0	0	120	323	
10:45 AM	38	0	24	0	0	62	0	0	0	0	0	0	0	107	44	0	0	151	20	79	0	0	0	99	312	
Total	147	0	60	0	0	207	0	0	0	0	2	0	0	346	173	0	0	519	62	378	0	0	2	440	1166	
11:00 AM	33	0	20	0	0	53	0	0	0	0	0	0	0	89	47	0	0	136	22	84	0	0	0	106	295	
11:15 AM	40	0	25	0	0	65	0	0	0	0	0	0	0	89	44	0	0	133	14	102	0	0	0	116	314	
11:30 AM	46	0	14	0	0	60	0	0	0	0	1	0	0	114	46	0	0	160	22	107	0	0	1	129	349	
11:45 AM	48	0	21	0	0	69	0	0	0	0	0	0	0	155	67	0	0	222	14	91	0	0	0	105	396	
Total	167	0	80	0	0	247	0	0	0	0	1	0	0	447	204	0	0	651	72	384	0	0	1	456	1354	
12:00 PM	67	0	25	0	0	92	0	0	0	0	0	0	0	127	57	0	0	184	25	95	0	0	0	120	396	
12:15 PM	64	0	21	0	0	85	0	0	0	0	2	0	0	117	57	0	1	174	20	99	0	0	0	119	378	
12:30 PM	61	0	24	0	1	85	0	0	0	0	0	0	0	96	78	0	0	174	20	123	0	0	0	143	402	
12:45 PM	51	0	18	0	0	69	0	0	0	0	0	0	0	112	44	0	0	156	20	99	0	0	0	119	344	
Total	243	0	88	0	1	331	0	0	0	0	2	0	0	452	236	0	1	689	85	416	0	0	0	1	501	1520
1:00 PM	57	0	24	0	0	81	0	0	0	0	0	0	0	106	48	0	0	154	18	91	0	0	0	109	344	
1:15 PM	60	0	23	0	0	83	0	0	0	0	0	0	0	104	52	1	0	157	22	105	0	0	0	127	367	
1:30 PM	64	0	23	0	0	87	0	0	0	0	1	0	0	130	65	0	0	195	18	105	0	0	1	123	405	
1:45 PM	55	0	18	0	0	73	0	0	0	0	1	0	0	102	54	0	0	156	21	77	0	0	1	98	327	
Total	236	0	88	0	0	324	0	0	0	0	2	0	0	442	219	1	0	662	79	378	0	0	2	457	1443	
BREAK																										
2:00 PM	104	0	24	0	0	128	0	0	0	0	0	0	0	105	52	1	1	158	9	74	0	0	0	83	369	
2:15 PM	101	0	25	0	3	126	0	0	0	0	0	0	0	147	44	0	0	191	9	98	0	0	0	107	424	
2:30 PM	143	0	29	0	0	172	0	0	0	0	0	0	0	143	52	0	0	195	10	112	0	0	0	122	489	
2:45 PM	81	0	36	0	0	117	0	0	0	0	0	0	0	140	35	0	0	175	11	92	0	0	0	103	395	
Total	429	0	114	0	3	543	0	0	0	0	0	0	0	535	183	1	1	719	39	376	0	0	0	415	1677	
3:00 PM	136	0	33	0	1	169	0	0	0	0	0	0	0	137	52	0	0	189	19	92	0	0	0	111	469	
3:15 PM	120	0	34	0	0	154	0	0	0	0	0	0	0	146	48	0	0	194	22	109	0	0	0	131	479	
3:30 PM	186	0	44	0	0	230	0	0	0	0	0	0	0	163	62	0	0	225	16	87	0	0	0	103	558	
3:45 PM	160	0	47	0	0	207	0	0	0	0	0	0	0	185	41	0	0	226	9	67	0	0	0	76	509	
Total	602	0	158	0	1	760	0	0	0	0	0	0	0	631	203	0	0	834	66	355	0	0	0	421	2015	
4:00 PM	154	0	50	0	0	204	0	0	0	0	0	0	0	171	53	0	0	224	11	93	0	0	0	104	532	
4:15 PM	134	0	50	0	0	184	0	0	0	0	0	0	0	200	52	0	0	252	29	127	0	0	0	156	592	
4:30 PM	164	0	50	0	0	214	0	0	0	0	0	0	0	190	54	0	0	244	22	100	0	0	0	122	580	
4:45 PM	196	0	42	0	0	238	0	0	0	0	0	0	0	144	75	0	0	219	18	98	0	0	0	116	573	
Total	648	0	192	0	0	840	0	0	0	0	0	0	0	705	234	0	0	939	80	418	0	0	0	498	2277	
5:00 PM	216	0	38	0	1	254	0	0	0	0	0	0	0	140	62	0	0	202	19	114	0	0	0	133	589	
5:15 PM	216	0	60	0	0	276	0	0	0	0	0	0	0	175	64	0	0	239	19	115	0	0	0			

Project ID: 25-430106-001
 Location: Middlesex Turnpike & Concord Rd
 City: Billerica

PEAK HOURS

Day: Wednesday
 Date: 7/23/2025

AM

Start Time	Middlesex Turnpike Northbound					Middlesex Turnpike Southbound					Concord Rd Eastbound					Concord Rd Westbound					Int. Total
	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	
Peak Hour Analysis from 08:00 AM - 10:00 AM																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
7:30 AM	76	0	5	0	81	0	0	0	0	0	0	74	89	0	163	33	211	0	0	244	488
7:45 AM	61	0	15	0	76	0	0	0	0	0	0	88	124	0	212	39	158	0	0	197	485
8:00 AM	64	0	18	0	82	0	0	0	0	0	0	85	120	0	205	19	190	0	0	209	496
8:15 AM	66	0	15	0	81	0	0	0	0	0	0	84	133	0	217	29	175	0	0	204	502
Total Volume	267	0	53	0	320	0	0	0	0	0	0	331	466	0	797	120	734	0	0	854	1971
% App. Total	83.4	0.0	16.6	0.0	100	0.0	0.0	0.0	0.0	0.0	0.0	41.5	58.5	0.0	100	14.1	85.9	0.0	0.0	100	
PHF 0.976 0.918 0.875 0.982																					
Cars, PU, Vans	251	0	50	0	301	0	0	0	0	0	0	318	457	0	775	116	714	0	0	830	1906
% Cars, PU, Vans	94.0	0.0	94.3	0.0	94.1	0.0	0.0	0.0	0.0	0.0	0.0	96.1	98.1	0.0	97.2	96.7	97.3	0.0	0.0	97.2	96.7
Buses	3	0	1	0	4	0	0	0	0	0	0	2	1	0	3	1	0	0	0	1	8
%Buses	1.1	0.0	1.9	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.2	0.0	0.4	0.8	0.0	0.0	0.0	0.1	0.4
Duals	10	0	2	0	12	0	0	0	0	0	0	7	7	0	14	3	18	0	0	21	47
%Duals	3.7	0.0	3.8	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	2.1	1.5	0.0	1.8	2.5	2.5	0.0	0.0	2.5	2.4
TTST	3	0	0	0	3	0	0	0	0	0	0	4	1	0	5	0	2	0	0	2	10
%TTST	1.1	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.2	0.0	0.6	0.0	0.3	0.0	0.0	0.2	0.5

NOON

Start Time	Middlesex Turnpike Northbound					Middlesex Turnpike Southbound					Concord Rd Eastbound					Concord Rd Westbound					Int. Total
	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	
Peak Hour Analysis from 10:00 AM - 02:00 PM																					
Peak Hour for Entire Intersection Begins at 11:45 AM																					
11:45 AM	48	0	21	0	69	0	0	0	0	0	0	155	67	0	222	14	91	0	0	105	396
12:00 PM	67	0	25	0	92	0	0	0	0	0	0	127	57	0	184	25	95	0	0	120	396
12:15 PM	64	0	21	0	85	0	0	0	0	0	0	117	57	0	174	20	99	0	0	119	378
12:30 PM	61	0	24	0	85	0	0	0	0	0	0	96	78	0	174	20	123	0	0	143	402
Total Volume	240	0	91	0	331	0	0	0	0	0	0	495	259	0	754	79	408	0	0	487	1572
% App. Total	72.5	0.0	27.5	0.0	100	0.0	0.0	0.0	0.0	0.0	0.0	65.6	34.4	0.0	100	16.2	83.8	0.0	0.0	100	
PHF 0.899 0.849 0.851 0.978																					
Cars, PU, Vans	228	0	88	0	316	0	0	0	0	0	0	474	248	0	722	75	389	0	0	464	1502
% Cars, PU, Vans	95.0	0.0	96.7	0.0	95.5	0.0	0.0	0.0	0.0	0.0	0.0	95.8	95.8	0.0	95.8	94.9	95.3	0.0	0.0	95.3	95.5
Buses	0	0	1	0	1	0	0	0	0	0	0	0	1	0	1	1	1	0	0	2	4
%Buses	0.0	0.0	1.1	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.1	1.3	0.2	0.0	0.0	0.4	0.3
Duals	9	0	1	0	10	0	0	0	0	0	0	16	8	0	24	2	16	0	0	16	52
%Duals	3.8	0.0	1.1	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	3.1	0.0	3.2	2.5	3.9	0.0	0.0	3.7	3.3
TTST	3	0	1	0	4	0	0	0	0	0	0	5	2	0	7	1	2	0	0	3	14
%TTST	1.3	0.0	1.1	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.8	0.0	0.9	1.3	0.5	0.0	0.0	0.6	0.9

PM

Start Time	Middlesex Turnpike Northbound					Middlesex Turnpike Southbound					Concord Rd Eastbound					Concord Rd Westbound					Int. Total
	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	
Peak Hour Analysis from 02:00 PM - 07:00 PM																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
4:45 PM	196	0	42	0	238	0	0	0	0	0	0	144	75	0	219	18	98	0	0	116	573
5:00 PM	216	0	38	0	254	0	0	0	0	0	0	140	62	0	202	19	114	0	0	133	589
5:15 PM	216	0	60	0	276	0	0	0	0	0	0	175	64	0	239	19	115	0	0	134	649
5:30 PM	198	0	51	0	249	0	0	0	0	0	0	172	60	0	232	15	92	0	0	107	588
Total Volume	826	0	191	0	1017	0	0	0	0	0	0	631	261	0	892	71	419	0	0	490	2399
% App. Total	81.2	0.0	18.8	0.0	100	0.0	0.0	0.0	0.0	0.0	0.0	70.7	29.3	0.0	100	14.5	85.5	0.0	0.0	100	
PHF 0.921 0.933 0.914 0.924																					
Cars, PU, Vans	812	0	188	0	1000	0	0	0	0	0	0	621	257	0	878	69	413	0	0	482	2360
% Cars, PU, Vans	98.3	0.0	98.4	0.0	98.3	0.0	0.0	0.0	0.0	0.0	0.0	98.4	98.5	0.0	98.4	97.2	98.6	0.0	0.0	98.4	98.4
Buses	1	0	1	0	2	0	0	0	0	0	0	2	1	0	3	1	0	0	0	1	6
%Buses	0.1	0.0	0.5	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.4	0.0	0.3	1.4	0.0	0.0	0.0	0.2	0.3
Duals	8	0	2	0	10	0	0	0	0	0	0	8	3	0	11	0	6	0	0	6	27
%Duals	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.1	0.0	1.2	0.0	1.4	0.0	0.0	1.2	1.1
TTST	5	0	0	0	5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	6
%TTST	0.6	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.2	0.3

Attachment C – Automatic Traffic Recorder (ATR) Counts

SPEED

Concord Rd E/O Federal St/Bright View Concord River Assisted Living Access Dwy

Day: Wednesday

City: Billerica

Date: 7/23/2025

Project #: MA25_430107_001

Time	EASTBOUND														Total	WESTBOUND														Total	TOTALS														Total		
	5 15	15 20	20 25	25 30	30 35	35 40	40 45	45 50	50 55	55 60	60 65	65 70	70 75	75 80		5 15	15 20	20 25	25 30	30 35	35 40	40 45	45 50	50 55	55 60	60 65	65 70	70 75	75 80		5 15	15 20	20 25	25 30	30 35	35 40	40 45	45 50	50 55	55 60	60 65	65 70	70 75	75 80			
0:00	0	0	0	0	5	7	9	2	0	0	0	0	0	23	0	0	0	1	1	6	2	0	0	0	0	0	10	0	0	0	1	6	13	11	2	0	0	0	0	0	0	0	0	0	0	0	33
0:15	0	0	0	0	1	8	7	2	0	0	0	0	0	17	0	0	0	1	2	6	5	1	0	0	0	0	15	0	0	0	1	3	14	12	1	1	0	0	0	0	0	0	0	0	0	0	32
0:30	0	0	0	0	2	6	8	3	1	0	0	0	0	20	0	0	0	3	4	4	0	0	0	0	0	11	0	0	0	3	6	10	8	3	1	0	0	0	0	0	0	0	0	0	0	31	
0:45	0	0	0	0	3	8	2	0	0	0	0	0	0	13	0	0	0	1	3	3	0	0	0	0	0	7	0	0	0	4	11	5	0	0	0	0	0	0	0	0	0	0	0	0	0	20	
1:00	0	0	0	0	1	6	3	1	0	0	0	0	0	11	0	0	0	0	1	1	0	0	0	0	0	2	0	0	0	1	7	4	1	0	0	0	0	0	0	0	0	0	0	0	0	13	
1:15	0	0	0	0	1	3	0	1	0	0	0	0	0	5	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	2	1	3	0	1	0	0	0	0	0	0	0	0	0	0	0	7	
1:30	0	0	0	0	3	2	3	1	0	0	0	0	0	9	0	0	0	3	5	0	1	0	0	0	0	9	0	0	0	3	8	2	4	1	0	0	0	0	0	0	0	0	0	0	0	18	
1:45	0	0	0	0	5	3	3	1	0	0	0	0	0	12	0	1	1	3	7	0	0	0	0	0	0	12	0	1	1	8	10	3	1	0	0	0	0	0	0	0	0	0	0	0	0	24	
2:00	0	0	0	0	2	1	5	4	0	0	0	0	0	12	0	0	0	0	3	2	0	0	0	0	0	5	0	0	0	2	4	7	4	0	0	0	0	0	0	0	0	0	0	0	0	17	
2:15	0	0	0	0	4	1	0	0	0	0	0	0	0	5	0	0	0	2	2	0	1	0	0	0	0	5	0	0	0	2	6	1	1	0	0	0	0	0	0	0	0	0	0	0	0	10	
2:30	0	0	0	0	1	3	0	0	0	0	0	0	0	4	0	0	0	3	3	1	1	0	0	0	0	8	0	0	0	4	6	1	1	0	0	0	0	0	0	0	0	0	0	0	0	12	
2:45	0	0	0	0	3	4	1	1	0	0	0	0	0	9	0	0	0	0	2	0	0	0	0	0	0	2	0	0	0	3	6	1	1	0	0	0	0	0	0	0	0	0	0	0	0	11	
3:00	0	0	0	0	4	2	0	1	0	0	0	0	0	7	0	0	0	3	1	1	1	0	0	0	0	6	0	0	0	3	5	3	1	1	0	0	0	0	0	0	0	0	0	0	0	13	
3:15	0	0	0	2	1	2	0	1	0	0	0	0	0	7	0	0	0	1	2	5	0	1	0	0	0	9	0	0	2	2	3	7	0	2	0	0	0	0	0	0	0	0	0	0	0	16	
3:30	0	0	0	0	1	3	1	1	0	0	0	0	0	6	0	0	0	2	4	2	3	0	0	0	0	11	0	0	0	3	7	3	4	0	0	0	0	0	0	0	0	0	0	0	0	17	
3:45	0	0	0	0	2	3	0	0	0	0	0	0	0	5	0	0	0	1	1	1	0	0	0	0	0	3	0	0	0	1	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	8	
4:00	0	0	0	0	2	2	0	2	0	0	0	0	0	6	0	0	0	3	5	2	2	0	1	0	0	13	0	0	0	3	7	4	2	2	1	0	0	0	0	0	0	0	0	0	0	19	
4:15	0	0	0	2	0	4	5	1	0	0	0	0	0	12	0	0	0	2	9	7	4	1	0	0	0	23	0	0	2	2	13	12	5	1	0	0	0	0	0	0	0	0	0	0	0	35	
4:30	0	0	1	2	3	12	11	2	0	0	0	0	0	31	0	0	0	10	11	4	2	0	1	0	0	28	0	1	2	13	23	15	4	0	1	0	0	0	0	0	0	0	0	0	0	59	
4:45	0	0	0	0	1	11	18	9	6	2	0	0	0	47	0	0	0	10	18	18	4	0	0	0	50	0	0	0	11	29	36	13	6	2	0	0	0	0	0	0	0	0	0	0	0	97	
5:00	0	0	0	0	1	27	18	7	2	0	0	0	0	55	0	1	1	4	22	19	7	1	0	0	55	0	1	1	5	49	37	14	3	0	0	0	0	0	0	0	0	0	0	0	110		
5:15	0	0	0	0	0	12	45	14	8	1	0	0	0	80	0	0	0	3	21	29	9	2	0	0	64	0	0	0	3	33	74	23	10	1	0	0	0	0	0	0	0	0	0	0	144		
5:30	0	0	0	0	6	41	47	30	5	1	0	0	0	130	0	0	0	13	47	43	7	2	0	0	112	0	0	0	19	88	90	37	7	1	0	0	0	0	0	0	0	0	0	0	242		
5:45	0	0	0	0	6	54	64	36	9	3	0	0	0	172	0	0	2	8	52	50	11	2	1	0	126	0	0	2	14	106	114	47	11	4	0	0	0	0	0	0	0	0	0	0	298		
6:00	0	0	0	0	0	14	73	21	12	0	1	0	0	121	0	0	0	11	66	57	10	4	0	0	148	0	0	0	11	80	130	31	16	0	1	0	0	0	0	0	0	0	0	0	269		
6:15	0	0	0	0	1	20	45	14	2	0	0	0	0	82	0	0	5	24	66	65	13	2	0	0	175	0	0	5	25	86	110	27	4	0	0	0	0	0	0	0	0	0	0	0	257		
6:30	0	0	0	0	1	24	56	25	7	1	0	0	0	114	0	0	3	28	95	77	16	3	1	0	223	0	0	3	29	119	133	41	10	2	0	0	0	0	0	0	0	0	0	0	337		
6:45	0	0	0	0	6	51	53	23	1	2	0	0	0	136	0	1	1	40	110	52	12	0	1	0	217	0	1	1	46	161	105	35	1	3	0	0	0	0	0	0	0	0	0	0	353		
7:00	0	0	0	0	6	49	75	18	4	1	0	0	0	153	0	1	7	37	96	62	10	0	0	0	214	0	1	7	43	145	137	28	4	1	1	0	0	0	0	0	0	0	0	0	367		
7:15	0	0	0	0	2	46	79	25	2	2	0	0	0	156	0	0	5	35	111	65	15	2	0	0	233	0	0	5	37	157	144	40	4	2	0	0	0	0	0	0	0	0	0	0	389		
7:30	0	0	0	0	7	73	72	33	7	0	0	0	0	192	0	1	2	47	139	74	12	2	0	0	277	0	1	2	54	212	146	45	9	0	0	0	0	0	0	0	0	0	0	0	469		
7:45	0	0	0	1	21	84	116	21	4	0	0	0	0	247	0	1	0	17	129	63	12	1	1	0	224	0	1	1	38	213	179	33	5	1	0	0	0	0	0	0	0	0	0	0	471		
8:00	0	0	0	0	18	123	81	18	4	4	0	0	0	248	0	0	0	46	119	66	12	2	0	0	245	0	0	0	64	242	147	30	6	4	0	0	0	0	0	0	0	0	0	0	493		
8:15	7	2	4	23	84	73	26	7	1	0	0	0	0	227	0	0	5	38	129	54	5	2	0	0	233	7	2	9	61	213	127	31	9	1	0	0	0	0	0	0	0	0	0	0	460		
8:30	0	0	0	0	19	75	98	14	6	0	1	0	0	213	0	0	1	24	95	63	8	1	0	0	192	0	0	1	43	170	161	22	7	0	1	0	0	0	0	0	0	0	0	0	405		
8:45	0	0	0	2	12	118	92	13	2	2	0	0	0	241	0	0	3	42	104	44	4	1	0	0	199	0	0	5	54	222	136	17	3	2	1	0	0	0	0	0	0	0	0	0	440		
9:00	0	0	0	0	7	51	100	20	0	2	0	0	0	180	0	0	4	30	88	60	7	2	0	0	191	0	0	4	37	139	160	27	2	2	0	0	0	0	0	0	0	0	0	0	371		
9:15	0	0	0	0	13	84	67	20	2	0	0	0	0	186	0	0	0	30	89	37	7	0	0	0	163	0	0	0	43	173	104	27	2	0	0	0	0	0	0	0	0	0	0	0	349		
9:30	0	0	0	0	9	47	70	15	5	0	0	0	0	146																																	

SPEED

Concord Rd E/O Federal St/Bright View Concord River Assisted Living Access Dwy

Day: Wednesday

City: Billerica

Date: 7/23/2025

Project #: MA25_430107_001

Time	EASTBOUND														Total	WESTBOUND														Total	TOTALS														Total
	5	15	20	25	30	35	40	45	50	55	60	65	70	70		5	15	20	25	30	35	40	45	50	55	60	65	70	70		5	15	20	25	30	35	40	45	50	55	60	65	70	70	
	15	20	25	30	35	40	45	50	55	60	65	70	99	15		20	25	30	35	40	45	50	55	60	65	70	99	15	20		25	30	35	40	45	50	55	60	65	70	99				
12:00	0	0	0	0	15	56	86	21	0	1	0	0	0	0	179	0	2	0	0	35	84	39	9	2	0	0	0	0	171	0	2	0	50	140	125	30	2	1	0	0	0	0	0	350	
12:15	0	0	0	0	3	54	67	37	5	0	0	0	0	0	166	0	0	4	32	83	34	9	1	0	0	0	0	163	0	0	4	35	137	101	46	6	0	0	0	0	0	0	329		
12:30	0	0	0	1	10	35	86	37	8	0	0	0	0	0	177	0	0	2	22	81	57	10	1	1	0	0	0	174	0	0	3	32	116	143	47	9	1	0	0	0	0	0	351		
12:45	0	0	0	1	10	68	65	21	4	1	0	0	0	0	170	0	0	6	23	73	38	10	1	0	0	0	0	151	0	0	7	33	141	103	31	5	1	0	0	0	0	313			
13:00	0	0	0	0	3	42	70	35	5	1	0	0	0	0	156	0	1	3	15	79	45	12	2	0	0	0	0	157	0	1	3	18	121	115	47	7	1	0	0	0	0	313			
13:15	0	0	0	0	2	57	80	21	4	0	0	0	0	0	164	0	0	1	36	81	46	5	2	0	0	0	0	171	0	0	1	38	138	126	26	6	0	0	0	0	0	335			
13:30	0	0	0	1	5	50	110	36	7	0	0	0	0	0	209	0	0	0	29	73	54	7	2	0	0	0	0	165	0	0	1	34	123	164	43	9	0	0	0	0	0	374			
13:45	0	0	0	0	2	46	88	28	2	0	1	0	0	0	167	0	0	3	17	75	40	8	0	0	0	0	0	143	0	0	3	19	121	128	36	2	0	1	0	0	0	310			
14:00	0	0	0	0	4	49	77	29	5	4	0	0	0	0	168	0	0	10	46	83	43	12	0	0	0	0	0	194	0	0	10	50	132	120	41	5	4	0	0	0	0	362			
14:15	0	0	0	1	2	49	70	51	8	0	0	0	0	0	181	0	0	1	40	107	52	13	2	0	0	0	0	215	0	0	2	42	156	122	64	10	0	0	0	0	0	396			
14:30	2	1	8	18	53	83	22	6	1	0	0	0	0	0	194	2	6	35	96	113	32	6	0	0	0	0	0	290	4	7	43	114	166	115	28	6	1	0	0	0	0	484			
14:45	0	0	0	0	7	37	74	41	7	1	0	0	0	0	167	0	0	0	28	90	51	16	2	0	0	1	0	188	0	0	0	35	127	125	57	9	1	1	0	0	0	355			
15:00	0	0	0	2	14	55	82	36	8	0	0	0	0	0	197	0	1	7	66	94	50	8	2	0	0	0	0	228	0	1	9	80	149	132	44	10	0	0	0	0	0	425			
15:15	0	0	0	1	12	74	75	21	3	0	0	0	0	0	186	0	0	5	63	127	45	8	1	0	0	0	0	249	0	0	6	75	201	120	29	4	0	0	0	0	0	435			
15:30	1	1	3	15	71	99	31	6	1	0	0	0	0	0	228	0	2	28	87	99	43	10	5	1	0	0	0	275	1	3	31	102	170	142	41	11	2	0	0	0	0	503			
15:45	0	1	4	19	53	104	27	6	2	0	0	0	0	0	216	0	2	23	70	93	48	6	1	0	0	0	0	243	0	3	27	89	146	152	33	7	2	0	0	0	0	459			
16:00	0	0	0	1	10	85	93	45	5	0	0	0	0	0	239	4	2	27	50	103	77	7	1	0	0	0	0	271	4	2	28	60	188	170	52	6	0	0	0	0	0	510			
16:15	0	0	1	1	10	69	114	39	5	1	0	0	0	0	240	0	1	10	74	121	51	14	3	1	0	0	0	275	0	2	11	84	190	165	53	8	2	0	0	0	0	515			
16:30	1	2	4	23	89	91	28	5	0	1	0	0	0	0	244	0	0	32	83	121	52	7	2	0	0	0	0	297	1	2	36	106	210	143	35	7	0	1	0	0	0	541			
16:45	0	0	0	0	16	79	87	33	3	0	0	0	0	0	218	3	6	28	84	123	56	11	2	0	0	0	0	313	3	6	28	100	202	143	44	5	0	0	0	0	0	531			
17:00	0	0	0	2	23	86	70	23	3	0	0	0	0	0	207	81	48	51	67	54	22	5	3	0	0	0	0	331	81	48	53	90	140	92	28	6	0	0	0	0	0	538			
17:15	0	2	3	26	118	79	13	1	0	0	0	0	0	0	242	7	24	62	112	129	32	6	0	0	0	0	0	372	7	26	65	138	247	111	19	1	0	0	0	0	0	614			
17:30	0	0	0	0	1	43	106	48	4	2	0	0	0	0	204	0	6	30	76	119	60	16	3	0	0	1	0	311	0	6	30	77	162	166	64	7	2	1	0	0	0	0	515		
17:45	0	0	0	0	10	48	97	37	1	1	0	0	0	0	194	1	9	44	118	108	27	5	0	0	0	0	0	312	1	9	44	128	156	124	42	1	1	0	0	0	0	506			
18:00	0	0	0	0	0	27	84	63	13	2	0	0	0	0	189	0	0	6	36	110	44	9	4	1	0	0	0	210	0	0	6	36	137	128	72	17	3	0	0	0	0	0	399		
18:15	0	0	0	1	9	58	70	37	2	3	0	0	0	0	180	0	0	4	38	87	36	8	1	0	0	0	0	174	0	0	5	47	145	106	45	3	3	0	0	0	0	0	354		
18:30	0	0	0	1	8	49	69	28	6	1	0	0	0	0	162	0	0	3	23	70	39	9	1	0	0	0	0	145	0	0	4	31	119	108	37	7	1	0	0	0	0	0	307		
18:45	0	0	0	0	1	50	81	29	2	0	0	0	0	0	163	0	0	3	24	70	30	13	1	1	0	0	0	142	0	0	3	25	120	111	42	3	1	0	0	0	0	0	305		
19:00	0	0	0	0	5	50	70	24	1	2	0	0	0	0	152	0	0	1	28	60	24	4	1	0	0	0	0	118	0	0	1	33	110	94	28	2	2	0	0	0	0	0	270		
19:15	0	0	0	2	21	36	62	17	4	1	0	0	0	0	143	0	0	7	56	52	25	1	0	0	0	0	0	120	0	0	9	56	88	87	18	4	1	0	0	0	0	0	263		
19:30	0	0	0	0	3	35	62	21	6	1	0	0	0	0	128	0	0	2	56	53	13	0	0	0	0	0	0	124	0	0	2	59	88	75	21	6	1	0	0	0	0	0	252		
19:45	0	0	0	0	1	26	61	20	2	0	0	0	0	0	110	0	0	4	30	46	15	2	0	0	0	0	0	97	0	0	4	31	72	76	22	2	0	0	0	0	0	0	207		
20:00	0	0	0	0	3	45	51	14	2	0	0	0	0	0	115	0	0	9	45	49	10	1	0	0	0	0	0	114	0	0	9	48	94	61	15	2	0	0	0	0	0	0	229		
20:15	0	0	0	0	3	40	44	13	2	0	0	0	0	0	102	0	0	9	43	50	2	0	0	0	0	0	0	104	0	0	9	46	90	46	13	2	0	0	0	0	0	0	206		
20:30	0	0	0	1	11	49	29	6	0	0	0	0	0	0	96	0	2	9	34	31	5	0	0	0	0	0	0	81	0	2	10	45	80	34	6	0	0	0	0	0	0	0	177		
20:45	0	0	0	0	11	65	27	5	1	0	0	0	0	0	109	0	1	7	35	27	5	1	0	0	0	0	0	76	0	1	7	46	92	32	6	1	0	0	0	0	0	0	185		
21:00	2	0	0	1	15	44	26	7	0	0	0	0	0	0	95	0	0	8	54	25	8	2	0	0	0	0	0	97	2	0	9	69	69	34	9	0	0	0	0	0	0	0	192		
21:15	0	0	0	1	12	50	34	10	3	0	0	0	0	0	110	0	1	10	42	20	6	0	0	0	0	0	0	79	0	1	11	54	70	40	10	3	0	0	0	0	0	0	189		
21:30	0	0	0	0	13	32	27	7	0	0	0	0	0	0	79	0	0	5	29	23	5	0	0	0	0	0	0	62	0	0	5	42	55	32	7	0	0	0	0	0	0	0	141		
21:45	1	0	0	0	3	30	27	11																																					

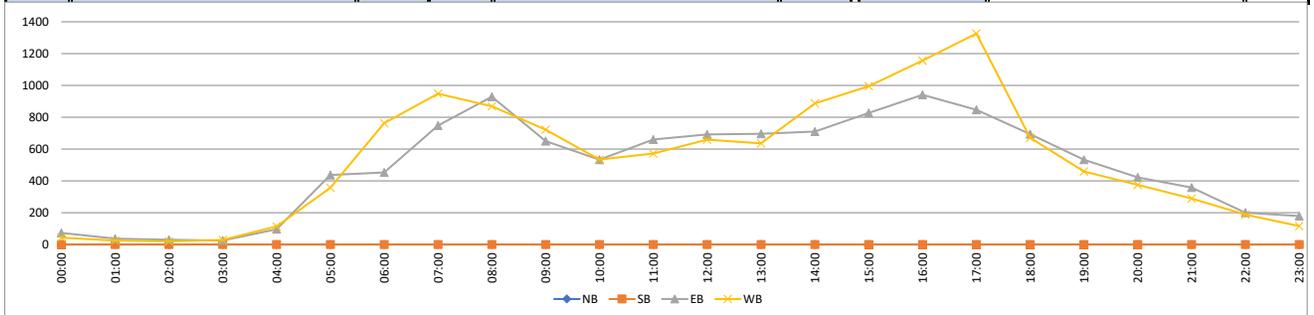
VOLUME

Concord Rd E/O Federal St/Bright View Concord River Assisted Living Access Dwy

Day: Wednesday
Date: 7/23/2025

City: Billerica
Project #: MA25_430107_001

DAILY TOTALS						NB	SB	EB	WB	Total	DAILY TOTALS						
						0	0	11,770	12,753	24,523							
15-Minutes Interval											Hourly Intervals						
TIME	NB	SB	EB	WB	TOTAL	TIME	NB	SB	EB	WB	TOTAL	TIME	NB	SB	EB	WB	TOTAL
0:00			23	10	33	12:00			179	171	350	00:00 01:00			73	43	116
0:15			17	15	32	12:15			166	163	329	01:00 02:00			37	25	62
0:30			20	11	31	12:30			177	174	351	02:00 03:00			30	20	50
0:45			13	7	20	12:45			170	151	321	03:00 04:00			25	29	54
1:00			11	2	13	13:00			156	157	313	04:00 05:00			96	114	210
1:15			5	2	7	13:15			164	171	335	05:00 06:00			437	357	794
1:30			9	9	18	13:30			209	165	374	06:00 07:00			453	763	1216
1:45			12	12	24	13:45			167	143	310	07:00 08:00			748	948	1696
2:00			12	5	17	14:00			168	194	362	08:00 09:00			929	869	1798
2:15			5	5	10	14:15			181	215	396	09:00 10:00			650	722	1372
2:30			4	8	12	14:30			194	290	484	10:00 11:00			533	534	1067
2:45			9	2	11	14:45			167	188	355	11:00 12:00			660	572	1232
3:00			7	6	13	15:00			197	228	425	12:00 13:00			692	659	1351
3:15			7	9	16	15:15			186	249	435	13:00 14:00			696	636	1332
3:30			6	11	17	15:30			228	275	503	14:00 15:00			710	887	1597
3:45			5	3	8	15:45			216	243	459	15:00 16:00			827	995	1822
4:00			6	13	19	16:00			239	271	510	16:00 17:00			941	1156	2097
4:15			12	23	35	16:15			240	275	515	17:00 18:00			847	1326	2173
4:30			31	28	59	16:30			244	297	541	18:00 19:00			694	671	1365
4:45			47	50	97	16:45			218	313	531	19:00 20:00			533	459	992
5:00			55	55	110	17:00			207	331	538	20:00 21:00			422	375	797
5:15			80	64	144	17:15			242	372	614	21:00 22:00			358	289	647
5:30			130	112	242	17:30			204	311	515	22:00 23:00			200	188	388
5:45			172	126	298	17:45			194	312	506	23:00 00:00			179	116	295
6:00			121	148	269	18:00			189	210	399	STATISTICS					
6:15			82	175	257	18:15			180	174	354	Peak Period	00:00	to	12:00		
6:30			114	223	337	18:30			162	145	307	Volume			4671	4996	9667
6:45			136	217	353	18:45			163	142	305	Peak Hour			7:45	7:15	7:30
7:00			153	214	367	19:00			152	118	270	Peak Volume			935	979	1893
7:15			156	233	389	19:15			143	120	263	Peak Hour Factor			0.943	0.884	0.960
7:30			192	277	469	19:30			128	124	252	Peak Period	12:00	to	00:00		
7:45			247	224	471	19:45			110	97	207	Volume			7099	7757	14856
8:00			248	245	493	20:00			115	114	229	Peak Hour			16:00	16:45	16:30
8:15			227	233	460	20:15			102	104	206	Peak Volume			941	1327	2224
8:30			213	192	405	20:30			96	81	177	Peak Hour Factor			0.964	0.892	0.906
8:45			241	199	440	20:45			109	76	185	Peak Period	07:00	to	09:00		
9:00			180	191	371	21:00			95	97	192	Volume			1677	1817	3494
9:15			186	163	349	21:15			110	79	189	Peak Hour			7:45	7:15	7:30
9:30			146	184	330	21:30			79	62	141	Peak Volume			935	979	1893
9:45			138	184	322	21:45			74	51	125	Peak Hour Factor			0.943	0.884	0.960
10:00			114	134	248	22:00			56	60	116	Peak Period	16:00	to	18:00		
10:15			114	131	245	22:15			47	43	90	Volume			1788	2482	4270
10:30			152	147	299	22:30			53	51	104	Peak Hour			16:00	16:45	16:30
10:45			153	122	275	22:45			44	34	78	Peak Volume			941	1327	2224
11:00			138	124	262	23:00			49	25	74	Peak Hour Factor			0.964	0.892	0.906
11:15			131	143	274	23:15			66	21	87						
11:30			180	155	335	23:30			32	41	73						
11:45			211	150	361	23:45			32	29	61						
TOTALS	0	0	4671	4996	9667	TOTALS	0	0	7099	7757	14856						
SPLIT %	0%	0%	48%	52%	39%	SPLIT %	0%	0%	48%	52%	61%						



SPEED

Concord Rd E/O Federal St/Bright View Concord River Assisted Living Access Dwy

Day: Thursday
Date: 7/24/2025

City: Billerica
Project #: MA25_430107_001

Time	EASTBOUND														Total	WESTBOUND														Total	TOTALS													
	5	15	20	25	30	35	40	45	50	55	60	65	70	70		5	15	20	25	30	35	40	45	50	55	60	65	70	70		5	15	20	25	30	35	40	45	50	55	60	65	70	70
	15	20	25	30	35	40	45	50	55	60	65	70	99	15		20	25	30	35	40	45	50	55	60	65	70	99	15	20		25	30	35	40	45	50	55	60	65	70	99			
0:00	0	0	1	8	27	26	10	2	0	0	0	0	0	74	0	0	0	5	17	23	6	2	0	0	0	0	53	0	0	1	13	44	49	16	4	0	0	0	0	127				
1:00	0	0	0	6	11	12	3	1	1	0	0	0	0	34	0	1	0	1	10	7	3	1	0	0	0	0	23	0	1	0	7	21	19	6	2	1	0	0	0	57				
2:00	1	0	0	1	9	14	9	2	0	0	0	0	0	36	0	0	0	0	8	4	3	2	0	0	0	0	17	1	0	0	1	17	18	12	4	0	0	0	0	53				
3:00	0	0	0	3	6	5	5	4	2	0	0	0	0	25	0	0	1	3	7	13	6	1	0	0	0	0	31	0	0	1	6	13	18	11	5	2	0	0	0	56				
4:00	0	0	0	5	9	35	24	15	4	0	0	0	0	92	0	0	0	1	23	32	31	8	1	0	0	0	96	0	0	0	6	32	67	55	23	5	0	0	0	188				
5:00	0	0	2	18	121	198	68	20	4	0	0	0	0	431	0	0	1	35	119	118	63	14	2	0	0	0	352	0	0	3	53	240	316	131	34	6	0	0	0	783				
6:00	0	0	0	31	147	171	62	13	0	1	0	0	0	425	0	2	13	162	375	154	29	3	1	0	0	0	739	0	2	13	193	522	325	91	16	1	1	0	0	1164				
7:00	3	2	13	47	243	317	87	24	3	1	0	0	0	740	3	6	27	180	423	261	49	10	0	0	0	0	959	6	8	40	227	666	578	136	34	3	1	0	0	1699				
8:00	0	0	0	39	280	421	153	31	2	3	0	0	0	929	0	0	6	106	385	267	61	6	0	0	0	0	831	0	0	6	145	665	688	214	37	2	3	0	0	0	1760			
9:00	0	0	2	53	246	296	110	18	2	1	0	0	0	728	0	0	10	126	288	168	38	5	0	0	0	0	635	0	0	12	179	534	464	148	23	2	1	0	0	0	1363			
10:00	0	0	6	35	212	232	79	14	3	0	0	0	0	581	0	0	11	118	239	163	34	3	0	0	0	0	568	0	0	17	153	451	395	113	17	3	0	0	0	0	1149			
11:00	1	0	5	42	212	240	82	9	1	0	0	0	0	592	3	3	17	115	262	179	30	6	1	0	0	0	616	4	3	22	157	474	419	112	15	2	0	0	0	0	1208			
12:00	0	0	1	23	219	284	99	25	3	0	0	0	0	654	0	0	4	125	278	176	54	6	1	0	0	0	644	0	0	5	148	497	460	153	31	4	0	0	0	0	1298			
13:00	0	1	6	108	265	233	73	11	0	0	0	0	0	697	0	2	28	200	244	108	20	2	0	1	0	0	605	0	3	34	308	509	341	93	13	0	1	0	0	0	1302			
14:00	0	0	5	91	360	262	45	10	0	0	0	0	0	773	0	2	24	256	432	183	15	2	2	0	0	0	916	0	2	29	347	792	445	60	12	2	0	0	0	0	1689			
15:00	0	1	13	97	361	281	52	4	0	0	0	0	0	809	0	3	49	337	484	129	12	1	0	0	0	0	1015	0	4	62	434	845	410	64	5	0	0	0	0	0	1824			
16:00	0	0	10	143	369	252	48	7	1	0	0	0	0	830	0	2	60	415	579	186	22	5	0	0	0	0	1269	0	2	70	558	948	438	70	12	1	0	0	0	0	2099			
17:00	0	0	7	108	372	291	107	11	0	0	0	0	0	896	0	0	42	313	484	206	35	9	0	0	0	0	1089	0	0	49	421	856	497	142	20	0	0	0	0	0	1985			
18:00	0	0	22	120	275	212	53	14	2	0	0	0	0	698	0	5	40	207	232	102	11	2	0	0	0	0	599	0	5	62	327	507	314	64	16	2	0	0	0	0	1297			
19:00	0	2	6	69	235	161	49	4	0	0	0	0	0	526	0	6	19	181	202	65	12	4	2	0	0	0	491	0	8	25	250	437	226	61	8	2	0	0	0	0	1017			
20:00	0	0	0	21	146	172	59	8	1	0	0	0	0	407	0	0	6	72	190	84	16	2	0	0	0	0	370	0	0	6	93	336	256	75	10	1	0	0	0	0	777			
21:00	0	0	1	16	141	137	34	6	0	0	0	0	0	335	0	0	1	54	122	56	11	4	0	0	0	0	248	0	0	2	70	263	193	45	10	0	0	0	0	0	583			
22:00	0	0	2	26	92	80	19	6	0	0	0	0	0	225	0	0	3	70	78	23	3	1	0	0	0	0	178	0	0	5	96	170	103	22	7	0	0	0	0	0	403			
23:00	0	0	2	28	82	55	11	1	1	0	0	0	0	180	0	0	8	38	53	24	4	0	0	0	0	0	127	0	0	10	66	135	79	15	1	1	0	0	0	0	307			
Totals	5	6	104	1,138	4,440	4,387	1,341	260	30	6	0	0	0	11,717	6	32	370	3,120	5,534	2,731	568	99	10	1	0	0	12,471	11	38	474	4,258	9,974	7,118	1,909	359	40	7	0	0	0	0	24,188		
% of Totals	0%	0%	1%	10%	38%	37%	11%	2%	0%	0%				100%	0%	0%	3%	25%	44%	22%	5%	1%	0%	0%		100%	0%	0%	2%	18%	41%	29%	8%	1%	0%	0%					100%			

STATISTICS	Time	Direction																																							
		EASTBOUND							WESTBOUND							EASTBOUND							WESTBOUND																		
		5	15	20	25	30	35	40	45	50	55	60	65	70	5	15	20	25	30	35	40	45	50	55	60	65	70	5	15	20	25	30	35	40	45	50	55	60	65	70	
00:00 - 12:00	%	5	2	29	288	1523	1967	692	153	22	6	0	0	4687	6	12	86	852	2156	1389	353	61	5	0	0	0	4920	11	14	115	1140	3679	3356	1045	214	27	6	0	0	0	9607
Peak Hour	%	6:15	6:15	7:00	9:00	7:45	7:45	8:30	7:45	4:00	7:30	0:00	0:00	7:45	6:15	6:15	6:45	6:30	7:15	7:30	7:45	4:45	4:30	0:00	0:00	0:00	7:15	6:15	6:15	6:45	6:30	7:15	7:45	7:45	4:45	4:30	7:30	0:00	0:00	0:00	7:45
Peak Volume	%	3	2	13	53	286	433	153	31	4	4	0	0	942	3	7	30	198	447	293	75	19	3	0	0	0	966	6	9	40	242	727	722	224	48	7	4	0	0	0	1849
12:00 - 24:00	%	0	4	75	850	2917	2420	649	107	8	0	0	0	7030	0	20	284	2268	3378	1342	215	38	5	1	0	0	7551	0	24	359	3118	6295	3762	864	145	13	1	0	0	0	14581
Peak Hour	%	12:00	18:45	18:00	16:00	14:30	15:15	17:00	12:00	12:00	12:00	12:00	17:00	12:00	18:45	16:00	16:15	16:00	17:00	12:00	16:30	13:30	12:15	12:00	12:00	16:00	12:00	18:45	15:45	16:00	17:00	17:00	7:00	12:00	12:00	12:15	12:00	12:00	16:15		
Peak Volume	%	0	2	22	143	388	297	107	25	3	0	0	0	896	0	8	60	418	579	206	54	12	2	1	0	0	1269	0	10	71	558	948	497	153	31	4	1	0	0	0	2122
07:00 - 09:00	%	3	2	13	86	523	738	240	55	5	4	0	0	1669	3	6	33	286	808	528	110	16	0	0	0	0	1790	6	8	46	372	1331	1266	350	71	5	4	0	0	0	3459
Peak Hour	%	7:00	7:00	7:00	7:00	7:45	7:45	8:00	7:45	7:15	7:30	7:00	7:00	7:45	7:00	7:00	7:00	7:00	7:15	7:30	7:45	7:15	7:00	7:00	7:00	7:15	7:00	7:00	7:00	7:00	7:15	7:45	7:45	7:15	7:30	7:00	7:00	7:00	7:45		
Peak Volume	%	3	2	13	47	286	433	153	31	4	4	0	0	942	3	6	27	180	447	293	75	11	0	0	0	0	966	6	8	40	227	727	722	224	39	4	0	0	0	0	1849
16:00 - 18:00	%	0	0	17	251	741	543	155	18	1	0	0	0	1726	0	2	102	728	1063	392	57	14	0	0	0	0	2358	0	2	119	979	1804	935	212	32	1	0	0	0	0	4084
Peak Hour	%	16:00	16:00	16:15	16:00	17:00	17:00	17:00	17:00	16:00	16:00	16:00	16:00	17:00	16:00																										

SPEED

Concord Rd E/O Federal St/Bright View Concord River Assisted Living Access Dwy

Day: Thursday
Date: 7/24/2025

City: Billerica
Project #: MA25_430107_001

Time	EASTBOUND										Total	WESTBOUND										Total	TOTALS										Total														
	5	15	20	25	30	35	40	45	50	55		60	65	70	70	99	5	15	20	25	30		35	35	40	45	50	55	60	65	70	70		99	5	15	20	25	30	35	40	45	50	55	60	65	70
0:00	0	0	0	0	4	5	10	2	1	0	0	0	0	0	22	0	0	0	0	0	5	8	0	1	0	0	0	0	0	14	0	0	0	4	10	18	2	2	0	0	0	0	0	0	0	0	36
0:15	0	0	0	0	13	7	4	1	0	0	0	0	0	0	25	0	0	0	0	0	2	4	0	0	0	0	0	0	16	0	0	0	13	9	8	1	0	0	0	0	0	0	0	0	0	31	
0:30	0	0	1	2	3	4	4	4	0	0	0	0	0	0	14	0	0	0	2	6	8	2	1	0	0	0	0	0	19	0	0	1	4	9	12	6	1	0	0	0	0	0	0	0	0	33	
0:45	0	0	0	0	2	6	5	0	0	0	0	0	0	0	13	0	0	0	3	6	5	0	0	0	0	0	0	14	0	0	0	5	12	10	0	0	0	0	0	0	0	0	0	0	0	27	
1:00	0	0	0	2	7	4	2	1	1	0	0	0	0	0	17	0	0	0	0	2	3	1	0	0	0	0	0	6	0	0	0	2	9	7	3	1	1	0	0	0	0	0	0	0	23		
1:15	0	0	0	1	1	2	0	0	0	0	0	0	0	0	4	0	1	0	0	5	2	0	0	0	0	0	0	8	0	1	0	1	6	4	0	0	0	0	0	0	0	0	0	0	12		
1:30	0	0	0	1	3	3	0	0	0	0	0	0	0	0	7	0	0	0	1	2	0	1	0	0	0	0	0	4	0	0	0	2	5	3	1	0	0	0	0	0	0	0	0	0	11		
1:45	0	0	0	2	0	3	1	0	0	0	0	0	0	0	6	0	0	0	0	1	2	1	1	0	0	0	0	5	0	0	0	2	1	5	2	1	0	0	0	0	0	0	0	0	11		
2:00	1	0	0	1	1	2	2	0	0	0	0	0	0	0	7	0	0	0	0	3	0	0	0	0	0	0	0	3	1	0	0	1	4	2	2	0	0	0	0	0	0	0	0	0	10		
2:15	0	0	0	0	5	6	2	0	0	0	0	0	0	0	13	0	0	0	0	2	1	0	0	0	0	0	0	3	0	0	0	0	7	7	2	0	0	0	0	0	0	0	0	0	16		
2:30	0	0	0	0	2	3	2	2	0	0	0	0	0	0	9	0	0	0	0	2	2	2	1	0	0	0	0	7	0	0	0	0	4	5	4	3	0	0	0	0	0	0	0	0	16		
2:45	0	0	0	0	1	3	3	0	0	0	0	0	0	0	7	0	0	0	0	1	1	1	1	0	0	0	0	4	0	0	0	0	2	4	4	1	0	0	0	0	0	0	0	0	11		
3:00	0	0	0	1	1	4	2	2	1	0	0	0	0	0	11	0	0	0	0	0	1	0	1	0	0	0	0	2	0	0	0	1	1	5	2	3	1	0	0	0	0	0	0	0	13		
3:15	0	0	0	0	1	0	1	1	1	0	0	0	0	0	4	0	0	0	1	2	1	2	0	0	0	0	0	6	0	0	0	1	3	1	3	1	1	0	0	0	0	0	0	0	10		
3:30	0	0	0	0	3	1	1	1	0	0	0	0	0	0	6	0	0	1	1	3	4	2	0	0	0	0	0	11	0	0	1	1	6	5	3	1	0	0	0	0	0	0	0	0	17		
3:45	0	0	0	2	1	0	1	0	0	0	0	0	0	0	4	0	0	0	1	2	7	2	0	0	0	0	0	12	0	0	0	3	3	7	3	0	0	0	0	0	0	0	0	0	16		
4:00	0	0	0	4	0	5	0	0	0	0	0	0	0	0	9	0	0	0	0	7	1	2	0	0	0	0	0	10	0	0	0	4	7	6	2	0	0	0	0	0	0	0	0	0	19		
4:15	0	0	0	0	3	4	1	0	0	0	0	0	0	0	8	0	0	0	0	2	8	11	1	0	0	0	0	22	0	0	0	0	5	12	12	1	0	0	0	0	0	0	0	0	30		
4:30	0	0	0	0	4	8	11	4	3	0	0	0	0	0	30	0	0	0	1	9	9	5	1	0	0	0	0	25	0	0	0	1	13	17	16	5	3	0	0	0	0	0	0	0	55		
4:45	0	0	0	1	2	18	12	11	1	0	0	0	0	0	45	0	0	0	0	5	14	13	6	1	0	0	0	39	0	0	0	1	7	32	25	17	2	0	0	0	0	0	0	0	84		
5:00	0	0	1	8	10	21	9	1	0	0	0	0	0	0	50	0	0	0	6	19	16	10	1	0	0	0	0	52	0	0	1	14	29	37	19	2	0	0	0	0	0	0	0	102			
5:15	0	0	0	2	11	29	18	5	0	0	0	0	0	0	65	0	0	0	2	7	27	25	8	2	0	0	0	71	0	0	0	4	18	56	43	13	2	0	0	0	0	0	0	136			
5:30	0	0	0	2	34	59	22	12	3	0	0	0	0	0	132	0	0	1	8	29	44	20	4	0	0	0	0	106	0	0	1	10	63	103	42	16	3	0	0	0	0	0	0	238			
5:45	0	0	1	6	66	89	19	2	1	0	0	0	0	0	184	0	0	0	19	64	31	8	1	0	0	0	0	123	0	0	1	25	130	120	27	3	1	0	0	0	0	0	0	307			
6:00	0	0	0	4	44	42	18	3	0	0	0	0	0	0	111	0	1	0	20	90	31	8	0	0	0	0	0	150	0	1	0	24	134	73	26	3	0	0	0	0	0	0	0	261			
6:15	0	0	0	8	32	44	15	2	0	0	0	0	0	0	101	0	0	5	52	83	35	7	2	1	0	0	0	185	0	0	5	60	115	79	22	4	1	0	0	0	0	0	0	286			
6:30	0	0	0	7	28	27	10	1	0	0	0	0	0	0	73	0	0	3	47	113	32	3	1	0	0	0	0	199	0	0	3	54	141	59	13	2	0	0	0	0	0	0	0	272			
6:45	0	0	0	12	43	58	19	7	0	1	0	0	0	0	140	0	1	5	43	89	56	11	0	0	0	0	0	205	0	1	5	55	132	114	30	7	0	1	0	0	0	0	0	345			
7:00	3	2	8	15	43	66	12	6	0	0	0	0	0	0	155	3	6	9	43	85	53	8	0	0	0	0	0	207	6	8	17	58	128	119	20	6	0	0	0	0	0	0	0	362			
7:15	0	0	1	10	65	63	14	8	0	0	0	0	0	0	161	0	0	9	65	109	53	6	3	0	0	0	0	245	0	0	10	75	174	116	20	11	0	0	0	0	0	0	0	406			
7:30	0	0	1	15	49	76	25	4	1	1	0	0	0	0	172	0	0	7	38	115	69	15	4	0	0	0	0	248	0	0	8	53	164	145	40	8	1	1	0	0	0	0	0	420			
7:45	0	0	3	7	86	112	36	6	2	0	0	0	0	0	252	0	0	2	34	114	86	20	3	0	0	0	0	259	0	0	5	41	200	198	56	9	2	0	0	0	0	0	0	511			
8:00	0	0	0	3	80	116	36	7	1	0	0	0	0	0	243	0	0	0	25	109	61	18	1	0	0	0	0	214	0	0	0	28	189	177	54	8	1	0	0	0	0	0	0	457			
8:15	0	0	0	11	53	95	38	12	0	3	0	0	0	0	212	0	0	0	39	105	77	16	1	0	0	0	0	238	0	0	0	50	158	172	54	13	0	3	0	0	0	0	0	450			
8:30	0	0	0	12	67	110	39	6	1	0	0	0	0	0	235	0	0	2	20	85	65	21	3	0	0	0	0	196	0	0	2	32	152	175	60	9	1	0	0	0	0	0	0	431			
8:45	0	0	0	13	80	100	40	6	0	0	0	0	0	0	239	0	0	4	22	86	64	6	1	0	0	0	0	183	0	0	4	35	166	164	46	7	0	0	0	0	0	0	0	422			
9:00	0	0	0	6	69	105	30	6	1	0	0	0	0	0	217	0	0	2	28	77	60	8	0	0	0	0	0	175	0	0	2	34	146	165	38	6	1	0	0	0	0	0	0	392			
9:15	0	0	0	9	51	67	36	10	1	0	0	0	0	0	174	0	0	2	26	66	49	14	2	0	0	0	0	159	0	0	2	35	117	116	50	12	1	0	0	0	0	0	0	333			
9:30	0	0	1	17	58	55	19	2	0	1	0	0	0	0	153	0	0	2	40	73	35	5	1	0	0	0	0	156	0	0	3	57	131	90	24	3	0	1	0	0	0	0	0	309			
9:45	0	0	1	21	68	69	25	0	0	0	0	0	0	0	184	0	0	4	32	72	24	11	2	0	0	0	0	145	0	0	5	53	140	93	36	2	0										

SPEED

Concord Rd E/O Federal St/Bright View Concord River Assisted Living Access Dwy

Day: Thursday
Date: 7/24/2025

City: Billerica
Project #: MA25_430107_001

Time	EASTBOUND														Total	WESTBOUND														Total	TOTALS														Total
	5	15	20	25	30	35	40	45	50	55	60	65	70	99		5	15	20	25	30	35	40	45	50	55	60	65	70	99		5	15	20	25	30	35	40	45	50	55	60	65	70	99	
	15	20	25	30	35	40	45	50	55	60	65	70	99	15		20	25	30	35	40	45	50	55	60	65	70	99	15	20		25	30	35	40	45	50	55	60	65	70	99				
12:00	0	0	0	3	41	55	37	12	1	0	0	0	0	149	0	0	1	16	73	69	29	3	1	0	0	0	192	0	0	1	19	114	124	66	15	2	0	0	0	0	341				
12:15	0	0	0	10	58	89	15	4	1	0	0	0	0	177	0	0	1	44	84	38	5	2	0	0	0	0	173	0	0	1	54	142	127	20	6	1	0	0	0	350					
12:30	0	0	0	4	55	63	26	5	1	0	0	0	0	154	0	0	2	31	60	33	11	0	0	0	0	0	137	0	0	2	35	115	96	37	5	1	0	0	0	291					
12:45	0	0	1	6	65	77	21	4	0	0	0	0	0	174	0	0	1	34	61	36	9	1	0	0	0	0	142	0	0	2	40	126	113	30	5	0	0	0	0	316					
13:00	0	1	0	22	63	51	11	3	0	0	0	0	0	151	0	2	5	55	53	18	5	1	0	1	0	0	140	0	3	5	77	116	69	16	4	0	1	0	0	291					
13:15	0	0	0	31	74	56	10	1	0	0	0	0	0	172	0	0	10	48	53	17	1	0	0	0	0	0	129	0	0	10	79	127	73	11	1	0	0	0	301						
13:30	0	0	5	41	76	46	18	3	0	0	0	0	0	189	0	0	12	63	62	28	7	0	0	0	0	0	172	0	0	17	104	138	74	25	3	0	0	0	361						
13:45	0	0	1	14	52	80	34	4	0	0	0	0	0	185	0	0	1	34	76	45	7	1	0	0	0	0	164	0	0	2	48	128	125	41	5	0	0	0	349						
14:00	0	0	1	14	82	63	15	4	0	0	0	0	0	179	0	0	1	59	89	51	5	0	1	0	0	0	206	0	0	2	73	171	114	20	4	1	0	0	0	385					
14:15	0	0	2	25	98	52	9	2	0	0	0	0	0	188	0	0	4	65	97	30	3	1	1	0	0	0	201	0	0	6	90	195	82	12	3	1	0	0	0	389					
14:30	0	0	2	31	103	63	9	1	0	0	0	0	0	209	0	2	12	78	136	46	4	0	0	0	0	0	278	0	2	14	109	239	109	13	1	0	0	0	0	487					
14:45	0	0	0	21	77	84	12	3	0	0	0	0	0	197	0	0	7	54	110	56	3	1	0	0	0	0	231	0	0	7	75	187	140	15	4	0	0	0	0	428					
15:00	0	0	1	19	96	61	10	0	0	0	0	0	0	187	0	0	17	83	89	25	0	1	0	0	0	0	215	0	0	18	102	185	86	10	1	0	0	0	0	402					
15:15	0	1	4	21	112	79	11	2	0	0	0	0	0	230	0	1	5	74	122	45	2	0	0	0	0	0	249	0	2	9	95	234	124	13	2	0	0	0	0	479					
15:30	0	0	3	37	68	60	16	2	0	0	0	0	0	186	0	0	16	86	144	31	6	0	0	0	0	0	283	0	0	19	123	212	91	22	2	0	0	0	0	469					
15:45	0	0	5	20	85	81	15	0	0	0	0	0	0	206	0	2	11	94	129	28	4	0	0	0	0	0	268	0	2	16	114	214	109	19	0	0	0	0	0	474					
16:00	0	0	1	23	97	77	15	3	0	0	0	0	0	216	0	0	10	66	153	66	4	0	0	0	0	0	299	0	0	11	89	250	143	19	3	0	0	0	0	515					
16:15	0	0	2	46	99	71	13	1	1	0	0	0	0	233	0	2	20	103	150	44	3	1	0	0	0	0	323	0	2	22	149	249	115	16	2	1	0	0	0	556					
16:30	0	0	4	35	89	52	10	2	0	0	0	0	0	192	0	0	18	116	129	42	10	1	0	0	0	0	316	0	0	22	151	218	94	20	3	0	0	0	0	508					
16:45	0	0	3	39	84	52	10	1	0	0	0	0	0	189	0	0	12	130	147	34	5	3	0	0	0	0	331	0	0	15	169	231	86	15	4	0	0	0	0	520					
17:00	0	0	2	19	86	88	39	5	0	0	0	0	0	239	0	0	10	69	131	72	13	4	0	0	0	0	299	0	0	12	88	217	160	52	9	0	0	0	0	538					
17:15	0	0	0	30	95	77	22	1	0	0	0	0	0	225	0	0	17	95	134	45	10	4	0	0	0	0	305	0	0	17	125	229	122	32	5	0	0	0	0	530					
17:30	0	0	1	34	104	60	29	2	0	0	0	0	0	230	0	0	9	89	118	48	4	0	0	0	0	0	268	0	0	10	123	222	108	33	2	0	0	0	0	498					
17:45	0	0	4	25	87	66	17	3	0	0	0	0	0	202	0	0	6	60	101	41	8	1	0	0	0	0	217	0	0	10	85	188	107	25	4	0	0	0	0	419					
18:00	0	0	6	31	66	57	16	6	1	0	0	0	0	183	0	0	14	59	76	32	6	1	0	0	0	0	188	0	0	20	90	142	89	22	7	1	0	0	0	371					
18:15	0	0	4	26	65	64	17	3	1	0	0	0	0	180	0	3	5	46	67	32	2	0	0	0	0	0	155	0	3	9	72	132	96	19	3	1	0	0	0	335					
18:30	0	0	2	27	79	49	7	1	0	0	0	0	0	165	0	0	5	64	46	14	0	0	0	0	0	0	129	0	0	7	91	125	63	7	1	0	0	0	0	294					
18:45	0	0	10	36	65	42	13	4	0	0	0	0	0	170	0	2	16	38	43	24	3	1	0	0	0	0	127	0	2	26	74	108	66	16	5	0	0	0	0	297					
19:00	0	0	0	19	58	45	14	1	0	0	0	0	0	137	0	0	2	51	58	28	3	2	0	0	0	0	0	144	0	0	2	70	116	73	17	3	0	0	0	0	281				
19:15	0	0	5	18	68	46	13	1	0	0	0	0	0	151	0	1	7	44	58	15	3	0	2	0	0	0	0	130	0	1	12	62	126	61	16	1	2	0	0	0	281				
19:30	0	2	1	12	48	35	16	2	0	0	0	0	0	116	0	5	5	34	44	16	5	2	0	0	0	0	111	0	7	6	46	92	51	21	4	0	0	0	0	227					
19:45	0	0	0	20	61	35	6	0	0	0	0	0	0	122	0	0	5	52	42	6	1	0	0	0	0	0	106	0	0	5	72	103	41	7	0	0	0	0	0	228					
20:00	0	0	0	8	35	43	10	0	1	0	0	0	0	97	0	0	1	18	51	18	1	0	0	0	0	0	89	0	0	1	26	86	61	11	0	1	0	0	0	186					
20:15	0	0	0	3	56	44	10	4	0	0	0	0	0	117	0	0	1	21	58	21	3	1	0	0	0	0	105	0	0	1	24	114	65	13	5	0	0	0	0	222					
20:30	0	0	0	0	20	37	23	3	0	0	0	0	0	83	0	0	0	9	55	30	9	0	0	0	0	0	103	0	0	0	9	75	67	32	3	0	0	0	0	186					
20:45	0	0	0	10	35	48	16	1	0	0	0	0	0	110	0	0	4	24	26	15	3	1	0	0	0	0	73	0	0	4	34	61	63	19	2	0	0	0	0	183					
21:00	0	0	1	5	37	29	8	0	0	0	0	0	0	80	0	0	0	18	40	14	3	3	0	0	0	0	78	0	0	1	23	77	43	11	3	0	0	0	0	158					
21:15	0	0	0	5	45	40	12	2	0	0	0	0	0	104	0	0	0	14	33	17	3	0	0	0	0	0	67	0	0	0	19	78	57	15	2	0	0	0	0	171					
21:30	0	0	0	1	31	34	8	2	0	0	0	0	0	76	0	0	1	13	24	12	3	1	0	0	0	0	54	0	0	1	14	55	46	11	3	0	0	0	0	130					
21:45	0	0	0	5	28	34	6	2	0	0	0	0	0	75	0	0	0	9	25	13	2	0	0	0	0	0	49	0	0	0	14	53	47	8	2	0	0	0	0	124					
22:00	0	0	1	13	23	14	3	1	0	0	0	0	0	55	0	0	2	21	20	4	0	0	0	0	0	0	47	0	0	3	34	43	18	3	1	0	0	0	0	102					
22:15	0	0	0	5	29	25	8	3	0	0	0	0	0	70	0	0	0	15	12	8	0	0	0	0	0	0	35	0																	

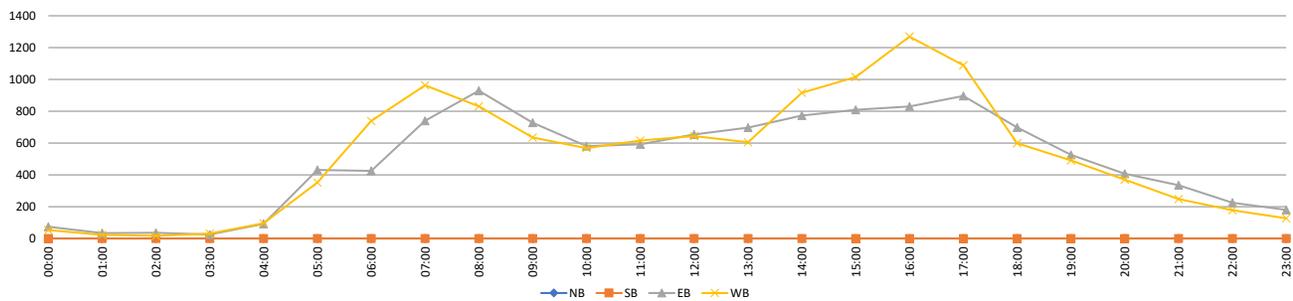
VOLUME

Concord Rd E/O Federal St/Bright View Concord River Assisted Living Access Dwy

Day: Thursday
Date: 7/24/2025

City: Billerica
Project #: MA25_430107_001

DAILY TOTALS						NB	SB	EB	WB	Total	DAILY TOTALS						
						0	0	11,717	12,475	24,192							
15-Minutes Interval											Hourly Intervals						
TIME	NB	SB	EB	WB	TOTAL	TIME	NB	SB	EB	WB	TOTAL	TIME	NB	SB	EB	WB	TOTAL
0:00			22	14	36	12:00			149	192	341	00:00 01:00			74	53	127
0:15			25	6	31	12:15			177	173	350	01:00 02:00			34	23	57
0:30			14	19	33	12:30			154	137	291	02:00 03:00			36	17	53
0:45			13	14	27	12:45			174	142	316	03:00 04:00			25	31	56
1:00			17	6	23	13:00			151	140	291	04:00 05:00			92	96	188
1:15			4	8	12	13:15			172	129	301	05:00 06:00			431	352	783
1:30			7	4	11	13:30			189	172	361	06:00 07:00			425	739	1164
1:45			6	5	11	13:45			185	164	349	07:00 08:00			740	963	1703
2:00			7	3	10	14:00			179	206	385	08:00 09:00			929	831	1760
2:15			13	3	16	14:15			188	201	389	09:00 10:00			728	635	1363
2:30			9	7	16	14:30			209	278	487	10:00 11:00			581	568	1149
2:45			7	4	11	14:45			197	231	428	11:00 12:00			592	616	1208
3:00			11	2	13	15:00			187	215	402	12:00 13:00			654	644	1298
3:15			4	6	10	15:15			230	249	479	13:00 14:00			697	605	1302
3:30			6	11	17	15:30			186	283	469	14:00 15:00			773	916	1689
3:45			4	12	16	15:45			206	268	474	15:00 16:00			809	1015	1824
4:00			9	10	19	16:00			216	299	515	16:00 17:00			830	1269	2099
4:15			8	22	30	16:15			233	323	556	17:00 18:00			896	1089	1985
4:30			30	25	55	16:30			192	316	508	18:00 19:00			698	599	1297
4:45			45	39	84	16:45			189	331	520	19:00 20:00			526	491	1017
5:00			50	52	102	17:00			239	299	538	20:00 21:00			407	370	777
5:15			65	71	136	17:15			225	305	530	21:00 22:00			335	248	583
5:30			132	106	238	17:30			230	268	498	22:00 23:00			225	178	403
5:45			184	123	307	17:45			202	217	419	23:00 00:00			180	127	307
6:00			111	150	261	18:00			183	188	371	STATISTICS					
6:15			101	185	286	18:15			180	155	335		NB	SB	EB	WB	TOTAL
6:30			73	199	272	18:30			165	129	294	Peak Period	00:00	to	12:00		
6:45			140	205	345	18:45			170	127	297	Volume			4687	4924	9611
7:00			155	211	366	19:00			137	144	281	Peak Hour			7:45	7:15	7:45
7:15			161	245	406	19:15			151	130	281	Peak Volume			942	966	1849
7:30			172	248	420	19:30			116	111	227	Peak Hour Factor			0.935	0.932	0.905
7:45			252	259	511	19:45			122	106	228	Peak Period	12:00	to	00:00		
8:00			243	214	457	20:00			97	89	186	Volume			7030	7551	14581
8:15			212	238	450	20:15			117	105	222	Peak Hour			17:00	16:00	16:15
8:30			235	196	431	20:30			83	103	186	Peak Volume			896	1269	2122
8:45			239	183	422	20:45			110	73	183	Peak Hour Factor			0.937	0.958	0.954
9:00			217	175	392	21:00			80	78	158	Peak Period	07:00	to	09:00		
9:15			174	159	333	21:15			104	67	171	Volume			1669	1794	3463
9:30			153	156	309	21:30			76	54	130	Peak Hour			7:45	7:15	7:45
9:45			184	145	329	21:45			75	49	124	Peak Volume			942	966	1849
10:00			152	155	307	22:00			55	47	102	Peak Hour Factor			0.935	0.932	0.905
10:15			132	151	283	22:15			70	35	105	Peak Period	16:00	to	18:00		
10:30			150	118	268	22:30			45	64	109	Volume			1726	2358	4084
10:45			147	144	291	22:45			55	32	87	Peak Hour			17:00	16:00	16:15
11:00			110	133	243	23:00			55	34	89	Peak Volume			896	1269	2122
11:15			138	139	277	23:15			51	19	70	Peak Hour Factor			0.937	0.958	0.954
11:30			159	170	329	23:30			44	49	93						
11:45			185	174	359	23:45			30	25	55						
TOTALS	0	0	4687	4924	9611	TOTALS	0	0	7030	7551	14581						
SPLIT %	0%	0%	49%	51%	40%	SPLIT %	0%	0%	48%	52%	60%						



SPEED
Middlesex Turnpike S/O Concord Rd

Day: Wednesday
Date: 7/23/2025

City: Billerica
Project #: MA25_430107_002

Time	NORTHBOUND														Total	SOUTHBOUND														Total	TOTALS														Total
	5	15	20	25	30	35	40	45	50	55	60	65	70	70		5	15	20	25	30	35	40	45	50	55	60	65	70	70		5	15	20	25	30	35	40	45	50	55	60	65	70	70	
	15	20	25	30	35	40	45	50	55	60	65	70	99	15		20	25	30	35	40	45	50	55	60	65	70	99	15	20		25	30	35	40	45	50	55	60	65	70	99				
0:00	0	2	3	8	11	1	0	0	0	0	0	0	0	25	0	0	4	8	8	0	1	0	0	0	0	0	21	0	2	7	16	19	1	1	0	0	0	0	0	0	0	0	0	46	
1:00	0	0	1	6	9	1	0	0	0	0	0	0	0	17	1	0	1	4	3	1	0	0	0	0	0	0	10	1	0	2	10	12	2	0	0	0	0	0	0	0	0	0	0	27	
2:00	0	0	0	6	1	0	0	0	0	0	0	0	0	7	0	1	4	6	3	1	0	0	0	0	0	0	15	0	1	4	12	4	1	0	0	0	0	0	0	0	0	0	0	22	
3:00	1	0	1	5	2	2	0	0	0	0	0	0	0	11	0	0	2	9	2	2	0	0	0	0	0	0	15	1	0	3	14	4	4	0	0	0	0	0	0	0	0	0	0	26	
4:00	0	0	0	12	12	4	1	0	0	0	0	0	0	29	1	1	5	15	40	6	0	0	0	0	0	0	68	1	1	5	27	52	10	1	0	0	0	0	0	0	0	0	0	97	
5:00	1	0	9	27	39	11	1	0	0	0	0	0	0	88	2	2	23	154	117	28	2	0	0	0	0	328	3	2	32	181	156	39	3	0	0	0	0	0	0	0	0	0	416		
6:00	1	0	9	83	69	15	1	0	0	0	0	0	0	178	1	0	16	220	138	27	1	1	0	0	0	404	2	0	25	303	207	42	2	1	0	0	0	0	0	0	0	0	582		
7:00	0	5	20	113	108	19	0	0	0	0	0	0	0	265	2	18	120	259	137	7	1	0	0	0	0	544	2	23	140	372	245	26	1	0	0	0	0	0	0	0	0	0	809		
8:00	1	2	51	126	92	12	2	0	0	0	0	0	0	286	2	8	108	298	109	11	0	0	0	0	0	536	3	10	159	424	201	23	2	0	0	0	0	0	0	0	0	0	822		
9:00	7	11	33	112	68	11	2	0	0	0	0	0	0	244	1	11	58	189	78	8	0	0	0	0	0	345	8	22	91	301	146	19	2	0	0	0	0	0	0	0	0	0	589		
10:00	1	3	20	87	81	14	0	1	0	0	0	0	0	207	0	0	31	120	81	3	0	0	0	0	0	235	1	3	51	207	162	17	0	1	0	0	0	0	0	0	0	0	442		
11:00	1	1	22	109	103	8	3	0	0	0	0	0	0	247	2	3	31	153	75	12	0	0	0	0	0	276	3	4	53	262	178	20	3	0	0	0	0	0	0	0	0	0	523		
12:00	3	9	48	140	112	19	0	0	0	0	0	0	0	331	4	8	39	162	98	10	0	0	0	0	0	321	7	17	87	302	210	29	0	0	0	0	0	0	0	0	0	0	652		
13:00	6	4	38	176	88	12	0	0	0	0	0	0	0	324	2	5	50	135	92	12	2	0	0	0	0	298	8	9	88	311	180	24	2	0	0	0	0	0	0	0	0	0	622		
14:00	13	56	185	217	65	6	1	0	0	0	0	0	0	543	1	2	31	122	55	10	1	0	0	0	0	222	14	58	216	339	120	16	2	0	0	0	0	0	0	0	0	0	765		
15:00	52	129	288	229	57	5	0	0	0	0	0	0	0	760	1	6	41	123	87	9	2	0	0	0	0	269	53	135	329	352	144	14	2	0	0	0	0	0	0	0	0	0	1029		
16:00	57	117	337	282	44	3	148	0	0	0	0	0	0	840	7	4	63	148	85	6	1	0	0	0	0	314	64	121	400	430	129	9	1	0	0	0	0	0	0	0	0	0	1154		
17:00	239	410	302	68	9	2	0	0	0	0	0	0	0	1030	6	7	84	160	44	7	0	0	0	0	0	308	245	417	386	228	53	9	0	0	0	0	0	0	0	0	0	1338			
18:00	4	35	165	157	43	9	0	0	0	0	0	0	0	413	5	7	36	116	39	5	0	0	0	0	0	208	9	42	201	273	82	14	0	0	0	0	0	0	0	0	0	621			
19:00	2	1	32	100	65	8	1	0	0	0	0	0	0	209	2	2	13	80	68	12	1	0	1	0	0	179	4	3	45	180	133	20	2	0	1	0	0	0	0	0	0	388			
20:00	0	4	15	111	44	5	1	0	0	0	0	0	0	180	0	2	12	68	50	2	1	0	0	0	0	135	0	6	27	179	94	7	2	0	0	0	0	0	0	0	0	0	315		
21:00	0	1	18	57	39	3	1	0	0	0	0	0	0	119	2	5	10	65	30	3	0	0	0	0	0	115	2	6	28	122	69	6	1	0	0	0	0	0	0	0	0	0	234		
22:00	0	0	11	35	25	5	0	0	0	0	0	0	0	76	0	0	11	33	26	4	0	0	0	0	0	74	0	0	22	68	51	9	0	0	0	0	0	0	0	0	0	0	150		
23:00	1	1	9	43	27	6	0	0	0	0	0	0	0	87	0	0	7	31	24	5	0	0	0	0	0	67	1	1	16	74	51	11	0	0	0	0	0	0	0	0	0	0	154		
Totals	390	791	1,617	2,309	1,213	181	14	1	0	0	0	0	0	6,516	42	92	800	2,678	1,489	191	13	1	1	0	0	5,307	432	883	2,417	4,987	2,702	372	27	2	1	0	0	0	0	0	0	0	11,823		
% of Totals	6%	12%	25%	35%	19%	3%	0%	0%						100%	1%	2%	15%	50%	28%	4%	0%	0%	0%		100%	4%	7%	20%	42%	23%	3%	0%	0%	0%	0%								100%		

STATISTICS	Time	NORTHBOUND																				SOUTHBOUND																				Total
		5	15	20	25	30	35	40	45	50	55	60	65	70	70	5	15	20	25	30	35	40	45	50	55	60	65	70	70													
		15	20	25	30	35	40	45	50	55	60	65	70	99	15	20	25	30	35	40	45	50	55	60	65	70	99															
00:00 - 12:00	%	13	24	169	694	595	98	10	1	0	0	0	0	1604	12	44	403	1435	791	106	5	1	0	0	0	0	2797	25	68	572	2129	1386	204	15	2	0	0	0	0	0	0	4401
Peak Hour	%	0%	0%	3%	11%	9%	2%	0%	0%	0%	0%	0%	0%	25%	0%	1%	6%	22%	12%	2%	0%	0%	0%	0%	0%	43%	0%	1%	9%	33%	21%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	68%
Peak Volume	%	7	11	51	730	1145	700	815	915	0	0	0	0	1145	745	745	745	730	545	515	500	530	0	0	0	730	900	745	745	730	645	515	515	530	0	0	0	0	0	0	730	
12:00 - 24:00	%	377	767	1448	1615	618	83	4	0	0	0	0	0	4912	30	48	397	1243	698	85	8	0	1	0	0	0	2510	407	815	1845	2858	1316	168	12	0	1	0	0	0	0	7422	
Peak Hour	%	6%	12%	22%	25%	9%	1%	0%	0%	0%	0%	0%	0%	75%	0%	1%	6%	19%	11%	1%	0%	0%	0%	0%	39%	6%	13%	28%	44%	20%	3%	0%	0%	0%	0%	0%	0%	0%	114%			
Peak Volume	%	17:00	17:00	16:15	16:00	12:00	12:00	20:15	12:00	12:00	12:00	12:00	17:00	16:30	17:15	17:00	16:45	12:15	14:30	12:15	12:00	19:00	12:00	12:00	16:30	17:00	17:00	16:45	16:00	12:00	12:00	14:15	12:00	19:00	12:00	12:00	12:00	16:45				
Peak Volume	%	239	410	356	282	112	19	2	0	0	0	0	0	1030	10	10	84	169	102	15	2	0	1	0	0	333	245	417	429	430	210	29	3	0	1	0	0	0	1349			
07:00 - 09:00	%	1	7	71	239	200	31	2	0	0	0	0	0	551	4	26	228	557	246	18	1	0	0	0	0	1080	5	33	299	796	446	49	3	0	0	0	0	0	0	1631		
Peak Hour	%	0%	0%	1%	4%	3%	0%	0%	0%	0%	0%	0%	0%	8%	0%	0%	3%	9%	4%	0%	0%	0%	0%	0%	17%	0%	1%	5%	12%	7%	1%	0%	0%	0%	0%	0%	0%	25%				
Peak Volume	%	7:30	7:00	8:00	7:30	7:30	7:00	7:45	7:00	7:00	7:00	7:00	7:00	7:30	7:45	7:45	7:45	7:30	7:00	8:00	7:00	7:00	7:00	7:00	7:30	7:45	7:45	7:30	7:00	7:00	7:00	7:45	7:00	7:00	7:00	7:00	7:00	7:00	7:00			
Peak Volume	%	1	5	51	140	116	19	2	0	0	0	0	0	320	4	21	142	306	137	11	1	0	0	0																		

SPEED
Middlesex Turnpike S/O Concord Rd

Day: Wednesday
Date: 7/23/2025

City: Billerica
Project #: MA25_430107_002

Time	NORTHBOUND														Total	SOUTHBOUND														Total	TOTALS														Total
	5	15	20	25	30	35	40	45	50	55	60	65	70	99		5	15	20	25	30	35	40	45	50	55	60	65	70	99		5	15	20	25	30	35	40	45	50	55	60	65	70	99	
	15	20	25	30	35	40	45	50	55	60	65	70	99	15		20	25	30	35	40	45	50	55	60	65	70	99	15	20		25	30	35	40	45	50	55	60	65	70	99				
12:00	0	3	11	43	29	6	0	0	0	0	0	0	0	92	0	3	15	43	19	2	0	0	0	0	0	0	82	0	6	26	86	48	8	0	0	0	0	0	0	0	0	0	0	174	
12:15	1	3	11	33	32	5	0	0	0	0	0	0	0	85	0	0	5	36	30	6	0	0	0	0	0	0	77	1	3	16	69	62	11	0	0	0	0	0	0	0	0	0	0	162	
12:30	1	3	15	37	25	4	0	0	0	0	0	0	0	85	3	2	5	55	32	1	0	0	0	0	0	0	98	4	5	20	92	57	5	0	0	0	0	0	0	0	0	0	183		
12:45	1	0	11	27	26	4	0	0	0	0	0	0	0	69	1	3	14	28	17	1	0	0	0	0	0	0	64	2	3	25	55	43	5	0	0	0	0	0	0	0	0	0	133		
13:00	3	2	12	40	22	2	0	0	0	0	0	0	0	81	0	0	6	30	23	5	2	0	0	0	0	0	66	3	2	18	70	45	7	2	0	0	0	0	0	0	0	147			
13:15	0	0	6	46	29	2	0	0	0	0	0	0	0	83	1	3	13	26	27	4	0	0	0	0	0	0	74	1	3	19	72	56	6	0	0	0	0	0	0	0	0	157			
13:30	0	1	6	55	20	5	0	0	0	0	0	0	0	87	1	1	19	39	20	3	0	0	0	0	0	0	83	1	2	25	94	40	8	0	0	0	0	0	0	0	0	170			
13:45	3	1	14	35	17	3	0	0	0	0	0	0	0	73	0	1	12	40	22	0	0	0	0	0	0	0	75	3	2	26	75	39	3	0	0	0	0	0	0	0	0	148			
14:00	2	8	45	57	14	2	0	0	0	0	0	0	0	128	0	0	13	30	17	1	0	0	0	0	0	0	61	2	8	58	87	31	3	0	0	0	0	0	0	0	0	189			
14:15	1	11	46	54	12	1	1	0	0	0	0	0	0	126	0	2	7	29	14	1	0	0	0	0	0	0	53	1	13	53	83	26	2	1	0	0	0	0	0	0	0	179			
14:30	7	29	61	61	13	1	0	0	0	0	0	0	0	172	0	0	5	36	15	5	1	0	0	0	0	0	62	7	29	66	97	28	6	1	0	0	0	0	0	0	0	234			
14:45	3	8	33	45	26	2	0	0	0	0	0	0	0	117	1	0	6	27	9	3	0	0	0	0	0	0	46	4	8	39	72	35	5	0	0	0	0	0	0	0	0	163			
15:00	9	32	53	66	9	0	0	0	0	0	0	0	0	169	0	1	8	31	28	2	1	0	0	0	0	0	71	9	33	61	97	37	2	1	0	0	0	0	0	0	0	240			
15:15	1	13	67	53	19	1	0	0	0	0	0	0	0	154	0	0	7	37	21	5	0	0	0	0	0	0	70	1	13	74	90	40	6	0	0	0	0	0	0	0	0	224			
15:30	24	61	100	42	3	0	0	0	0	0	0	0	0	230	1	4	21	35	16	0	1	0	0	0	0	0	78	25	65	121	77	19	0	1	0	0	0	0	0	0	308				
15:45	18	23	68	68	26	4	0	0	0	0	0	0	0	207	0	1	5	20	22	2	0	0	0	0	0	0	50	18	24	73	88	48	6	0	0	0	0	0	0	0	0	257			
16:00	22	30	68	74	10	0	0	0	0	0	0	0	0	204	1	0	14	31	15	3	0	0	0	0	0	0	64	23	30	82	105	25	3	0	0	0	0	0	0	0	0	268			
16:15	17	31	69	58	9	0	0	0	0	0	0	0	0	184	1	1	14	37	26	1	1	0	0	0	0	0	81	18	32	83	95	35	1	1	0	0	0	0	0	0	0	265			
16:30	10	32	109	53	10	0	0	0	0	0	0	0	0	214	1	1	20	36	17	1	0	0	0	0	0	0	76	11	33	129	89	27	1	0	0	0	0	0	0	0	0	290			
16:45	8	24	91	97	15	3	0	0	0	0	0	0	0	238	4	2	15	44	27	1	0	0	0	0	0	0	93	12	26	106	141	42	4	0	0	0	0	0	0	0	0	331			
17:00	51	85	87	28	3	0	0	0	0	0	0	0	0	254	1	0	21	41	17	1	0	0	0	0	0	0	81	52	85	108	69	20	1	0	0	0	0	0	0	0	0	335			
17:15	88	114	65	8	1	0	0	0	0	0	0	0	0	276	4	6	17	45	10	1	0	0	0	0	0	0	83	92	120	82	53	11	1	0	0	0	0	0	0	0	359				
17:30	32	99	108	10	0	0	0	0	0	0	0	0	0	249	0	0	25	39	9	2	0	0	0	0	0	0	75	32	99	133	49	9	2	0	0	0	0	0	0	0	324				
17:45	68	112	42	22	5	2	0	0	0	0	0	0	0	251	1	1	21	35	8	3	0	0	0	0	0	0	69	69	113	63	57	13	5	0	0	0	0	0	0	0	320				
18:00	0	19	66	47	6	3	0	0	0	0	0	0	0	141	3	3	14	30	12	1	0	0	0	0	0	0	63	3	22	80	77	18	4	0	0	0	0	0	0	0	0	204			
18:15	1	6	53	39	17	2	0	0	0	0	0	0	0	118	0	0	13	34	6	0	0	0	0	0	0	0	53	1	6	66	73	23	2	0	0	0	0	0	0	0	0	171			
18:30	0	4	29	41	5	2	0	0	0	0	0	0	0	81	2	4	6	30	6	2	0	0	0	0	0	0	50	2	8	35	71	11	4	0	0	0	0	0	0	0	0	131			
18:45	3	6	17	30	15	2	0	0	0	0	0	0	0	73	0	0	3	22	15	2	0	0	0	0	0	0	42	3	6	20	52	30	4	0	0	0	0	0	0	0	0	115			
19:00	2	0	8	16	14	1	1	0	0	0	0	0	0	42	0	2	8	27	15	3	0	0	0	0	0	0	55	2	2	16	43	29	4	1	0	0	0	0	0	0	0	97			
19:15	0	1	10	36	16	1	0	0	0	0	0	0	0	64	1	0	1	25	20	1	1	0	0	0	0	0	49	1	1	11	61	36	2	1	0	0	0	0	0	0	0	113			
19:30	0	0	9	23	13	1	0	0	0	0	0	0	0	46	0	0	4	16	17	2	0	0	0	0	0	0	39	0	0	13	39	30	3	0	0	0	0	0	0	0	0	85			
19:45	0	0	5	25	22	5	0	0	0	0	0	0	0	57	1	0	0	12	16	6	0	0	0	0	0	0	36	1	0	5	37	38	11	0	0	0	0	0	0	0	0	93			
20:00	0	0	2	37	20	4	0	0	0	0	0	0	0	63	0	0	6	24	12	1	0	0	0	0	0	0	43	0	0	8	61	32	5	0	0	0	0	0	0	0	0	106			
20:15	0	0	4	34	10	1	1	0	0	0	0	0	0	50	0	0	1	12	12	1	0	0	0	0	0	0	26	0	0	5	46	22	2	1	0	0	0	0	0	0	0	76			
20:30	0	0	2	21	7	0	0	0	0	0	0	0	0	30	0	1	2	10	14	0	1	0	0	0	0	0	28	0	1	4	31	21	0	1	0	0	0	0	0	0	0	58			
20:45	0	4	7	19	7	0	0	0	0	0	0	0	0	37	0	1	3	22	12	0	0	0	0	0	0	0	38	0	5	10	41	19	0	0	0	0	0	0	0	0	0	75			
21:00	0	0	7	12	11	2	1	0	0	0	0	0	0	33	0	1	3	11	9	0	0	0	0	0	0	0	24	0	1	10	23	20	2	1	0	0	0	0	0	0	0	57			
21:15	0	0	6	18	10	0	0	0	0	0	0	0	0	34	1	3	3	27	7	0	0	0	0	0	0	0	41	1	3	9	45	17	0	0	0	0	0	0	0	0	75				
21:30	0	1	4	14	7	0	0	0	0	0	0	0	0	26	1	0	4	10	7	1	0	0	0	0	0	0	23	1	1	8	24	14	1	0	0	0	0	0	0	0	0	49			
21:45	0	0	1	13	11	1	0	0	0	0	0	0	0	26	0	1	0	17	7	2	0	0	0	0	0	0	27	0	1	1	30	18	3	0	0	0	0	0	0	0	0	53			
22:00	0	0	5	8	7	2	0	0	0	0	0	0	0	22	0	0	4	14	7	1	0	0	0	0	0	0	26	0	0	9	22	14	3	0	0	0	0	0							

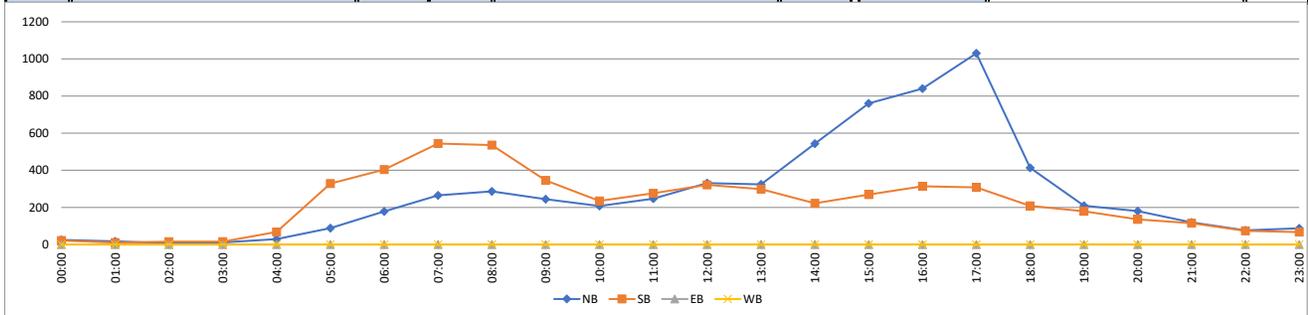
VOLUME

Middlesex Turnpike S/O Concord Rd

Day: Wednesday
Date: 7/23/2025

City: Billerica
Project #: MA25_430107_002

DAILY TOTALS					NB	SB	EB	WB	Total	DAILY TOTALS							
					6,516	5,307	0	0	11,823								
15-Minutes Interval											Hourly Intervals						
TIME	NB	SB	EB	WB	TOTAL	TIME	NB	SB	EB	WB	TOTAL	TIME	NB	SB	EB	WB	TOTAL
0:00	8	10			18	12:00	92	82			174	00:00	01:00	25	21		46
0:15	5	8			13	12:15	85	77			162	01:00	02:00	17	10		27
0:30	7	1			8	12:30	85	98			183	02:00	03:00	7	15		22
0:45	5	2			7	12:45	69	64			133	03:00	04:00	11	15		26
1:00	1	2			3	13:00	81	66			147	04:00	05:00	29	68		97
1:15	2	1			3	13:15	83	74			157	05:00	06:00	88	328		416
1:30	6	2			8	13:30	87	83			170	06:00	07:00	178	404		582
1:45	8	5			13	13:45	73	75			148	07:00	08:00	265	544		809
2:00	3	5			8	14:00	128	61			189	08:00	09:00	286	536		822
2:15	2	0			2	14:15	126	53			179	09:00	10:00	244	345		589
2:30	0	2			2	14:30	172	62			234	10:00	11:00	207	235		442
2:45	2	8			10	14:45	117	46			163	11:00	12:00	247	276		523
3:00	2	4			6	15:00	169	71			240	12:00	13:00	331	321		652
3:15	4	5			9	15:15	154	70			224	13:00	14:00	324	298		622
3:30	5	2			7	15:30	230	78			308	14:00	15:00	543	222		765
3:45	0	4			4	15:45	207	50			257	15:00	16:00	760	269		1029
4:00	1	5			6	16:00	204	64			268	16:00	17:00	840	314		1154
4:15	5	10			15	16:15	184	81			265	17:00	18:00	1030	308		1338
4:30	8	19			27	16:30	214	76			290	18:00	19:00	413	208		621
4:45	15	34			49	16:45	238	93			331	19:00	20:00	209	179		388
5:00	25	30			55	17:00	254	81			335	20:00	21:00	180	135		315
5:15	15	48			63	17:15	276	83			359	21:00	22:00	119	115		234
5:30	22	103			125	17:30	249	75			324	22:00	23:00	76	74		150
5:45	26	147			173	17:45	251	69			320	23:00	00:00	87	67		154
6:00	36	85			121	18:00	141	63			204	STATISTICS					
6:15	35	80			115	18:15	118	53			171		NB	SB	EB	WB	TOTAL
6:30	53	119			172	18:30	81	50			131	Peak Period	00:00	to	12:00		
6:45	54	120			174	18:45	73	42			115	Volume	1604	2797			4401
7:00	51	135			186	19:00	42	55			97	Peak Hour	7:30	7:30			7:30
7:15	57	124			181	19:15	64	49			113	Peak Volume	320	586			906
7:30	81	122			203	19:30	46	39			85	Peak Hour Factor	0.976	0.899			0.932
7:45	76	163			239	19:45	57	36			93	Peak Period	12:00	to	00:00		
8:00	82	139			221	20:00	63	43			106	Volume	4912	2510			7422
8:15	81	162			243	20:15	50	26			76	Peak Hour	17:00	16:30			16:45
8:30	57	116			173	20:30	30	28			58	Peak Volume	1030	333			1349
8:45	66	119			185	20:45	37	38			75	Peak Hour Factor	0.933	0.895			0.939
9:00	59	104			163	21:00	33	24			57	Peak Period	07:00	to	09:00		
9:15	62	102			164	21:15	34	41			75	Volume	551	1080			1631
9:30	68	77			145	21:30	26	23			49	Peak Hour	7:30	7:30			7:30
9:45	55	62			117	21:45	26	27			53	Peak Volume	320	586			906
10:00	44	52			96	22:00	22	26			48	Peak Hour Factor	0.976	0.899			0.932
10:15	47	57			104	22:15	15	17			32	Peak Period	16:00	to	18:00		
10:30	54	62			116	22:30	20	17			37	Volume	1870	622			2492
10:45	62	64			126	22:45	19	14			33	Peak Hour	17:00	16:30			16:45
11:00	53	69			122	23:00	15	20			35	Peak Volume	1030	333			1349
11:15	65	58			123	23:15	17	30			47	Peak Hour Factor	0.933	0.895			0.939
11:30	60	68			128	23:30	40	9			49						
11:45	69	81			150	23:45	15	8			23						
TOTALS	1604	2797	0	0	4401	TOTALS	4912	2510	0	0	7422						
SPLIT %	36%	64%	0%	0%	37%	SPLIT %	66%	34%	0%	0%	63%						



SPEED
Middlesex Turnpike S/O Concord Rd

Day: Thursday
Date: 7/24/2025

City: Billerica
Project #: MA25_430107_002

Time	NORTHBOUND														Total	SOUTHBOUND														Total	TOTALS														Total			
	5	15	20	25	30	35	40	45	50	55	60	65	70	99		5	15	20	25	30	35	35	40	45	50	55	60	65	70		99	5	15	20	25	30	35	40	45	50	55	60	65	70		99		
	15	20	25	30	35	40	45	50	55	60	65	70	99	15		20	25	30	35	35	40	45	50	55	60	65	70	99	15		20	25	30	35	40	45	50	55	60	65	70	99						
12:00	0	3	6	46	17	0	0	0	0	0	0	0	0	72	0	1	5	22	32	4	0	0	0	0	0	0	0	64	0	4	11	68	49	4	0	0	0	0	0	0	0	0	0	0	0	136		
12:15	0	1	11	46	29	1	0	0	0	0	0	0	0	88	1	2	12	19	41	2	0	0	0	0	0	0	0	77	1	3	23	65	70	3	0	0	0	0	0	0	0	0	0	0	0	165		
12:30	1	1	6	30	27	4	0	0	0	0	0	0	0	69	0	1	8	21	29	2	0	0	0	0	0	0	0	61	1	2	14	51	56	6	0	0	0	0	0	0	0	0	0	0	0	130		
12:45	1	0	9	43	22	3	0	0	0	0	0	0	0	78	0	2	5	36	26	3	0	0	0	0	0	0	0	72	1	2	14	79	48	6	0	0	0	0	0	0	0	0	0	0	0	150		
13:00	2	4	8	37	17	2	0	0	0	0	0	0	0	70	1	0	6	19	27	2	0	0	0	0	0	0	0	55	3	4	14	56	44	4	0	0	0	0	0	0	0	0	0	0	0	125		
13:15	0	0	6	35	22	3	1	0	0	0	0	0	0	67	2	0	6	35	24	1	0	0	0	0	0	0	0	68	2	0	12	70	46	4	1	0	0	0	0	0	0	0	0	0	0	135		
13:30	0	2	8	52	20	2	0	0	0	0	0	0	0	84	1	1	24	40	27	0	1	0	0	0	0	0	0	94	1	3	32	92	47	2	1	0	0	0	0	0	0	0	0	0	0	178		
13:45	1	1	10	27	36	3	0	1	0	0	0	0	0	79	0	3	4	29	27	6	0	0	0	0	0	0	0	69	1	4	14	56	63	9	0	1	0	0	0	0	0	0	0	0	0	0	148	
14:00	9	20	39	46	10	0	0	0	0	0	0	0	0	124	0	0	8	39	18	2	0	0	0	0	0	0	0	67	9	20	47	85	28	2	0	0	0	0	0	0	0	0	0	0	0	0	191	
14:15	0	2	26	50	27	2	1	0	0	0	0	0	0	108	0	1	10	26	32	2	0	0	0	0	0	0	0	71	0	3	36	76	59	4	1	0	0	0	0	0	0	0	0	0	0	0	179	
14:30	23	25	42	50	29	2	0	0	0	0	0	0	0	171	0	0	13	51	17	5	0	0	0	0	0	0	0	86	23	25	55	101	46	7	0	0	0	0	0	0	0	0	0	0	0	0	257	
14:45	0	14	32	66	25	0	0	1	0	0	0	0	0	138	0	0	11	29	25	0	1	0	0	0	0	0	0	66	0	14	43	95	50	0	1	1	0	0	0	0	0	0	0	0	0	0	0	204
15:00	1	2	33	98	17	2	0	0	0	0	0	0	0	153	0	0	14	41	26	2	0	0	0	0	0	0	0	83	1	2	47	139	43	4	0	0	0	0	0	0	0	0	0	0	0	0	236	
15:15	8	15	48	69	27	1	0	0	0	0	0	0	0	168	1	4	3	26	36	4	0	0	0	0	0	0	0	74	9	19	51	95	63	5	0	0	0	0	0	0	0	0	0	0	0	0	242	
15:30	11	14	81	100	23	1	0	0	0	0	0	0	0	230	1	1	5	28	28	1	0	0	0	0	0	0	0	64	12	15	86	128	51	2	0	0	0	0	0	0	0	0	0	0	0	0	294	
15:45	21	14	56	82	12	2	0	0	0	0	0	0	0	187	1	0	2	28	27	4	0	0	0	0	0	0	0	62	22	14	58	110	39	6	0	0	0	0	0	0	0	0	0	0	0	0	0	249
16:00	25	26	68	85	20	4	0	0	0	0	0	0	0	228	0	0	3	28	29	3	0	0	0	0	0	0	0	63	25	26	71	113	49	7	0	0	0	0	0	0	0	0	0	0	0	0	291	
16:15	15	27	70	71	31	2	0	0	0	0	0	0	0	216	1	0	4	26	25	1	0	0	0	0	0	0	0	57	16	27	74	97	56	3	0	0	0	0	0	0	0	0	0	0	0	0	273	
16:30	15	14	56	113	36	1	0	0	0	0	0	0	0	235	0	0	3	33	36	4	0	1	0	0	0	0	0	77	15	14	59	146	72	5	0	1	0	0	0	0	0	0	0	0	0	0	0	312
16:45	15	20	78	93	29	2	0	0	0	0	0	0	0	237	0	0	7	29	20	4	0	0	0	0	0	0	0	60	15	20	85	122	49	6	0	0	0	0	0	0	0	0	0	0	0	0	0	297
17:00	9	25	66	96	38	1	0	0	0	0	0	0	0	235	0	2	10	32	28	4	0	0	0	0	0	0	0	76	9	27	76	128	66	5	0	0	0	0	0	0	0	0	0	0	0	0	311	
17:15	2	12	64	111	22	1	0	0	0	0	0	0	0	212	0	0	3	33	38	1	0	0	0	0	0	0	0	75	2	12	67	144	60	2	0	0	0	0	0	0	0	0	0	0	0	0	287	
17:30	8	19	64	89	25	2	0	0	0	0	0	0	0	207	0	0	3	34	32	2	1	0	0	0	0	0	0	72	8	19	67	123	57	4	1	0	0	0	0	0	0	0	0	0	0	0	0	279
17:45	0	3	23	81	33	1	0	0	0	0	0	0	0	141	0	1	8	37	30	2	1	0	0	0	0	0	0	79	0	4	31	118	63	3	1	0	0	0	0	0	0	0	0	0	0	0	0	220
18:00	2	1	11	67	32	1	1	0	0	0	0	0	0	115	0	1	12	36	25	3	0	0	0	0	0	0	0	77	2	2	23	103	57	4	1	0	0	0	0	0	0	0	0	0	0	0	0	192
18:15	0	0	11	56	24	2	0	0	0	0	0	0	0	93	0	1	7	28	21	3	0	0	0	0	0	0	60	0	1	18	84	45	5	0	0	0	0	0	0	0	0	0	0	0	0	0	153	
18:30	0	2	3	31	32	3	1	0	0	0	0	0	0	72	0	0	3	22	25	6	1	0	0	0	0	0	0	57	0	2	6	53	57	9	2	0	0	0	0	0	0	0	0	0	0	0	0	129
18:45	0	0	6	26	21	7	0	0	0	0	0	0	0	60	0	1	2	19	21	7	0	0	0	0	0	0	50	0	1	8	45	42	14	0	0	0	0	0	0	0	0	0	0	0	0	0	110	
19:00	0	2	8	36	23	1	1	1	0	0	0	0	0	72	0	0	1	12	15	4	0	0	0	0	0	0	0	32	0	2	9	48	38	5	1	1	0	0	0	0	0	0	0	0	0	0	0	104
19:15	0	0	12	37	20	3	1	0	0	0	0	0	0	73	0	0	4	20	28	1	0	0	0	0	0	0	0	53	0	0	16	57	48	4	1	0	0	0	0	0	0	0	0	0	0	0	0	126
19:30	0	0	3	31	18	2	1	0	0	0	0	0	0	55	0	0	3	11	23	4	1	0	1	0	0	0	0	43	0	0	6	42	41	6	2	0	1	0	0	0	0	0	0	0	0	0	0	98
19:45	0	0	6	36	18	3	0	0	0	0	0	0	0	63	0	0	2	16	20	2	2	0	1	0	0	0	0	43	0	0	8	52	38	5	2	0	1	0	0	0	0	0	0	0	0	0	0	106
20:00	0	1	6	17	10	2	1	0	0	0	0	0	0	37	0	1	1	16	17	3	0	0	0	0	0	0	38	0	2	7	33	27	5	1	0	0	0	0	0	0	0	0	0	0	0	0	75	
20:15	0	0	8	19	17	1	0	0	0	0	0	0	0	45	2	0	3	18	12	5	2	0	0	0	0	0	42	2	0	11	37	29	6	2	0	0	0	0	0	0	0	0	0	0	0	0	87	
20:30	0	0	11	24	9	1	0	0	0	0	0	0	0	45	3	0	4	20	7	0	0	0	0	0	0	0	34	3	0	15	44	16	1	0	0	0	0	0	0	0	0	0	0	0	0	0	79	
20:45	0	0	3	24	10	1	0	0	0	0	0	0	0	38	0	0	6	21	11	1	0	0	0	0	0	0	39	0	0	9	45	21	2	0	0	0	0	0	0	0	0	0	0	0	0	0	77	
21:00	0	1	8	16	7	2	0	0	0	0	0	0	0	34	1	0	0	17	12	0	0	0	0	0	0	0	30	1	1	8	33	19	2	0	0	0	0</											

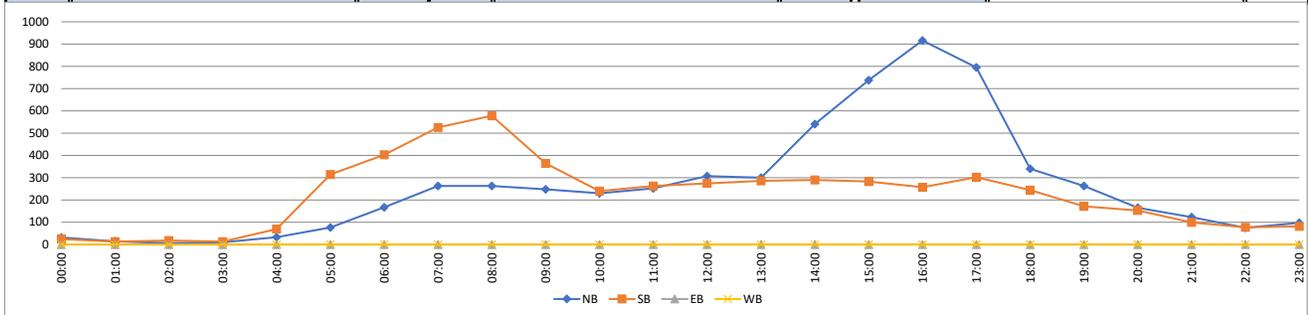
VOLUME

Middlesex Turnpike S/O Concord Rd

Day: Thursday
Date: 7/24/2025

City: Billerica
Project #: MA25_430107_002

DAILY TOTALS						NB	SB	EB	WB	Total	DAILY TOTALS						
						6,253	5,342	0	0	11,595							
15-Minutes Interval											Hourly Intervals						
TIME	NB	SB	EB	WB	TOTAL	TIME	NB	SB	EB	WB	TOTAL	TIME	NB	SB	EB	WB	TOTAL
0:00	9	7			16	12:00	72	64			136	00:00	01:00	31	24		55
0:15	3	12			15	12:15	88	77			165	01:00	02:00	14	13		27
0:30	10	5			15	12:30	69	61			130	02:00	03:00	6	18		24
0:45	9	0			9	12:45	78	72			150	03:00	04:00	10	13		23
1:00	4	4			8	13:00	70	55			125	04:00	05:00	33	69		102
1:15	4	2			6	13:15	67	68			135	05:00	06:00	76	314		390
1:30	3	3			6	13:30	84	94			178	06:00	07:00	167	403		570
1:45	3	4			7	13:45	79	69			148	07:00	08:00	263	526		789
2:00	3	1			4	14:00	124	67			191	08:00	09:00	263	578		841
2:15	1	6			7	14:15	108	71			179	09:00	10:00	248	364		612
2:30	0	5			5	14:30	171	86			257	10:00	11:00	230	240		470
2:45	2	6			8	14:45	138	66			204	11:00	12:00	252	263		515
3:00	0	7			7	15:00	153	83			236	12:00	13:00	307	274		581
3:15	1	4			5	15:15	168	74			242	13:00	14:00	300	286		586
3:30	7	1			8	15:30	230	64			294	14:00	15:00	541	290		831
3:45	2	1			3	15:45	187	62			249	15:00	16:00	738	283		1021
4:00	2	9			11	16:00	228	63			291	16:00	17:00	916	257		1173
4:15	5	8			13	16:15	216	57			273	17:00	18:00	795	302		1097
4:30	8	15			23	16:30	235	77			312	18:00	19:00	340	244		584
4:45	18	37			55	16:45	237	60			297	19:00	20:00	263	171		434
5:00	13	28			41	17:00	235	76			311	20:00	21:00	165	153		318
5:15	23	47			70	17:15	212	75			287	21:00	22:00	123	99		222
5:30	18	96			114	17:30	207	72			279	22:00	23:00	75	77		152
5:45	22	143			165	17:45	141	79			220	23:00	00:00	97	81		178
6:00	37	84			121	18:00	115	77			192	STATISTICS					
6:15	50	98			148	18:15	93	60			153		NB	SB	EB	WB	TOTAL
6:30	43	84			127	18:30	72	57			129	Peak Period	00:00	to	12:00		
6:45	37	137			174	18:45	60	50			110	Volume	1593	2825			4418
7:00	63	132			195	19:00	72	32			104	Peak Hour	7:30	7:45			7:45
7:15	50	114			164	19:15	73	53			126	Peak Volume	291	599			867
7:30	82	121			203	19:30	55	43			98	Peak Hour Factor	0.887	0.942			0.955
7:45	68	159			227	19:45	63	43			106	Peak Period	12:00	to	00:00		
8:00	68	151			219	20:00	37	38			75	Volume	4660	2517			7177
8:15	73	143			216	20:15	45	42			87	Peak Hour	16:15	14:30			16:30
8:30	59	146			205	20:30	45	34			79	Peak Volume	923	309			1207
8:45	63	138			201	20:45	38	39			77	Peak Hour Factor	0.974	0.898			0.967
9:00	61	112			173	21:00	34	30			64	Peak Period	07:00	to	09:00		
9:15	63	87			150	21:15	40	30			70	Volume	526	1104			1630
9:30	63	72			135	21:30	22	22			44	Peak Hour	7:30	7:45			7:45
9:45	61	93			154	21:45	27	17			44	Peak Volume	291	599			867
10:00	63	56			119	22:00	16	15			31	Peak Hour Factor	0.887	0.942			0.955
10:15	51	56			107	22:15	20	24			44	Peak Period	16:00	to	18:00		
10:30	55	71			126	22:30	23	19			42	Volume	1711	559			2270
10:45	61	57			118	22:45	16	19			35	Peak Hour	16:15	17:00			16:30
11:00	47	56			103	23:00	21	37			58	Peak Volume	923	302			1207
11:15	67	58			125	23:15	16	28			44	Peak Hour Factor	0.974	0.956			0.967
11:30	75	71			146	23:30	41	8			49						
11:45	63	78			141	23:45	19	8			27						
TOTALS	1593	2825	0	0	4418	TOTALS	4660	2517	0	0	7177						
SPLIT %	36%	64%	0%	0%	38%	SPLIT %	65%	35%	0%	0%	62%						



Attachment D – Seasonal Adjustments

Massachusetts Highway Department
Statewide Traffic Data Collection
2024 Weekday Seasonal Factors

Factor Group	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Axle Factor
R1	1.17	1.12	1.11	1.06	1.00	0.96	0.94	0.92	1.00	0.98	1.06	1.07	0.78
R3	1.10	1.04	1.04	1.02	0.91	0.88	0.88	0.87	0.92	0.92	0.99	1.01	0.98
R4-R7	1.16	1.12	1.08	1.03	0.92	0.89	0.88	0.89	0.92	0.94	1.04	1.10	0.98
U1-Boston	1.07	1.03	0.98	0.97	0.94	0.91	0.94	0.91	0.94	0.94	0.98	1.02	0.94
U1-Essex	1.13	1.09	1.06	1.04	0.95	0.89	0.88	0.87	0.95	0.95	1.03	1.05	0.96
U1-Southeast	1.14	1.10	1.04	0.99	0.93	0.86	0.87	0.85	0.91	0.93	0.99	1.02	0.96
U1-West	1.10	1.02	0.98	0.96	0.95	0.92	0.94	0.91	0.91	0.91	0.96	1.00	0.83
U1-Worcester	1.08	1.03	0.99	0.98	0.94	0.91	0.93	0.91	0.92	0.91	0.95	1.00	0.93
U3	1.06	1.02	0.98	0.96	0.93	0.91	0.95	0.94	0.93	0.93	0.96	1.00	0.98
U4-U7	1.04	1.02	0.96	0.95	0.91	0.90	0.94	0.94	0.93	0.94	0.98	1.02	0.99
UR2	1.08	1.02	0.98	0.97	0.93	0.90	0.93	0.90	0.92	0.92	0.97	1.01	0.98
Rec - East	1.21	1.20	1.09	1.01	0.91	0.81	0.77	0.79	0.91	0.95	1.05	1.13	0.99
Rec - West	1.46	1.38	1.32	1.06	0.94	0.79	0.59	0.69	0.97	0.99	1.18	1.28	0.99

Round off:

0-999 = 10

>1000 = 100

U = Urban

R = Rural

1 - Interstate

2 - Freeway and Expressway

3 - Other Principal Arterial

4 - Minor Arterial

5 - Major Collector

6 - Minor Collector

7 - Local Road and Street

UR2 Group - Combination of Urban Freeways and Expressways and Rural Freeways and Expressways.

Recreational - East Group - Cape Cod (all towns) including the town of Plymouth south of Route 3A (stations 7014,7079,7080,7090,7091,7092,7093,7094,7095,7096,7097,7108 and 7178), Martha's Vineyard and Nantucket.

Recreational - West Group - Continuous Stations 2 and 189 including stations 1066,1067,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,1105,1106,1107,1108,1113,1114,1116,2196,2197 and 2198.

Location Info	
Location ID	4066
Type	I-SECTION
Functional Class	4
Located On	
	E.OF OLD MIDDLESEX PIKE
Direction	2-WAY
Community	Billerica
MPO_ID	
HPMS ID	31005900510
Agency	Massachusetts Highway Department

Count Data Info	
Start Date	9/17/2024
End Date	9/18/2024
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	
Count Source	4066
File Name	
Weather	
Study	
Owner	rpa06
QC Status	Accepted

Interval: 15 mins					
Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	25	18	17	4	64
01:00 - 02:00	6	6	5	6	23
02:00 - 03:00	5	11	11	7	34
03:00 - 04:00	10	6	8	13	37
04:00 - 05:00	18	15	42	57	132
05:00 - 06:00	56	105	129	175	465
06:00 - 07:00	197	231	253	289	970
07:00 - 08:00	302	321	318	339	1280
08:00 - 09:00	302	273	269	262	1106
09:00 - 10:00	236	208	194	178	816
10:00 - 11:00	177	214	190	200	781
11:00 - 12:00	190	230	201	244	865
12:00 - 13:00	294	280	245	259	1078
13:00 - 14:00	225	243	231	225	924
14:00 - 15:00	267	250	279	298	1094
15:00 - 16:00	277	288	293	316	1174
16:00 - 17:00	321	283	304	297	1205
17:00 - 18:00	331	287	271	271	1160
18:00 - 19:00	237	224	213	207	881
19:00 - 20:00	220	199	206	163	788
20:00 - 21:00	135	148	124	127	534
21:00 - 22:00	82	115	59	69	325
22:00 - 23:00	82	55	57	41	235
23:00 - 24:00	42	35	34	32	143
TOTAL					16114

Location Info	
Location ID	4066
Type	I-SECTION
Functional Class	4
Located On	
	E.OF OLD MIDDLESEX PIKE
Direction	2-WAY
Community	Billerica
MPO_ID	
HPMS ID	31005900510
Agency	Massachusetts Highway Department

Count Data Info	
Start Date	9/18/2024
End Date	9/19/2024
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	
Count Source	4066
File Name	
Weather	
Study	
Owner	rpa06
QC Status	Accepted

Interval: 15 mins					
Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	29	30	10	12	81
01:00 - 02:00	14	8	12	5	39
02:00 - 03:00	4	7	13	5	29
03:00 - 04:00	3	10	7	17	37
04:00 - 05:00	15	17	51	45	128
05:00 - 06:00	53	115	137	179	484
06:00 - 07:00	187	206	272	294	959
07:00 - 08:00	292	334	305	342	1273
08:00 - 09:00	298	279	296	271	1144
09:00 - 10:00	240	217	234	213	904
10:00 - 11:00	172	219	222	211	824
11:00 - 12:00	191	242	223	251	907
12:00 - 13:00	252	231	264	272	1019
13:00 - 14:00	227	221	228	255	931
14:00 - 15:00	272	271	293	252	1088
15:00 - 16:00	262	270	278	277	1087
16:00 - 17:00	286	289	308	292	1175
17:00 - 18:00	317	311	275	298	1201
18:00 - 19:00	249	240	222	219	930
19:00 - 20:00	181	212	194	174	761
20:00 - 21:00	167	141	132	125	565
21:00 - 22:00	117	102	93	65	377
22:00 - 23:00	71	64	67	48	250
23:00 - 24:00	37	43	34	38	152
TOTAL					16345

Location Info	
Location ID	4066
Type	I-SECTION
Functional Class	4
Located On	
	E.OF OLD MIDDLESEX PIKE
Direction	2-WAY
Community	Billerica
MPO_ID	
HPMS ID	31005900510
Agency	Massachusetts Highway Department

Count Data Info	
Start Date	9/19/2024
End Date	9/20/2024
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	
Count Source	4066
File Name	
Weather	
Study	
Owner	rpa06
QC Status	Accepted

Interval: 15 mins					
Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	33	26	29	7	95
01:00 - 02:00	14	14	11	8	47
02:00 - 03:00	11	9	5	7	32
03:00 - 04:00	8	11	15	13	47
04:00 - 05:00	17	17	37	61	132
05:00 - 06:00	71	100	134	178	483
06:00 - 07:00	176	219	243	262	900
07:00 - 08:00	312	334	311	314	1271
08:00 - 09:00	278	262	274	257	1071
09:00 - 10:00	226	223	206	192	847
10:00 - 11:00	168	223	208	236	835
11:00 - 12:00	218	211	226	254	909
12:00 - 13:00	261	273	260	247	1041
13:00 - 14:00	210	249	236	259	954
14:00 - 15:00	263	268	271	284	1086
15:00 - 16:00	288	303	298	286	1175
16:00 - 17:00	330	311	309	302	1252
17:00 - 18:00	336	303	292	320	1251
18:00 - 19:00	268	238	228	213	947
19:00 - 20:00	215	232	217	181	845
20:00 - 21:00	159	146	114	124	543
21:00 - 22:00	109	96	89	81	375
22:00 - 23:00	79	52	60	58	249
23:00 - 24:00	47	56	0	0	103
TOTAL					16490

Location Info		Count Data Info	
Location ID	4066	Start Date	5/13/2025
Type	I-SECTION	End Date	5/14/2025
Functional Class	4	Start Time	12:00 AM
Located On		End Time	12:00 AM
	E.OF OLD MIDDLESEX PIKE	Direction	
Direction	2-WAY	Notes	
Community	Billerica	Count Source	4066
MPO_ID		File Name	
HPMS ID	31005900510	Weather	
Agency	Massachusetts Highway Department	Study	
		Owner	rpa06
		QC Status	Accepted

Interval: 15 mins					
Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	31	24	21	11	87
01:00 - 02:00	11	13	10	10	44
02:00 - 03:00	6	5	9	6	26
03:00 - 04:00	5	8	9	15	37
04:00 - 05:00	18	25	32	56	131
05:00 - 06:00	58	97	140	204	499
06:00 - 07:00	181	248	269	274	972
07:00 - 08:00	293	342	326	298	1259
08:00 - 09:00	307	309	301	254	1171
09:00 - 10:00	239	222	227	232	920
10:00 - 11:00	206	202	208	223	839
11:00 - 12:00	196	228	241	205	870
12:00 - 13:00	257	247	248	248	1000
13:00 - 14:00	234	237	203	256	930
14:00 - 15:00	251	266	287	273	1077
15:00 - 16:00	281	263	303	281	1128
16:00 - 17:00	329	325	319	311	1284
17:00 - 18:00	309	309	288	303	1209
18:00 - 19:00	267	278	244	210	999
19:00 - 20:00	181	187	175	196	739
20:00 - 21:00	190	135	147	118	590
21:00 - 22:00	130	105	89	88	412
22:00 - 23:00	75	69	89	52	285
23:00 - 24:00	46	35	43	32	156
TOTAL					16664

Location Info		Count Data Info	
Location ID	4066	Start Date	5/14/2025
Type	I-SECTION	End Date	5/15/2025
Functional Class	4	Start Time	12:00 AM
Located On		End Time	12:00 AM
	E.OF OLD MIDDLESEX PIKE	Direction	
Direction	2-WAY	Notes	
Community	Billerica	Count Source	4066
MPO_ID		File Name	
HPMS ID	31005900510	Weather	
Agency	Massachusetts Highway Department	Study	
		Owner	rpa06
		QC Status	Accepted

Interval: 15 mins					
Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	25	23	16	14	78
01:00 - 02:00	8	11	8	10	37
02:00 - 03:00	5	6	7	8	26
03:00 - 04:00	3	5	10	14	32
04:00 - 05:00	14	23	32	61	130
05:00 - 06:00	67	103	161	181	512
06:00 - 07:00	195	219	271	301	986
07:00 - 08:00	321	342	349	312	1324
08:00 - 09:00	305	278	264	267	1114
09:00 - 10:00	252	206	206	226	890
10:00 - 11:00	184	191	210	205	790
11:00 - 12:00	191	225	233	223	872
12:00 - 13:00	287	252	258	266	1063
13:00 - 14:00	222	272	251	241	986
14:00 - 15:00	268	272	278	286	1104
15:00 - 16:00	303	292	273	314	1182
16:00 - 17:00	316	320	315	308	1259
17:00 - 18:00	344	353	290	294	1281
18:00 - 19:00	254	259	251	243	1007
19:00 - 20:00	241	231	180	191	843
20:00 - 21:00	151	198	113	124	586
21:00 - 22:00	108	111	92	112	423
22:00 - 23:00	96	56	73	80	305
23:00 - 24:00	56	43	50	23	172
TOTAL					17002

Location Info		Count Data Info	
Location ID	4066	Start Date	5/15/2025
Type	I-SECTION	End Date	5/16/2025
Functional Class	4	Start Time	12:00 AM
Located On		End Time	12:00 AM
	E.OF OLD MIDDLESEX PIKE	Direction	
Direction	2-WAY	Notes	
Community	Billerica	Count Source	4066
MPO_ID		File Name	
HPMS ID	31005900510	Weather	
Agency	Massachusetts Highway Department	Study	
		Owner	rpa06
		QC Status	Accepted

Interval: 15 mins					
Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	22	26	22	8	78
01:00 - 02:00	9	9	15	5	38
02:00 - 03:00	3	5	3	6	17
03:00 - 04:00	7	9	6	12	34
04:00 - 05:00	17	23	35	54	129
05:00 - 06:00	61	98	136	172	467
06:00 - 07:00	178	249	259	230	916
07:00 - 08:00	296	301	327	314	1238
08:00 - 09:00	299	302	299	234	1134
09:00 - 10:00	261	233	236	189	919
10:00 - 11:00	198	189	213	198	798
11:00 - 12:00	219	195	236	214	864
12:00 - 13:00	235	261	253	247	996
13:00 - 14:00	237	256	245	259	997
14:00 - 15:00	266	296	296	277	1135
15:00 - 16:00	305	301	264	280	1150
16:00 - 17:00	337	305	316	308	1266
17:00 - 18:00	330	352	307	282	1271
18:00 - 19:00	246	259	226	196	927
19:00 - 20:00	215	193	204	161	773
20:00 - 21:00	158	174	161	93	586
21:00 - 22:00	129	107	95	81	412
22:00 - 23:00	80	74	77	54	285
23:00 - 24:00	61	50	40	33	184
TOTAL					16614

Attachment E – Crash History

Crash Data Summary Tables
 Concord Road @ Federal Street - Billerica, MA
 1/1/2019 - 12/31/2023

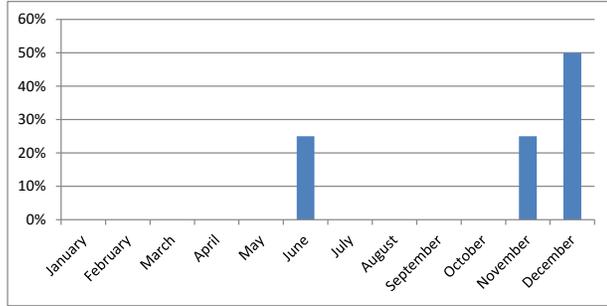
Collision Diagram	Crash Number	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Number of Vehicles	Vehicle Travel Directions				Crash Severity	Number of NonFatal Injuries	Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Report)
								V1	V2	V3	V4					
1	4972364	6/14/2021	2:11 PM	Daylight	Rain	Wet	2	N	E			Non-fatal Injury	1	Angled	Failure to Yield Right-of-Way	
2	5171566	11/2/2022	5:38 AM	Dawn	Clear	Dry	3	S	W	W		Property Damage Only	0	Rear-end	Excessive Speed	
3	5194615	12/29/2022	7:14 PM	Dark - Lighted	Clear	Dry	2	N	N			Non-fatal injury	1	Rear-end	Followed Too Closely	
4	5331501	12/6/2023	4:57 PM	Dark - Lighted	Clear	Dry	2	W	S			Non-fatal injury	1	Angled	Failure to Yield Right-of-Way	

Crash Data Summary Charts
 Concord Road @ Federal Street - Billerica, MA
 1/1/2019 - 12/31/2023

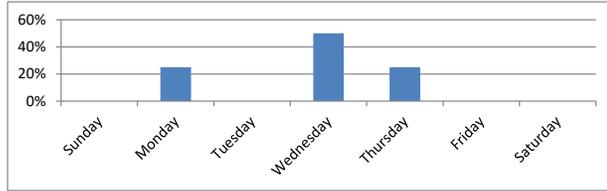
Concord Road @ Federal Street

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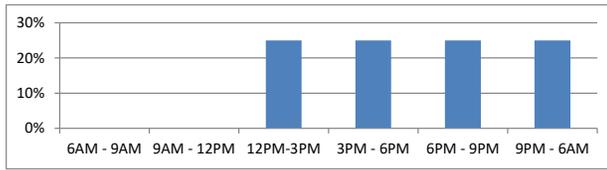
Month	#	%
January	0	0%
February	0	0%
March	0	0%
April	0	0%
May	0	0%
June	1	25%
July	0	0%
August	0	0%
September	0	0%
October	0	0%
November	1	25%
December	2	50%



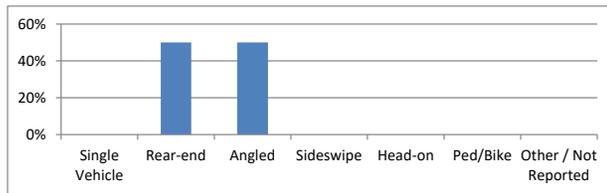
Day of Week	#	%
Sunday	0	0%
Monday	1	25%
Tuesday	0	0%
Wednesday	2	50%
Thursday	1	25%
Friday	0	0%
Saturday	0	0%



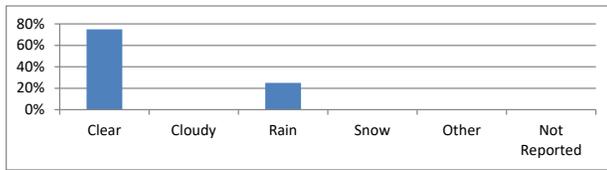
Time of Day	#	%
6AM - 9AM	0	0%
9AM - 12PM	0	0%
12PM-3PM	1	25%
3PM - 6PM	1	25%
6PM - 9PM	1	25%
9PM - 6AM	1	25%



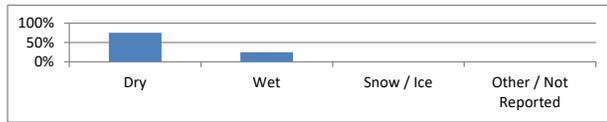
Manner of Collision	#	%
Single Vehicle	0	0%
Rear-end	2	50%
Angled	2	50%
Sideswipe	0	0%
Head-on	0	0%
Ped/Bike	0	0%
Other / Not Reported	0	0%



Weather Conditions	#	%
Clear	3	75%
Cloudy	0	0%
Rain	1	25%
Snow	0	0%
Other	0	0%
Not Reported	0	0%



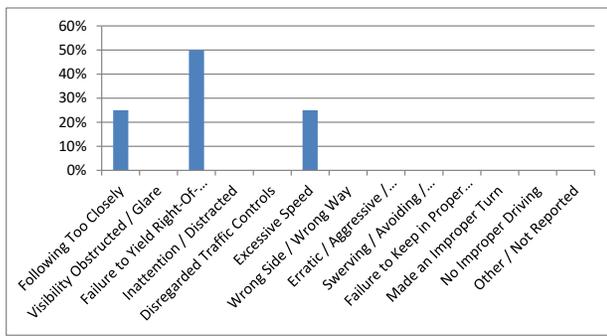
Road Surface	#	%
Dry	3	75%
Wet	1	25%
Snow / Ice	0	0%
Other / Not Reported	0	0%



Crash Severity	#	%
Property Damage Only	1	25%
Non-Fatal Injury	3	75%
Fatal Injury	0	0%
Not Reported	0	0%



Main Contributing Factor from Narrative	#	%
Following Too Closely	1	25%
Visibility Obstructed / Glare	0	0%
Failure to Yield Right-Of-Way	2	50%
Inattention / Distracted	0	0%
Disregarded Traffic Controls	0	0%
Excessive Speed	1	25%
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
 Concord Road @ Middlesex Turnpike - Billerica, MA
 1/1/2019 - 12/31/2023

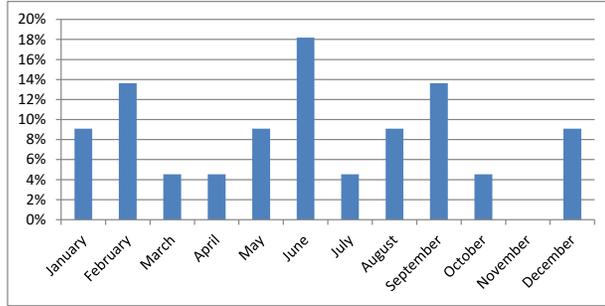
Collision Diagram	Crash Number	Crash Date	Crash Time	Ambient Light	Weather Condition	Road Surface	Number of Vehicles	Vehicle Travel Directions				Crash Severity	Number of NonFatal Injuries	Manner of Collision	Driver Contributing Codes	Detailed Narrative (from Crash Report)	
								V1	V2	V3	V4						
1	4665334	2/15/2019	1:29 PM	Daylight	Rain	Wet	2	W	W				Property Damage Only	0	Rear-end	Followed Too Closely	
2	4704369	5/18/2019	2:51 PM	Daylight	Clear	Dry	2	N	N				Property Damage Only	0	Rear-end	Excessive Speed	
3	4718928	6/28/2019	8:33 AM	Daylight	Clear	Dry	2	W	W				Property Damage Only	0	Rear-end	Followed Too Closely	
4	4731942	7/30/2019	11:55 PM	Dark - Lighted	Clear	Not Reported	2	W	W				Property Damage Only	0	Rear-end	Inattention / Distracted	
5	4733643	8/16/2019	10:20 AM	Daylight	Not Reported	Dry	2	S	E				Non-fatal Injury	2	Head-on	Failure to Yield Right-of-Way	
6	4752455	9/23/2019	7:55 AM	Daylight	Clear	Dry	2	E	W				Property Damage Only	0	Angled	Failure to Yield Right-of-Way	
7	4765170	10/22/2019	7:07 PM	Dark - Not Lighted	Rain	Wet	2	W	E				Property Damage Only	0	Sideswipe	Disregarded Traffic Controls	
8	4808924	1/25/2020	6:32 PM	Dark - Lighted	Rain	Wet	2	N	W				Property Damage Only	1	Head-on	Disregarded Traffic Controls	
9	4815038	2/8/2020	3:09 AM	Dark - Lighted	Cloudy	Dry	1	E					Non-fatal Injury	1	Not Reported	Failure to Keep in Proper Lane	
10	4828462	3/12/2020	6:33 PM	Daylight	Clear	Dry	2	E	W				Non-fatal Injury	0	Head-on	Not Reported	
11	4856392	6/30/2020	4:02 PM	Daylight	Clear	Dry	2	E	E				Property Damage Only	0	Rear-end	Erratic / Aggressive / Reckless Driving	
12	4935805	2/26/2021	4:26 PM	Daylight	Clear	Dry	2	E	E				Property Damage Only	0	Rear-end	Inattention / Distracted	
13	4948101	4/2/2021	6:54 PM	Daylight	Clear	Dry	2	S	S				Property Damage Only	0	Angled	Made an Improper Turn	
14	4973666	6/16/2021	5:04 PM	Daylight	Clear	Dry	2	N	N				Property Damage Only	1	Rear-end	Not Reported	
15	4998561	8/20/2021	8:38 AM	Daylight	Cloudy	Wet	2	S	E				Non-fatal Injury	0	Angled	Not Reported	
16	5013191	9/25/2021	3:54 PM	Daylight	Clear	Dry	2	W	E				Property Damage Only	0	Angled	Failure to Yield Right-of-Way	
17	5049686	12/22/2021	12:13 PM	Daylight	Rain	Dry	2	E	E				Property Damage Only	0	Rear-end	Inattention / Distracted	
18	5151674	9/15/2022	6:34 AM	Daylight	Clear	Dry	2	S	E				Property Damage Only	0	Sideswipe	No Improper Driving	
19	5185704	12/1/2022	2:04 PM	Daylight	Clear	Dry	2	E	E				Property Damage Only	0	Rear-end	Not Reported	
20	5195555	1/2/2023	7:35 PM	Dark - Lighted	Clear	Dry	2	W	E				Property Damage Only	0	Head-on	Not Reported	
21	5267088	5/31/2023	2:41 PM	Daylight	Clear	Dry	2	E	E				Non-fatal Injury	1	Rear-end	Inattention / Distracted	
22	5291343	6/24/2023	8:39 PM	Dusk	Cloudy	Dry	3	N	N	N			Property Damage Only	0	Rear-end	Inattention / Distracted	

Crash Data Summary Tables
 Concord Road @ Middlesex Turnpike - Billerica, MA
 1/1/2019 - 12/31/2023

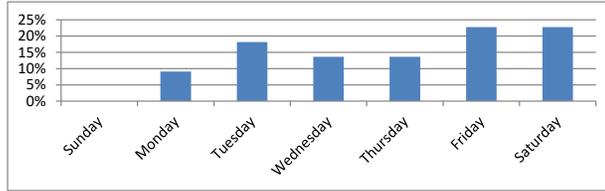
Concord Road @ Middlesex Turnpike

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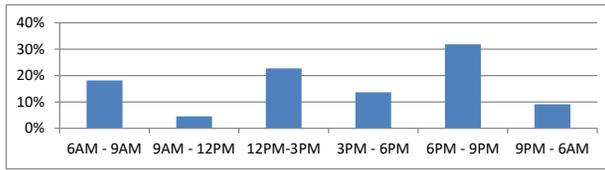
Month	#	%
January	2	9%
February	3	14%
March	1	5%
April	1	5%
May	2	9%
June	4	18%
July	1	5%
August	2	9%
September	3	14%
October	1	5%
November	0	0%
December	2	9%



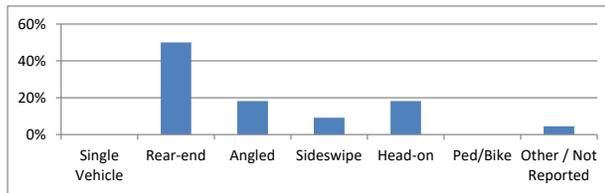
Day of Week	#	%
Sunday	0	0%
Monday	2	9%
Tuesday	4	18%
Wednesday	3	14%
Thursday	3	14%
Friday	5	23%
Saturday	5	23%



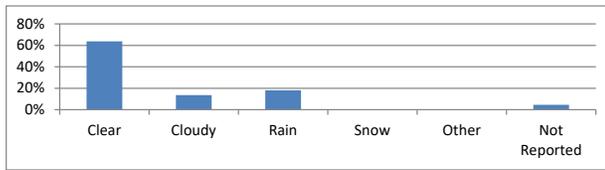
Time of Day	#	%
6AM - 9AM	4	18%
9AM - 12PM	1	5%
12PM-3PM	5	23%
3PM - 6PM	3	14%
6PM - 9PM	7	32%
9PM - 6AM	2	9%



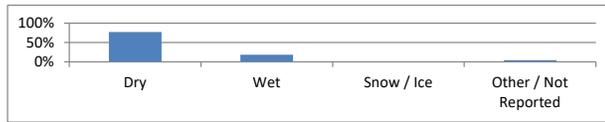
Manner of Collision	#	%
Single Vehicle	0	0%
Rear-end	11	50%
Angled	4	18%
Sideswipe	2	9%
Head-on	4	18%
Ped/Bike	0	0%
Other / Not Reported	1	5%



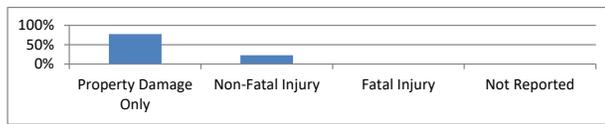
Weather Conditions	#	%
Clear	14	64%
Cloudy	3	14%
Rain	4	18%
Snow	0	0%
Other	0	0%
Not Reported	1	5%



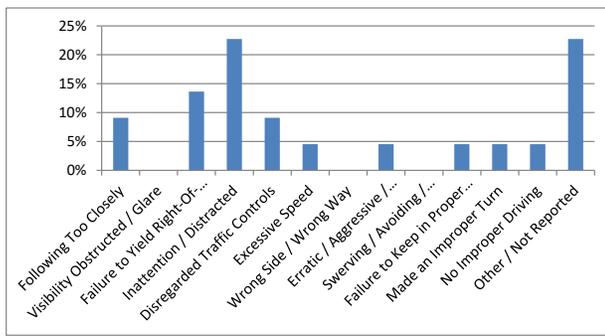
Road Surface	#	%
Dry	17	77%
Wet	4	18%
Snow / Ice	0	0%
Other / Not Reported	1	5%



Crash Severity	#	%
Property Damage Only	17	77%
Non-Fatal Injury	5	23%
Fatal Injury	0	0%
Not Reported	0	0%



Main Contributing Factor from Narrative	#	%
Following Too Closely	2	9%
Visibility Obstructed / Glare	0	0%
Failure to Yield Right-Of-Way	3	14%
Inattention / Distracted	5	23%
Disregarded Traffic Controls	2	9%
Excessive Speed	1	5%
Wrong Side / Wrong Way	0	0%
Erratic / Aggressive / Reckless Driving	1	5%
Swerving / Avoiding / Over-Steering / Over-Correcting	0	0%
Failure to Keep in Proper Lane	1	5%
Made an Improper Turn	1	5%
No Improper Driving	1	5%
Other / Not Reported	5	23%



Crash Number	Crash Date	Crash Severity	Crash Time	Driver Contributing Circumstances (All Drivers)	Manner of Collision	Vulnerable User Type (All Persons)	Road Surface Condition	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Latitude	Longitude
3432942	05/25/2013	Not Reported	4:15 PM	D1: (Distracted) / D2: (No improper driving)	Angle		Wet	V1: Travelling straight ahead / V2: Travelling straight ahead	V1: Not Reported / V2: Not Reported	42.5455131	-71.2825485
3452722	06/04/2013	Property damage only (none injured)	5:00 PM	D1: (Followed too closely) / D2: (No improper driving)	Rear-end		Dry	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic	V1: W / V2: W	42.5455131	-71.2825485
3604452	09/27/2013	Property damage only (none injured)	4:30 PM	D1: (Failed to yield right of way) / D2: (No improper driving)	Angle		Dry	V1: Turning left / V2: Travelling straight ahead	V1: N / V2: Not Reported	42.5455131	-71.2825485
3695531	10/25/2013	Property damage only (none injured)	7:08 PM	D1: (Failed to yield right of way) / D2: (No improper driving)	Angle		Dry	V1: Turning left / V2: Travelling straight ahead	V1: S / V2: W	42.5455131	-71.2825485
3787111	02/28/2014	Property damage only (none injured)	1:40 PM	D1: (No improper driving) / D2: (Inattention),(Other improper action)	Angle		Dry	V1: Travelling straight ahead / V2: Changing lanes	V1: W / V2: W	42.5455131	-71.2825485
3885541	07/15/2014	Property damage only (none injured)	6:45 PM	D1: (No improper driving) / D2: (Followed too closely)	Rear-end		Wet	V1: Travelling straight ahead / V2: Travelling straight ahead	V1: W / V2: W	42.5455131	-71.2825485
3887133	06/13/2014	Property damage only (none injured)	4:40 PM	D1: (Driving too fast for conditions) / D2: (No improper driving)	Angle		Wet	V1: Travelling straight ahead / V2: Entering traffic lane	V1: E / V2: N	42.5455131	-71.2825485
3963202	10/01/2014	Non-fatal injury	4:00 PM	D1: (No improper driving) / D2: (Followed too closely)	Rear-end		Wet	V1: Travelling straight ahead / V2: Travelling straight ahead	V1: E / V2: E	42.5455131	-71.2825485
4025698	01/14/2015	Not Reported	4:45 PM	D1: (Failed to yield right of way) / D2: (No improper driving)	Angle		Wet	V1: Turning left / V2: Travelling straight ahead	V1: W / V2: E	42.5455131	-71.2825485
4048644	03/11/2015	Property damage only (none injured)	4:50 PM	D1: ();(No improper driving) / D2: ();(No improper driving) / D3: ();(No improper driving)	Rear-end		Dry	V1: Slowing or stopped in traffic / V2: Travelling straight ahead / V3: Travelling straight ahead	V1: E / V2: E / V3: E	42.5455131	-71.2825485
4126792	10/14/2015	Non-fatal injury	4:31 PM	D1: (No improper driving) / D2: (Failed to yield right of way),(Exceeded to yield right of way)	Angle		Dry	V1: Turning left / V2: Travelling straight ahead	V1: N / V2: E	42.5455131	-71.2825485
4173618	01/27/2016	Property damage only (none injured)	6:05 PM	D1: (Inattention) / D2: (No improper driving)	Rear-end		Dry	V1: Travelling straight ahead / V2: Slowing or stopped in traffic	V1: E / V2: E	42.5455131	-71.2825485
4198187	05/09/2016	Property damage only (none injured)	3:48 PM	D1: (Failed to yield right of way),(Failure to keep in proper lane or running off road) / D2: (No improper driving)	Sideswipe, same direction		Dry	V1: Changing lanes / V2: Slowing or stopped in traffic	V1: E / V2: E	42.5455131	-71.2825485
4240750	08/25/2016	Property damage only (none injured)	8:45 AM	D1: (No improper driving) / D2: (Visibility obstructed)	Angle		Dry	V1: Travelling straight ahead / V2: Turning left	V1: Not Reported / V2: Not Reported	42.5455131	-71.2825485
4363777	05/10/2017	Non-fatal injury	5:21 PM	D1: (No improper driving) / D2: (Disregarded traffic signs, signals, road markings)	Head-on		Dry	V1: Turning left / V2: Travelling straight ahead	V1: W / V2: E	42.54550393	-71.28246331
4384262	06/20/2017	Property damage only (none injured)	6:45 AM	D1: (No improper driving) / D2: (No improper driving)	Angle		Wet	V1: Travelling straight ahead / V2: Turning left	V1: N / V2: W	42.5455131	-71.2825485
4439619	10/13/2017	Property damage only (none injured)	8:10 AM	D1: (No improper driving) / D2: (Made an improper turn),(Failed to yield right of way)	Sideswipe, same direction		Dry	V1: Travelling straight ahead / V2: Turning left	V1: W / V2: W	42.5455131	-71.2825485
4565303	07/16/2018	Non-fatal injury	9:51 AM	D1: (No improper driving) / D2: (Followed too closely),(No improper driving)	Rear-end		Dry	V1: Turning left / V2: Travelling straight ahead	V1: E / V2: E	42.54551014	-71.28254556
4628822	11/27/2018	Property damage only (none injured)	7:42 AM	D1: (No improper driving) / D2: (Failed to yield right of way),(Inattention)	Angle		Wet	V1: Travelling straight ahead / V2: Turning left	V1: S / V2: N	42.54551014	-71.28254556
4643084	12/14/2018	Property damage only (none injured)	6:20 PM	D1: (Disregarded traffic signs, signals, road markings),(Inattention) / D2: (No improper driving)	Angle		Dry	V1: Not reported / V2: Not reported	V1: Not Reported / V2: N	42.54551014	-71.28254556

Data Level: CRASH

Query Type: Spatial

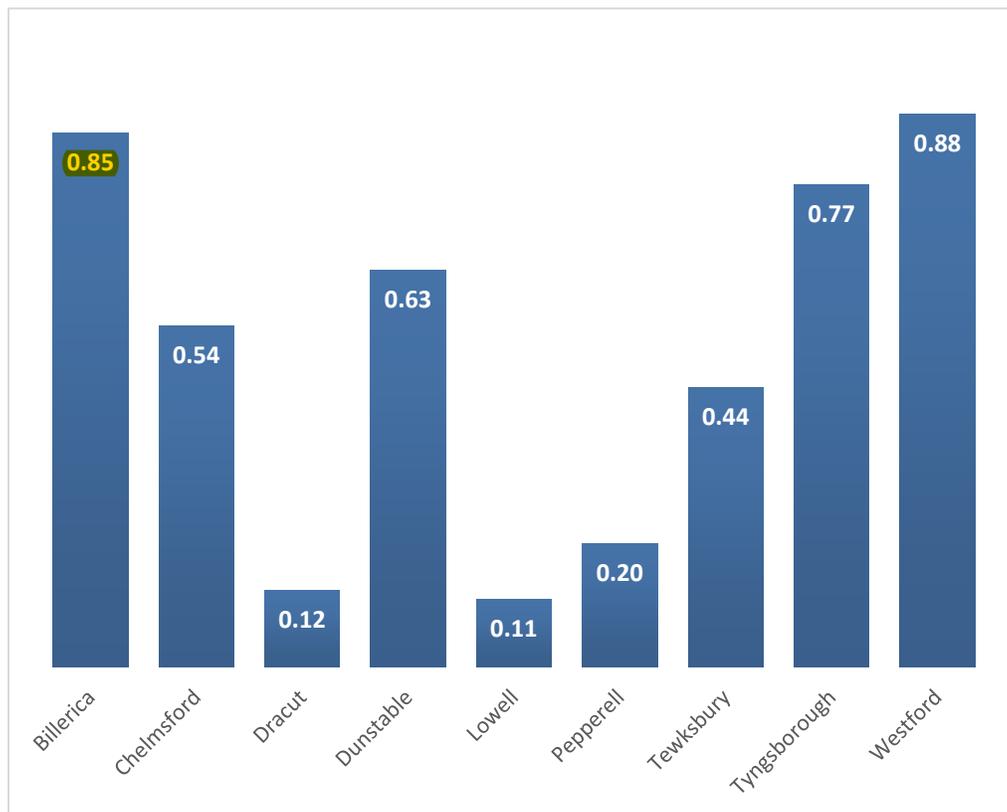
Criteria: If you conducted an Advanced Query your SQL statement will be listed here

Attachment F – NMCOG Annual Growth Information

2.3 TRAFFIC GROWTH IN THE NORTHERN MIDDLESEX REGION.

NMCOG's annual traffic counting program has compiled growth rate data at over 200 locations throughout the region since 2012. Documenting traffic growth rates for the region's communities is important in the determination of impacts from transportation improvements or new developments on the existing system. Growth rates are determined from NMCOG's regional traffic counting activities and used widely in traffic impact analyses. Determining accurate traffic growth rates is dependent upon the available data and the accuracy of the data collected. Average annual traffic volume growth rates have been calculated for locations where three or more counts have been performed since 2010. Figure 2-5 shows the average traffic volume growth rates for each community. Historical count data can be provided upon request.

FIGURE 2-5: AVERAGE ANNUAL TRAFFIC GROWTH RATES FOR NORTHERN MIDDLESEX COMMUNITIES 2012 – 2022.



Over the past decade, traffic growth in the region has been relatively constant, with the highest annual growth in traffic volume occurring in Billerica, Westford, and Tyngsborough. In 2022 the highest annual growth in traffic volume occurred in Tewksbury, Chelmsford, and Billerica. The Town of Lowell has the lowest average growth rate in the region with Dracut and Pepperell close behind. The City of Lowell has recently undertaken large-scale improvements to its existing transportation infrastructure such as redesigning the Lord Overpass to be an at-grade multi-modal boulevard, as well as improvements to bridges over the canal system and Merrimack River. In upcoming years, the Rourke Bridge will be replaced, likely having a great impact on regional circulation. Map 2.1 shows traffic growth rates for selected locations throughout the Northern Middlesex region. Traffic growth trends have been compiled for all U.S. and State numbered routes and is reported as part of the regional traffic count database (Tables 2-6 through 2-14).

Attachment G – Specific Developments by Others, Roadway Infrastructure Projects, & Reoccupancy of Federal Street

Specific Development by Others

300 Concord Road

May 14, 2021

Zachary Richards, P.E.
Bohler Engineering
45 Franklin Street, 5th Floor
Boston, MA 02110

RE: **Traffic Assessment**
300 Concord Road – Proposed Lab
McMahon Project No. Y21303.11

McMahon Associates has completed a traffic assessment for the proposed lab to be located at 300 Concord Road within the Concord Road Corporate Center in Billerica, MA, as shown in Figure 1 below. The Concord Road Corporate Center currently consists of three office buildings at 296, 298, and 300 Concord Road totaling 353,708 square feet. 1,241 parking spaces are provided within the Concord Road Corporate Center. Under the proposed redevelopment, a two-story lab building totaling 151,700 square feet of lab space would be constructed on a portion of the existing parking lot. Access to the site would continue to be provided via the existing driveway located on Concord Road and via Old Concord Road. The proposed project would provide a total of 778 parking spaces for the proposed lab space and existing office space on the project site. Under current (Spring 2021) conditions, approximately 52 percent (183,928 square feet) of the office space within the Concord Road Corporate Center is occupied, and approximately 48 percent (169,780 square feet) of the office space is vacant. If needed, 186 additional parking spaces could be constructed in a future phase of the project to accommodate future parking demand; however, to avoid unnecessary impervious surface, the area identified for additional parking is proposed to remain landscaped under this phase of the development.

Figure 1: Site Location Map



Existing Conditions

Concord Road is classified as an urban minor arterial under Town of Billerica jurisdiction. Concord Road runs in the north-south direction through the Town of Billerica and generally provides one approximately 12-foot travel lane with an approximately three-foot shoulder in each direction. A speed limit of 35 miles per hour is posted along Concord Road in the vicinity of the site.

Historic Automatic Traffic Recorder (ATR) counts conducted in October and November of 2017 indicate an average daily traffic of approximately 7,400 vehicles per day along Concord Road at a location just north of the Bedford town line. ATR volumes on Concord Road in closer proximity to the site would be expected to be higher than those at the Bedford town line. ATR data taken from the Bedford town line in September of 2020 indicated an 85th percentile vehicle speed of 44 miles per hour in the northbound direction and 43 miles per hour in the southbound direction on Concord Road.

Crash Data Summary

Crash data at the unsignalized intersection of the site driveway at Concord Road, and the signalized intersection of Old Concord Road at Concord Road, was obtained from MassDOT for the most recent five-year period available. This includes crash data from 2014 through 2018 which is presented in the summary attached to this assessment. The unsignalized intersection of the site driveway at Concord Road was shown to experience a total of two crashes during the five-year period analyzed. One of the two crashes resulted in personal injury, and the other resulted in property damage only. The signalized intersection of Old Concord Road at Concord Road experienced eleven crashes in the period from 2014 through 2018. Of the eleven crashes recorded, one was an angle collision, seven were rear-end collision, two were sideswipe collisions, and one was unreported. Two of the crashes resulted in personal injury while nine of the crashes resulted in property damage only. The two analyzed intersections on Concord Road have not been identified as a Highway Safety Improvement Program (HSIP) priority intersection.

Project Site Generated Trips

As part of this assessment, a comparison of proposed project trip generation and the office space proposed to be left vacant was evaluated. The trip generation review focused on the weekday morning and weekday afternoon peak hour periods when the combination of adjacent roadway volumes and potential traffic increases associated with the redevelopment would be greatest. To establish the trip generation of the project, the Institute of Transportation Engineers (ITE) publication, *Trip Generation Manual, 10th Edition* was used as a reference. ITE is a national research organization of transportation professionals and their publication provides traffic generation information for various land uses compiled from studies conducted by members nationwide.

Vehicle trip generation for the proposed lab was calculated based on data published for ITE Land Use Code 760 (Research and Development Center). Vehicle trip rates were established in trips per square foot, and the resulting proposed project site trips are presented in Table 1 below.

Table 1: Proposed Trip Generation Summary

Description	Size	Weekday AM Peak Hour			Weekday PM Peak Hour		
		In	Out	Total	In	Out	Total
Proposed Lab ¹	151,270 sf	48	16	64	11	63	74

1 ITE Land Use Code 760 (Research and Development Center), based on 151,270 square feet.

As shown in Table 1, the proposed laboratory development is estimated to generate approximately 64 additional vehicle trips (48 entering vehicles and 16 exiting vehicles) during the weekday morning peak hour, and approximately 74 additional vehicle trips (11 entering vehicles and 63 exiting vehicles) during the weekday afternoon peak hour.

The vehicle trip generation for the existing office space was calculated using Land Use Code 710 (General Office Building). As noted above, approximately 48 percent (169,780 square feet) of the office space within the Concord Road Corporate Center is currently vacant, resulting in a total of approximately 183,928 square feet of active office space. Table 2, below, compares the estimated trip generation for the fully occupied existing office space with the estimated trip generation associated with the occupied office space. Table 3 summarizes the net change in total site trips with the addition of the proposed lab, considering approximately 48 percent of the existing office space is vacant.

Table 2: Office Space Trip Generation

Description	Size	Weekday AM Peak Hour			Weekday PM Peak Hour		
		In	Out	Total	In	Out	Total
Total Office Trips ¹	353,708 sf	309	50	359	60	318	378
- Occupied Office ²	183,928 sf	172	28	200	32	171	203
Credit for Vacant Office Space		137	22	159	28	147	175

1 ITE Land Use Code 710 (General Office Building), based on 353,708 square feet.

2 ITE Land Use Code 710 (General Office Building), based on 183,928 square feet.

As shown in Table 2, with approximately 48 percent of the existing office space vacant there is a theoretical reduction in the number of vehicles traveling to and from the project site of approximately 159 vehicle trips (137 entering vehicles and 22 exiting vehicles) during the weekday morning peak hour, and a reduction of approximately 175 vehicle trips (28 entering vehicles and 147 exiting vehicles) during the weekday afternoon peak hour.

Table 3: Net Change in Site Trips with Proposed Lab and Vacant Office Space

Description	Weekday AM Peak Hour			Weekday PM Peak Hour		
	In	Out	Total	In	Out	Total
Proposed Lab Trips ¹	48	16	64	11	63	74
- Credit for Vacant Office Space ²	137	22	159	28	147	175
Net Change in Site Generated Trips	-89	-6	-95	-17	-84	-101

1 From Table 1

2 From Table 2

As shown in Table 3, the total Concord Road Corporate Center site, with the proposed lab development and considering 48 percent of the existing office space is vacant, is estimated to generate approximately 95 fewer vehicle trips (89 fewer entering vehicles and six fewer exiting vehicles) during the weekday morning peak hour, and approximately 101 fewer vehicle trips (17 fewer entering vehicles and 84 fewer exiting vehicles) during the weekday afternoon peak hour compared with the office space being full occupied.

Site-Generated Parking Demand

Under proposed conditions, the final Concord Road Corporate Center configuration would provide 964 parking spaces, including 33 accessible spaces. In order to determine the projected opening day parking demand for the proposed lab and office space, parking generation data from the ITE publication, *Parking Generation Manual, 5th Edition* was referenced. The *Parking Generation Manual* provides parking generation information for various land uses compiled from studies conducted by members nationwide. The parking demand analysis considers that 48 percent (169,780 square feet) of office space is vacant, resulting in a total 183,928 square feet of occupied office space in addition to the proposed 151,270 square foot lab development. Weekday parking demand estimates for the proposed lab and office space were developed based on data presented in this publication for Land Use Codes 110 (General Light Industrial) and 710 (General Office Building), and are presented in Table 4 below.

Table 4: Parking Demand Summary

Description	Size	Weekday Peak Parking Demand
Proposed Lab Development	151,270 sf	98
<u>Office Space</u>	<u>183,928 sf</u>	<u>440</u>
Total Estimated Parking Demand		538

1 ITE Land Use Code 110 (General Light Industrial), based on 151,270 square feet.

2 ITE Land Use Code 710 (General Office Building), based on 183,928 square feet.

As shown in Table 4, the proposed lab and currently occupied office space are projected to generate an average peak parking demand of approximately 538 vehicles. The estimated peak parking utilization for Concord Road Corporate Center with the proposed lab and occupied office space is presented in Table 5 below.

Table 5: Parking Utilization Summary

Estimated Peak Parking Demand	538
<u>Proposed Parking Supply</u>	<u>778</u>
Estimated Peak Parking Utilization	69%

With a total of 778 parking spaces proposed in the Concord Road Corporate Center configuration with the lab project constructed, the estimated weekday peak parking demand would be approximately 69%, as shown in Table 5.

As noted above, 186 additional spaces could be constructed in a future phase of the project to accommodate future parking demand, for a total of 964 parking spaces. As these spaces are not projected to be needed under the currently proposed development, the area identified for additional parking is proposed to remain landscaped under this phase of the development to avoid the unnecessary addition of impervious surface.

Site Access & Circulation

The site would continue to be accessed via the existing driveway on Concord Road as well as via Old Concord Road. Internal circulation roadways within the Concord Road Corporate Center are not anticipated to change significantly from existing conditions, outside of the location of the proposed lab space building.

As a part of the proposed project, new parking spaces would be added to the Concord Road Corporate Center, immediately adjacent to the proposed lab facility as shown on the Site Development Plans prepared by Bohler Engineering. Should the project site need additional parking in the future, 186 additional parking spaces could be constructed in a future phase of the project to accommodate future parking demand. The additional parking spaces would be constructed in a new parking lot adjacent to Concord Road.

Sight Distance

A review of the available sight distance was conducted at the existing driveway on Concord Road. The American Association of State Highway and Transportation Officials (AASHTO) publication, *A Policy on Geometric Design, 2018 Edition*, defines minimum and recommended sight distances at intersections. The minimum sight distance is based on the required Stopping Sight Distance (SSD) for vehicles traveling along the main road. According to AASHTO, “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 time to anticipate and avoid collisions.”

The posted speed limit along Concord Road in the site vicinity is 35 miles per hour. In order to provide a conservative assessment of the required sight distance, the measured 85th percentile speed of 44 miles per hour in the northbound direction and 43 miles per hour in the southbound direction were used which may be different than those at the site driveway. Table 6 below summarizes the AASHTO sight distance standards for the 85th percentile speeds and the measured sight distances available at the site driveway location on Concord Road.

Table 6: Sight Distance Requirements

Location	Looking	Speed Limit (mph)	85th % Speed (mph)	SSD ¹ Required	Sight Distance Measured	Meets Required SSD?
Site Driveway at	Left (South)	35	44	335	350	Yes
Concord Road	Right (North)	35	43	340	350	Yes

1 Stopping sight distance (see AASHTO equations 3-2 and 3-3) for the 85th percentile speeds.

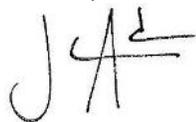
2 Intersection sight distance (see AASHTO equations 9-1 and 9-2) for the 85th percentile speeds.

As shown in Table 6, the available sight distance for a vehicle exiting the site driveway was measured to be approximately 350 feet looking both left (south) and right (north) along Concord Road which exceeds the minimum stopping sight distance for 85th percentile speeds on the roadway. The available stopping sight distance at the existing site driveway along Concord Road is greater than 550 feet approaching the driveway from the south and from the north, which exceeds the AASHTO required stopping sight distances for an 85th percentile speed of 44 miles per hour in the northbound direction and 43 miles per hour in the southbound direction.

Based on the above assessment, it is anticipated that with the proposed lab development and the current vacancy rate of Concord Road Corporate Center, the project site would generate fewer vehicle trips within the surrounding roadway network during the weekday morning and weekday afternoon peak hour periods than when the office space is fully occupied. With the site access locations proposed to remain the same, it is not expected that the proposed project would result in any significant impact on the operations of the surrounding roadway vicinity. The project site is shown to provide enough parking spaces to accommodate the expected demands of the proposed lab and the currently occupied office space.

Please do not hesitate to contact me with any questions you may have.

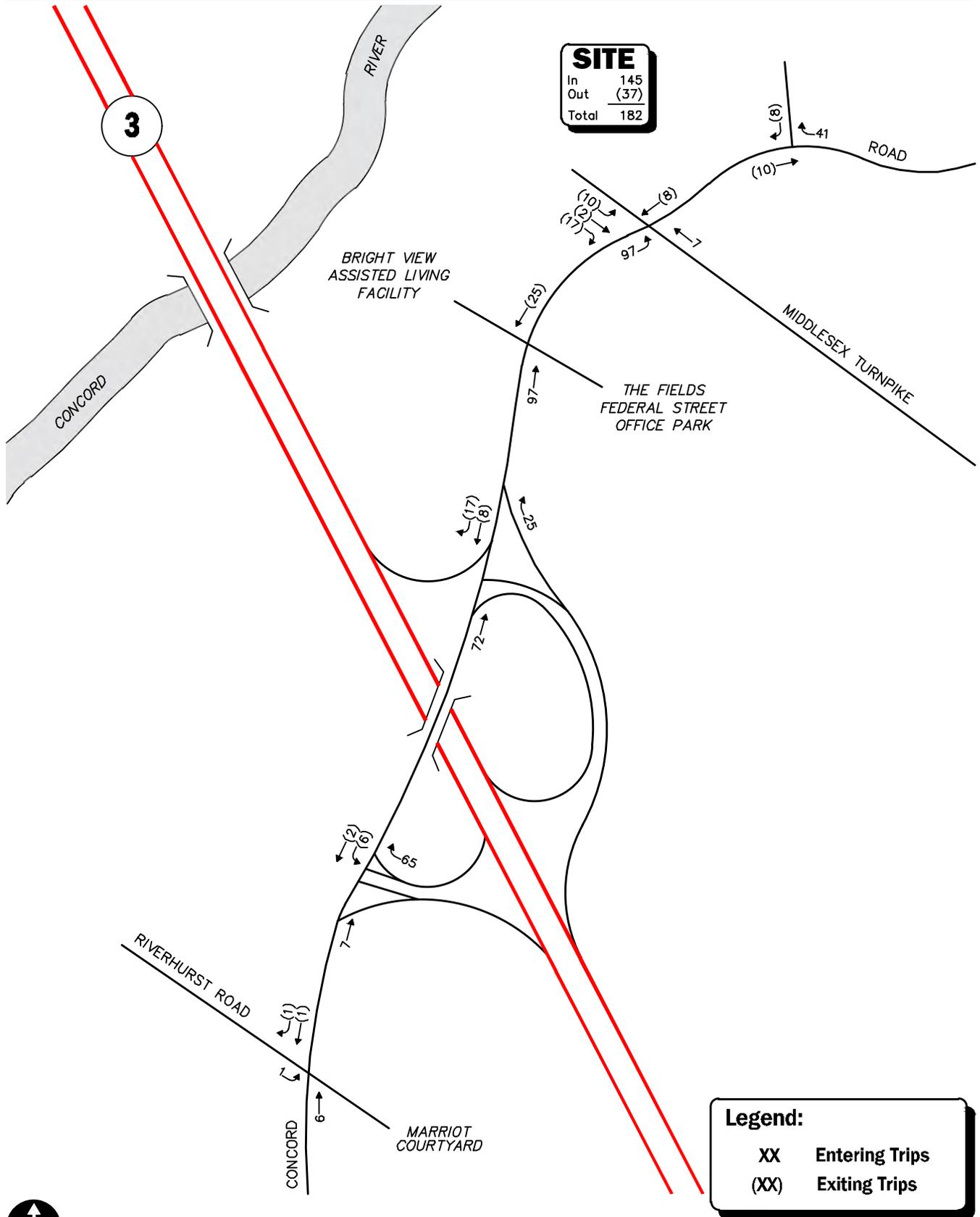
Sincerely,

A handwritten signature in black ink, consisting of the letters 'J' and 'A' in a stylized, cursive font. The 'J' is on the left and the 'A' is on the right, with a horizontal line extending from the top of the 'A' to the right.

Jason Adams, P.E., PTOE
Associate

Specific Development by Others

161 Concord Road

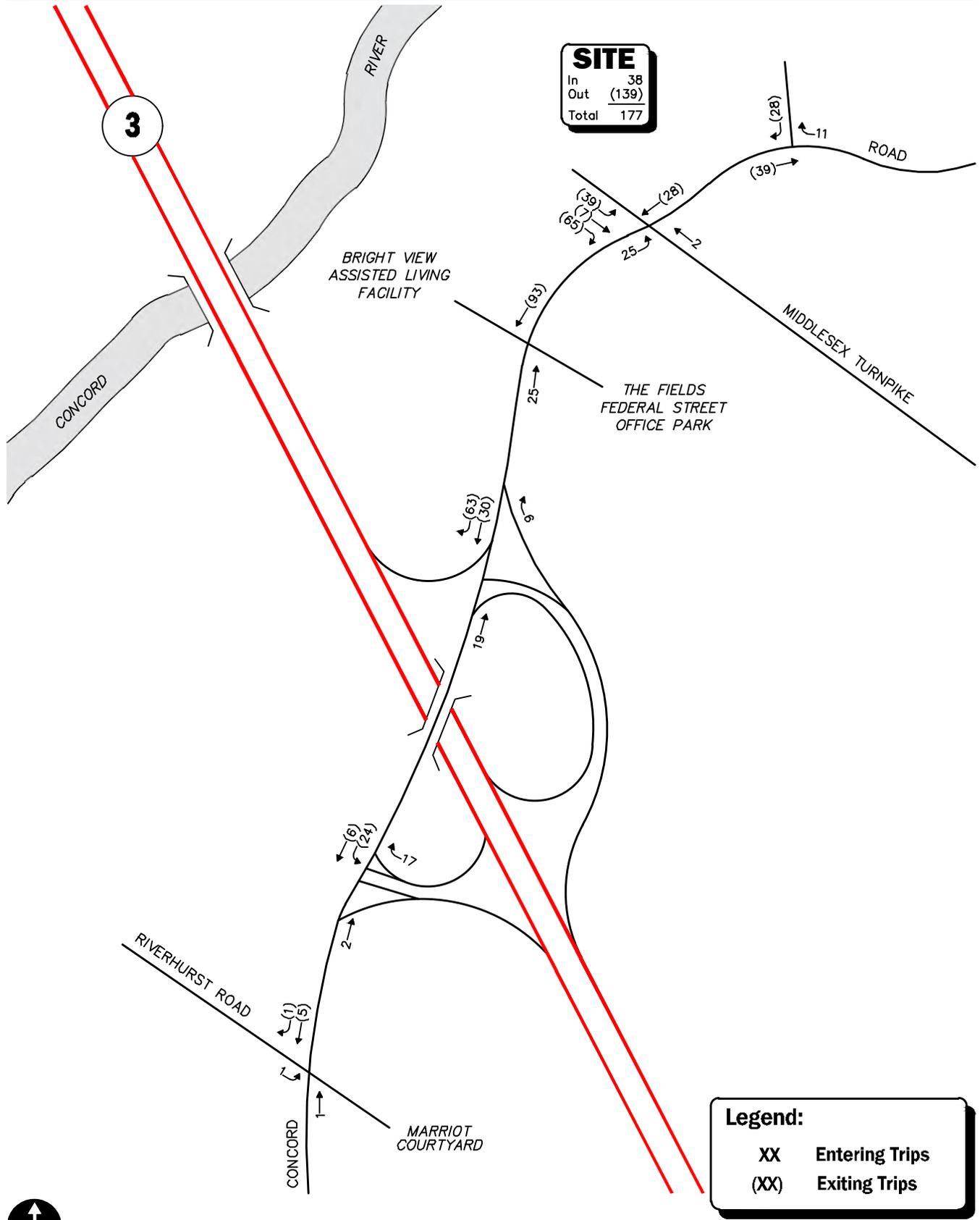


Not To Scale

Figure 8
 Project-Generated
 Weekday Morning
 Peak-Hour Traffic Volumes



R:\9276\9276NT1.dwg, 4/26/2022 9:12:16 AM



Not To Scale

Figure 9
 Project-Generated
 Weekday Evening
 Peak-Hour Traffic Volumes



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- The Project site driveways and internal circulating drives should be designed to accommodate the turning and maneuvering requirements of the largest anticipated responding emergency vehicle, with the primary Project site driveway to accommodate large tractor semi-trailer combinations (WB-67 design vehicle).
- Where perpendicular parking is proposed within the employee parking areas, the drive aisle behind the parking will be a minimum of 23 feet in order to facilitate parking maneuvers.
- All signs and pavement markings to be installed within the Project site will conform to the applicable standards of the *Manual on Uniform Traffic Control Devices* (MUTCD).¹¹
- Americans with Disabilities Act (ADA)-compliant wheelchair ramps will be provided at pedestrian crossings that are to be constructed or modified in conjunction with the Project.
- A pedestrian connection will be constructed as a part of the Project that will link the proposed building to the existing sidewalk along the west side of Concord Road.
- Signs and landscaping to be installed as a part of the Project within the intersection sight triangle areas of the Project site driveways will be designed and maintained so as not to restrict lines of sight.
- Existing trees and vegetation located along the west side of Concord Road north of the primary (west) Project site driveway within the sight triangle area should be selectively trimmed or removed and maintained.
- Snow accumulation (windrows) within sight triangle areas of the Project site driveways will be promptly removed where such accumulations would impede sight lines.

Off-Site

Concord Road at Middlesex Turnpike and the Project Site Driveway

As a follow-up to the initial activation and integration of the Project site driveway into the traffic signal system at the Concord Road/Middlesex Turnpike intersection, the traffic signal timing and phasing will be adjusted prior to the issuance of a Certificate of Occupancy for the Project. These improvements will be completed by the Project proponent subject to receipt of all necessary rights, permits and approvals.

Concord Road at Federal Street and the Brightview Concord River Driveway

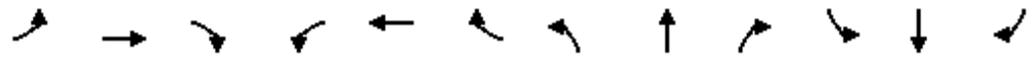
Project-related impacts at the intersection of Concord Road at Federal Street and the driveway to the Brightview Concord River Senior Assisted Living & Memory Care facility was generally defined as an increase in average motorist delay that resulted in a corresponding increase in vehicle queuing of up to one (1) vehicle. In order to manage the flow of traffic entering and exiting Federal Street and the Brightview Concord River driveway, the existing police detail officer control of the intersection during the weekday peak hours should be continued independent of the Project.

¹¹Ibid 2.

2029 Build Weekday Morning

1: Concord Road & West Project Driveway/Middlesex Turnpike

04/25/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	2	17	280	7	71	97	369	549	279	915	0
Future Volume (vph)	10	2	17	280	7	71	97	369	549	279	915	0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.865			0.939			0.910				
Flt Protected	0.950			0.950	0.973		0.950			0.950		
Satd. Flow (prot)	1770	1611	0	1681	1610	0	1711	3189	0	1728	3574	0
Flt Permitted	0.950			0.950	0.000		0.950			0.950		
Satd. Flow (perm)	1770	1611	0	1681	0	0	1711	3189	0	1728	3574	0
Satd. Flow (RTOR)		18			31			367				
Adj. Flow (vph)	11	2	18	326	8	83	105	405	603	340	1116	0
Lane Group Flow (vph)	11	20	0	212	205	0	105	1008	0	340	1116	0
Turn Type	Prot	NA										
Protected Phases	8	4		3	7		5	2		1	6	
Permitted Phases												
Detector Phase	8	4		3	7		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Total Split (s)	15.0	11.0		15.0	11.0		11.0	21.0		21.0	31.0	
Total Split (%)	16.7%	12.2%		16.7%	12.2%		12.2%	23.3%		23.3%	34.4%	
Maximum Green (s)	9.0	5.0		9.0	5.0		5.0	15.0		15.0	25.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0		-2.0	-2.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes										
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None										
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
v/c Ratio	0.04	0.10		0.68	0.63		0.52	0.85		0.68	0.68	
Control Delay	23.3	15.3		37.1	30.6		36.7	22.3		28.8	16.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	23.3	15.3		37.1	30.6		36.7	22.3		28.8	16.0	
Queue Length 50th (ft)	3	1		70	56		34	104		100	142	
Queue Length 95th (ft)	17	19		#183	#170		#104	#267		#217	244	
Internal Link Dist (ft)		493			550			574			627	
Turn Bay Length (ft)	100			195			85			220		
Base Capacity (vph)	330	207		313	325		203	1181		498	1637	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.03	0.10		0.68	0.63		0.52	0.85		0.68	0.68	

Intersection Summary

Cycle Length: 90

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	24%
Maximum Green (s)	20.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

Actuated Cycle Length: 59.2

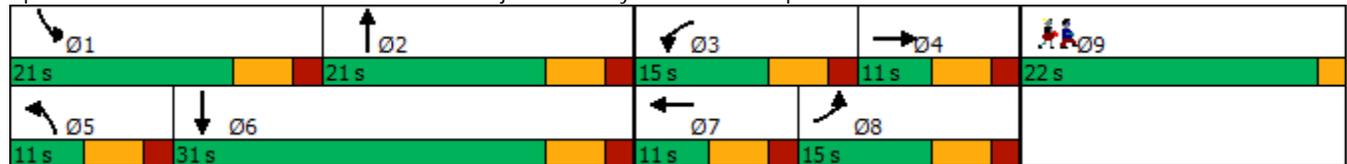
Natural Cycle: 90

Control Type: Actuated-Uncoordinated

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

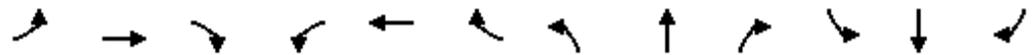
Splits and Phases: 1: Concord Road & West Project Driveway/Middlesex Turnpike



2029 Build Weekday Evening

1: Concord Road & West Project Driveway/Middlesex Turnpike

04/25/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↔		↖	↕		↖	↕	
Traffic Volume (vph)	39	7	65	734	2	245	25	896	268	123	526	0
Future Volume (vph)	39	7	65	734	2	245	25	896	268	123	526	0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.865			0.922			0.965				
Flt Protected	0.950			0.950	0.977		0.950			0.950		
Satd. Flow (prot)	1770	1611	0	1698	1610	0	1711	3441	0	1728	3574	0
Flt Permitted	0.950			0.950	0.000		0.950			0.950		
Satd. Flow (perm)	1770	1611	0	1698	0	0	1711	3441	0	1728	3574	0
Satd. Flow (RTOR)		71			36			29				
Adj. Flow (vph)	42	8	71	781	2	261	27	1042	312	138	591	0
Lane Group Flow (vph)	42	79	0	539	505	0	27	1354	0	138	591	0
Turn Type	Prot	NA										
Protected Phases	8	4		3	7		5	2		1	6	
Permitted Phases												
Detector Phase	8	4		3	7		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		11.0	22.5		11.0	22.5	
Total Split (s)	46.0	11.0		46.0	11.0		11.0	58.0		13.0	60.0	
Total Split (%)	30.7%	7.3%		30.7%	7.3%		7.3%	38.7%		8.7%	40.0%	
Maximum Green (s)	40.0	5.0		40.0	5.0		5.0	52.0		7.0	54.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0		-2.0	-2.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes										
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None										
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
v/c Ratio	0.11	0.51		0.97	0.91		0.29	0.92		1.14	0.35	
Control Delay	33.6	27.8		73.6	61.1		66.4	45.7		176.5	22.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	33.6	27.8		73.6	61.1		66.4	45.7		176.5	22.9	
Queue Length 50th (ft)	24	6		462	397		22	542		-133	170	
Queue Length 95th (ft)	52	58		#706	#623		54	602		#264	215	
Internal Link Dist (ft)		493			550			574			508	
Turn Bay Length (ft)	100			195			85			220		
Base Capacity (vph)	580	155		557	552		93	1468		121	1686	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.07	0.51		0.97	0.91		0.29	0.92		1.14	0.35	

Intersection Summary

Cycle Length: 150

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	15%
Maximum Green (s)	20.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	0
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

2029 Build Weekday Evening

1: Concord Road & West Project Driveway/Middlesex Turnpike

04/25/2022

Actuated Cycle Length: 128

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

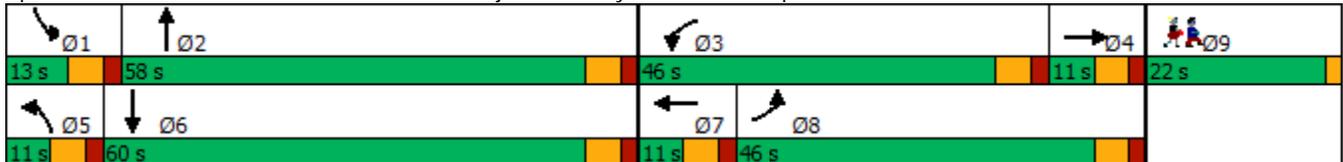
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Concord Road & West Project Driveway/Middlesex Turnpike





BILLERICA PLANNING BOARD

Town Hall

365 Boston Road Billerica, MA 01821

978-671-0962

978-670-9448 Fax

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TOWN CLERK
BILLERICA

Marlies Henderson, Chair

Janet Morris, Vice Chair

Chris Tribou

Ed Giroux

Pat Flemming, Secretary

Blake Robertson

Michael Parker

CERTIFICATE OF DECISION SITE PLAN SPECIAL PERMIT 0 & 161 CONCORD ROAD, BILLERICA, MA

APPLICANT

Berkeley Concord Rd, Owner, LLC
Berkeley Investments, Inc.
125 High Street, Suite 531
Boston, MA 02110

PERMIT SOUGHT

The applicant seeks a Site Plan Special Permit from the Billerica Planning Board pursuant to Section 6 of the Zoning By-Laws to construct a building totaling approximately 203,165 square feet to be utilized as a Current Good Manufacturing Practice (cGMP) facility. The building is in the Industrial Zoning District and located at 0 and 161 Concord Road, Billerica, MA. This decision applies to the Site Plan entitled "Proposed Site Plan Documents for Berkeley, Proposed cGMP Lab Building", prepared by Bohler, 45 Franklin Street, 5th Floor, Boston, MA 02110, consisting of sheets C-101, C-102, C-301, C-302, C-303, C-401, C-402, C-403, C-501, C-502, C-601, C-602, L-100, L-101, L-200, L-201, L-300, C-801, C-901, C-902, and C-903, dated May 11, 2022, as amended.

PROCEDURE

A virtual public hearing was advertised for June 13, 2022. Advertisements appeared in the Lowell Sun on May 26, 2022 and June 3, 2022. A notice of the hearing was posted on the Town website prior to the hearing. Notices were sent to interested parties as specified in General Laws, Chapter 40A, Section 11, in accordance with certification from the Assessor's Office setting forth the names and addresses of such parties. Notices were also sent to the Planning Boards of abutting towns.

The hearing was opened on June 13, 2022 and was continued to July 11, 2022. The public hearing was closed on July 11, 2022.

MATERIALS

1. Form S Special Permit Application and associated materials dated May 12, 2022.
2. Site Plan entitled “ Proposed Site Plan Documents for Berkeley, Proposed cGMP Lab Building”, prepared by Bohler Engineering, 45 Franklin Street, 5th Floor, Boston, MA 02110, consisting of sheets C-101, C-102, C-301, C-302, C-303, C-401, C-402, C-403, C-501, C-502, C-601, C-602, L-100, L-101, L-200, L-201, L-300, C-801, C-901, C-902, and C-903, dated May 11, 2022.
3. Drainage Report prepared by Bohler Engineering dated May 11, 2022.
4. Fire Truck Turns Plan by Bohler Engineering dated May 11, 2022.
5. Transportation Impact Assessment by Vanasse & Associates inc dated May 2022.
6. Existing Conditions Survey by Feldman Geospatial, dated March 31, 2022.
7. Peer Review Memos prepared by Beta Group Inc. and dated May 18, 2022, June 7, 2022 and June 7, 2022.
8. Police Department Comments dated May 16, 2022.
9. Fire Department Comments dated May 31, 2022.
10. DPW Engineering Division Comments dated June 1, 2022.
11. Board of Health Comments dated June 7, 2022.
12. Response to Conservation Commission prepared by Lucas Environmental, LLC dated June 30, 2022.
13. Response to peer review comments prepared by Bohler Engineering and dated July 6, 2022, to include
 - a. Site Plan Documents dated May 11, 2022 and revised through July 6, 2022.
 - b. Response to Traffic Assessment Review by Vanasse & Associates, Inc, dated July 6, 2022.

PLANNING BOARD FINDINGS

The Planning Board finds that if the conditions included herein are met, the Site Plan and associated application documents meet the requirements of Section 5 and 6 of the Zoning By-Law for the following reasons:

1. The use is not detrimental to the area in which it is located.

2. Vehicular and pedestrian movements and volumes anticipated from the proposed building can be accommodated by the adjacent roads. The increase in vehicular and pedestrian movements and volumes will not have a detrimental impact on the area. The nearby roads have the capacity to accommodate the additional traffic generated by this project.
3. The plans are adequate to address sewage, refuse, and waste disposal methods as reflected in the various Town department comments.
4. The siting of the facility and its location within an existing industrially developed area helps to prevent incompatibility of uses.
5. Ingress and egress to and from the site, site circulation and provision for loading and unloading of vehicles are adequate.
6. Lighting will be shielded from adjacent properties.
7. The proposed landscaping and existing woodland act to buffer the site from adjacent uses, and green strips for the site and the proposed building are found to be sufficient and/or waived by the Board pursuant to Section 7.G.7 of the Zoning By-Laws.
8. The use will not result in any odors, fumes, noise, vibrations, chemical spills, or hazardous wastes
9. The plans do not show that unreasonable demands will be placed on Town services and infrastructure.
10. The proposed use is not located in any known historical area
11. The parking proposed on the site for the proposed use is acceptable.

VOTE

At their regularly scheduled meeting on July 11, 2022, the Planning Board voted with seven (7) in favor, none (0) opposed, and none (0) absent to approve the site plan special permit (Section 5.B.5) with conditions as amended.

In addition, the Planning Board voted with seven (7) in favor, none (0) opposed, and none (0) absent to waive the following:

1. Building Perimeter Green Strips (Section 7.G.5): The provisions of this section may be reduced or waived as part of and in conjunction with the Site Plan Special Permit Process described under Section 6 (Section 7.G.7). The Planning Board finds that waiving the Building Perimeter Green Strips requirements does not effectively detract from the enhancement of the natural, scenic and aesthetic qualities of the development.
2. Lot Perimeter Green Strips (Section 7.G.4): The provisions of this section may be reduced or waived as part of and in conjunction with the Site Plan Special Permit Process described

under Section 6 (Section 7.G.7). The Planning Board finds that waiving the Lot Perimeter Green Strips requirements does not detract from the enhancement of the natural, scenic and aesthetic qualities of the development.

STANDARD CONDITIONS

1. This Site Plan Special Permit shall not take effect until a copy of this Decision has been recorded at the Registry of Deeds within 90 days of filing of this decision with the Town Clerk. The copy of this decision shall bear the certification of the Town Clerk that 20 days have elapsed after the decision has been filed in the Office of the Town Clerk and no appeal has been filed, or if filed, such appeal has been dismissed or otherwise resolved.
2. Per Section 13 of the Zoning By-Laws this Special Permit shall lapse if a substantial use or construction thereunder has not begun, except for good cause, within two (2) years of the filing of this decision with the Town Clerk (plus any time required to pursue or await the determination of an appeal). The Planning Board may, upon request of the applicant citing good cause, grant such extensions of time, each no longer than one (1) year, as it shall deem necessary to carry the use into effect.
3. Per Section 6 of the Zoning By-Laws, this Site Plan Special Permit is not valid until the project complies with all Board of Health Rules and Regulations.
4. The applicant shall arrange for a pre-construction meeting at its own expense with the Town's Fire, Police, Engineering, Planning, Board of Health and Building officials to review permit requirements.
5. Per Section 16(b)(1) of the Zoning By-Laws, all construction and installation shall in all respects conform to the Zoning By-Laws unless otherwise granted relief by the Board of Appeals or by the Planning Board. Failure to comply with all conditions herein shall be deemed cause to revoke or modify this approval. All improvements shall be constructed in accordance with the approved site plan and all conditions herein.
6. Per Section 1.C.16 of the Zoning By-Laws, construction management and site control shall include the following:
 - a. Construction related dust, dirt, and debris shall be controlled on-site. Any off-site impact shall be mitigated fully the day on which it is documented.
 - b. The applicant shall provide the name and phone number of the Facilities Manager to be contacted by the abutters in case of any problems occur during construction.
 - c. No off-site storage of construction materials or staging shall be permitted.
7. Per Section 9 of the Zoning By-Laws, all new lighting shall be glare shielded from adjacent properties and streets.

8. All required landscaping shall be installed and stabilized. Following construction, landscaping shall be subject to field enhancements as reviewed and approved by the Planning Director.
9. Any and all operation that takes place at the site must meet all noise and dust By-Laws in the Town of Billerica.
10. Any new signage to be located on the building must be approved by the Planning Director prior to installation.

SPECIFIC CONDITIONS

11. The applicant will install the portion of the Yankee Doodle Bike Path within their construction limits. Applicant will work with VHB (bike path consultants) and DPW to verify compatibility with future segments and to provide easements as necessary.
12. The design of the secondary access must be constructed as proposed and agreed upon at the meeting to allow only right-turning entrances, preventing left turns from entering or existing the site to/from northeast-bound Concord Road.
13. The applicant shall construct a sidewalk along the Concord Road frontage between site entrances in conformance with DPW standards.
14. The applicant shall work with DPW in consideration of 24" water main location, currently under the main drive entrance.
15. The applicant shall satisfy any additional comments from peer review.

RECEIVED

Majority of the Planning Board

2022 AUG -4 A 11: 32

Martin Henderson
Ed [Signature]
Patricia Flemming
Christopher Graton

[Signature]
[Signature]

TOWN CLERK
BILLERICA

Commonwealth of Massachusetts

Middlesex, ss

Then Personally appeared Patricia Flemming, one of the above named members of the Town of Billerica Planning Board and acknowledged the foregoing instrument to be the free act and deed of said Planning Board, before me.

Donna McCoy
Notary Public

June 29, 2023
My commission expires

Notary Public
Commonwealth of Massachusetts
My Commission Expires
June 29, 2023
DONNA MCCOY



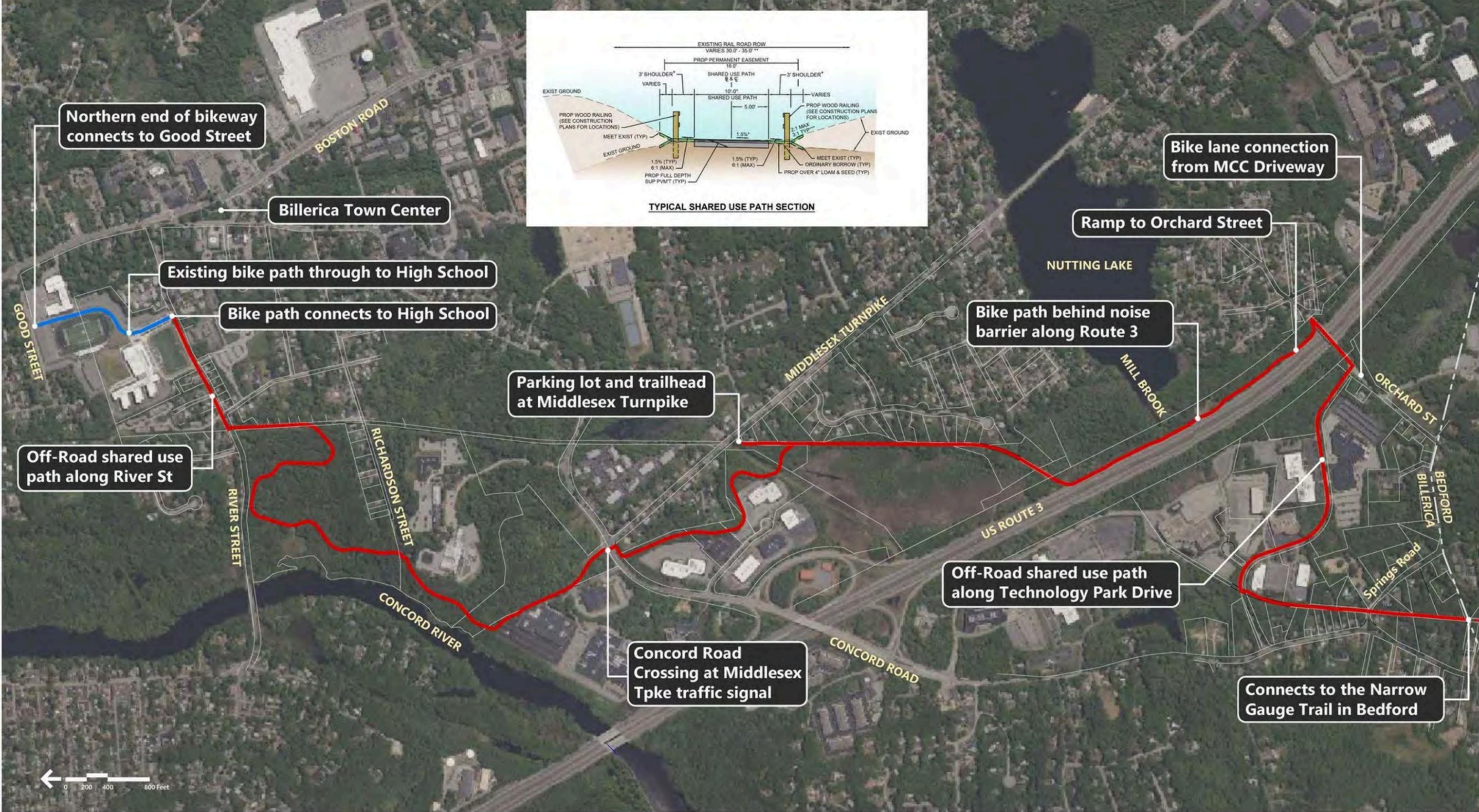
I, _____, Town Clerk of the Town of Billerica, Massachusetts hereby certify that this Decision by the Billerica Planning Board has been received and recorded at this office and no appeal was received during the twenty days next after such receipt and recording of such notice.

Town Clerk

Date

Roadway Infrastructure Projects

Yankee Doodle Bike Path



Yankee Doodle Bike Path

Billerica, MA

Date: June 14, 2023

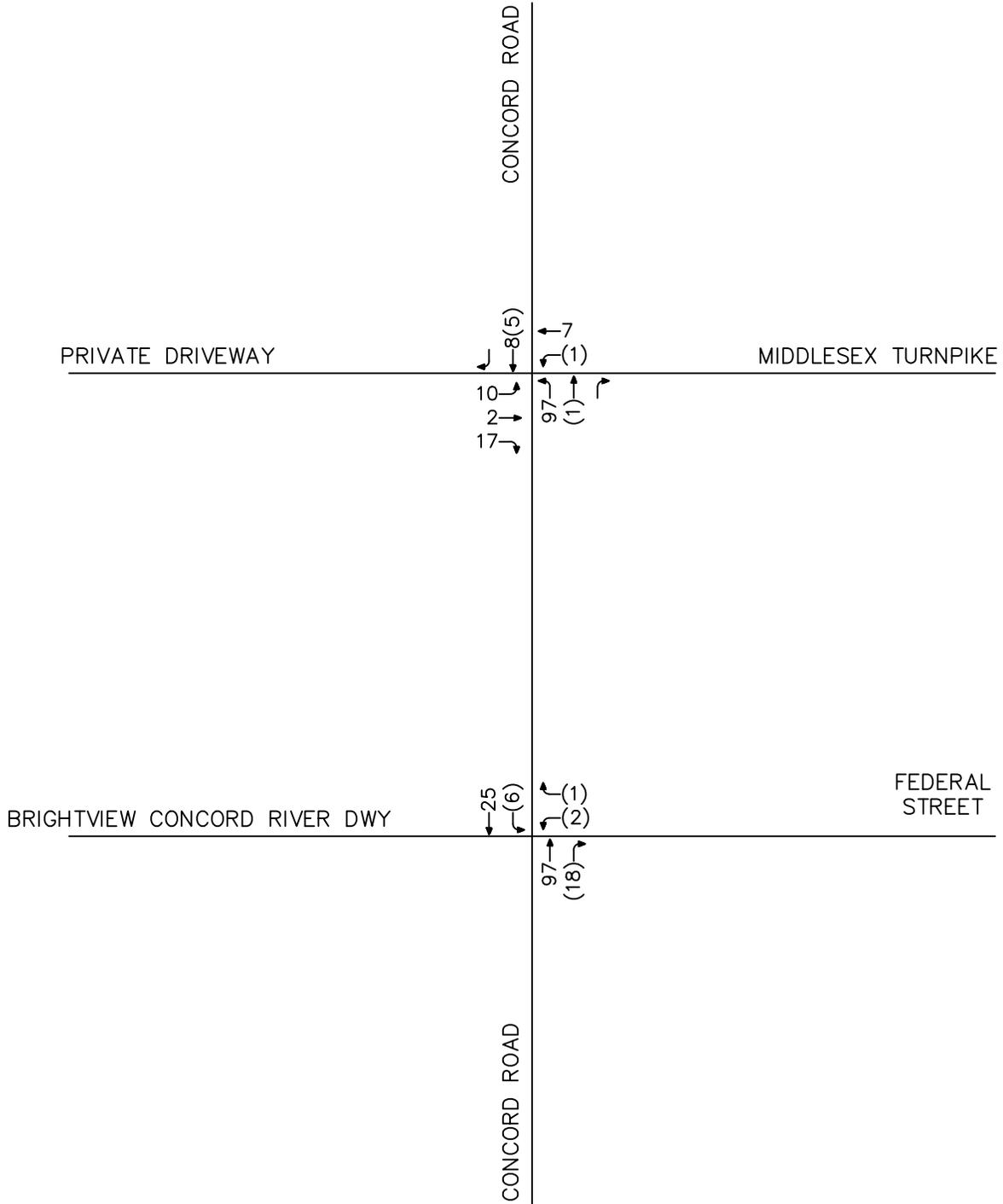


Reoccupancy of Vacancies

3 Federal Street



Not to Scale



XXX(XXX) = 161 Concord Road Development (Reoccupancy of 3 Federal Street)

Figure G-1

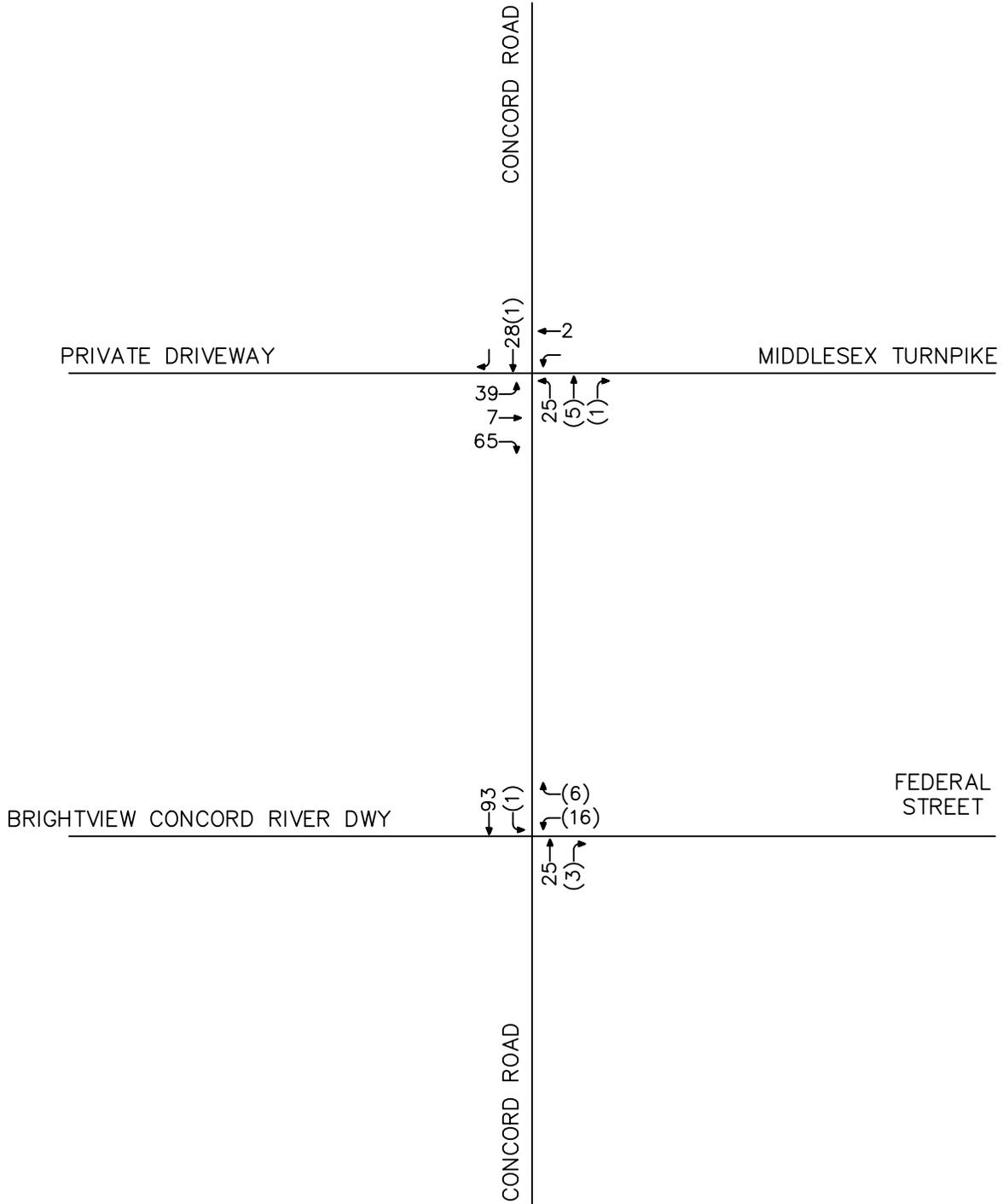


TEC, Inc.
282 Merrimack Street
Lawrence, MA 01843
978-794-1792
www.TheEngineeringCorp.com

Specific Developments by Others &
Reoccupancy of #3 Federal Street -
Weekday Morning
Peak Hour Traffic Volumes



Not to Scale



XXX(XXX) = 161 Concord Road Development (Reoccupancy of 3 Federal Street)

Figure G-1

Specific Developments by Others &
Reoccupancy of #3 Federal Street -
Weekday Evening
Peak Hour Traffic Volumes



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978-794-1792
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General Office Building (710)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 59

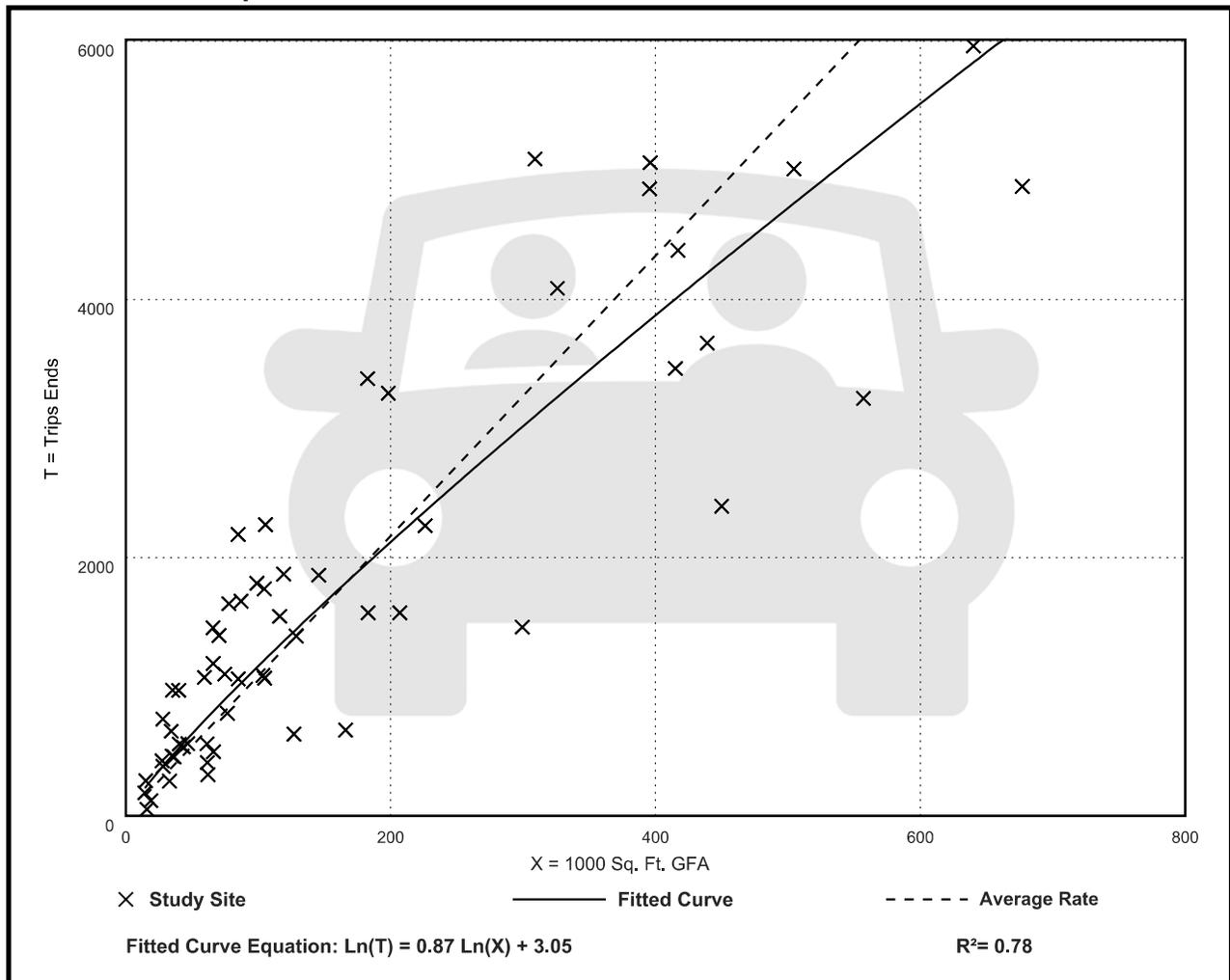
Avg. 1000 Sq. Ft. GFA: 163

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
10.84 = 195 trips	3.27 - 27.56	4.76

Data Plot and Equation



General Office Building (710)

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: 221

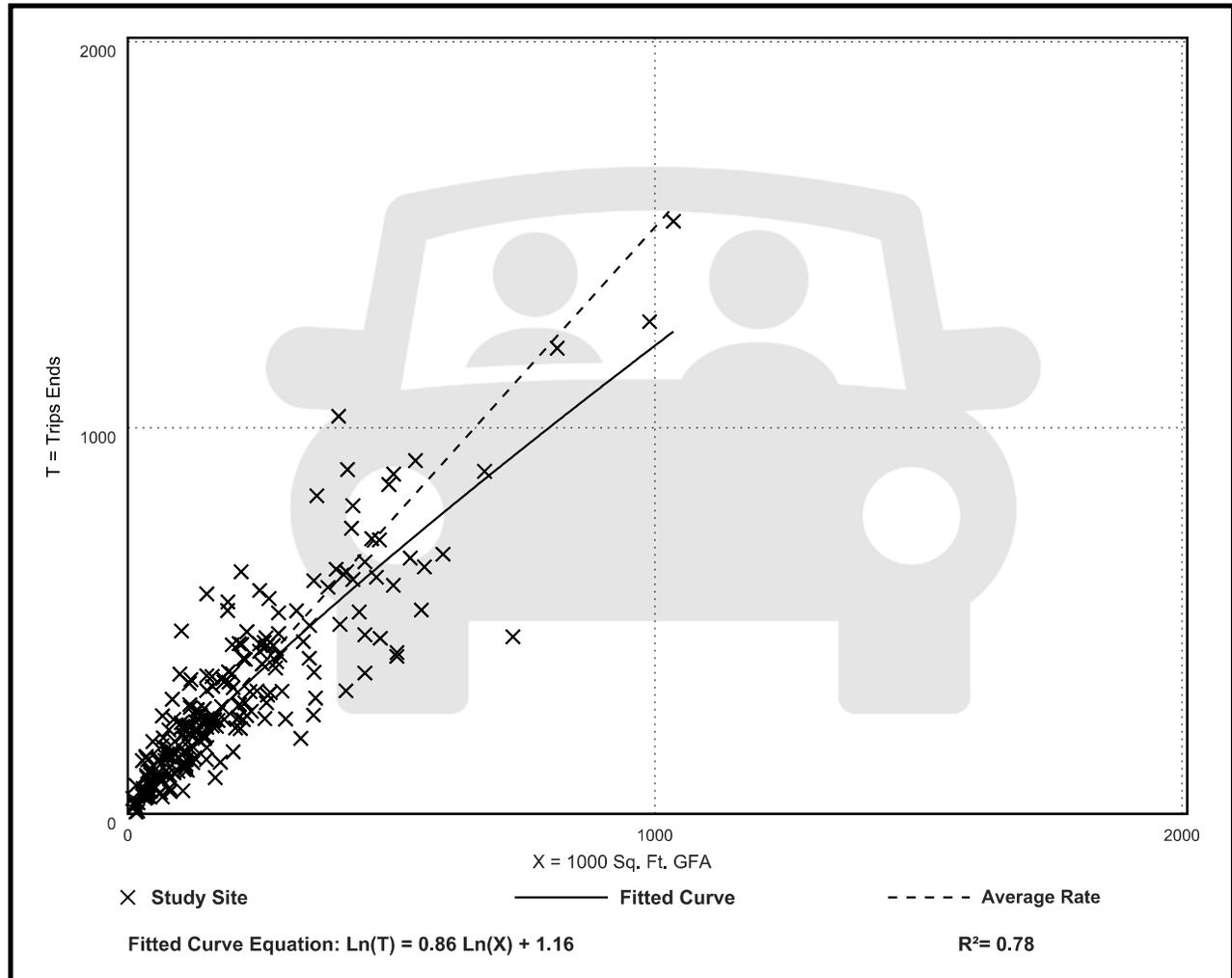
Avg. 1000 Sq. Ft. GFA: 201

Directional Distribution: 88% entering, 12% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.52 = 27 trips	0.32 - 4.93	0.58

Data Plot and Equation



General Office Building (710)

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: 232

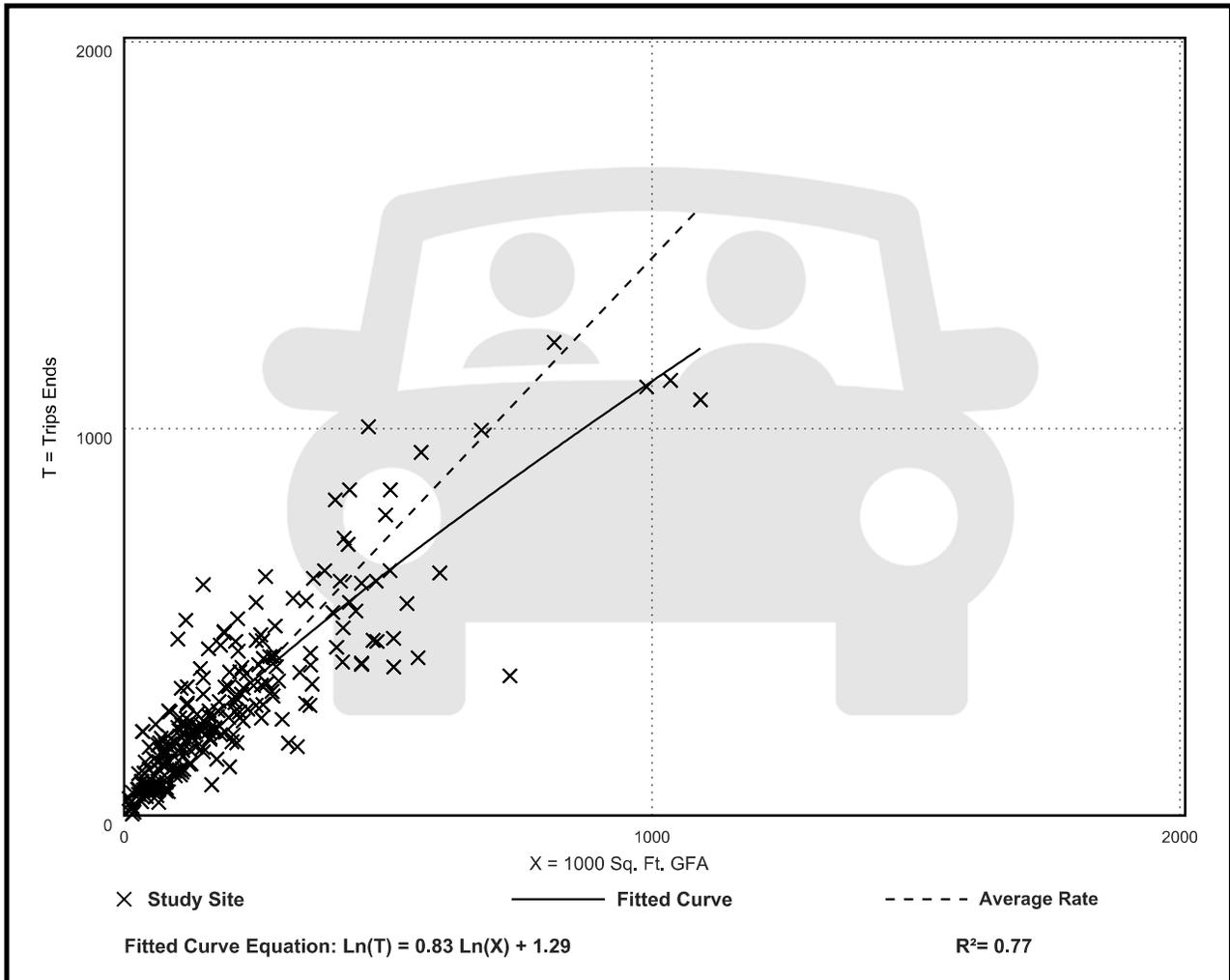
Avg. 1000 Sq. Ft. GFA: 199

Directional Distribution: 17% entering, 83% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.44 = 26 trips	0.26 - 6.20	0.60

Data Plot and Equation



Attachment H – Reoccupancy of #1 & #2 Federal Street Office Space

General Office Building (710)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 59

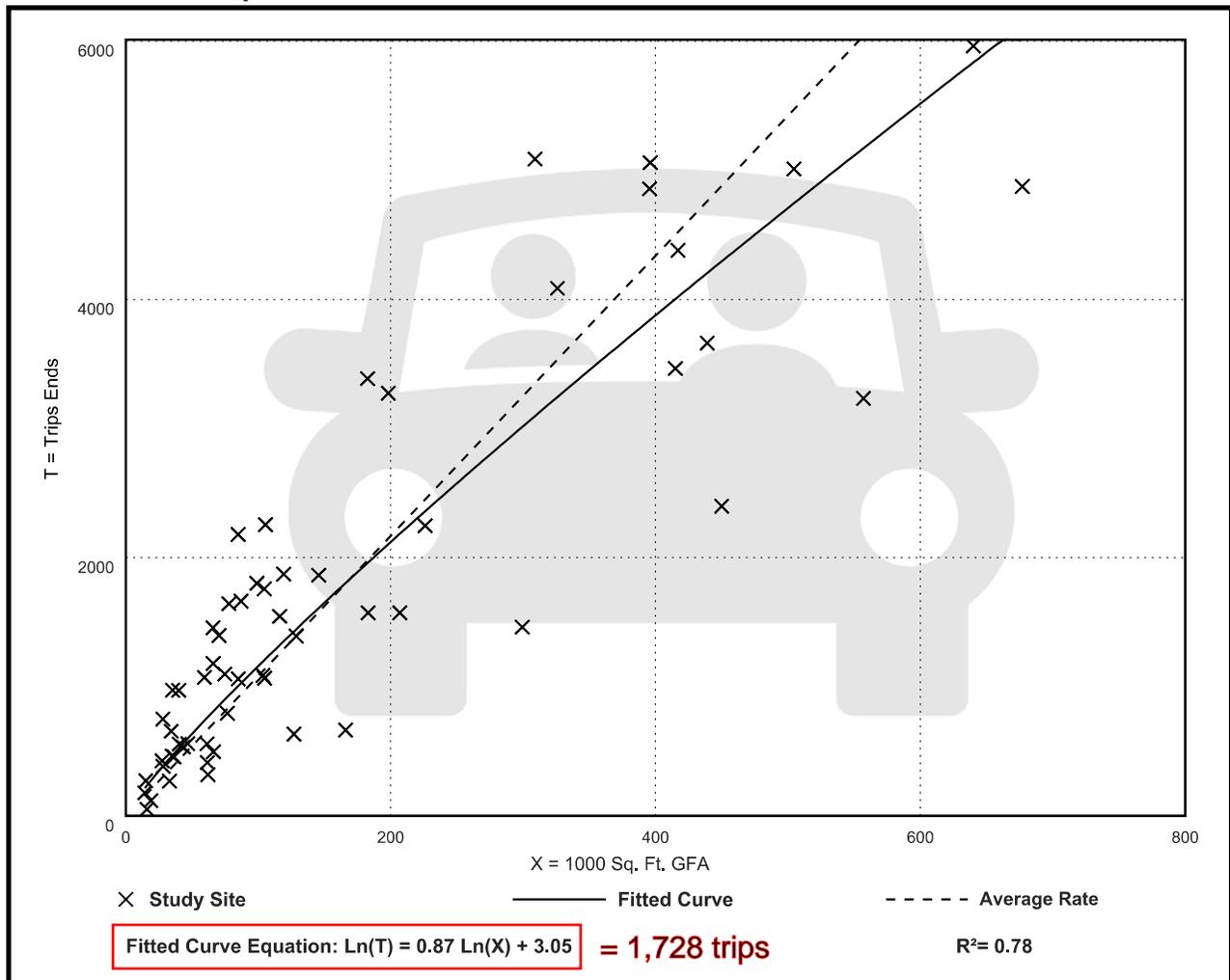
Avg. 1000 Sq. Ft. GFA: 163

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
10.84	3.27 - 27.56	4.76

Data Plot and Equation



General Office Building (710)

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: 221

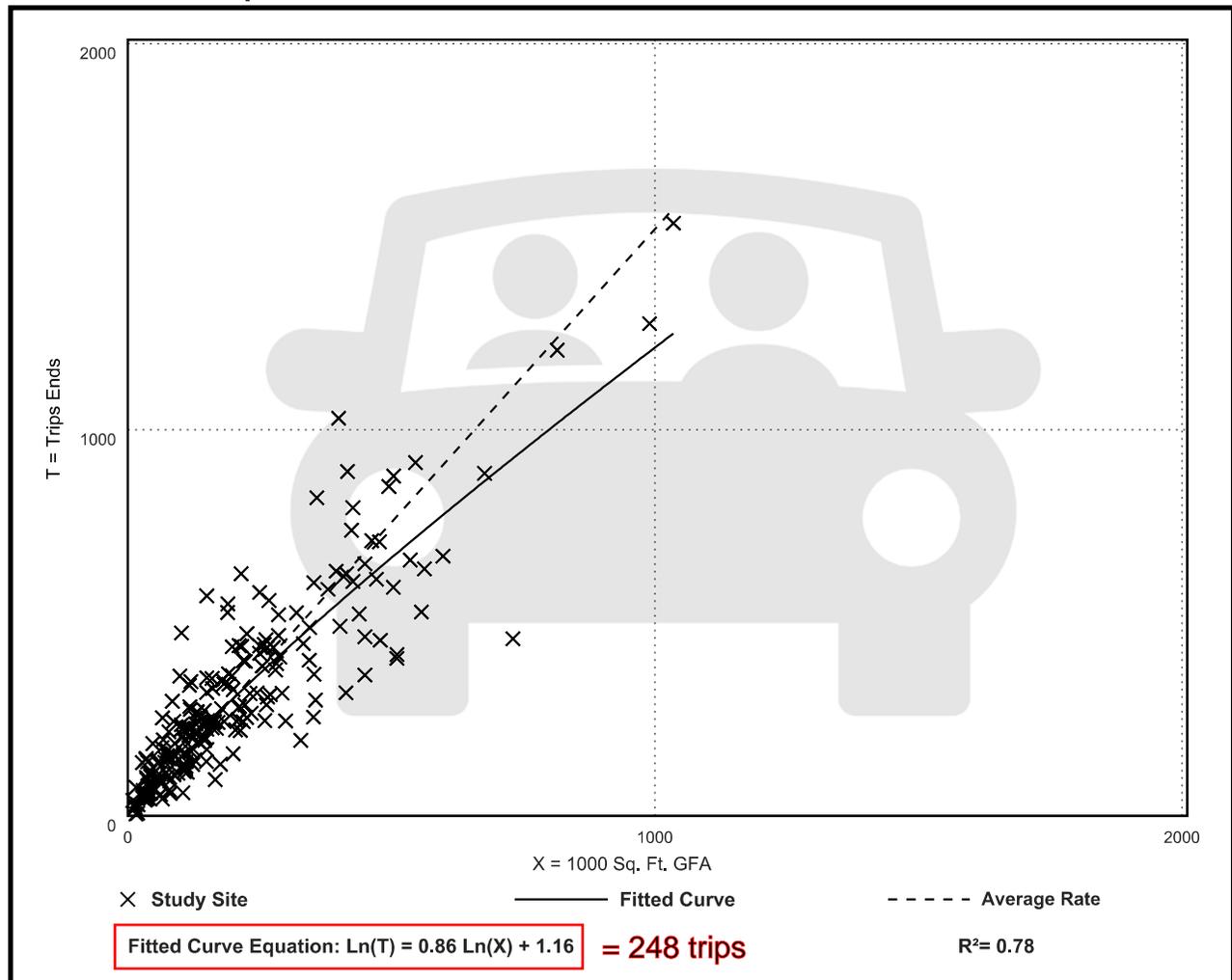
Avg. 1000 Sq. Ft. GFA: 201

Directional Distribution: 88% entering, 12% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.52	0.32 - 4.93	0.58

Data Plot and Equation



General Office Building (710)

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: 232

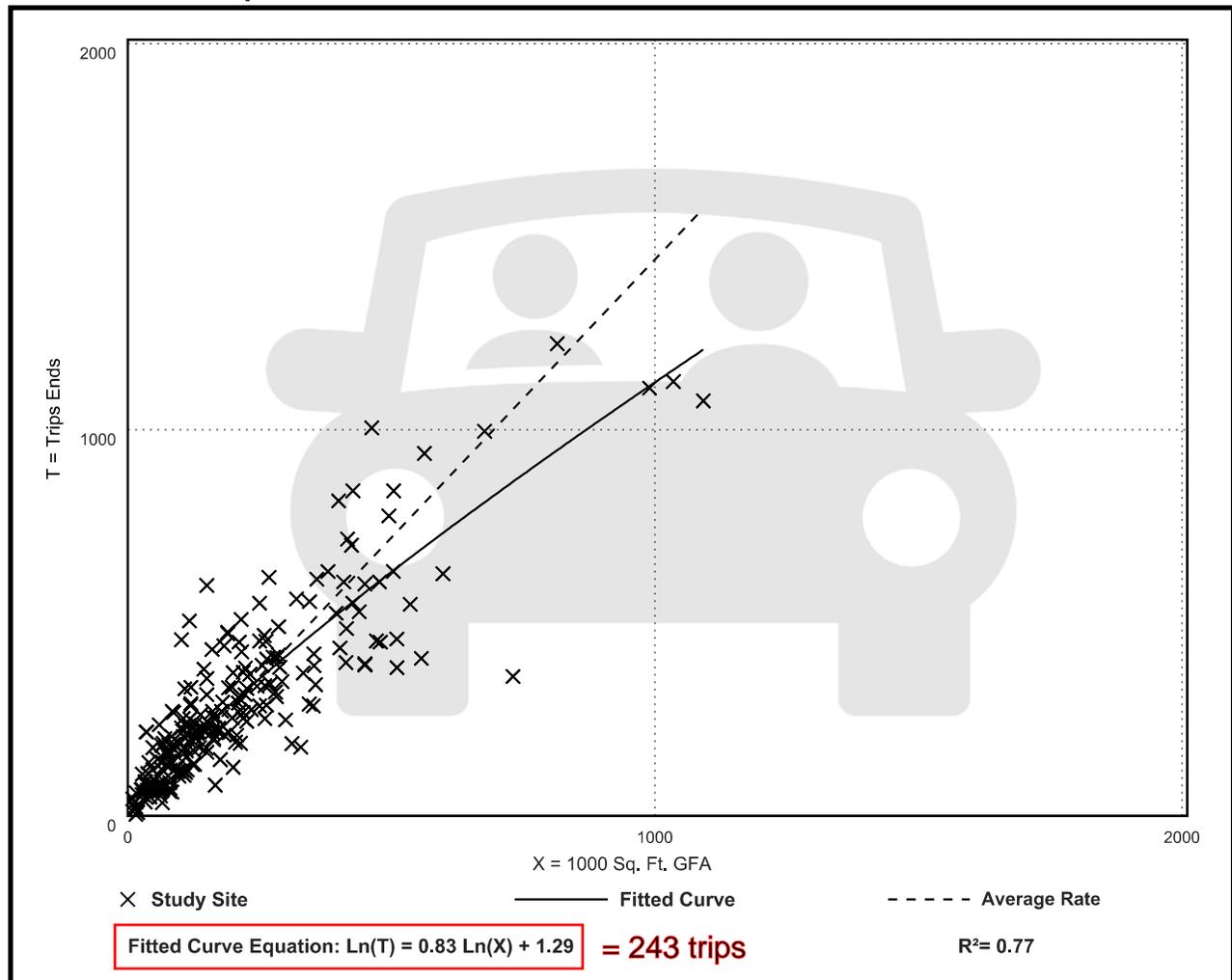
Avg. 1000 Sq. Ft. GFA: 199

Directional Distribution: 17% entering, 83% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.44	0.26 - 6.20	0.60

Data Plot and Equation



Attachment I – Trip Generation Data

Multifamily Housing (Low-Rise) Not Close to Rail Transit (220)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 22

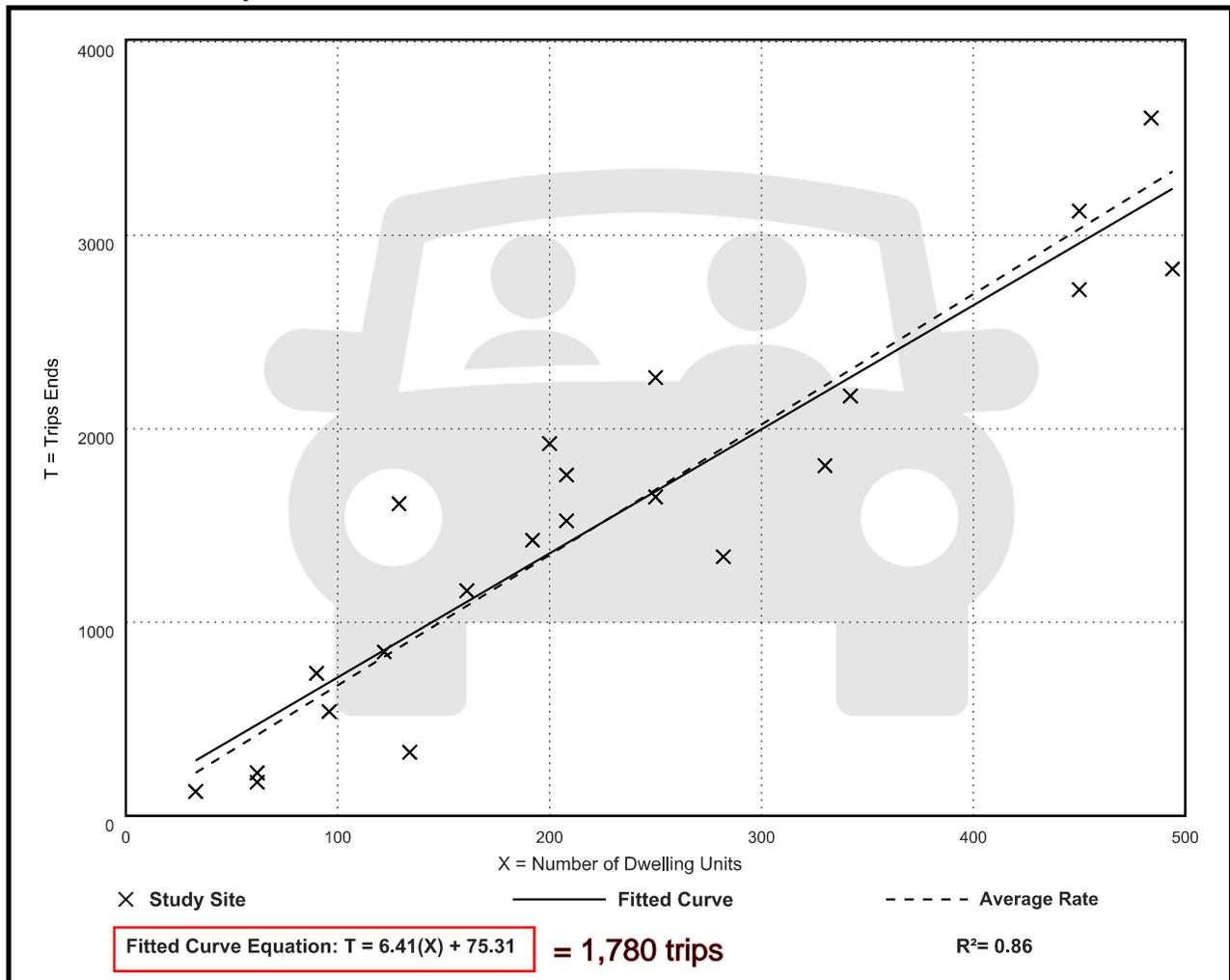
Avg. Num. of Dwelling Units: 229

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
6.74	2.46 - 12.50	1.79

Data Plot and Equation



Multifamily Housing (Low-Rise) Not Close to Rail Transit (220)

Vehicle Trip Ends vs: Dwelling Units

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: 49

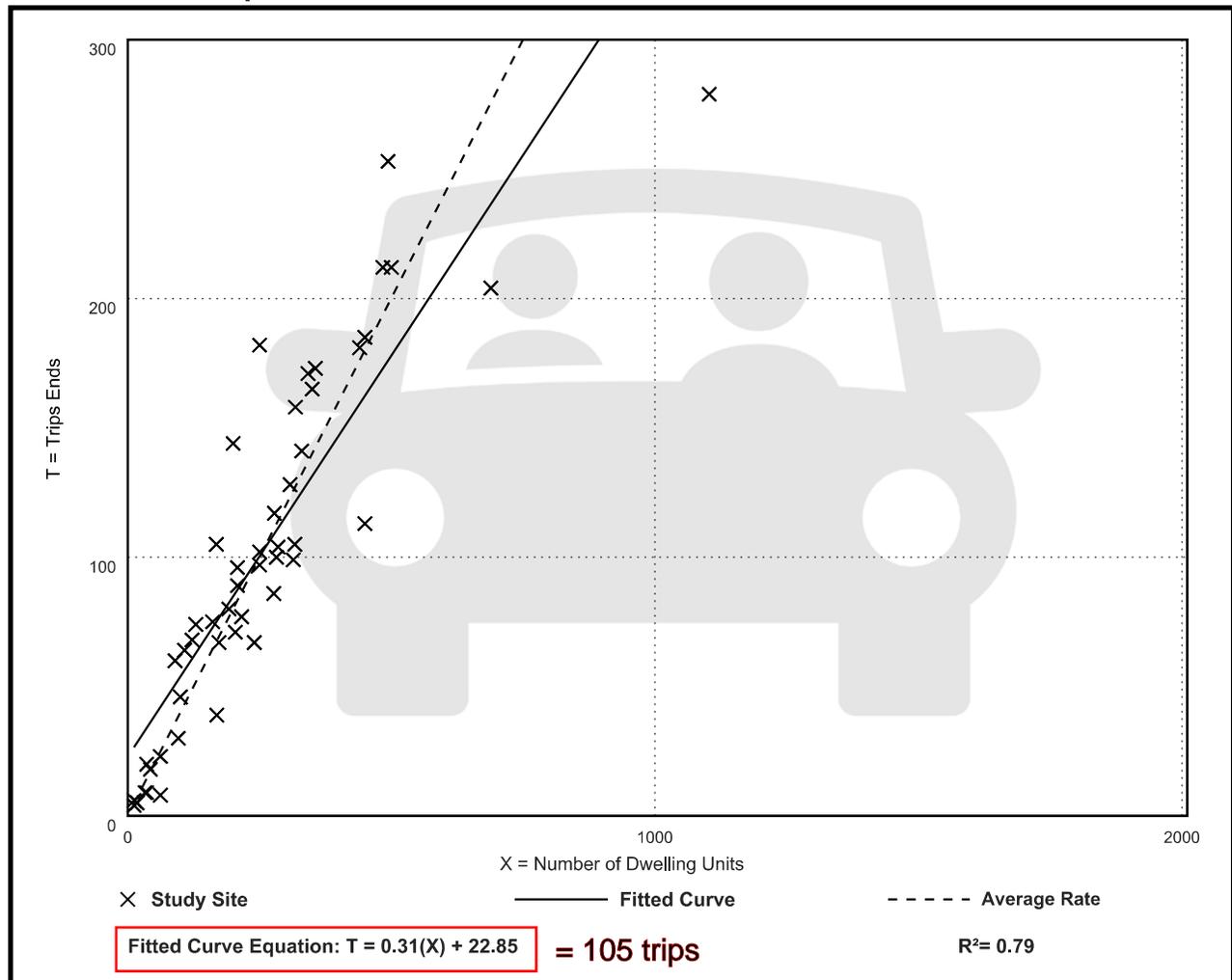
Avg. Num. of Dwelling Units: 249

Directional Distribution: 24% entering, 76% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.40	0.13 - 0.73	0.12

Data Plot and Equation



Multifamily Housing (Low-Rise) Not Close to Rail Transit (220)

Vehicle Trip Ends vs: Dwelling Units

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: 59

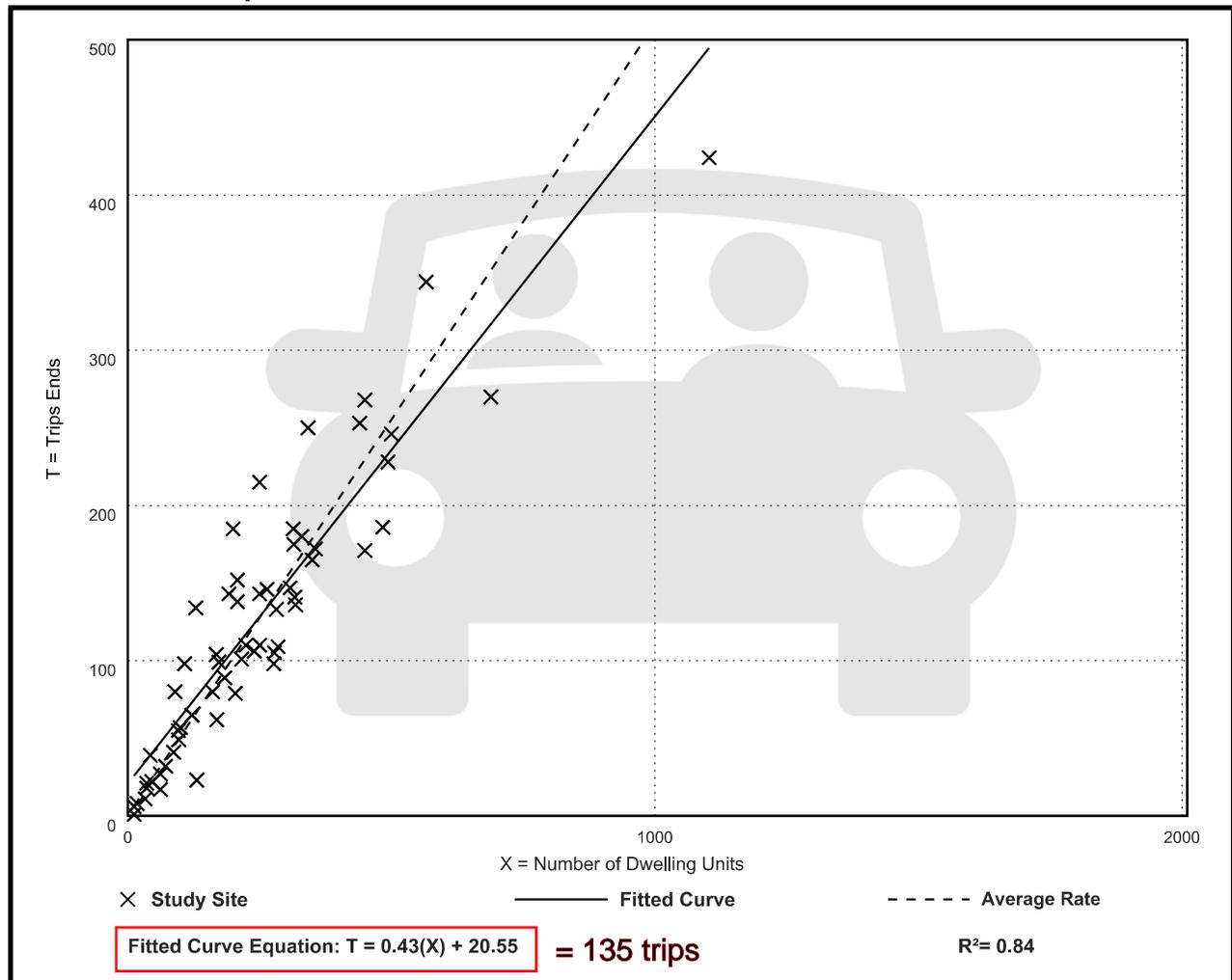
Avg. Num. of Dwelling Units: 241

Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.51	0.08 - 1.04	0.15

Data Plot and Equation



Multifamily Housing (Low-Rise) Not Close to Rail Transit (220)

Vehicle Trip Ends vs: Dwelling Units
On a: Saturday

Setting/Location: General Urban/Suburban

Number of Studies: 1

Avg. Num. of Dwelling Units: 282

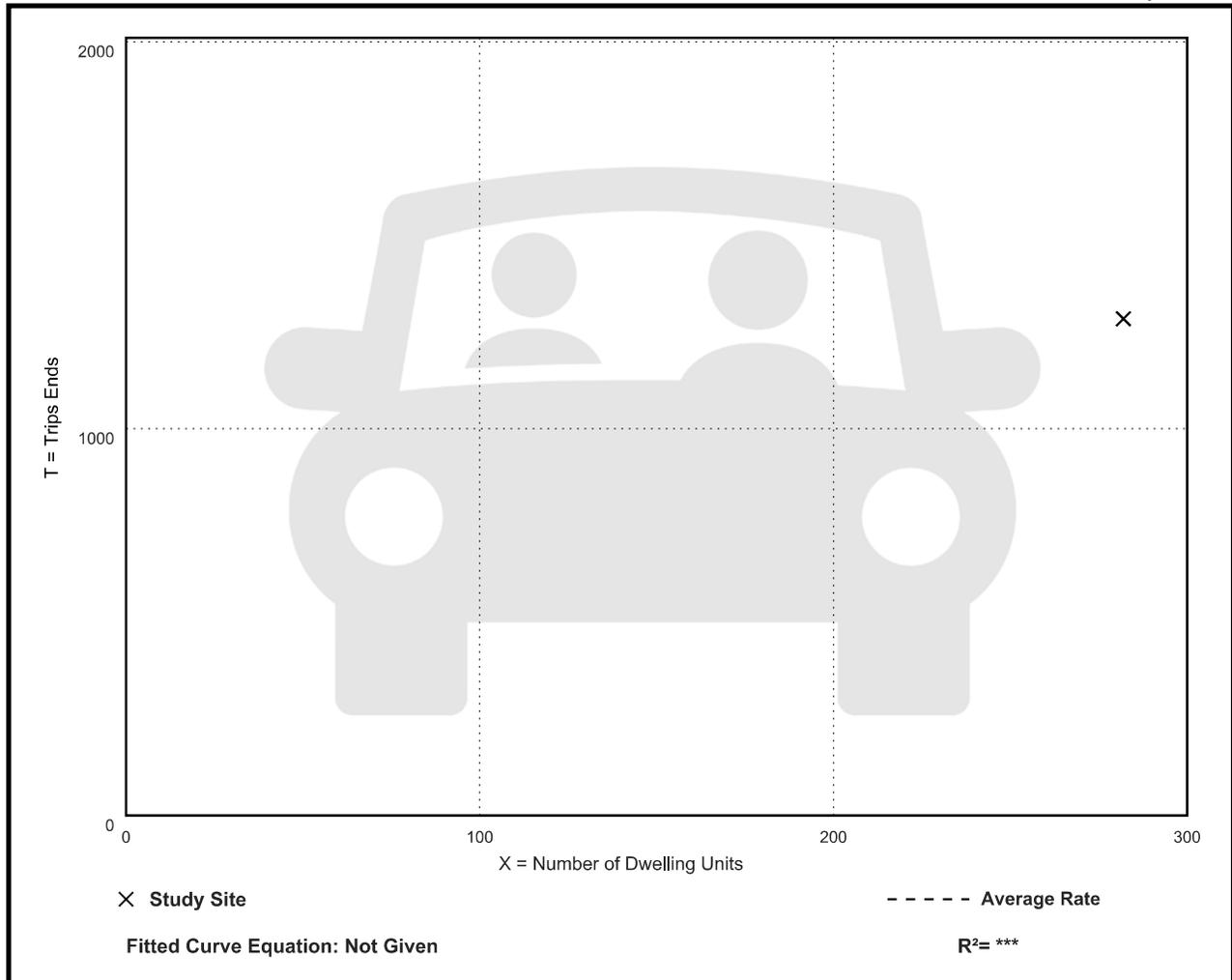
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
4.55 = 1,210 trips	4.55 - 4.55	***

Data Plot and Equation

Caution – Small Sample Size



Multifamily Housing (Low-Rise) Not Close to Rail Transit (220)

Vehicle Trip Ends vs: Dwelling Units

On a: Saturday, Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 1

Avg. Num. of Dwelling Units: 282

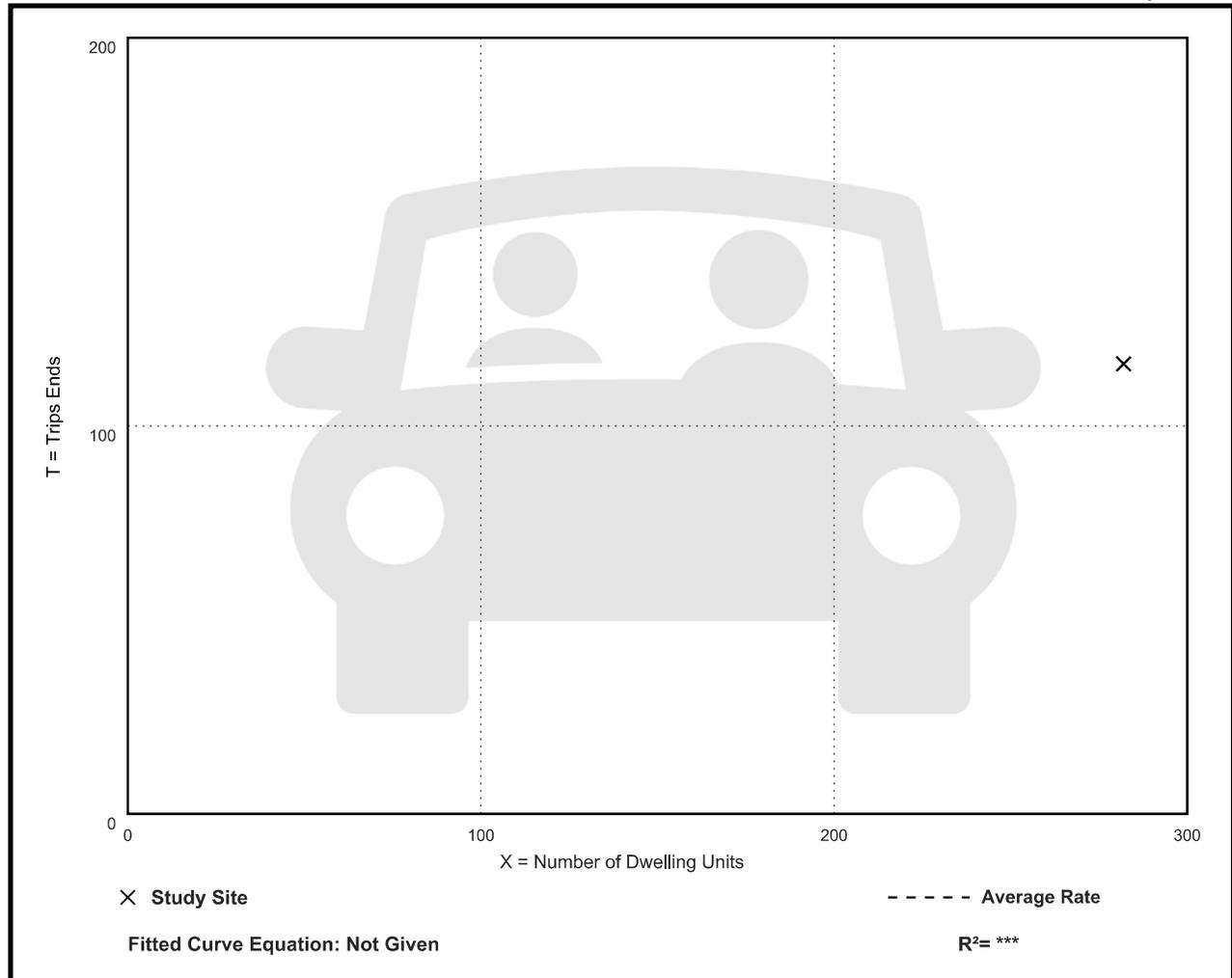
Directional Distribution: Not Available

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.41 = 109 trips	0.41 - 0.41	***

Data Plot and Equation

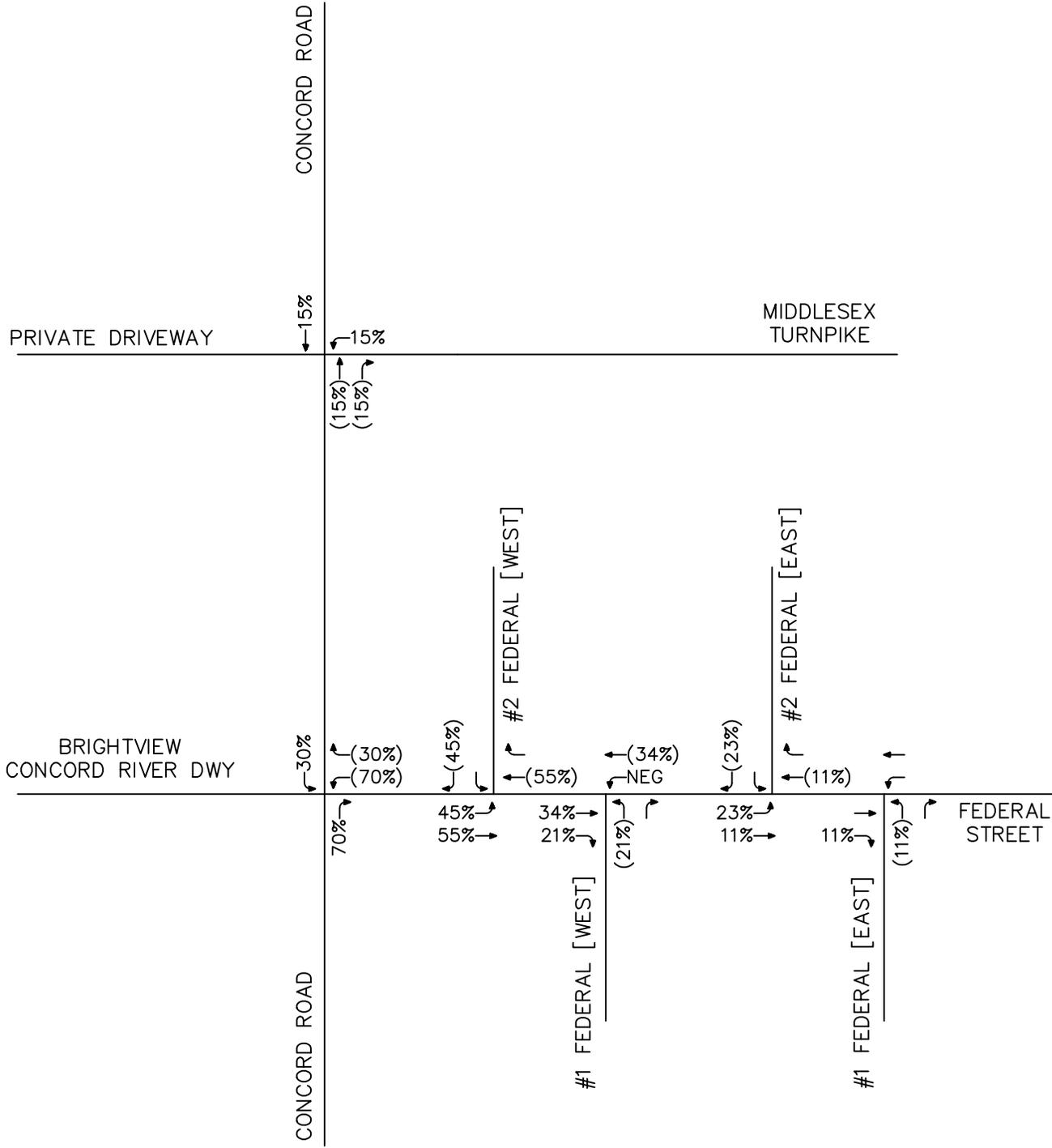
Caution – Small Sample Size



Attachment J – Trip Distribution Data



Not to Scale



XXX(XXX) = ENTERING(EXITING)

Figure J-1

Trip Distribution
Residential Trips



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T:\T1757\CAD\Highway\Graphics\T1757_Traffic Network.dwg 2/10/2026 11:01:54 PM

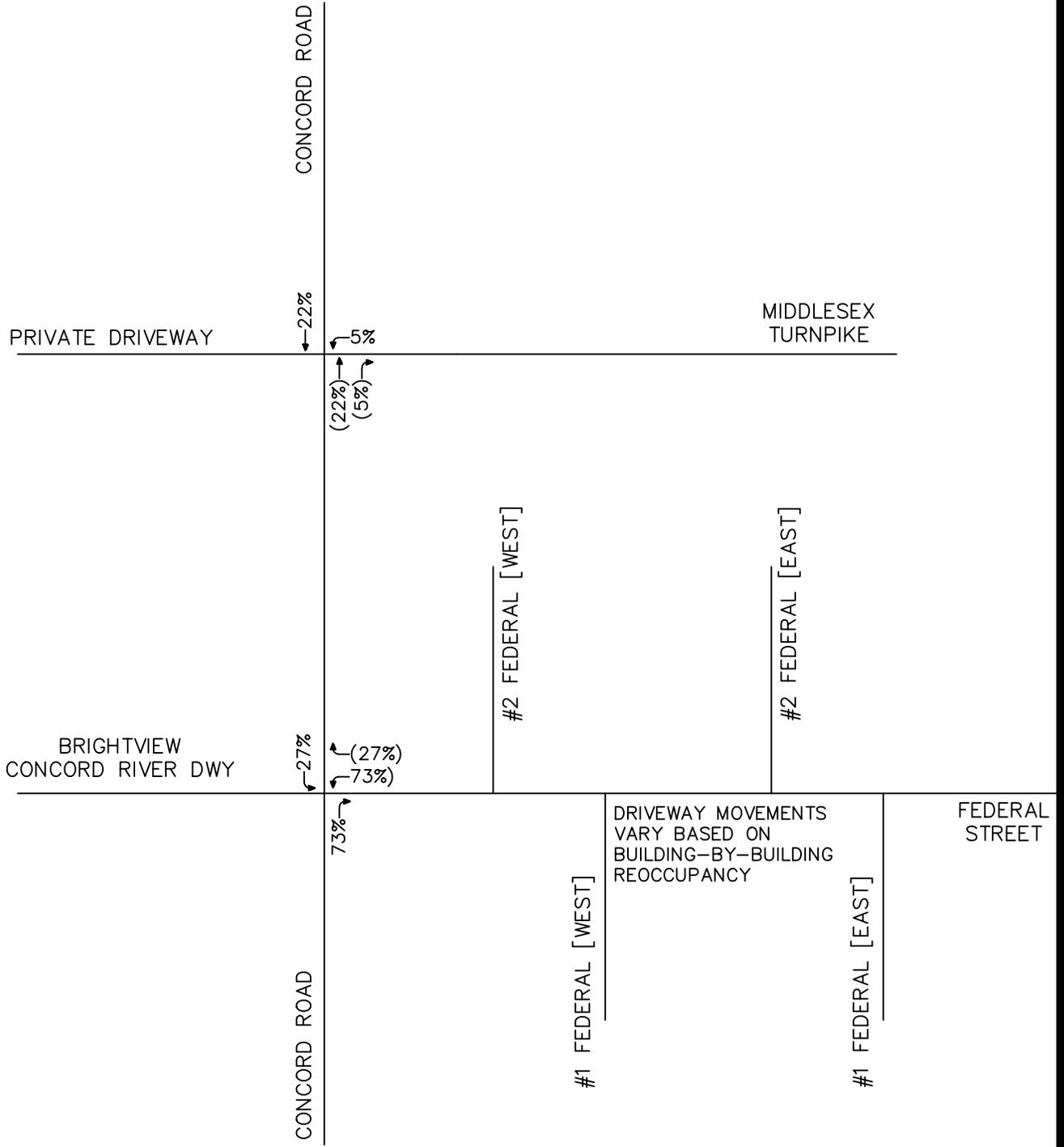
Trip Distribution - Billerica Residence

Project: T1757 - Traffic Impact Assessment - Billerica, MA
 Date: 8/14/2025
 Source: US Census Bureau - 2022 OnTheMap Tool - Top 22 Communities
 Analyst: TEC / RE

Place of Residence		Place of Work		Commuting Flow			Major Routes Entering/Exiting						Major Route Breakdown Entering/Exiting					
State Name	Minor Civil Division Name	State Name	Minor Civil Division Name	Workers in Commuting Flow	% of total Commuters	% of selected commuters	Concord Road (North)	Middlesex Turnpike (East)	Route 3 (North)	Route 3 (South)	Concord Road (South)	Check	Concord Road (North)	Middlesex Turnpike (East)	Route 3 (North)	Route 3 (South)	Concord Road (South)	Check
Massachusetts	Billerica	Massachusetts	Billerica	2,718	11.9%	17.8%	60%	30%			10%	100%	1,631	815	0	0	272	2,718
Massachusetts	Billerica	Massachusetts	Boston city, MA	2,063	9.0%	13.5%		20%		80%		100%	0	413	0	1,650	0	2,063
Massachusetts	Billerica	Massachusetts	Burlington CDP, MA	1,711	7.5%	11.2%		40%		60%		100%	0	684	0	1,027	0	1,711
Massachusetts	Billerica	Massachusetts	Woburn city, MA	932	4.1%	6.1%		10%		90%		100%	0	93	0	839	0	932
Massachusetts	Billerica	Massachusetts	Waltham city, MA	814	3.6%	5.3%				100%		100%	0	0	0	814	0	814
Massachusetts	Billerica	Massachusetts	Cambridge city, MA	809	3.5%	5.3%				100%		100%	0	0	0	809	0	809
Massachusetts	Billerica	Massachusetts	Lowell city, MA	752	3.3%	4.9%				100%		100%	0	0	752	0	0	752
Massachusetts	Billerica	Massachusetts	Chelmsford town	674	2.9%	4.4%	5%		80%		15%	100%	34	0	539	0	101	674
Massachusetts	Billerica	Massachusetts	Bedford town	653	2.9%	4.3%			5%		95%	100%	0	0	0	33	620	653
Massachusetts	Billerica	Massachusetts	Wilmington CDP, MA	624	2.7%	4.1%	50%	50%				100%	312	312	0	0	0	624
Massachusetts	Billerica	Massachusetts	Lexington CDP, MA	549	2.4%	3.6%				100%		100%	0	0	0	549	0	549
Massachusetts	Billerica	Massachusetts	Pinehurst CDP, MA	319	1.4%	2.1%	80%	10%		10%		100%	255	32	0	32	0	319
Massachusetts	Billerica	Massachusetts	Newton city, MA	284	1.2%	1.9%				100%		100%	0	0	0	284	0	284
Massachusetts	Billerica	Massachusetts	Framingham city, MA	246	1.1%	1.6%				100%		100%	0	0	0	246	0	246
Massachusetts	Billerica	Massachusetts	Danvers CDP, MA	237	1.0%	1.5%	20%			80%		100%	47	0	0	190	0	237
Massachusetts	Billerica	Massachusetts	Nashua city, NH	205	0.9%	1.3%			100%			100%	0	0	205	0	0	205
Massachusetts	Billerica	Massachusetts	Arlington CDP, MA	204	0.9%	1.3%				100%		100%	0	0	0	204	0	204
Massachusetts	Billerica	Massachusetts	Winchester CDP, MA	204	0.9%	1.3%				100%		100%	0	0	0	204	0	204
Massachusetts	Billerica	Massachusetts	Lawrence city, MA	202	0.9%	1.3%			100%			100%	0	0	202	0	0	202
Massachusetts	Billerica	Massachusetts	Watertown Town	201	0.9%	1.3%				100%		100%	0	0	0	201	0	201
Massachusetts	Billerica	Massachusetts	Marlborough city,	190	0.8%	1.2%			90%	10%		100%	0	0	171	19	0	190
Massachusetts	Billerica	Massachusetts	Worcester city, MA	190	0.8%	1.2%			90%	10%		100%	0	0	171	19	0	190
Massachusetts	Billerica	Massachusetts	Medford city, MA	180	0.8%	1.2%	20%			80%		100%	36	0	0	144	0	180
Massachusetts	Billerica	Massachusetts	Peabody city, MA	180	0.8%	1.2%	10%			90%		100%	18	0	0	162	0	180
Massachusetts	Billerica	Massachusetts	Wakefield CDP, MA	171	0.7%	1.1%				100%		100%	0	0	0	171	0	171
				22,872		15,312							2,333	2,349	2,040	7,596	993	15,312
						66.9%							15.2%	15.3%	13.3%	49.6%	6.5%	100.0%
													15%	15%	13%	50%	7%	100%



Not to Scale



XXX(XXX) = ENTERING(EXITING)

Figure J-2

Trip Distribution
Office Trips (Reoccupancy)



TEC, Inc.
282 Merrimack Street
Lawrence, MA 01843
978-794-1792
www.TheEngineeringCorp.com

Trip Distribution - Billerica Workers

Project: T1757 - Traffic Impact Assessment - Billerica, MA
 Date: 8/14/2025
 Source: US Census Bureau - 2022 OnTheMap Tool - Top 22 Communities
 Analyst: TEC / RE

Place of Residence		Place of Work		Commuting Flow			Major Routes Entering/Exiting						Major Route Breakdown Entering/Exiting					
State Name	Minor Civil Division Name	State Name	Minor Civil Division Name	Workers in Commuting Flow	% of total Commuters	% of selected commuters	Concord Road (North)	Middlesex Turnpike (East)	Route 3 (North)	Route 3 (South)	Concord Road (South)	Check	Concord Road (North)	Middlesex Turnpike (East)	Route 3 (North)	Route 3 (South)	Concord Road (South)	Check
Massachusetts	Billerica town	Massachusetts	Billerica	2,718	10.3%	19.2%	70%	20%			10%	100%	1,903	544	0	0	272	2,718
Massachusetts	Lowell city	Massachusetts	Billerica	2,434	9.2%	17.2%			100%			100%	0	0	2,434	0	0	2,434
Massachusetts	Chelmsford town	Massachusetts	Billerica	841	3.2%	6.0%	5%		80%		15%	100%	42	0	673	0	126	841
Massachusetts	Boston city (Suffolk,	Massachusetts	Billerica	796	3.0%	5.6%			100%			100%	0	0	0	796	0	796
Massachusetts	Nashua city	Massachusetts	Billerica	704	2.7%	5.0%			100%			100%	0	0	704	0	0	704
Massachusetts	Dracut town	Massachusetts	Billerica	639	2.4%	4.5%			100%			100%	0	0	639	0	0	639
Massachusetts	Tewksbury town	Massachusetts	Billerica	628	2.4%	4.4%	100%					100%	628	0	0	0	0	628
Massachusetts	Lawrence city (Essex,	Massachusetts	Billerica	596	2.3%	4.2%			100%			100%	0	0	596	0	0	596
Massachusetts	Methuen Town city	Massachusetts	Billerica	454	1.7%	3.2%			100%			100%	0	0	454	0	0	454
Massachusetts	Haverhill city (Essex,	Massachusetts	Billerica	425	1.6%	3.0%			100%			100%	0	0	425	0	0	425
Massachusetts	Lynn city (Essex, MA)	Massachusetts	Billerica	405	1.5%	2.9%				100%		100%	0	0	0	405	0	405
Massachusetts	Burlington town	Massachusetts	Billerica	377	1.4%	2.7%		25%		75%		100%	0	94	0	283	0	377
Massachusetts	Woburn city	Massachusetts	Billerica	362	1.4%	2.6%				75%		100%	0	91	0	272	0	362
Massachusetts	Westford town	Massachusetts	Billerica	354	1.3%	2.5%			100%			100%	0	0	354	0	0	354
Massachusetts	Wilmington town	Massachusetts	Billerica	349	1.3%	2.5%	100%					100%	349	0	0	0	0	349
Massachusetts	Waltham city	Massachusetts	Billerica	287	1.1%	2.0%				100%		100%	0	0	0	287	0	287
Massachusetts	Peabody city (Essex,	Massachusetts	Billerica	276	1.0%	2.0%	25%			75%		100%	69	0	0	207	0	276
Massachusetts	Andover town	Massachusetts	Billerica	262	1.0%	1.9%	25%		75%			100%	66	0	197	0	0	262
Massachusetts	Tyngsborough town	Massachusetts	Billerica	262	1.0%	1.9%			100%			100%	0	0	262	0	0	262
Massachusetts	Somerville city	Massachusetts	Billerica	256	1.0%	1.8%				100%		100%	0	0	0	256	0	256
Massachusetts	Hudson town	Massachusetts	Billerica	239	0.9%	1.7%				100%		100%	0	0	239	0	0	239
Massachusetts	Medford city	Massachusetts	Billerica	235	0.9%	1.7%				100%		100%	0	0	0	235	0	235
Massachusetts	Worcester city	Massachusetts	Billerica	232	0.9%	1.6%			90%	10%		100%	0	0	209	23	0	232
				26,325		14,131							3,056	728	7,185	2,763	398	14,131
						53.7%							21.6%	5.2%	50.8%	19.6%	2.8%	100.0%
													22%	5%	51%	19%	3%	100%

Attachment K – Traffic Signal Warrants

Project: Residential
 Town: Billerica, MA
 TEC #T1757
 Analyst: TEC, Inc

Land Use Code	220
Land Use	Multifamily Housing (Low-Rise)
Subcategory	Not Close to Rail transit
Setting	General Urban/Suburban
Time Period	Weekday
# Data Sites	6

710
General Office Building
General Urban/Suburban
Weekday
11

Time	% of 24-Hour Vehicle Trips		
	Total	Entering	Exiting
12:00 - 1:00 AM	0.7%	0.9%	0.4%
1:00 - 2:00 AM	0.4%	0.5%	0.3%
2:00 - 3:00 AM	0.4%	0.4%	0.4%
3:00 - 4:00 AM	0.4%	0.4%	0.3%
4:00 - 5:00 AM	0.9%	0.3%	1.4%
5:00 - 6:00 AM	1.6%	0.5%	2.6%
6:00 - 7:00 AM	4.2%	1.4%	6.9%
7:00 - 8:00 AM	6.5%	2.0%	10.8%
8:00 - 9:00 AM	5.8%	3.1%	8.5%
9:00 - 10:00 AM	3.9%	2.9%	4.9%
10:00 - 11:00 AM	3.6%	2.4%	4.8%
11:00 - 12:00 PM	4.3%	3.8%	4.7%
12:00 - 1:00 PM	4.3%	4.5%	4.1%
1:00 - 2:00 PM	4.2%	4.0%	4.4%
2:00 - 3:00 PM	5.2%	5.6%	4.9%
3:00 - 4:00 PM	6.1%	6.9%	5.3%
4:00 - 5:00 PM	7.9%	10.1%	5.6%
5:00 - 6:00 PM	9.5%	11.4%	7.6%
6:00 - 7:00 PM	8.2%	9.7%	6.7%
7:00 - 8:00 PM	6.4%	8.1%	4.7%
8:00 - 9:00 PM	5.9%	7.7%	4.2%
9:00 - 10:00 PM	4.4%	6.0%	2.7%
10:00 - 11:00 PM	3.5%	4.7%	2.4%
11:00 - 12:00 AM	1.9%	2.5%	1.4%
	100.0%	100.0%	

Entering	Exiting
890	890
8	4
5	3
4	3
4	3
3	13
5	23
12	61
18	96
28	75
25	43
22	42
34	42
40	37
35	39
50	43
62	47
90	50
102	67
87	60
72	42
68	37
54	24
42	21
22	12
892	887

Time	% of 24-Hour Vehicle Trips		
	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
313	313
1	0
0	0
0	0
0	0
0	1
1	0
15	2
43	6
45	11
20	14
17	19
19	32
32	32
28	21
26	20
23	26
17	48
13	49
5	8
3	7
2	4
2	5
1	7
1	1
314	313

Right turns removed from the total side street volume

Enter
 Exit

Start Time	Southbound				Eastbound				Northbound				Westbound			
	Concord Road From North				Private Driveway From West				Concord Road From South				Federal Street From East			
	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total
Residential	0.3				0	0	0				0.7		0.7		0.3	1
Office	0.27				See Table to Right						0.73		0.73		0.27	
7:00 - 8:00 AM	17			17	0	0	0	0			44	44	72		30	72
8:00 - 9:00 AM	21			21	0	0	0	0			52	52	61		25	61
9:00 - 10:00 AM	13			13	0	0	0	0			32	32	40		17	40
10:00 - 11:00 AM	11			11	0	0	0	0			28	28	43		18	43
11:00 - 12:00 PM	15			15	0	0	0	0			38	38	53		21	53
12:00 - 1:00 PM	21			21	0	0	0	0			51	51	49		20	49
1:00 - 2:00 PM	18			18	0	0	0	0			45	45	43		17	43
2:00 - 3:00 PM	22			22	0	0	0	0			54	54	45		18	45
3:00 - 4:00 PM	25			25	0	0	0	0			60	60	52		21	52
4:00 - 5:00 PM	32			32	0	0	0	0			75	75	70		28	70
5:00 - 6:00 PM	34			34	0	0	0	0			81	81	83		33	83
6:00 - 7:00 PM	27			27	0	0	0	0			65	65	48		20	48

Evaluation of Traffic Signal Warrants

Project: T1757 - Proposed Residential Development	Eval Date: Wednesday, February 11, 2026
Location: Concord Road / Federal Street	Source: MUTCD 2023
Municipality: Billerica, MA	Trip Gen: ITE Trip Generation, 11th Edition
Count Date: Wednesday, July 23, 2025	Analyst: TEC
Count Time: 7:00 AM - 7:00 PM	

Minor Street Roadway 1:	Private Driveway	Major Street Roadway 1:	Concord Road
Minor Street Roadway 2:	Federal Street	Major Street Roadway 2:	Concord Road

Minor Street Direction 1:	EB	Major Street Direction 1:	NB
Minor Street Direction 2:	WB	Major Street Direction 2:	SB

Minor Street Lanes:	1	Major Street Lanes:	2
---------------------	---	---------------------	---

Major Street 85th Speed >40 mph OR Isolated Population ≤ 10,000 persons: **No**

RAW DATA INPUT

Time	VOLUMES			
	Minor Private Driveway EB	Minor Federal Street WB	Major Concord Road NB	Major Concord Road SB
7-8 AM	1	6	784	948
8-9 AM	3	10	992	869
9-10 AM	1	8	694	722
10-11 AM	4	11	545	534
11-12 PM	4	11	663	572
12-1 PM	5	17	694	659
1-2 PM	4	25	707	636
2-3 PM	8	17	704	887
3-4 PM	8	16	821	995
4-5 PM	3	41	945	1157
5-6 PM	2	46	831	1324
6-7 PM	2	17	694	671

SEASONALLY ADJUSTED DATA

Time	VOLUMES			
	Minor Private Driveway EB	Minor Federal Street WB	Major Concord Road NB	Major Concord Road SB
7-8 AM	1	6	784	948
8-9 AM	3	10	992	869
9-10 AM	1	8	694	722
10-11 AM	4	11	545	534
11-12 PM	4	11	663	572
12-1 PM	5	17	694	659
1-2 PM	4	25	707	636
2-3 PM	8	17	704	887
3-4 PM	8	16	821	995
4-5 PM	3	41	945	1157
5-6 PM	2	46	831	1324
6-7 PM	2	17	694	671

Seasonal Adjustment: **0.0%**

SITE-GENERATED DATA INCL REOCC

Time	VOLUMES			
	Minor Private Driveway EB	Minor 115 WB	Major Concord Road NB	Major Concord Road SB
7-8 AM	0	72	44	17
8-9 AM	0	61	52	21
9-10 AM	0	40	32	13
10-11 AM	0	43	28	11
11-12 PM	0	53	38	15
12-1 PM	0	49	51	21
1-2 PM	0	43	45	18
2-3 PM	0	45	54	22
3-4 PM	0	52	60	25
4-5 PM	0	70	75	32
5-6 PM	0	83	81	34
6-7 PM	0	48	65	27

OPENING YEAR DATA

Time	VOLUMES			
	Minor Private Driveway EB	Minor Federal Street WB	Major Concord Road NB	Major Concord Road SB
7-8 AM	1	78	828	965
8-9 AM	3	71	1044	890
9-10 AM	1	48	726	735
10-11 AM	4	54	573	545
11-12 PM	4	64	701	587
12-1 PM	5	66	745	680
1-2 PM	4	68	752	654
2-3 PM	8	62	758	909
3-4 PM	8	68	881	1020
4-5 PM	3	111	1020	1189
5-6 PM	2	129	912	1358
6-7 PM	2	65	759	698

Annual Adjustment: **0**
 Opening Year: **2025**
 Years Until Opening Year: **0**

Evaluation of Traffic Signal Warrants - Warrant #1 - 8 Hour Vehicular Traffic Volume

OPENING YEAR DATA
VOLUMES

Time	Minor	Minor	Major	Major	Total Major Street Volume
	Private Driveway	Federal Street	Concord Road	Concord Road	
	EB	WB	NB	SB	
7-8 AM	1	78	828	965	1793
8-9 AM	3	71	1044	890	1934
9-10 AM	1	48	726	735	1461
10-11 AM	4	54	573	545	1118
11-12 PM	4	64	701	587	1288
12-1 PM	5	66	745	680	1425
1-2 PM	4	68	752	654	1406
2-3 PM	8	62	758	909	1667
3-4 PM	8	68	881	1020	1901
4-5 PM	3	111	1020	1189	2209
5-6 PM	2	129	912	1358	2270
6-7 PM	2	65	759	698	1457

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 for moving traffic on each approach		Major Street Volume (VPH) (total of both approaches)				Minor Street Volume (VPH) (critical minor street approach - one direction only)			
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 for moving traffic on each approach		Major Street Volume (VPH) (total of both approaches)				Minor Street Volume (VPH) (critical minor street approach - one direction only)			
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

Street	Lanes	Minimum Volume	TMC Data											
			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	2	600	1793	1934	1461	1118	1288	1425	1406	1667	1901	2209	2270	1457
Minor	1	150	78	71	48	54	64	66	68	62	68	111	129	65
Met?			NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

OR

Condition B: Interruption of Continuous Traffic

Street	Lanes	Minimum Volume	TMC Data											
			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	2	900	1793	1934	1461	1118	1288	1425	1406	1667	1901	2209	2270	1457
Minor	1	75	78	71	48	54	64	66	68	62	68	111	129	65
Met?			YES	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES	NO

Result: NO

Combination Option:

Condition A: Minimum Vehicular Volume

Street	Lanes	Minimum Volume	TMC Data											
			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	2	480	1793	1934	1461	1118	1288	1425	1406	1667	1901	2209	2270	1457
Minor	1	120	78	71	48	54	64	66	68	62	68	111	129	65
Met?			NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO

AND

Condition B: Interruption of Continuous Traffic

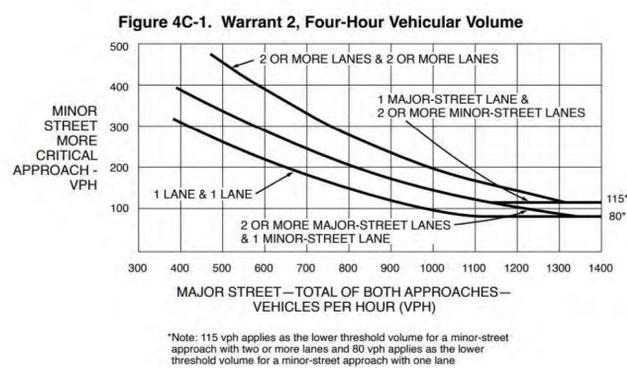
Street	Lanes	Minimum Volume	TMC Data											
			7-8 AM	8-9 AM	9-10 AM	10-11 AM	11-12 PM	12-1 PM	1-2 PM	2-3 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Major	2	720	1793	1934	1461	1118	1288	1425	1406	1667	1901	2209	2270	1457
Minor	1	60	78	71	48	54	64	66	68	62	68	111	129	65
Met?			YES	YES	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES

Result: NO

Evaluation of Traffic Signal Warrants - Warrant #2 - 4 Hour Vehicular Traffic Volume

OPENING YEAR DATA					
VOLUMES					
	Minor Private Driveway	Minor Federal Street	Major Concord Road	Major Concord Road	Total Major Street Volume
Time	EB	WB	NB	SB	
7-8 AM	1	78	828	965	1793
8-9 AM	3	71	1044	890	1934
9-10 AM	1	48	726	735	1461
10-11 AM	4	54	573	545	1118
11-12 PM	4	64	701	587	1288
12-1 PM	5	66	745	680	1425
1-2 PM	4	68	752	654	1406
2-3 PM	8	62	758	909	1667
3-4 PM	8	68	881	1020	1901
4-5 PM	3	111	1020	1189	2209
5-6 PM	2	129	912	1358	2270
6-7 PM	2	65	759	698	1457

Warrant #2 - Must be met for any 4 hours of an average day



Street	Lanes	Minimum Volume	TMC Data											
			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	2	Figure 4C-1	1793	1934	1461	1118	1288	1425	1406	1667	1901	2209	2270	1457
Minor	1	Figure 4C-1	78	71	48	54	64	66	68	62	68	111	129	65
		Met?	No	No	No	No	No	No	No	No	No	Yes	Yes	No

Result: **NO**

Attachment L – Capacity and Queue Analysis Worksheets

Lanes, Volumes, Timings
 1: Concord Road & Private Driveway/Middlesex Turnpike

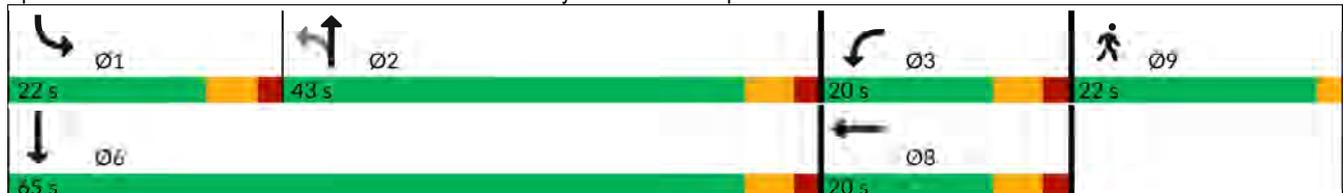
2025 Existing Condition
 Weekday Morning Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	267	0	53	0	331	466	120	734	0
Future Volume (vph)	0	0	0	267	0	53	0	331	466	120	734	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		150	150		150	150		150	150		150
Storage Lanes	0		0	1		0	1		0	1		0
Taper Length (ft)	25			25			50			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		330			2775			1149			1797	
Travel Time (s)		7.5			63.1			22.4			35.0	
Peak Hour Factor	0.97	0.97	0.97	0.92	0.92	0.92	0.87	0.87	0.87	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	6%	0%	6%	0%	4%	2%	2%	2%	2%
Shared Lane Traffic (%)				39%								
Turn Type				Prot	NA		Perm	NA		Prot	NA	
Protected Phases				3	8			2		1	6	
Permitted Phases							2					
Detector Phase				3	8		2	2		1	6	
Switch Phase												
Minimum Initial (s)				5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)				11.0	11.0		22.0	22.0		22.0	22.0	
Total Split (s)				20.0	20.0		43.0	43.0		22.0	65.0	
Total Split (%)				18.7%	18.7%		40.2%	40.2%		20.6%	60.7%	
Yellow Time (s)				4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)				2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)				0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)				6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode				None	None		Min	Min		Min	Min	

Intersection Summary

Area Type: Other
 Cycle Length: 107
 Actuated Cycle Length: 62.1
 Natural Cycle: 80
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Concord Road & Private Driveway/Middlesex Turnpike



Lane Group	Ø9
<hr/>	
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
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	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	21%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
<hr/>	
Intersection Summary	
<hr/>	

Queues
 1: Concord Road & Private Driveway/Middlesex Turnpike

2025 Existing Condition
 Weekday Morning Peak Hour

					
Lane Group	WBL	WBT	NBT	SBL	SBT
Lane Group Flow (vph)	177	171	916	130	798
v/c Ratio	0.52	0.41	0.72	0.44	0.38
Control Delay (s/veh)	30.5	13.7	14.4	30.2	7.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	30.5	13.7	14.4	30.2	7.1
Queue Length 50th (ft)	61	18	91	45	75
Queue Length 95th (ft)	149	82	155	103	102
Internal Link Dist (ft)		2695	1069		1717
Turn Bay Length (ft)	150			150	
Base Capacity (vph)	374	419	2101	468	3244
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.47	0.41	0.44	0.28	0.25

Intersection Summary

HCM Signalized Intersection Capacity Analysis
 1: Concord Road & Private Driveway/Middlesex Turnpike

2025 Existing Condition
 Weekday Morning Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	267	0	53	0	331	466	120	734	0
Future Volume (vph)	0	0	0	267	0	53	0	331	466	120	734	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			6.0		6.0	6.0	
Lane Util. Factor				0.95	0.95			0.95		1.00	0.95	
Frt				1.00	0.95			0.91		1.00	1.00	
Flt Protected				0.95	0.97			1.00		0.95	1.00	
Satd. Flow (prot)				1618	1565			3203		1770	3539	
Flt Permitted				0.95	0.97			1.00		0.95	1.00	
Satd. Flow (perm)				1618	1565			3203		1770	3539	
Peak-hour factor, PHF	0.97	0.97	0.97	0.92	0.92	0.92	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	290	0	58	0	380	536	130	798	0
RTOR Reduction (vph)	0	0	0	0	88	0	0	244	0	0	0	0
Lane Group Flow (vph)	0	0	0	177	83	0	0	672	0	130	798	0
Heavy Vehicles (%)	0%	0%	0%	6%	0%	6%	0%	4%	2%	2%	2%	2%
Turn Type				Prot	NA		Perm	NA		Prot	NA	
Protected Phases				3	8			2		1	6	
Permitted Phases							2					
Actuated Green, G (s)				13.2	13.2			20.2		10.4	36.6	
Effective Green, g (s)				13.2	13.2			20.2		10.4	36.6	
Actuated g/C Ratio				0.21	0.21			0.33		0.17	0.59	
Clearance Time (s)				6.0	6.0			6.0		6.0	6.0	
Vehicle Extension (s)				3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)				345	334			1046		297	2095	
v/s Ratio Prot				c0.11	0.05			c0.21		0.07	c0.23	
v/s Ratio Perm												
v/c Ratio				0.51	0.25			0.64		0.44	0.38	
Uniform Delay, d1				21.5	20.2			17.7		23.1	6.6	
Progression Factor				1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2				1.3	0.4			1.4		1.0	0.1	
Delay (s)				22.8	20.6			19.1		24.1	6.8	
Level of Service				C	C			B		C	A	
Approach Delay (s/veh)		0.0			21.7			19.1			9.2	
Approach LOS		A			C			B			A	
Intersection Summary												
HCM 2000 Control Delay (s/veh)			15.3									B
HCM 2000 Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			61.8							20.0		
Intersection Capacity Utilization			54.8%									A
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
 2: Concord Road & Private Driveway/Federal Street

2025 Existing Condition
 Weekday Morning Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	1	8	0	2	4	911	53	13	962	4
Future Volume (vph)	1	0	1	8	0	2	4	911	53	13	962	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	15	15	15	11	12	12	12	12	12	12	12	12
Storage Length (ft)	150		150	150		150	150		150	150		150
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		598			981			1348			1149	
Travel Time (s)		13.6			22.3			26.3			22.4	
Peak Hour Factor	0.50	0.50	0.50	0.83	0.83	0.83	0.93	0.93	0.93	0.88	0.88	0.88
Heavy Vehicles (%)	0%	0%	0%	33%	0%	0%	0%	3%	0%	0%	4%	50%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized

HCM 7th TWSC
2: Concord Road & Private Driveway/Federal Street

2025 Existing Condition
Weekday Morning Peak Hour

Intersection												
Int Delay, s/veh	0.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔			↔			↔	
Traffic Vol, veh/h	1	0	1	8	0	2	4	911	53	13	962	4
Future Vol, veh/h	1	0	1	8	0	2	4	911	53	13	962	4
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	-	-	None									
Storage Length	-	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	50	50	50	83	83	83	93	93	93	88	88	88
Heavy Vehicles, %	0	0	0	33	0	0	0	3	0	0	4	50
Mvmt Flow	2	0	2	10	0	2	4	980	57	15	1093	5

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1623	2170	549	1593	2144	518	1098	0	0	1037	0	0
Stage 1	1125	1125	-	1017	1017	-	-	-	-	-	-	-
Stage 2	498	1045	-	576	1127	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	8.16	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	7.16	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	7.16	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.83	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	69	47	485	53	49	508	643	-	-	678	-	-
Stage 1	222	283	-	204	318	-	-	-	-	-	-	-
Stage 2	528	308	-	400	282	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	66	45	485	50	47	508	643	-	-	678	-	-
Mov Cap-2 Maneuver	66	45	-	50	47	-	-	-	-	-	-	-
Stage 1	215	274	-	202	315	-	-	-	-	-	-	-
Stage 2	520	305	-	386	273	-	-	-	-	-	-	-

Approach	EB		WB		NB			SB		
HCM Ctrl Dly, s/v	36.92		76.47		0.14			0.45		
HCM LOS	E		F							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	14	-	-	117	50	508	48	-	-
HCM Lane V/C Ratio	0.007	-	-	0.034	0.191	0.005	0.022	-	-
HCM Ctrl Dly (s/v)	10.6	0.1	-	36.9	92.6	12.1	10.4	0.3	-
HCM Lane LOS	B	A	-	E	F	B	B	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.6	0	0.1	-	-

Lanes, Volumes, Timings
 1: Concord Road & Private Driveway/Middlesex Turnpike

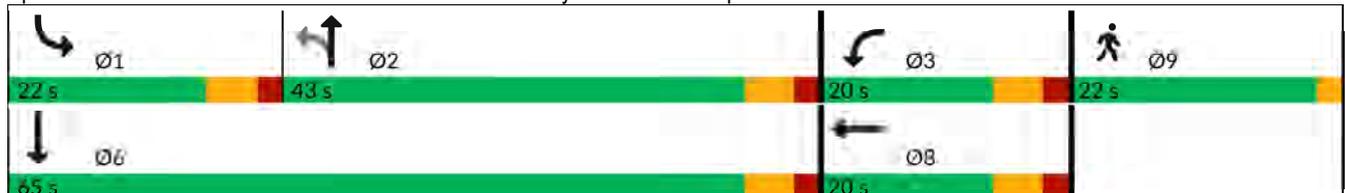
2025 Existing Condition
 Weekday Evening Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	826	0	191	0	631	261	71	419	0
Future Volume (vph)	0	0	0	826	0	191	0	631	261	71	419	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		150	150		150	150		150	150		150
Storage Lanes	0		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			35				35
Link Distance (ft)		330			2775			1149				1797
Travel Time (s)		7.5			63.1			22.4				35.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.91	0.91	0.91
Heavy Vehicles (%)	2%	2%	2%	2%	0%	1%	0%	1%	2%	2%	1%	0%
Shared Lane Traffic (%)				37%								
Turn Type				Prot	NA		Perm	NA		Prot	NA	
Protected Phases				3	8			2		1	6	
Permitted Phases							2					
Detector Phase				3	8		2	2		1	6	
Switch Phase												
Minimum Initial (s)				5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)				11.0	11.0		22.0	22.0		22.0	22.0	
Total Split (s)				20.0	20.0		43.0	43.0		22.0	65.0	
Total Split (%)				18.7%	18.7%		40.2%	40.2%		20.6%	60.7%	
Yellow Time (s)				4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)				2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)				0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)				6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode				None	None		Min	Min		Min	Min	

Intersection Summary

Area Type: Other
 Cycle Length: 107
 Actuated Cycle Length: 66.5
 Natural Cycle: 140
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Concord Road & Private Driveway/Middlesex Turnpike



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
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	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	21%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Intersection Summary	

Queues
 1: Concord Road & Private Driveway/Middlesex Turnpike

2025 Existing Condition
 Weekday Evening Peak Hour

					
Lane Group	WBL	WBT	NBT	SBL	SBT
Lane Group Flow (vph)	566	540	959	78	460
v/c Ratio	1.58	1.24	0.72	0.34	0.21
Control Delay (s/veh)	297.7	150.6	19.5	32.5	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	297.7	150.6	19.5	32.5	6.0
Queue Length 50th (ft)	~345	~249	155	29	38
Queue Length 95th (ft)	#663	#541	231	75	55
Internal Link Dist (ft)		2695	1069		1717
Turn Bay Length (ft)	150			150	
Base Capacity (vph)	359	435	1954	432	3175
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	1.58	1.24	0.49	0.18	0.14

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
 1: Concord Road & Private Driveway/Middlesex Turnpike

2025 Existing Condition
 Weekday Evening Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	826	0	191	0	631	261	71	419	0
Future Volume (vph)	0	0	0	826	0	191	0	631	261	71	419	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			6.0		6.0	6.0	
Lane Util. Factor				0.95	0.95			0.95		1.00	0.95	
Frt				1.00	0.94			0.96		1.00	1.00	
Flt Protected				0.95	0.97			1.00		0.95	1.00	
Satd. Flow (prot)				1681	1624			3407		1770	3574	
Flt Permitted				0.95	0.97			1.00		0.95	1.00	
Satd. Flow (perm)				1681	1624			3407		1770	3574	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.91	0.91	0.91
Adj. Flow (vph)	0	0	0	898	0	208	0	678	281	78	460	0
RTOR Reduction (vph)	0	0	0	0	88	0	0	40	0	0	0	0
Lane Group Flow (vph)	0	0	0	566	452	0	0	919	0	78	460	0
Heavy Vehicles (%)	2%	2%	2%	2%	0%	1%	0%	1%	2%	2%	1%	0%
Turn Type				Prot	NA		Perm	NA		Prot	NA	
Protected Phases				3	8			2		1	6	
Permitted Phases							2					
Actuated Green, G (s)				14.2	14.2			25.5		8.6	40.1	
Effective Green, g (s)				14.2	14.2			25.5		8.6	40.1	
Actuated g/C Ratio				0.21	0.21			0.38		0.13	0.60	
Clearance Time (s)				6.0	6.0			6.0		6.0	6.0	
Vehicle Extension (s)				3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)				360	347			1310		229	2161	
v/s Ratio Prot				c0.34	0.28			c0.27		c0.04	0.13	
v/s Ratio Perm												
v/c Ratio				1.57	1.30			0.70		0.34	0.21	
Uniform Delay, d1				26.1	26.1			17.2		26.3	5.9	
Progression Factor				1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2				270.6	155.7			1.7		0.9	0.0	
Delay (s)				296.6	181.7			18.9		27.2	6.0	
Level of Service				F	F			B		C	A	
Approach Delay (s/veh)		0.0			240.5			18.9			9.1	
Approach LOS		A			F			B			A	
Intersection Summary												
HCM 2000 Control Delay (s/veh)			111.0									F
HCM 2000 Volume to Capacity ratio			0.93									
Actuated Cycle Length (s)			66.3							20.0		
Intersection Capacity Utilization			73.7%									D
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
 2: Private Driveway/Federal Street & Concord Road

2025 Existing Condition
 Weekday Evening Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	0	4	47	0	15	5	890	10	4	1304	4
Future Volume (vph)	5	0	4	47	0	15	5	890	10	4	1304	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	15	15	15	12	12	12	12	12	12	12	12	12
Storage Length (ft)	150		150	150		150	150		150	150		150
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		598			981			1348			1149	
Travel Time (s)		13.6			22.3			26.3			22.4	
Peak Hour Factor	0.56	0.56	0.56	0.74	0.74	0.74	0.91	0.91	0.91	0.88	0.88	0.88
Heavy Vehicles (%)	0%	0%	0%	4%	0%	6%	0%	2%	25%	14%	2%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized

HCM 7th TWSC
 2: Private Driveway/Federal Street & Concord Road

2025 Existing Condition
 Weekday Evening Peak Hour

Intersection												
Int Delay, s/veh	9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		+		+	+			+			+	
Traffic Vol, veh/h	5	0	4	47	0	15	5	890	10	4	1304	4
Future Vol, veh/h	5	0	4	47	0	15	5	890	10	4	1304	4
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	-	-	None									
Storage Length	-	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	56	56	56	74	74	74	91	91	91	88	88	88
Heavy Vehicles, %	0	0	0	4	0	6	0	2	25	14	2	0
Mvmt Flow	9	0	7	64	0	20	5	978	11	5	1482	5

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1993	2493	743	1745	2490	495	1486	0	0	989	0	0
Stage 1	1493	1493	-	995	995	-	-	-	-	-	-	-
Stage 2	500	1000	-	750	1495	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.58	6.5	7.02	4.1	-	-	4.38	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.58	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.58	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.54	4	3.36	2.2	-	-	2.34	-	-
Pot Cap-1 Maneuver	37	30	362	~ 54	30	510	458	-	-	626	-	-
Stage 1	132	188	-	259	325	-	-	-	-	-	-	-
Stage 2	527	324	-	365	188	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	34	29	362	~ 51	29	510	458	-	-	626	-	-
Mov Cap-2 Maneuver	34	29	-	~ 51	29	-	-	-	-	-	-	-
Stage 1	130	186	-	255	320	-	-	-	-	-	-	-
Stage 2	497	318	-	353	186	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	90.98		254.66		0.28		0.16	
HCM LOS	F		F					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	20	-	-	57	51	510	11	-	-
HCM Lane V/C Ratio	0.012	-	-	0.281	1.235	0.04	0.007	-	-
HCM Ctrl Dly (s/v)	13	0.2	-	91	\$ 332	12.4	10.8	0.1	-
HCM Lane LOS	B	A	-	F	F	B	B	A	-
HCM 95th %tile Q(veh)	0	-	-	1	5.7	0.1	0	-	-

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

Lanes, Volumes, Timings

2032 No Build

1: Concord Road & Private Driveway/Middlesex Turnpike

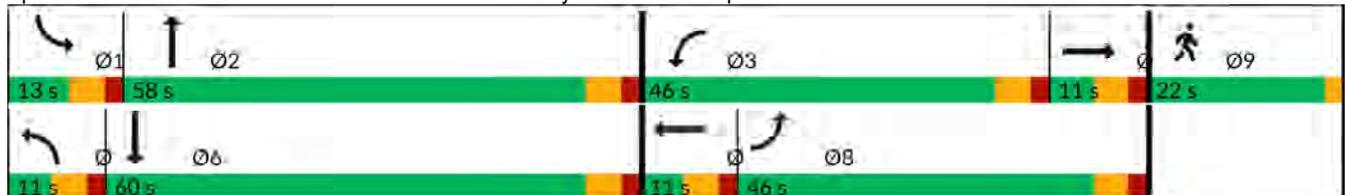
Weekday Evening Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	39	7	65	878	2	203	25	719	288	75	483	0
Future Volume (vph)	39	7	65	878	2	203	25	719	288	75	483	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		150	150		150	150		150	150		150
Storage Lanes	0		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		330			2775			1149			1797	
Travel Time (s)		7.5			63.1			22.4			35.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.91	0.91	0.91
Heavy Vehicles (%)	2%	2%	2%	2%	0%	1%	0%	1%	2%	2%	1%	0%
Shared Lane Traffic (%)				37%								
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	8	4		3	7		5	2		1	6	
Permitted Phases												
Detector Phase	8	4		3	7		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Total Split (s)	46.0	11.0		46.0	11.0		11.0	58.0		13.0	60.0	
Total Split (%)	30.7%	7.3%		30.7%	7.3%		7.3%	38.7%		8.7%	40.0%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	Min		Min	Min	

Intersection Summary

Area Type: Other
 Cycle Length: 150
 Actuated Cycle Length: 125.8
 Natural Cycle: 150
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Concord Road & Private Driveway/Middlesex Turnpike



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
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	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	23.0
Total Split (s)	22.0
Total Split (%)	15%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Intersection Summary	

Queues

2032 No Build

1: Concord Road & Private Driveway/Middlesex Turnpike

Weekday Evening Peak Hour

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	42	79	601	576	27	1083	82	531
v/c Ratio	0.12	0.60	1.11	1.08	0.38	0.87	0.83	0.36
Control Delay (s/veh)	38.2	36.2	113.6	101.2	78.5	44.6	112.4	27.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	38.2	36.2	113.6	101.2	78.5	44.6	112.4	27.9
Queue Length 50th (ft)	23	6	~560	~510	21	388	65	155
Queue Length 95th (ft)	65	#80	#1065	#1001	#66	#622	#202	261
Internal Link Dist (ft)		250		2695		1069		1717
Turn Bay Length (ft)	150		150		150		150	
Base Capacity (vph)	568	132	540	535	72	1450	99	1554
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.60	1.11	1.08	0.38	0.75	0.83	0.34

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
 1: Concord Road & Private Driveway/Middlesex Turnpike

2032 No Build
 Weekday Evening Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	39	7	65	878	2	203	25	719	288	75	483	0	
Future Volume (vph)	39	7	65	878	2	203	25	719	288	75	483	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0		
Lane Util. Factor	1.00	1.00		0.95	0.95		1.00	0.95		1.00	0.95		
Frt	1.00	0.87		1.00	0.94		1.00	0.96		1.00	1.00		
Flt Protected	0.95	1.00		0.95	0.97		0.95	1.00		0.95	1.00		
Satd. Flow (prot)	1770	1612		1681	1624		1805	3411		1770	3574		
Flt Permitted	0.95	1.00		0.95	0.00		0.95	1.00		0.95	1.00		
Satd. Flow (perm)	1770	1612		1681	0		1805	3411		1770	3574		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.91	0.91	0.91	
Adj. Flow (vph)	42	8	71	954	2	221	27	773	310	82	531	0	
RTOR Reduction (vph)	0	67	0	0	14	0	0	28	0	0	0	0	
Lane Group Flow (vph)	42	12	0	601	562	0	27	1055	0	82	531	0	
Heavy Vehicles (%)	2%	2%	2%	2%	0%	1%	0%	1%	2%	2%	1%	0%	
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA		
Protected Phases	8	4		3	7		5	2		1	6		
Permitted Phases													
Actuated Green, G (s)	22.8	7.7		40.4	40.4		2.9	47.8		7.1	52.0		
Effective Green, g (s)	22.8	7.7		40.4	40.4		2.9	47.8		7.1	52.0		
Actuated g/C Ratio	0.17	0.06		0.30	0.30		0.02	0.36		0.05	0.39		
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)	304	93		512	495		39	1230		94	1402		
v/s Ratio Prot	c0.02	0.01		c0.36	0.35		0.01	c0.31		c0.05	c0.15		
v/s Ratio Perm													
v/c Ratio	0.14	0.13		1.17	1.14		0.69	0.86		0.87	0.38		
Uniform Delay, d1	46.5	59.2		46.1	46.1		64.4	39.2		62.3	28.7		
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00		
Incremental Delay, d2	0.2	0.6		97.3	83.3		41.8	6.1		53.6	0.2		
Delay (s)	46.7	59.9		143.4	129.4		106.2	45.3		115.9	28.9		
Level of Service	D	E		F	F		F	D		F	C		
Approach Delay (s/veh)		55.3			136.5			46.8			40.5		
Approach LOS		E			F			D			D		
Intersection Summary													
HCM 2000 Control Delay (s/veh)			80.8									HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio			0.90										
Actuated Cycle Length (s)			132.5									Sum of lost time (s)	26.0
Intersection Capacity Utilization			85.5%									ICU Level of Service	E
Analysis Period (min)			15										
c Critical Lane Group													

Lanes, Volumes, Timings
 2: Private Driveway/Federal Street & Concord Road

2032 No Build
 Weekday Evening Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	0	4	214	0	76	5	969	44	16	1477	4
Future Volume (vph)	5	0	4	214	0	76	5	969	44	16	1477	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	15	15	15	12	12	12	12	12	12	12	12	12
Storage Length (ft)	150		150	150		150	150		150	150		150
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		598			981			1348			1149	
Travel Time (s)		13.6			22.3			26.3			22.4	
Peak Hour Factor	0.56	0.56	0.56	0.74	0.74	0.74	0.91	0.91	0.91	0.88	0.88	0.88
Heavy Vehicles (%)	0%	0%	0%	4%	0%	6%	0%	2%	25%	14%	2%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized

Intersection												
Int Delay, s/veh	343.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		+		+	+			+			+	
Traffic Vol, veh/h	5	0	4	214	0	76	5	969	44	16	1477	4
Future Vol, veh/h	5	0	4	214	0	76	5	969	44	16	1477	4
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	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	56	56	56	74	74	74	91	91	91	88	88	88
Heavy Vehicles, %	0	0	0	4	0	6	0	2	25	14	2	0
Mvmt Flow	9	0	7	289	0	103	5	1065	48	18	1678	5

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	2260	2841	841	1976	2819	557	1683	0	0	1113	0	0
Stage 1	1717	1717	-	1100	1100	-	-	-	-	-	-	-
Stage 2	543	1124	-	876	1719	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.58	6.5	7.02	4.1	-	-	4.38	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.58	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.58	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.54	4	3.36	2.2	-	-	2.34	-	-
Pot Cap-1 Maneuver	23	18	312	~36	18	464	385	-	-	558	-	-
Stage 1	95	146	-	~223	290	-	-	-	-	-	-	-
Stage 2	496	283	-	306	146	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	16	16	312	~32	17	464	385	-	-	558	-	-
Mov Cap-2 Maneuver	16	16	-	~32	17	-	-	-	-	-	-	-
Stage 1	89	137	-	~218	284	-	-	-	-	-	-	-
Stage 2	378	277	-	~281	137	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	239.41	\$ 2816.39	0.35	0.81
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1WBLn2	SBL	SBT	SBR
Capacity (veh/h)	17	-	-	28 32 464	38	-	-
HCM Lane V/C Ratio	0.014	-	-	0.567 8.942 0.221 0.033	-	-	-
HCM Ctrl Dly (s/v)	14.5	0.3	-	239.41 3811.3 14.9 11.7	0.7	-	-
HCM Lane LOS	B	A	-	F F B B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	1.8 35.2 0.8 0.1	-	-	-

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

Lanes, Volumes, Timings

2032 No Build

1: Concord Road & Private Driveway/Middlesex Turnpike

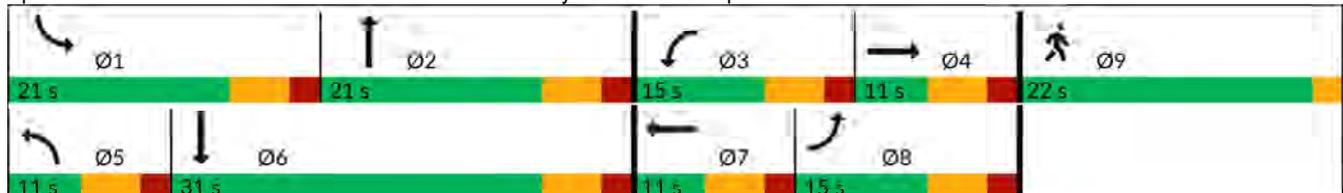
Weekday Morning Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	2	17	295	7	56	97	358	496	127	840	0
Future Volume (vph)	10	2	17	295	7	56	97	358	496	127	840	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		150	150		150	150		150	150		150
Storage Lanes	0		0	1		0	1		0	1		0
Taper Length (ft)	25			25			50			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		330			2775			1149			1797	
Travel Time (s)		7.5			63.1			22.4			35.0	
Peak Hour Factor	0.97	0.97	0.97	0.92	0.92	0.92	0.87	0.87	0.87	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	6%	0%	6%	0%	4%	2%	2%	2%	2%
Shared Lane Traffic (%)				38%								
Turn Type	Prot	NA										
Protected Phases	8	4		3	7		5	2		1	6	
Permitted Phases												
Detector Phase	8	4		3	7		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Total Split (s)	15.0	11.0		15.0	11.0		11.0	21.0		21.0	31.0	
Total Split (%)	16.7%	12.2%		16.7%	12.2%		12.2%	23.3%		23.3%	34.4%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes										
Recall Mode	None	None		None	None		None	Min		Min	Min	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 60.7
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Concord Road & Private Driveway/Middlesex Turnpike



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
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	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	23.0
Total Split (s)	22.0
Total Split (%)	24%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Intersection Summary	

Queues

2032 No Build

1: Concord Road & Private Driveway/Middlesex Turnpike

Weekday Morning Peak Hour

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	10	20	199	191	111	981	138	913
v/c Ratio	0.05	0.13	0.79	0.73	0.71	0.84	0.46	0.69
Control Delay (s/veh)	30.9	20.2	53.2	44.0	58.6	23.9	31.0	22.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	30.9	20.2	53.2	44.0	58.6	23.9	31.0	22.1
Queue Length 50th (ft)	3	1	66	55	36	93	41	116
Queue Length 95th (ft)	21	23	#293	#263	#171	#377	131	#392
Internal Link Dist (ft)		250		2695		1069		1717
Turn Bay Length (ft)	150		150		150		150	
Base Capacity (vph)	281	158	252	263	156	1164	459	1531
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.13	0.79	0.73	0.71	0.84	0.30	0.60

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
 1: Concord Road & Private Driveway/Middlesex Turnpike

2032 No Build
 Weekday Morning Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	10	2	17	295	7	56	97	358	496	127	840	0	
Future Volume (vph)	10	2	17	295	7	56	97	358	496	127	840	0	
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0		
Lane Util. Factor	1.00	1.00		0.95	0.95		1.00	0.95		1.00	0.95		
Frt	1.00	0.87		1.00	0.95		1.00	0.91		1.00	1.00		
Flt Protected	0.95	1.00		0.95	0.97		0.95	1.00		0.95	1.00		
Satd. Flow (prot)	1805	1644		1618	1575		1805	3204		1770	3539		
Flt Permitted	0.95	1.00		0.95	0.00		0.95	1.00		0.95	1.00		
Satd. Flow (perm)	1805	1644		1618	0		1805	3204		1770	3539		
Peak-hour factor, PHF	0.97	0.97	0.97	0.92	0.92	0.92	0.87	0.87	0.87	0.92	0.92	0.92	
Adj. Flow (vph)	10	2	18	321	8	61	111	411	570	138	913	0	
RTOR Reduction (vph)	0	18	0	0	18	0	0	246	0	0	0	0	
Lane Group Flow (vph)	10	2	0	199	173	0	111	735	0	138	913	0	
Heavy Vehicles (%)	0%	0%	0%	6%	0%	6%	0%	4%	2%	2%	2%	2%	
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA		
Protected Phases	8	4		3	7		5	2		1	6		
Permitted Phases													
Actuated Green, G (s)	1.3	0.7		9.5	9.5		5.3	17.6		10.2	22.5		
Effective Green, g (s)	1.3	0.7		9.5	9.5		5.3	17.6		10.2	22.5		
Actuated g/C Ratio	0.02	0.01		0.14	0.14		0.08	0.26		0.15	0.34		
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)	35	17		230	223		143	844		270	1192		
v/s Ratio Prot	c0.01	0.00		c0.12	0.11		0.06	0.23		c0.08	c0.26		
v/s Ratio Perm													
v/c Ratio	0.29	0.13		0.87	0.78		0.78	0.87		0.51	0.77		
Uniform Delay, d1	32.3	32.7		28.0	27.6		30.2	23.5		26.0	19.8		
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00		
Incremental Delay, d2	4.5	3.4		27.0	15.4		22.7	9.8		1.6	3.0		
Delay (s)	36.8	36.2		55.0	43.1		52.9	33.3		27.6	22.8		
Level of Service	D	D		E	D		D	C		C	C		
Approach Delay (s/veh)		36.4			49.2			35.3			23.4		
Approach LOS		D			D			D			C		
Intersection Summary													
HCM 2000 Control Delay (s/veh)			32.5									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.74										
Actuated Cycle Length (s)			66.8									Sum of lost time (s)	26.0
Intersection Capacity Utilization			64.6%									ICU Level of Service	C
Analysis Period (min)			15										
c Critical Lane Group													

Lanes, Volumes, Timings
 2: Private Driveway/Federal Street & Concord Road

2032 No Build
 Weekday Morning Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	1	32	0	11	4	1064	233	79	1046	4
Future Volume (vph)	1	0	1	32	0	11	4	1064	233	79	1046	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	15	15	15	12	12	12	12	12	12	12	12	12
Storage Length (ft)	150		150	150		150	150		150	150		150
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			35				35
Link Distance (ft)		598			981			1348				1149
Travel Time (s)		13.6			22.3			26.3				22.4
Peak Hour Factor	0.50	0.50	0.50	0.83	0.83	0.83	0.93	0.93	0.93	0.88	0.88	0.88
Heavy Vehicles (%)	0%	0%	0%	33%	0%	0%	0%	3%	0%	0%	4%	50%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized

Intersection												
Int Delay, s/veh	18.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		+		+	+			+			+	
Traffic Vol, veh/h	1	0	1	32	0	11	4	1064	233	79	1046	4
Future Vol, veh/h	1	0	1	32	0	11	4	1064	233	79	1046	4
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	-	-	None									
Storage Length	-	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	50	50	50	83	83	83	93	93	93	88	88	88
Heavy Vehicles, %	0	0	0	33	0	0	0	3	0	0	4	50
Mvmt Flow	2	0	2	39	0	13	4	1144	251	90	1189	5

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1951	2774	597	2052	2651	697	1193	0	0	1395	0	0
Stage 1	1370	1370	-	1278	1278	-	-	-	-	-	-	-
Stage 2	581	1403	-	774	1373	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	8.16	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	7.16	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	7.16	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.83	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	39	19	451	~22	23	388	592	-	-	497	-	-
Stage 1	157	216	-	135	239	-	-	-	-	-	-	-
Stage 2	472	208	-	296	215	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	27	14	451	~16	17	388	592	-	-	497	-	-
Mov Cap-2 Maneuver	27	14	-	~16	17	-	-	-	-	-	-	-
Stage 1	114	158	-	134	236	-	-	-	-	-	-	-
Stage 2	450	206	-	215	157	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	80.37	\$ 858.02	0.14	3.98
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1WBLn2	SBL	SBT	SBR
Capacity (veh/h)	9	-	-	52 16 388	251	-	-
HCM Lane V/C Ratio	0.007	-	-	0.077 2.432 0.034	0.181	-	-
HCM Ctrl Dly (s/v)	11.1	0.1	-	80.37 1147.9 14.6	13.8	3.3	-
HCM Lane LOS	B	A	-	F F B B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2 5.5 0.1 0.7	-	-	-

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

Lanes, Volumes, Timings
1: Concord Road & Private Driveway/Middlesex Turnpike

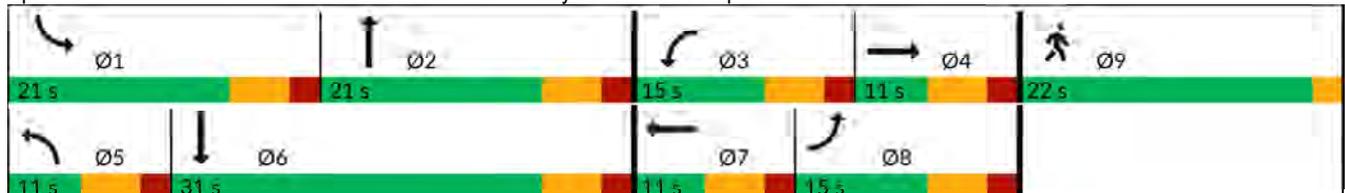
2032 Build Condition
Weekday Morning Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	2	17	288	7	56	97	364	506	127	796	0
Future Volume (vph)	10	2	17	288	7	56	97	364	506	127	796	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		150	150		150	150		150	150		150
Storage Lanes	0		0	1		0	1		0	1		0
Taper Length (ft)	25			25			50			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		330			2775			1149			1797	
Travel Time (s)		7.5			63.1			22.4			35.0	
Peak Hour Factor	0.97	0.97	0.97	0.92	0.92	0.92	0.87	0.87	0.87	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	6%	0%	6%	0%	4%	2%	2%	2%	2%
Shared Lane Traffic (%)				38%								
Turn Type	Prot	NA										
Protected Phases	8	4		3	7		5	2		1	6	
Permitted Phases												
Detector Phase	8	4		3	7		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Total Split (s)	15.0	11.0		15.0	11.0		11.0	21.0		21.0	31.0	
Total Split (%)	16.7%	12.2%		16.7%	12.2%		12.2%	23.3%		23.3%	34.4%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes										
Recall Mode	None	None		None	None		None	Min		None	Min	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 59.6
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Concord Road & Private Driveway/Middlesex Turnpike



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
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	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	23.0
Total Split (s)	22.0
Total Split (%)	24%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Intersection Summary	

Queues
1: Concord Road & Private Driveway/Middlesex Turnpike

2032 Build Condition
Weekday Morning Peak Hour

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	10	20	194	188	111	1000	138	865
v/c Ratio	0.05	0.12	0.75	0.70	0.69	0.78	0.45	0.68
Control Delay (s/veh)	30.7	20.1	49.0	41.7	56.3	21.1	30.4	21.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	30.7	20.1	49.0	41.7	56.3	21.1	30.4	21.8
Queue Length 50th (ft)	3	1	61	51	34	96	39	108
Queue Length 95th (ft)	21	23	#285	#257	#171	#387	131	#360
Internal Link Dist (ft)		250		2695		1069		1717
Turn Bay Length (ft)	150		150		150		150	
Base Capacity (vph)	288	162	258	268	160	1279	470	1569
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.12	0.75	0.70	0.69	0.78	0.29	0.55

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
 1: Concord Road & Private Driveway/Middlesex Turnpike

2032 Build Condition
 Weekday Morning Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	10	2	17	288	7	56	97	364	506	127	796	0	
Future Volume (vph)	10	2	17	288	7	56	97	364	506	127	796	0	
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0		
Lane Util. Factor	1.00	1.00		0.95	0.95		1.00	0.95		1.00	0.95		
Frt	1.00	0.87		1.00	0.95		1.00	0.91		1.00	1.00		
Flt Protected	0.95	1.00		0.95	0.97		0.95	1.00		0.95	1.00		
Satd. Flow (prot)	1805	1644		1618	1574		1805	3204		1770	3539		
Flt Permitted	0.95	1.00		0.95	0.00		0.95	1.00		0.95	1.00		
Satd. Flow (perm)	1805	1644		1618	0		1805	3204		1770	3539		
Peak-hour factor, PHF	0.97	0.97	0.97	0.92	0.92	0.92	0.87	0.87	0.87	0.92	0.92	0.92	
Adj. Flow (vph)	10	2	18	313	8	61	111	418	582	138	865	0	
RTOR Reduction (vph)	0	18	0	0	18	0	0	239	0	0	0	0	
Lane Group Flow (vph)	10	2	0	194	170	0	111	761	0	138	865	0	
Heavy Vehicles (%)	0%	0%	0%	6%	0%	6%	0%	4%	2%	2%	2%	2%	
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA		
Protected Phases	8	4		3	7		5	2		1	6		
Permitted Phases													
Actuated Green, G (s)	1.2	0.7		9.5	9.5		5.3	19.6		8.5	22.8		
Effective Green, g (s)	1.2	0.7		9.5	9.5		5.3	19.6		8.5	22.8		
Actuated g/C Ratio	0.02	0.01		0.14	0.14		0.08	0.29		0.13	0.34		
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)	32	17		229	222		142	935		224	1202		
v/s Ratio Prot	c0.01	0.00		c0.12	0.11		0.06	c0.24		c0.08	c0.24		
v/s Ratio Perm													
v/c Ratio	0.31	0.13		0.85	0.77		0.78	0.81		0.62	0.72		
Uniform Delay, d1	32.5	32.9		28.1	27.7		30.3	22.1		27.8	19.4		
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00		
Incremental Delay, d2	5.5	3.4		24.0	14.5		23.8	5.5		5.0	2.1		
Delay (s)	38.1	36.3		52.1	42.3		54.2	27.6		32.7	21.5		
Level of Service	D	D		D	D		D	C		C	C		
Approach Delay (s/veh)		36.9			47.3			30.2			23.0		
Approach LOS		D			D			C			C		
Intersection Summary													
HCM 2000 Control Delay (s/veh)			30.0									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.73										
Actuated Cycle Length (s)			67.1									Sum of lost time (s)	26.0
Intersection Capacity Utilization			64.9%									ICU Level of Service	C
Analysis Period (min)			15										
c Critical Lane Group													

Lanes, Volumes, Timings
 2: Private Driveway/Federal Street & Concord Road

2032 Build Condition
 Weekday Morning Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	1	66	0	27	4	1064	91	28	1046	4
Future Volume (vph)	1	0	1	66	0	27	4	1064	91	28	1046	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	15	15	15	12	12	12	12	12	12	12	12	12
Storage Length (ft)	150		150	150		150	150		150	150		150
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			35				35
Link Distance (ft)		598			981			1348				1149
Travel Time (s)		13.6			22.3			26.3				22.4
Peak Hour Factor	0.50	0.50	0.50	0.83	0.83	0.83	0.93	0.93	0.93	0.88	0.88	0.88
Heavy Vehicles (%)	0%	0%	0%	33%	0%	0%	0%	3%	0%	0%	4%	50%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized

Intersection												
Int Delay, s/veh	34.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		+		+	+			+			+	
Traffic Vol, veh/h	1	0	1	66	0	27	4	1064	91	28	1046	4
Future Vol, veh/h	1	0	1	66	0	27	4	1064	91	28	1046	4
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	-	-	None									
Storage Length	-	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	50	50	50	83	83	83	93	93	93	88	88	88
Heavy Vehicles, %	0	0	0	33	0	0	0	3	0	0	4	50
Mvmt Flow	2	0	2	80	0	33	4	1144	98	32	1189	5

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1835	2505	597	1860	2458	621	1193	0	0	1242	0	0
Stage 1	1255	1255	-	1202	1202	-	-	-	-	-	-	-
Stage 2	581	1251	-	658	1257	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	8.16	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	7.16	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	7.16	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.83	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	48	29	451	~32	31	435	592	-	-	568	-	-
Stage 1	185	245	-	153	260	-	-	-	-	-	-	-
Stage 2	472	247	-	353	245	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	40	26	451	~29	28	435	592	-	-	568	-	-
Mov Cap-2 Maneuver	40	26	-	~29	28	-	-	-	-	-	-	-
Stage 1	169	225	-	151	257	-	-	-	-	-	-	-
Stage 2	432	244	-	322	224	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	56.29		\$ 775.92		0.15		1.21	
HCM LOS	F		F					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	11	-	-	74	29	435	93	-	-
HCM Lane V/C Ratio	0.007	-	-	0.054	2.766	0.075	0.056	-	-
HCM Ctrl Dly (s/v)	11.1	0.1	-	56.29	1087.6	13.9	11.7	0.9	-
HCM Lane LOS	B	A	-	F	F	B	B	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	9.5	0.2	0.2	-	-

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

Lanes, Volumes, Timings
 3: Federal Street & #2 Fed [West]

2032 Build Condition
 Weekday Morning Peak Hour

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	11	108	57	0	0	36
Future Volume (vph)	11	108	57	0	0	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11
Link Speed (mph)		30	30		30	
Link Distance (ft)		425	100		200	
Travel Time (s)		9.7	2.3		4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized

Intersection

Int Delay, s/veh 1.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
----------	-----	-----	-----	-----	-----	-----

Lane Configurations		4	4		4	
Traffic Vol, veh/h	11	108	57	0	0	36
Future Vol, veh/h	11	108	57	0	0	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	117	62	0	0	39

Major/Minor	Major1	Major2	Minor2
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Conflicting Flow All	62	0	0	203	62
Stage 1	-	-	-	62	-
Stage 2	-	-	-	141	-
Critical Hdwy	4.12	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	3.518	3.318
Pot Cap-1 Maneuver	1541	-	-	785	1003
Stage 1	-	-	-	961	-
Stage 2	-	-	-	886	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	1541	-	-	779	1003
Mov Cap-2 Maneuver	-	-	-	779	-
Stage 1	-	-	-	953	-
Stage 2	-	-	-	886	-

Approach	EB	WB	SB
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HCM Ctrl Dly, s/v	0.68	0	8.74
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
-----------------------	-----	-----	-----	-----	-------

Capacity (veh/h)	166	-	-	-	1003
HCM Lane V/C Ratio	0.008	-	-	-	0.039
HCM Ctrl Dly (s/v)	7.4	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lanes, Volumes, Timings
 4: #1 Fed [West] & Federal Street

2032 Build Condition
 Weekday Morning Peak Hour

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	103	5	0	40	17	0
Future Volume (vph)	103	5	0	40	17	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11
Link Speed (mph)	30			30	30	
Link Distance (ft)	100			50	200	
Travel Time (s)	2.3			1.1	4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized

Intersection

Int Delay, s/veh	1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	T			T	T	
Traffic Vol, veh/h	103	5	0	40	17	0
Future Vol, veh/h	103	5	0	40	17	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	112	5	0	43	18	0

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	117	0	158
Stage 1	-	-	-	-	115
Stage 2	-	-	-	-	43
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1471	-	833
Stage 1	-	-	-	-	910
Stage 2	-	-	-	-	979
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1471	-	833
Mov Cap-2 Maneuver	-	-	-	-	833
Stage 1	-	-	-	-	910
Stage 2	-	-	-	-	979

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0	9.42
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	833	-	-	1471	-
HCM Lane V/C Ratio	0.022	-	-	-	-
HCM Ctrl Dly (s/v)	9.4	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Lanes, Volumes, Timings
 5: Federal Street & #2 Fed [East]

2032 Build Condition
 Weekday Morning Peak Hour

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	6	97	22	0	0	18
Future Volume (vph)	6	97	22	0	0	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11
Link Speed (mph)		30	30		30	
Link Distance (ft)		50	380		200	
Travel Time (s)		1.1	8.6		4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized

Intersection						
Int Delay, s/veh	1.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		4	1		Y	
Traffic Vol, veh/h	6	97	22	0	0	18
Future Vol, veh/h	6	97	22	0	0	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	105	24	0	0	20

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	24	0	-	0	142
Stage 1	-	-	-	-	24
Stage 2	-	-	-	-	118
Critical Hdwy	4.12	-	-	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	2.218	-	-	-	3.518
Pot Cap-1 Maneuver	1591	-	-	-	850
Stage 1	-	-	-	-	999
Stage 2	-	-	-	-	907
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1591	-	-	-	847
Mov Cap-2 Maneuver	-	-	-	-	847
Stage 1	-	-	-	-	994
Stage 2	-	-	-	-	907

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.42	0	8.48
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	105	-	-	-	1053
HCM Lane V/C Ratio	0.004	-	-	-	0.019
HCM Ctrl Dly (s/v)	7.3	0	-	-	8.5
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lanes, Volumes, Timings
 6: #1 Fed [East] & Federal Street

2032 Build Condition
 Weekday Morning Peak Hour

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	94	3	0	13	9	0
Future Volume (vph)	94	3	0	13	9	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11
Link Speed (mph)	30			30	30	
Link Distance (ft)	380			190	200	
Travel Time (s)	8.6			4.3	4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized

Intersection						
Int Delay, s/veh	0.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	T			T	T	
Traffic Vol, veh/h	94	3	0	13	9	0
Future Vol, veh/h	94	3	0	13	9	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	102	3	0	14	10	0

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	105	0	118
Stage 1	-	-	-	-	104
Stage 2	-	-	-	-	14
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1486	-	878
Stage 1	-	-	-	-	920
Stage 2	-	-	-	-	1009
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1486	-	878
Mov Cap-2 Maneuver	-	-	-	-	878
Stage 1	-	-	-	-	920
Stage 2	-	-	-	-	1009

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0	9.15
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	878	-	-	1486	-
HCM Lane V/C Ratio	0.011	-	-	-	-
HCM Ctrl Dly (s/v)	9.1	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings
 1: Concord Road & Private Driveway/Middlesex Turnpike

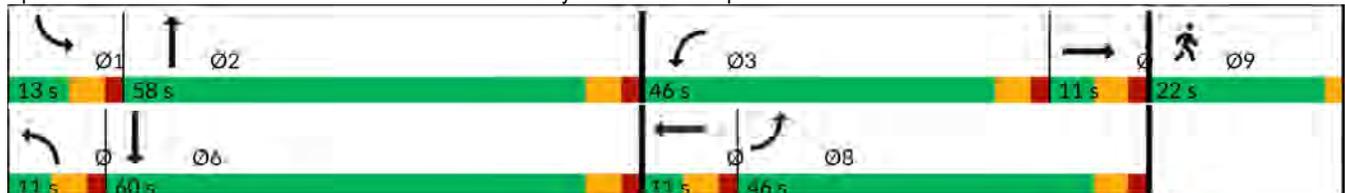
2032 Build Condition
 Weekday Evening Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	39	7	65	889	2	203	25	683	286	75	487	0
Future Volume (vph)	39	7	65	889	2	203	25	683	286	75	487	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		150	150		150	150		150	150		150
Storage Lanes	0		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		330			2775			1149			1797	
Travel Time (s)		7.5			63.1			22.4			35.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.91	0.91	0.91
Heavy Vehicles (%)	2%	2%	2%	2%	0%	1%	0%	1%	2%	2%	1%	0%
Shared Lane Traffic (%)				37%								
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	8	4		3	7		5	2		1	6	
Permitted Phases												
Detector Phase	8	4		3	7		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Total Split (s)	46.0	11.0		46.0	11.0		11.0	58.0		13.0	60.0	
Total Split (%)	30.7%	7.3%		30.7%	7.3%		7.3%	38.7%		8.7%	40.0%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag	Lag	Lag		Lead	Lead		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	Min		None	Min	

Intersection Summary

Area Type: Other
 Cycle Length: 150
 Actuated Cycle Length: 123.3
 Natural Cycle: 150
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Concord Road & Private Driveway/Middlesex Turnpike



Lane Group	Ø9
<hr/>	
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
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	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	23.0
Total Split (s)	22.0
Total Split (%)	15%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
<hr/>	
Intersection Summary	

Queues
1: Concord Road & Private Driveway/Middlesex Turnpike

2032 Build Condition
Weekday Evening Peak Hour

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	42	79	609	580	27	1042	82	535
v/c Ratio	0.12	0.59	1.10	1.06	0.36	0.86	0.81	0.37
Control Delay (s/veh)	37.3	35.5	109.1	94.6	77.0	44.8	107.7	28.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	37.3	35.5	109.1	94.6	77.0	44.8	107.7	28.4
Queue Length 50th (ft)	22	6	~549	~493	21	365	63	156
Queue Length 95th (ft)	65	#80	#1082	#1008	#66	580	#202	263
Internal Link Dist (ft)		250		2695		1069		1717
Turn Bay Length (ft)	150		150		150		150	
Base Capacity (vph)	581	134	552	547	74	1482	101	1585
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.59	1.10	1.06	0.36	0.70	0.81	0.34

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
 1: Concord Road & Private Driveway/Middlesex Turnpike

2032 Build Condition
 Weekday Evening Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	39	7	65	889	2	203	25	683	286	75	487	0	
Future Volume (vph)	39	7	65	889	2	203	25	683	286	75	487	0	
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0		
Lane Util. Factor	1.00	1.00		0.95	0.95		1.00	0.95		1.00	0.95		
Frt	1.00	0.87		1.00	0.94		1.00	0.96		1.00	1.00		
Flt Protected	0.95	1.00		0.95	0.97		0.95	1.00		0.95	1.00		
Satd. Flow (prot)	1770	1612		1681	1625		1805	3406		1770	3574		
Flt Permitted	0.95	1.00		0.95	0.00		0.95	1.00		0.95	1.00		
Satd. Flow (perm)	1770	1612		1681	0		1805	3406		1770	3574		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.91	0.91	0.91	
Adj. Flow (vph)	42	8	71	966	2	221	27	734	308	82	535	0	
RTOR Reduction (vph)	0	67	0	0	14	0	0	31	0	0	0	0	
Lane Group Flow (vph)	42	12	0	609	566	0	27	1011	0	82	535	0	
Heavy Vehicles (%)	2%	2%	2%	2%	0%	1%	0%	1%	2%	2%	1%	0%	
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA		
Protected Phases	8	4		3	7		5	2		1	6		
Permitted Phases													
Actuated Green, G (s)	22.8	7.8		40.5	40.5		2.8	45.2		7.1	49.5		
Effective Green, g (s)	22.8	7.8		40.5	40.5		2.8	45.2		7.1	49.5		
Actuated g/C Ratio	0.18	0.06		0.31	0.31		0.02	0.35		0.05	0.38		
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)	310	96		523	506		38	1184		96	1360		
v/s Ratio Prot	c0.02	0.01		c0.36	0.35		0.01	c0.30		c0.05	c0.15		
v/s Ratio Perm													
v/c Ratio	0.14	0.13		1.16	1.12		0.71	0.85		0.85	0.39		
Uniform Delay, d1	45.3	57.9		44.8	44.8		63.2	39.3		60.9	29.3		
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00		
Incremental Delay, d2	0.2	0.6		93.3	76.9		47.3	6.2		48.1	0.2		
Delay (s)	45.5	58.5		138.1	121.6		110.5	45.5		109.1	29.5		
Level of Service	D	E		F	F		F	D		F	C		
Approach Delay (s/veh)		54.0			130.0			47.2			40.1		
Approach LOS		D			F			D			D		
Intersection Summary													
HCM 2000 Control Delay (s/veh)			78.9									HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio			0.90										
Actuated Cycle Length (s)			130.0									Sum of lost time (s)	26.0
Intersection Capacity Utilization			84.7%									ICU Level of Service	E
Analysis Period (min)			15										
c Critical Lane Group													

Lanes, Volumes, Timings
 2: Private Driveway/Federal Street & Concord Road

2032 Build Condition
 Weekday Evening Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	0	4	100	0	38	5	969	73	31	1477	4
Future Volume (vph)	5	0	4	100	0	38	5	969	73	31	1477	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	15	15	15	12	12	12	12	12	12	12	12	12
Storage Length (ft)	150		150	150		150	150		150	150		150
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		598			981			1348			1149	
Travel Time (s)		13.6			22.3			26.3			22.4	
Peak Hour Factor	0.56	0.56	0.56	0.74	0.74	0.74	0.91	0.91	0.91	0.88	0.88	0.88
Heavy Vehicles (%)	0%	0%	0%	4%	0%	6%	0%	2%	25%	14%	2%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized

HCM 7th TWSC
 2: Private Driveway/Federal Street & Concord Road

2032 Build Condition
 Weekday Evening Peak Hour

Intersection												
Int Delay, s/veh	92											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		+		+	+			+			+	
Traffic Vol, veh/h	5	0	4	100	0	38	5	969	73	31	1477	4
Future Vol, veh/h	5	0	4	100	0	38	5	969	73	31	1477	4
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	-	-	None									
Storage Length	-	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	56	56	56	74	74	74	91	91	91	88	88	88
Heavy Vehicles, %	0	0	0	4	0	6	0	2	25	14	2	0
Mvmt Flow	9	0	7	135	0	51	5	1065	80	35	1678	5

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	2295	2907	841	2026	2869	573	1683	0	0	1145	0	0
Stage 1	1751	1751	-	1116	1116	-	-	-	-	-	-	-
Stage 2	543	1156	-	910	1753	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.58	6.5	7.02	4.1	-	-	4.38	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.58	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.58	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.54	4	3.36	2.2	-	-	2.34	-	-
Pot Cap-1 Maneuver	22	16	312	~33	17	453	385	-	-	542	-	-
Stage 1	91	141	-	218	285	-	-	-	-	-	-	-
Stage 2	496	273	-	292	140	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	16	14	312	~28	14	453	385	-	-	542	-	-
Mov Cap-2 Maneuver	16	14	-	~28	14	-	-	-	-	-	-	-
Stage 1	80	124	-	213	279	-	-	-	-	-	-	-
Stage 2	431	268	-	250	123	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	238.65		\$ 1477		0.35		1.64	
HCM LOS	F		F					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	16	-	-	28	28	453	74	-	-
HCM Lane V/C Ratio	0.014	-	-	0.566	4.883	0.113	0.065	-	-
HCM Ctrl Dly (s/v)	14.5	0.3	-	238.7	\$ 2033	14	12.1	1.4	-
HCM Lane LOS	B	A	-	F	F	B	B	A	-
HCM 95th %tile Q(veh)	0	-	-	1.8	16.5	0.4	0.2	-	-

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

Lanes, Volumes, Timings
 3: Federal Street & #2 Fed [West]

2032 Build Condition
 Weekday Evening Peak Hour

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	38	66	115	0	0	23
Future Volume (vph)	38	66	115	0	0	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11
Link Speed (mph)		30	30		30	
Link Distance (ft)		425	100		200	
Travel Time (s)		9.7	2.3		4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized

Intersection

Int Delay, s/veh 2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		4	1		W	
Traffic Vol, veh/h	38	66	115	0	0	23
Future Vol, veh/h	38	66	115	0	0	23
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	41	72	125	0	0	25

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	125	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	1462	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1462	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	2.75	0	9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	658	-	-	-	926
HCM Lane V/C Ratio	0.028	-	-	-	0.027
HCM Ctrl Dly (s/v)	7.5	0	-	-	9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Lanes, Volumes, Timings
 4: #1 Fed [West] & Federal Street

2032 Build Condition
 Weekday Evening Peak Hour

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	48	18	0	105	10	0
Future Volume (vph)	48	18	0	105	10	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11
Link Speed (mph)	30			30	30	
Link Distance (ft)	100			50	200	
Travel Time (s)	2.3			1.1	4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized

Intersection						
Int Delay, s/veh	0.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1			4	W	
Traffic Vol, veh/h	48	18	0	105	10	0
Future Vol, veh/h	48	18	0	105	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	52	20	0	114	11	0

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	72	0	176 62
Stage 1	-	-	-	-	62 -
Stage 2	-	-	-	-	114 -
Critical Hdwy	-	-	4.12	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	-	-	2.218	-	3.518 3.318
Pot Cap-1 Maneuver	-	-	1528	-	814 1003
Stage 1	-	-	-	-	961 -
Stage 2	-	-	-	-	911 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1528	-	814 1003
Mov Cap-2 Maneuver	-	-	-	-	814 -
Stage 1	-	-	-	-	961 -
Stage 2	-	-	-	-	911 -

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0	9.48
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	814	-	-	1528	-
HCM Lane V/C Ratio	0.013	-	-	-	-
HCM Ctrl Dly (s/v)	9.5	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings
 5: Federal Street & #2 Fed [East]

2032 Build Condition
 Weekday Evening Peak Hour

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	20	28	93	0	0	12
Future Volume (vph)	20	28	93	0	0	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11
Link Speed (mph)		30	30		30	
Link Distance (ft)		50	380		200	
Travel Time (s)		1.1	8.6		4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized

Intersection

Int Delay, s/veh 1.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		4	4		4	
Traffic Vol, veh/h	20	28	93	0	0	12
Future Vol, veh/h	20	28	93	0	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	30	101	0	0	13

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	101	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	1491	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1491	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	3.1	0	8.82
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	750	-	-	-	954
HCM Lane V/C Ratio	0.015	-	-	-	0.014
HCM Ctrl Dly (s/v)	7.4	0	-	-	8.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Lanes, Volumes, Timings
 6: #1 Fed [East] & Federal Street

2032 Build Condition
 Weekday Evening Peak Hour

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	19	9	0	88	5	0
Future Volume (vph)	19	9	0	88	5	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11
Link Speed (mph)	30			30	30	
Link Distance (ft)	380			294	200	
Travel Time (s)	8.6			6.7	4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized

Intersection

Int Delay, s/veh 0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1			4	Y	
Traffic Vol, veh/h	19	9	0	88	5	0
Future Vol, veh/h	19	9	0	88	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	10	0	96	5	0

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	30	0	121
Stage 1	-	-	-	-	26
Stage 2	-	-	-	-	96
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1582	-	874
Stage 1	-	-	-	-	997
Stage 2	-	-	-	-	928
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1582	-	874
Mov Cap-2 Maneuver	-	-	-	-	874
Stage 1	-	-	-	-	997
Stage 2	-	-	-	-	928

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0	9.14
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	874	-	-	1582	-
HCM Lane V/C Ratio	0.006	-	-	-	-
HCM Ctrl Dly (s/v)	9.1	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Attachment M – Parking Data & Town of Billerica MCMOD Parking Bylaw

Multifamily Housing - 1 BR (Low-Rise) - Not Close to Rail Transit (217)

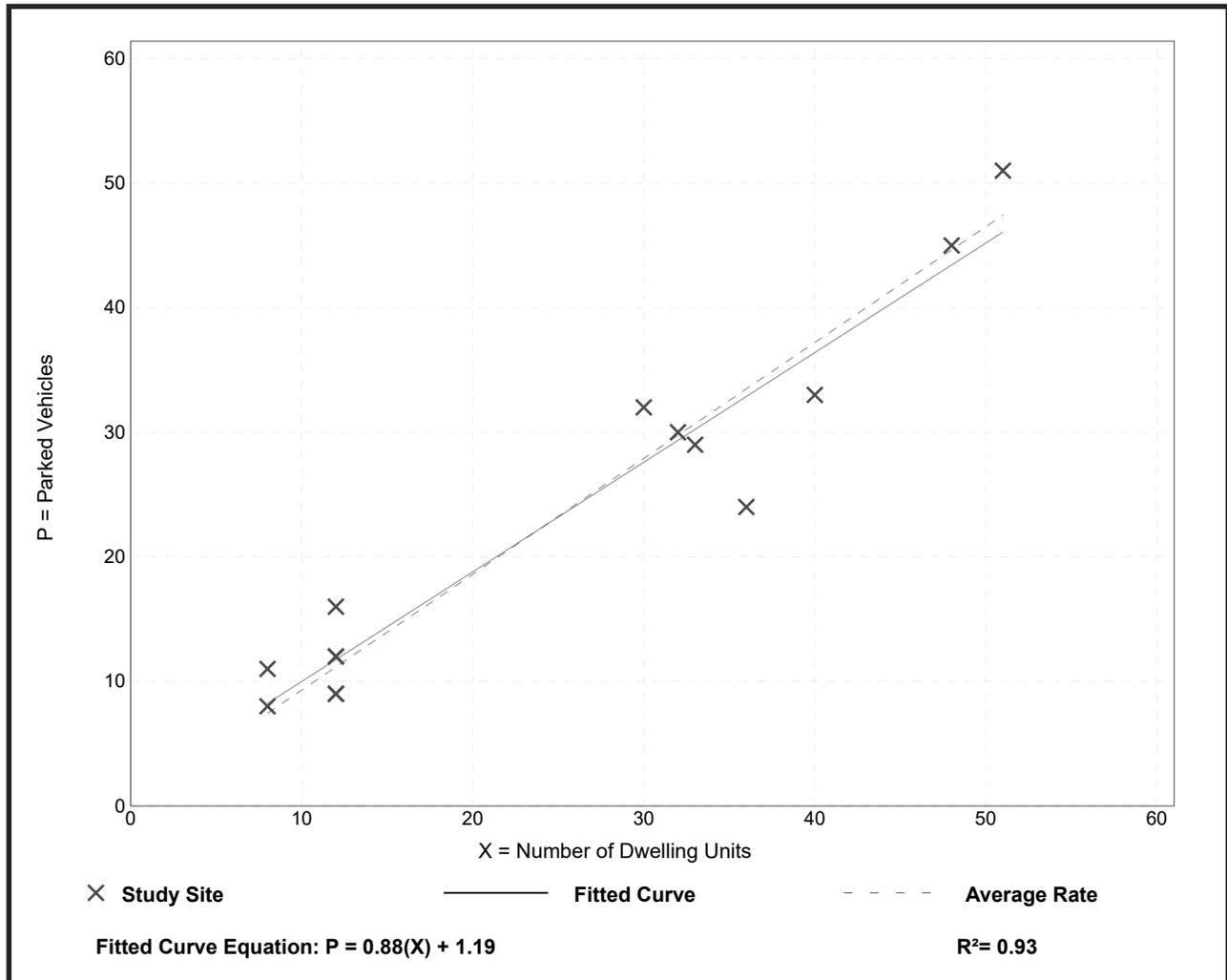
Peak Period Parking Demand vs: Dwelling Units
On a: Weekday (Monday - Friday)
Setting/Location: General Urban/Suburban
 Number of Studies: 14
 Avg. Num. of Dwelling Units: 25

Peak Period Parking Demand per Dwelling Unit

Average Rate	Range of Rates	33rd / 85th Percentile	95% Confidence Interval	Standard Deviation (Coeff. of Variation)
0.93	0.67 - 1.38	0.88 / 1.27	***	0.16 (17%)

Data Plot and Equation

= 197 spaces



Parking Generation Manual, 6th Edition • Institute of Transportation Engineers

Multifamily Housing - 2+ BR (Low-Rise) - Not Close to Rail Transit (220)

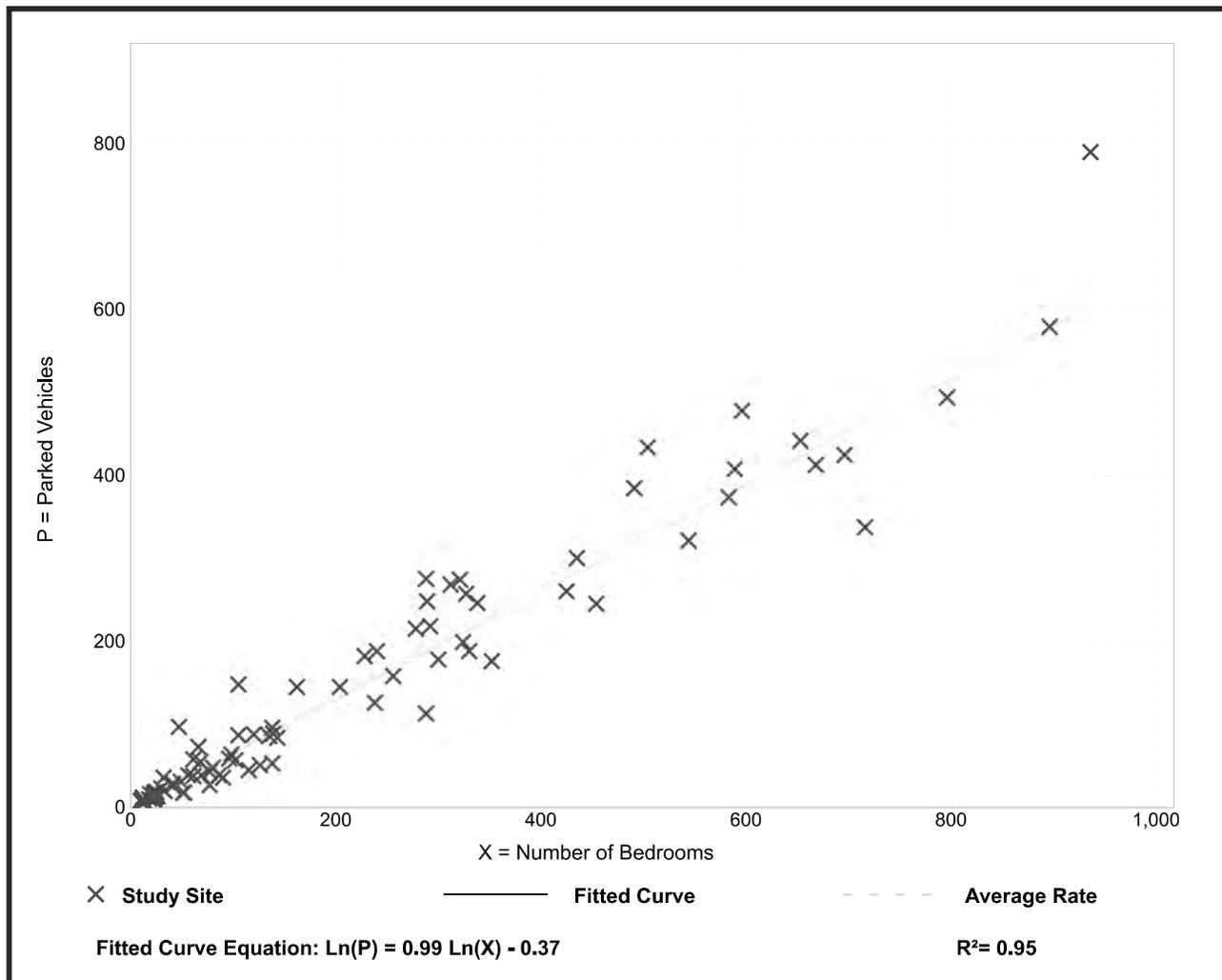
Peak Period Parking Demand vs: **Bedrooms**
 On a: **Weekday (Monday - Friday)**
 Setting/Location: **General Urban/Suburban**
 Number of Studies: 97
 Avg. Num. of Bedrooms: 192

Peak Period Parking Demand per Bedroom

Average Rate	Range of Rates	33rd / 85th Percentile	95% Confidence Interval	Standard Deviation (Coeff. of Variation)
0.68	0.36 - 2.09	0.61 / 0.86	0.65 - 0.71	0.16 (24%)

Data Plot and Equation

= 200 spaces



SECTION 5.E.12: MBTA Communities Multi-Family Overlay District

A. PURPOSE

The purpose of the MBTA Communities Multi-Family Overlay District (MCMOD) is to allow multi-family housing as of right in accordance with Section 3A of the Zoning Act (Massachusetts General Laws Chapter 40A). This zoning provides for as of right multi-family housing to accomplish the following purposes:

1. To ensure compliance with MGL c. 40A § 3A.
2. Encourage the production of a variety of housing sizes and typologies to provide equal access to new housing throughout the community for people with a variety of needs and income levels;
3. Support vibrant neighborhoods by encouraging an appropriate mix and intensity of uses to support an active public space that provides equal access to housing, jobs, gathering spaces, recreational opportunities, goods, and services.
4. Locate housing within walking distance of public transit to promote general public health, reduce the number of vehicular miles traveled, support economic development, and meet community-based environmental goals, including reducing greenhouse gases and improving air quality.
5. Preserve open space in a community by locating new housing within or adjacent to existing developed areas and infrastructure.
6. Support public investment in public transit and pedestrian- and bike-friendly infrastructure.
7. Increase the municipal tax base through private investment in new residential developments.

B. ESTABLISHMENT AND APPLICABILITY

This MCMOD is an overlay district having a land area of approximately 129 acres in size that is superimposed over the underlying zoning district(s) and is shown on the Zoning Map.

1. **Applicability of MCMOD.** An applicant may develop multi-family housing located within a MCMOD in accordance with the provisions of this Section 5.E.12.
2. **Underlying Zoning.** The MCMOD is an overlay district superimposed on underlying zoning districts. This Section 5.E.12 shall apply only to Permitted Uses set forth in Section 5.E.12.D on lots located within the MCMOD. Land within the MCMOD may be put to those uses expressly permitted in this Section 5.E.12, in which case the requirements of this Section and those of the underlying zoning districts shall apply to such use. If the provisions of the MCMOD conflict with the requirements of the underlying districts for such use, the requirements of the MCMOD shall control. The regulations for use, dimension, and all other provisions of the Zoning Bylaw governing the respective underlying zoning

district(s) shall otherwise remain in full force and effect and shall continue to apply to those uses that are not identified in Section 5.E.12.D.

3. **Subdistricts.** The MCMOD contains the following subdistricts, all of which are shown on the MCMOD Boundary Map:

- i. Subdistrict A: Outer Mills District
- ii. Subdistrict B: Inner Mills District
- iii. **Subdistrict C: Federal District**
- iv. Subdistrict D: Kenmar District

4. **Location.**

- i. Subdistrict A: Outer Mills District is located and bounded as shown on a map entitled "MCMOD-Subdistrict A Outer Mills" dated 11/18/2024 on file in the Office of the Town Clerk.
- ii. Subdistrict B: Inner Mills District is located and bounded as shown on a map entitled "MCMOD-Subdistrict B Inner Mills" dated 11/18/2024 on file in the Office of the Town Clerk.
- iii. Subdistrict C: Federal District is located and bounded as shown on a map entitled "MCMOD-Subdistrict C Federal St" dated 11/18/2024 on file in the Office of the Town Clerk.
- iv. Subdistrict D: Kenmar District is located and bounded as shown on a map entitled "MCMOD-Subdistrict D Kenmar" dated 11/18/2024 on file in the Office of the Town Clerk.

C. DEFINITIONS

For purposes of this Section 5.E.12, the following definitions shall apply.

- **Affordable unit.** A multi-family housing unit that is subject to a use restriction recorded in its chain of title limiting the sale price or rent or limiting occupancy to an individual or household of a specified income, or both.
- **Affordable housing.** Housing that contains Affordable Units as defined by this Section 5.E.12.C.
- **Applicant.** A person, business, or organization that applies for a building permit, Site Plan Review, or Special Permit.
- **Area Median Income (AMI).** The median family income for the metropolitan statistical region that includes the Town of Billerica, as defined by the U.S. Department of Housing and Urban Development (HUD).
- **As of right.** Development that may proceed under the zoning in place at time of application without the need for a special permit, variance, zoning amendment, waiver, or other discretionary zoning approval.
- **Compliance Guidelines.** Compliance Guidelines for Multi-Family Zoning Districts under Section 3A of the Zoning Act as further revised or amended from time to time.

- **Development standards.** Provisions of Section 5.E.12.G. General Development Standards made applicable to projects within the MCMOD.
- **EOHLC.** The Massachusetts Executive Office of Housing and Livable Communities, or any successor agency.
- **Gross density.** A units-per-acre density measurement that includes land occupied by public rights-of-way and any recreational, civic, commercial, and other nonresidential uses.
- **MBTA.** Massachusetts Bay Transportation Authority.
- **Mixed-Use Development.** Development containing a mix of residential uses and non-residential uses, including, without limitation, commercial, institutional, industrial, or other uses.
- **Multi-family housing.** A building with three or more residential dwelling units or two or more buildings on the same lot with more than one residential dwelling unit in each building.
- **Multi-family zoning district.** A zoning district, either a base district or an overlay district, in which multi-family housing is allowed as of right.
- **Open space.** Contiguous undeveloped land within a parcel boundary.
- **Parking, surface.** One or more parking spaces without a built structure above the space. A solar panel designed to be installed above a surface parking space does not count as a built structure for the purposes of this definition.
- **Residential dwelling unit.** A single unit providing complete, independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.
- **Section 3A.** Section 3A of the Zoning Act.
- **Site plan review authority.** The Billerica Planning Board.
- **Special permit granting authority.** The Special Permit Granting Authority shall be the Billerica Planning Board for any special permit required under section 5.E.12.
- **Subzone/Subdistrict.** An area within the MCMOD that is geographically smaller than the MCMOD district and differentiated from the rest of the district by use, dimensional standards, or development standards.
- **Subsidized Housing Inventory (SHI).** A list of qualified Affordable Housing Units maintained by EOHLC used to measure a community's stock of low-or moderate-income housing for the purposes of M.G.L. Chapter 40B, the Comprehensive Permit Law.

D. PERMITTED USES

1. **Uses Permitted As of Right.** The following uses are permitted as of right within the MCMOD.
 - i. **Multi-family housing.**
 - ii. **Two-family dwelling.**

- iii. **Mixed-use development.** Within subdistricts B Inner Mills and C Federal, the following use(s) under 5,000 sf of floor area per site are allowed as of right on the basement or ground floor. All mixed-use developments shall include a residential use.
- Philanthropic Uses
 - Personal services
 - Retail
 - Indoor Amusement
 - Experiential retail, including retail associated with dance or exercise studios, music studios, photography studios, or other combinations of education, services, and retail
 - Restaurant, café, and other eating establishments without a drive-through
 - Office, professional office, medical and dental offices, and co-working space
 - Artists' studios, maker space, and small-scale food production, and retail associated with each use

2. **Uses Permitted by Special Permit.** The following uses require the approval of a special permit under section 5.E.12.D.

- i. **Mixed-use development.** Within subdistricts B and C, containing the following use(s) over 5,000 sf of floor area per site or located above the ground floor:
- Philanthropic Uses
 - Personal services
 - Retail
 - Indoor Amusement
 - Experiential retail, including retail associated with dance or exercise studios, music studios, photography studios, or other combinations of education, services, and retail.
 - Restaurant, café, and other eating establishments without a drive-through
 - Office, professional office, medical and dental offices, and co-working space
 - Artists' studios, maker space, and small-scale food production, and retail associated with each use.

3. **Accessory Uses.** The following uses are considered accessory as of right to any of the permitted uses in Section 5.E.12.D.
 - i. Parking, including surface parking and parking within a structure such as an above ground or underground parking garage or other building on the same lot as the principal use.
 - ii. Any building, structure, or use customarily incidental to the principal residential use, included but not limited to a playhouse, private greenhouse, tool shed, tennis court, or swimming pool.

E. DENSITY AND DIMENSIONAL STANDARDS

1. Table of Dimensional Standards. Notwithstanding anything to the contrary in this Zoning, the dimensional requirements applicable to the uses in the MCMOD are as follows:

Standard	Subdistrict A: Outer Mills	Subdistrict B: Inner Mills	Subdistrict C: Federal	Subdistrict D: Kenmar
Height				
Stories (maximum)	2.5	5	3	3
Feet (maximum)	35	60	40	40
Minimum open space	20%	20%	20%	20%
Gross density	15 units per acre	35 units per acre	25 units per acre	20 units per acre
Setbacks				
Front yard	15	10	15	15
Side yard	15	15	15	15
Rear yard	20	20	45	20

2. **Multi-Building Lots.** In the MCMOD, lots may have more than one (1) principal building.
3. **Exceptions.**
 - i. **Building height.** The limitation on height of buildings shall not apply to chimneys, ventilators, towers, silos, spires, or other ornamental features of buildings, which features are in no way used for living purposes and do not constitute more than 25% of the ground floor area of the building.
 - ii. **Renewable Energy Installations.** The Site Plan Review Authority may waive the height and setbacks in Section 5.E.12.E. Dimensional Standards to accommodate the installation of solar photovoltaic, solar thermal, living, and other eco-roofs, energy storage, and air-source heat pump

equipment. Such installations shall not create a significant detriment to abutters in terms of noise or shadow and must be appropriately integrated into the architecture of the building and the layout of the site. The installations shall not provide additional habitable space within the development

- iii. **Waiver of Setback Requirements for Historic Districts.** The Site Plan Review Authority may allow for waivers to front, side, and rear-yard setbacks and minimum open space requirements of this section for properties in the North Billerica Mills Historic District.

F. OFF-STREET PARKING

These parking requirements are applicable to development of uses identified in the MCMOD.

- 1. **Number of parking spaces.** The following minimum numbers of off-street parking spaces shall be permitted by use, either in surface parking or within garages or other structures:

Use	Minimum spaces per dwelling unit by Subzone			
	Subdistrict A: Outer Mills	Subdistrict B: Inner Mills	Subdistrict C: Federal	Subdistrict D: Kenmar
Multi-family studio and one (1) bedroom units	1.5/unit	1.5/unit	1.5/unit	1.5/unit
Multi-family two (2) or more bedrooms	2/unit	1.5/unit	2/unit	2/unit
Mixed-Use (Non-residential)/ Commercial Component	n/a	Sum of uses computed separately. (See SECTION 8 PARKING AND LOADING REGULATIONS.)	Sum of uses computed separately. (See SECTION 8 PARKING AND LOADING REGULATIONS.)	n/a

- 2. **Number of bicycle parking spaces.** The following minimum numbers of covered bicycle storage spaces shall be provided by use:

Use	Minimum spaces per dwelling unit by Subzone			
	Subdistrict A: Outer Mills	Subdistrict B: Inner Mills	Subdistrict C: Federal	Subdistrict D: Kenmar
Multi-family	1	1	1	1

Mixed-Use (Non-residential)/ Commercial Component	n/a	1 per every 20 parking spaces	1 per every 20 parking spaces	n/a
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3. **Bicycle storage.** For a multi-family development of six (6) units or more, or a mixed-use development of 25,000 square feet or more, covered parking bicycle parking spaces shall be integrated into the structure of the building(s).
4. **Shared Parking within a Mixed-Use Development.** Parking requirements for a mix of uses on a single site may be adjusted through the Site Plan Review process, if the applicant can demonstrate that shared spaces will meet parking demands by using accepted methodologies.
5. **Waiver of Parking Requirements for Historic Buildings.** The Planning Board may allow for parking requirement waivers of this section for the adaptive reuse of buildings listed on the National or State Registers of Historic Places, or eligible for such listing through the Site Plan Review process. The Planning Board may also approve offsite off-street parking agreements to locate the required parking on an adjacent parcel or parcel located within 300 feet of the development.
6. **Number of electric vehicle (EV) charging stations.** For all uses within the MCMOD, electric charging stations are required with one EV space required for every 20 parking spaces, rounded up to the next highest number of EV stations.

G. GENERAL DEVELOPMENT STANDARDS

1. The Development standards in this section are applicable to all multi-family development and any mixed-use development within the MCMOD. These standards are components of the Site Plan Review process in Section 5.E.12.I. Site Plan Review.
2. **Site Design.**
 - i. **Connections.** Sidewalks shall provide direct connections among building entrances, the public sidewalk, bicycle storage, and parking.
 - ii. **Vehicular access.** Where feasible, curb cuts shall be minimized, and shared driveways encouraged.
 - iii. **Open Space.** Acceptable activities within the minimum required Open Space include natural areas (including wetlands and surface waters), wildlife and native plant habitat, landscape plantings, agricultural activities, low impact design stormwater management, non-motorized trails, and other low-impact activities. Open Space shall not contain habitable structures.
 - iv. **Location of Parking.** Parking, either surface or structured, is not allowed between a building and the front yard lot line. On a corner lot, parking is not allowed between the building and the front and side yard lot lines.

- v. **Screening for Parking.** Surface parking adjacent to a public sidewalk shall be screened by a landscaped buffer of sufficient width to allow the healthy establishment of trees, shrubs, and perennials, but no less than six (6) feet. The buffer may include a fence or wall of no more than three feet in height unless there is a significant grade change between the parking and the sidewalk.
- vi. **Parking Materials.** The parking surface may be concrete, asphalt, bricks, or pavers, including pervious materials but not including grass or soil not contained within a paver or other structure.
- vii. **Plantings.** Plantings shall include species that are native or adapted to the region. Plants on the Massachusetts Prohibited Plant List, as may be amended, shall be prohibited.
- viii. **Lighting.** Light levels shall meet or exceed the minimum design guidelines defined by the Illuminating Engineering Society of North America (IESNA) and shall provide illumination necessary for safety and convenience while preventing glare and overspill onto adjoining properties and reducing the amount of skyglow.
- ix. **Mechanicals.** Mechanical equipment at ground level shall be screened by a combination of fencing and plantings. Rooftop mechanical equipment shall be screened if visible from a public right-of-way.
- x. **Dumpsters.** Dumpsters shall be screened by a combination of fencing and plantings. Where possible, dumpsters or other trash and recycling collection points shall be located within the building.
- xi. **Stormwater management.** Strategies that demonstrate compliance of the construction activities and the proposed project with the most current versions of the Massachusetts Department of Environmental Protection Stormwater Management Standards, the Massachusetts Stormwater Handbook, Massachusetts Erosion Sediment and Control Guidelines, and, if applicable, additional requirements under the Town of Billerica MS4 Permit for projects that disturb more than one acre and discharge to the Town's municipal stormwater system, and an Operations and Management Plan for both the construction activities and ongoing post-construction maintenance and reporting requirements.

3. Buildings: General.

- i. **Position relative to principal street.** The primary building shall have its principal façade and entrance facing the principal street. On lots with multiple buildings, the building closest to the principal street is considered the primary building for this section. See also Section G.7. Buildings: Corner Lots.
- ii. **Entries.** Where feasible, entries shall be clearly defined and linked to a paved pedestrian network that includes the public sidewalk.

4. **Buildings: Multiple buildings on a lot.**
 - i. For a mixed-use development, uses may be mixed within the buildings or in separate buildings.
 - ii. Parking and circulation on the site shall be organized so as to reduce the amount of impervious surface. Where possible, parking and loading areas shall be connected to minimize curb cuts onto public rights-of-way.
 - iii. A paved pedestrian network shall connect parking to the entries to all buildings and the buildings to each other.
 - iv. All building façade(s) shall be treated with the same care and attention in terms of entries, fenestration, and materials.
 - v. The building(s) adjacent to the public street shall have a pedestrian entry facing the public street.
5. **Buildings: Mixed-use development.**
 - i. In a mixed-use building, access to and egress from the residential component shall be clearly differentiated from access to other uses. Such differentiation may occur by using separate entrances or egresses from the building or within a lobby space shared among different uses.
 - ii. Paved pedestrian access from the residential component shall be provided to residential parking and amenities and to the public sidewalk, as applicable.
 - iii. Materials for non-residential uses shall be stored inside or under cover and shall not be accessible to residents of the development.
 - iv. Parking and circulation on the site shall be organized so as to reduce the amount of impervious surface. Where possible, parking and loading areas shall be connected to minimize curb cuts onto public rights-of-way.
6. **Buildings: Shared Outdoor Space.** Multi-family housing and mixed-use development shall have common outdoor space that all residents can access. Such space may be located in any combination of ground floor, courtyard, rooftop, or terrace. All outdoor space shall count towards the project's minimum Open Space requirement.
7. **Buildings: Corner Lots.** A building on a corner lot shall indicate a primary entrance either along one of the street-facing façades or on the primary corner as an entrance serving both streets.
 - i. Such entries shall be connected by a paved surface to the public sidewalk, if applicable.
 - ii. All façades visible from a public right-of-way shall be treated with the same care and attention in terms of entries, fenestration, and materials.

- iii. Fire exits serving more than one story shall not be located on either of the street-facing façades.
- 8. **Buildings: Infill Lots.** If the adjacent buildings are set back at a distance that exceeds the minimum front yard requirements, infill buildings shall meet the requirements of Section 5.E.12.E. Density and Dimensional Standards. Otherwise, infill buildings may match the setback line of either adjacent building, or an average of the setback of the two buildings to provide consistency along the street.
- 9. **Buildings: Principal Façade and Parking.** Parking shall be subordinate in design and location to the principal building façade.
 - i. **Surface parking.** Surface parking shall be located to the rear or side of the principal building. Parking shall not be located in the setback between the building and any lot line adjacent to the public right-of-way.
 - ii. **Integrated garages.** The principal pedestrian entry into the building shall be more prominent in design and placement than the vehicular entry into the garage.
 - iii. **Parking structures.** Building(s) dedicated to structured parking on the same lot as one or more multi-family buildings or mixed-use development shall be subordinate in design and placement to the multi-family or mixed-use building(s) on the lot.
- 10. **Waivers.** Upon the request of the Applicant and subject to compliance with the Compliance Guidelines, the Site Plan Review Authority may waive requirements of this Section 5.E.12.G. General Development Standards, in the interests of design flexibility and overall project quality, and upon a finding of consistency of such variation with the overall purpose and objectives of the MCMOD.

H. AFFORDABILITY REQUIREMENTS

- 1. **Purpose.**
 - i. Promote the public health, safety, and welfare by encouraging a diversity of housing opportunities for people of different income levels;
 - ii. Provide for a full range of housing choices for households of all incomes, ages, and sizes;
 - iii. Increase the production of affordable housing units to meet existing and anticipated housing needs; and
 - iv. Work to overcome economic segregation allowing Billerica to be a community of opportunity in which low and moderate-income households have the opportunity to advance economically.
- 2. **Applicability.** This requirement is applicable to all multi-family and mixed-use developments with six (6) or more dwelling units, whether new construction, substantial rehabilitation, expansion, reconstruction, or residential conversion

(Applicable Projects). No project may be divided or phased to avoid the requirements of this section.

3. **Provision of Affordable Housing.** In Applicable Projects, not fewer than 10% of housing units constructed shall be Affordable Housing Units as defined by the EOHLC Subsidized Housing Inventory (SHI). For the purposes of calculating the number of units of Affordable Housing required within a development project, any fractional unit of 0.5 or greater shall be deemed to constitute a whole unit and any fractional unit of 0.4 or less shall require no contribution to satisfy the fractional share. The Affordable Units shall be available to households earning income up to eighty percent (80%) of the AMI.
4. **Development Standards.** Affordable Units shall be:
 - i. Integrated with the rest of the development and shall be compatible in design, appearance, construction, and quality of exterior and interior materials with the other units and/or lots;
 - ii. Dispersed throughout the development;
 - iii. Located such that the units have equal access to shared amenities, including light, air, and utilities (including any bicycle storage and/or Electric Vehicle charging stations) within the development;
 - iv. Located such that the units have equal avoidance of any potential nuisances as market-rate units within the development;
 - v. Distributed proportionately among unit sizes; and
 - vi. Distributed proportionately across each phase of a phased development.
 - vii. Occupancy permits shall only be issued for market-rate units prior to the end of construction of the entire development if occupancy permits for Affordable Units are issued simultaneously on a pro rata basis.
5. **Administration.**
 - i. The Planning Director shall be responsible for administering and enforcing the requirements in this section.

I. SITE PLAN REVIEW

1. **Administration.** The provisions of this Section 5.E.12.I shall be administered by the Site Plan Review Authority, except as otherwise provided herein.
2. **Applicability.** Site Plan Review is required for a project that proposes six (6) dwelling units or more. An application for Site Plan Review shall be reviewed by the Permitting Authority for consistency with the purpose and intent of Sections 5.E.12.D through H.
 - i. In cases where the Site Plan Review Authority is also considering a Special Permit, they should determine the Special Permit first and then undertake a final Site Plan Review.

- ii. This section supersedes the Site Plan review process described in Section 6 of the Zoning Bylaw.
3. **Submission Requirements.** As part of any application for Site Plan Review for a project within the MCMOD, the Applicant must submit the following documents to the Municipality:
- i. Application and fee for Site Plan Review.
 - ii. Site plans that show the position of the building on the site, points of vehicular access to and from the site and vehicular circulation on the site, stormwater management, utilities, and landscape treatments, including any screening of adjacent properties, and other information commonly required by Municipality for Site Plan Review.
 - iii. Elevations of the building(s) showing the architectural design of the building.
 - iv. All site plans shall be prepared by a certified architect, landscape architect, and/or a civil engineer registered in the Commonwealth of Massachusetts. All landscape plans shall be prepared by a certified landscape architect registered in the Commonwealth of Massachusetts. All building elevations shall be prepared by a certified architect registered in the Commonwealth of Massachusetts. All plans shall be signed and stamped, and drawings prepared at a scale of one inch equals forty feet (1"=40') or larger, or at a scale as approved in advance by the Permitting Authority.
 - v. Narrative of compliance with the applicable design standards of this Section 5.E.12.
4. **Timeline.** Site Plan Review should be commenced no later than 30 days after the submission of a complete application and should be completed expeditiously. The site plan review authority may, when appropriate, seek the input of other municipal boards or officials. In general, site plan review should be completed no more than six (6) months after the submission of the application.
5. **Site Plan Approval.** Site Plan approval for uses listed in Section 5.E.12.D Permitted Uses shall be granted upon determination by the Site Plan Review Authority that the following findings have been satisfied. The Site Plan Review Authority may impose reasonable conditions, at the expense of the applicant, to ensure that these findings have been satisfied.
- i. The Applicant has submitted the required fees and information as set forth in Municipality's requirements for a Building Permit and Site Plan Review; and
 - ii. The project as described in the application meets the development standards set forth in Section 5.E.12.G. General Development Standards.]
6. **Project Phasing.** An Applicant may propose, in a Site Plan Review submission, that a project be developed in phases subject to the approval of the Site Plan

Review Authority, provided that the submission shows the full buildout of the project and all associated impacts as of the completion of the final phase. However, no project may be phased solely to avoid the provisions of Section 5.E.12.H. Affordability Requirements.

J. SEVERABILITY

If any provision of this Section 5.E.12 is found to be invalid by a court of competent jurisdiction, the remainder of Section 5.E.12 shall not be affected but shall remain in full force. The invalidity of any provision of this Section 5.E.12 shall not affect the validity of the remainder of the Town of Billerica’s Zoning.

K. SUNSET CLAUSE

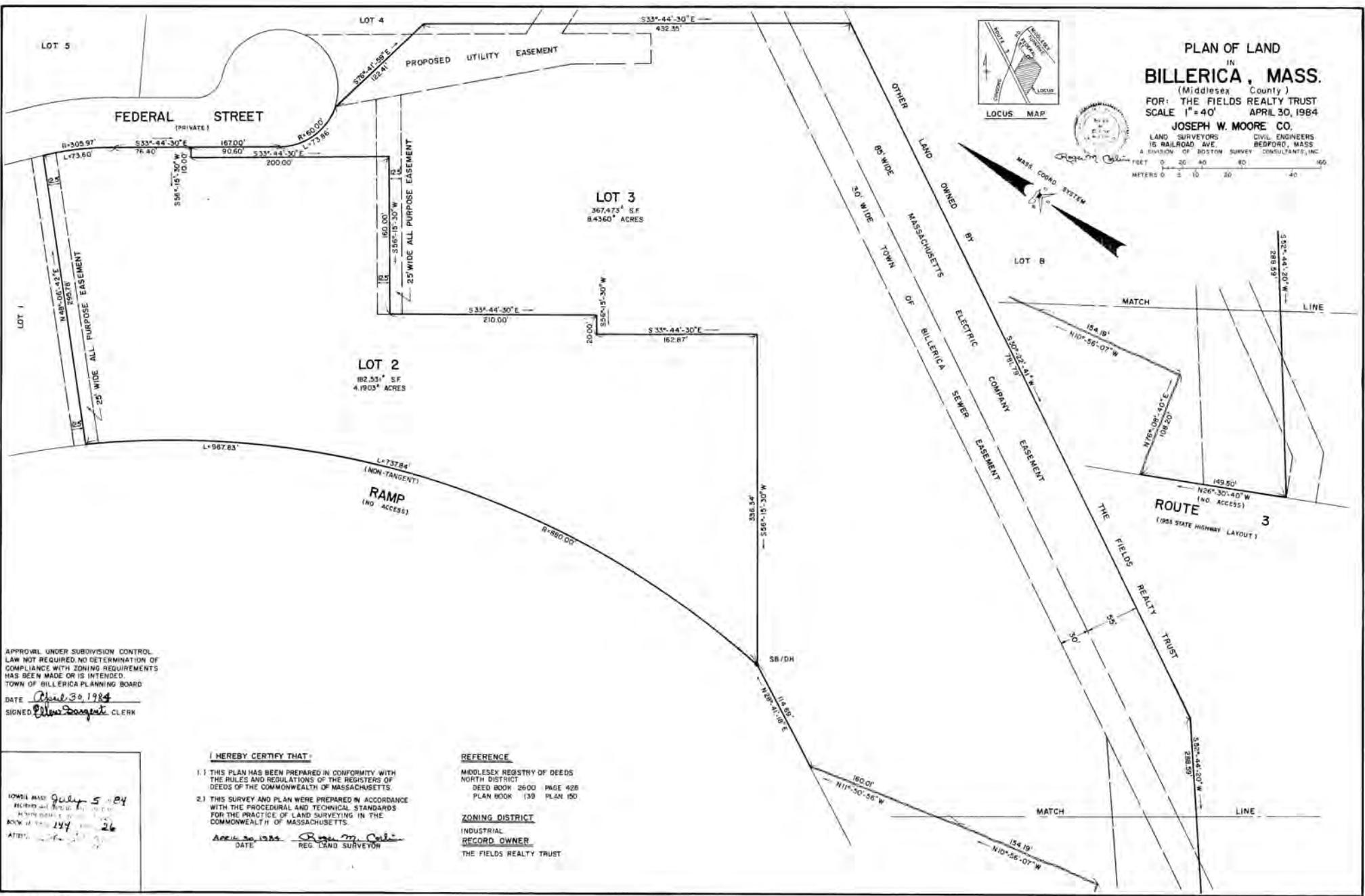
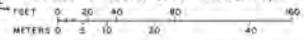
This Section 5.E.12 MBTA Communities Multi-Family Overlay District, along with:

1. the reference to Section 5.E.12. in the Table of Contents,
2. the reference to “MBTA Communities Multi-family Overlay District” in subsection k. to Section 3.a.3,
3. the reference to “MCMOD- MBTA Communities Multi-family Overlay District in District Abbreviations under the Overlay category in Section 5.f, and
4. the portions of the Zoning Map depicting the MBTA Communities Multi-family Overlay District on the maps entitled: “MBTA Communities Multi-family Overlay District: A. “Outer Mills Subdistrict”, B: “Inner Mills Subdistrict”, C: “Federal St Subdistrict”, and D: “Kenmar Subdistrict”, on file with the Town Clerk

shall expire and no longer remain in effect when a court of competent jurisdiction issues a final decision invalidating Massachusetts General Laws Chapter 40A, § 3A in its entirety or invalidating the requirement of Massachusetts General Laws Chapter 40A, §3A(a)(1) that an MBTA community shall have a zoning ordinance or by-law that provides for at least 1 district of reasonable size in which multi-family housing is permitted as of right or when legislation is enacted into law invalidating Massachusetts General Laws Chapter 40A, § 3A in its entirety or invalidating the requirement of Massachusetts General Laws Chapter 40A, §3A(a)(1) that an MBTA community shall have a zoning ordinance or by-law that provides for at least 1 district of reasonable size in which multi-family housing is permitted as of right.

Attachment N – Relevant Easement Documentation

PLAN OF LAND
 IN
BILLERICA, MASS.
 (Middlesex County)
 FOR: THE FIELDS REALTY TRUST
 SCALE 1" = 40'
 APRIL 30, 1984
JOSEPH W. MOORE CO.
 LAND SURVEYORS CIVIL ENGINEERS
 15 RAILROAD AVE. BEDFORD, MASS.
 A DIVISION OF BOSTON SURVEY CONSULTANTS, INC.

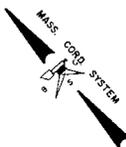


APPROVAL UNDER SUBDIVISION CONTROL
 LAW NOT REQUIRED. NO DETERMINATION OF
 COMPLIANCE WITH ZONING REQUIREMENTS
 HAS BEEN MADE OR IS INTENDED.
 TOWN OF BILLERICA PLANNING BOARD
 DATE April 30, 1984
 SIGNED [Signature] CLERK

HEREBY CERTIFY THAT:
 1. THIS PLAN HAS BEEN PREPARED IN CONFORMITY WITH
 THE RULES AND REGULATIONS OF THE REGISTERS OF
 DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS.
 2. THIS SURVEY AND PLAN WERE PREPARED IN ACCORDANCE
 WITH THE PROCEDURAL AND TECHNICAL STANDARDS
 FOR THE PRACTICE OF LAND SURVEYING IN THE
 COMMONWEALTH OF MASSACHUSETTS.
 DATE April 30, 1984 [Signature]
 REG. LAND SURVEYOR

REFERENCE
 MIDDLESEX REGISTRY OF DEEDS
 NORTH DISTRICT
 DEED BOOK 2600 PAGE 428
 PLAN BOOK 139 PLAN 150
 ZONING DISTRICT
 INDUSTRIAL
 RECORD OWNER
 THE FIELDS REALTY TRUST

OWNER SAID July 5 '84
 REC'D BY [Signature]
 BOOK # 144 PAGE # 26
 ATTORNEY [Signature]



TO:
 TIGOR TITLE INSURANCE COMPANY
 CSAPLAR & BOK
 BANKERS LIFE COMPANY
 THE FIELDS REALTY TRUST

THIS IS TO CERTIFY THAT THIS PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE "MINIMUM STANDARD DETAIL REQUIREMENTS FOR LAND TITLE SURVEYS" JOINTLY ESTABLISHED AND ADOPTED BY ATA AND ACSM IN 1962.

I HEREBY CERTIFY THAT I HAVE SURVEYED THE PROPERTY HEREIN DESCRIBED, THAT THIS SURVEY WAS MADE ON THE GROUND AS PER THE RECORD DESCRIPTION, AND THAT IT IS CORRECT AND IS THE TRUE FINDINGS OF A SURVEY FOR LOAN PURPOSES; FURTHER, THAT IT SHOWS THE TRUE LOCATION OF IMPROVEMENTS, AND THAT THERE ARE NO ENCRoACHMENTS EITHER WAY ACROSS PROPERTY LINES EXCEPT AS NOTED.

ALSO, I HEREBY CERTIFY THAT:

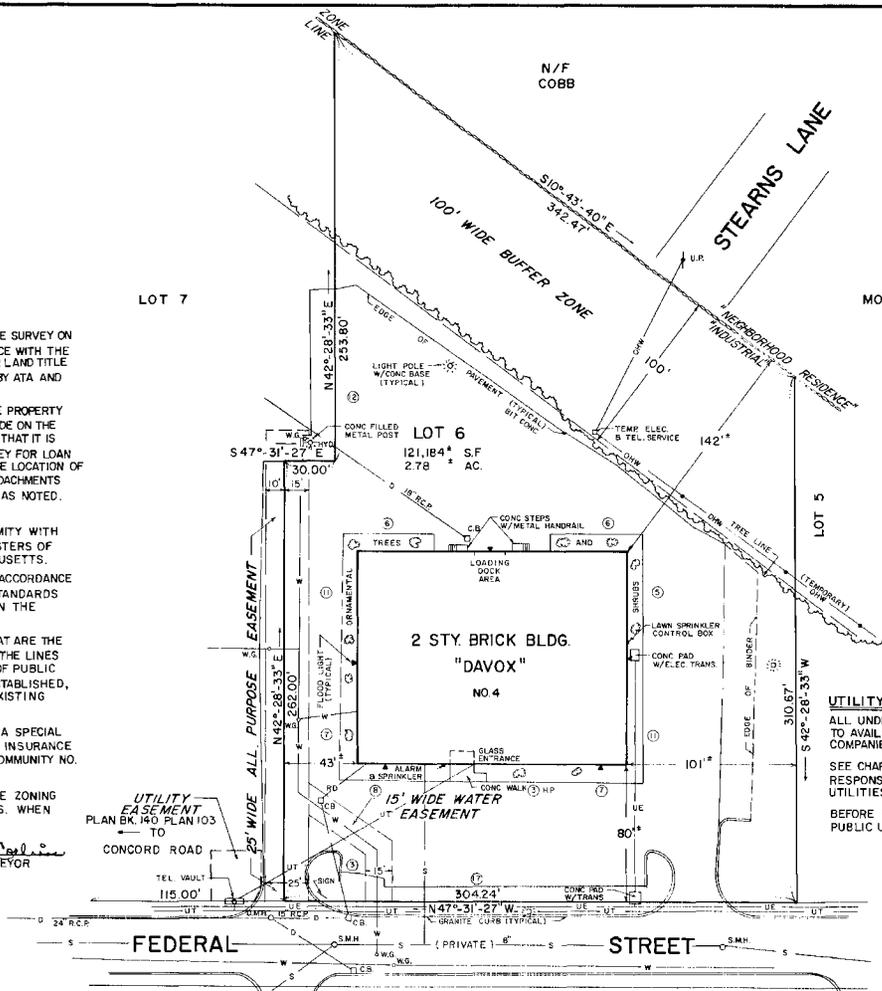
- 1) THIS PLAN HAS BEEN PREPARED IN CONFORMITY WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS.
- 2) THIS SURVEY AND PLAN WERE PREPARED IN ACCORDANCE WITH THE PROCEDURAL AND TECHNICAL STANDARDS FOR THE PRACTICE OF LAND SURVEYING IN THE COMMONWEALTH OF MASSACHUSETTS.
- 3) THIS PLAN SHOWS THE PROPERTY LINES THAT ARE THE LINES OF EXISTING OWNERSHIPS, AND THAT THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED, AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.
- 4) THE BUILDING SHOWN IS NOT LOCATED IN A SPECIAL FLOOD HAZARD ZONE AS SHOWN ON FLOOD INSURANCE RATE MAP, TOWN OF BILLERICA, MASS.; COMMUNITY NO. 250183 A, DATED SEPTEMBER 20, 1974.
- 5) THE BUILDING SHOWN CONFORMED TO THE ZONING BYLAWS OF THE TOWN OF BILLERICA, MASS. WHEN CONSTRUCTED.

June 25, 1984 *Roger M. Carlin*
 DATE REG. LAND SURVEYOR

July 13 1984
 144 43

REFERENCE
 MIDDLESEX REGISTRY OF DEEDS
 NORTH DISTRICT
 DEED BOOK 2600 PAGE 426
 PLAN BOOK 139 PAGE 150
 " " 141 " 60

ZONING DISTRICT
 INDUSTRIAL
RECORD OWNER
 THE FIELDS REALTY TRUST



LEGEND

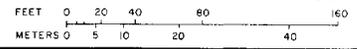
BIT CONC	BITUMINOUS CONCRETE
CONC	CONCRETE
U.P.	UTILITY POLE
HYD.	HYDRANT
W.G.	WATER GATE
C.B.	CATCH BASIN
S.M.H.	SEWER MANHOLE
D.M.H.	DRAIN MANHOLE
ELEC.	ELECTRIC
TRANS.	TRANSFORMER
O.H.W.	OVERHEAD WIRE
TEL.	TELEPHONE
R.C.P.	REINFORCED CONCRETE PIPE
RD	ROOF DRAIN
-D-	DRAIN LINE
-S-	SEWER LINE
-UE-	UNDERGROUND ELECTRIC
-UT-	UNDERGROUND TELEPHONE
-W-	WATER LINE
H.P.	HANDICAPPED PARKING
?	NUMBER OF PARKING SPACES

TOTAL NUMBER OF PARKING SPACES=96

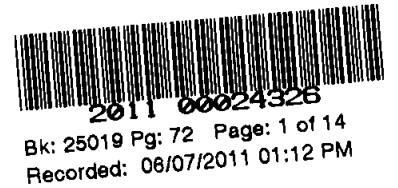
UTILITY NOTE
 ALL UNDERGROUND UTILITIES SHOWN WERE COMPILED ACCORDING TO AVAILABLE RECORD PLANS FROM THE VARIOUS UTILITY COMPANIES AND PUBLIC AGENCIES AND ARE APPROXIMATE ONLY. SEE CHAPTER 370, ACTS OF 1963, MASS. GEN. LAWS. WE ASSUME NO RESPONSIBILITY FOR DAMAGES INCURRED AS A RESULT OF UTILITIES OMITTED OR INACCURATELY SHOWN. BEFORE PLANNING FUTURE CONNECTIONS, THE APPROPRIATE PUBLIC UTILITY ENGINEERING DEPARTMENT MUST BE CONSULTED.

PLAN OF LAND
 IN
BILLERICA, MASS.
 (Middlesex County)
 FOR: THE FIELDS REALTY TRUST
 SCALE 1" = 40' JUNE 25, 1984

JOSEPH W. MOORE CO.
 LAND SURVEYORS CIVIL ENGINEERS
 16 RAILROAD AVE. BEDFORD, MASS.
 A DIVISION OF BOSTON SURVEY CONSULTANTS, INC.



14



RECIPROCAL EASEMENT AGREEMENT

THIS RECIPROCAL EASEMENT AGREEMENT ("Agreement") made as of this 31st day of March, 2011, between Atlantic-Philadelphia Realty LLC, a Massachusetts limited liability company with a principal address at 205 Newbury Street, Framingham, MA 01701 ("Atlantic"), and RREEF America REIT III-Z1 LLC, a Delaware limited liability company with a principal address at 875 North Michigan Avenue, 41st Floor, Chicago, IL 60611 ("RREEF").

RECITALS

- A. Atlantic is the owner in fee of two parcels of land located in Billerica, Middlesex County, Commonwealth of Massachusetts, more particularly described in Exhibit A attached hereto. The parcel of land described on Exhibit A as "The 3 Federal Street Parcel" consists of approximately 4.19 acres of land. The parcel of land described on Exhibit A as "The 8 Federal Street Parcel" consists of approximately 8.62 acres of land. For Atlantic's title, see Deeds recorded with Middlesex (North) Registry of Deeds at Book 23763, Page 156, and Book 23763, Page 167.

- B. RREEF is the owner in fee of two parcels of land located in Billerica, Middlesex County, Commonwealth of Massachusetts, more particularly described in Exhibit B attached hereto. The parcel of land described on Exhibit B as "The Lot 1 Parcel" consists of approximately 3.24 acres of land. The parcel of land described on Exhibit B as "The Lot 3 Parcel" consists of approximately 8.44 acres of land. For RREEF's title, see Deeds recorded with Middlesex (North) Registry of Deeds at Book 19524, Page 56, and Book 19524, Page 66.

- C. Atlantic and RREEF have determined that the property owned by each encroaches on the property of the other in certain locations. In addition, each party has easements over land of the other that are shown on recorded plans, but for which no easement is recorded with the Middlesex County (North) Registry of Deeds. Therefore, the parties wish to resolve the encroachments and grant each other easements, as set forth on a plan entitled "Easement Plan in Billerica, Mass.", dated April 9, 2010, prepared by MetroWest Engineering, Inc. (the "Plan") and recorded herewith at Book ___, Page ___, in order to clarify the status of title on The 3 Federal Street Parcel, The 8 Federal Street Parcel, The Lot 1 Parcel and The Lot 3 Parcel, in the manner set forth in this Reciprocal Easement Agreement. The 3 Federal Street Parcel, The 8 Federal Street Parcel, The Lot 1 Parcel and The Lot 3 Parcel are sometimes collectively referred to hereinafter as the "Parcels" or individually as a "Parcel."

NOW, THEREFORE, in consideration of the mutual covenants and agreements hereinafter set forth, Atlantic and RREEF hereby grant, covenant and agrees as follows:

ARTICLE I – GRANT OF EASEMENTS

- 1.01. Drainage Easement. Atlantic grants to RREEF an easement for purposes of stormwater drainage, over that portion of The 3 Federal Street Parcel and The 8 Federal Street Parcel shown on the Plan as “Article 1 – Section 1.01 Drainage Ditch Easement Area.” RREEF grants to Atlantic an easement for purposes of stormwater drainage, over that portion of The Lot 3 Parcel shown on the Plan as “Article 1- Section 1.01 Drainage Ditch Easement Area.”
- 1.02. Sign Easement. Atlantic grants to RREEF an easement to locate and maintain two signs identifying The Lot 3 Parcel and the businesses operating thereon, in the locations shown on the Plan as the “Article 1 – Section 1.02 RREEF Signage Area.” Such signs shall be no larger than the following dimensions, and may not be illuminated: Leasing sign: 6’ 7 ¼” L x 6’ 9” H, Brick monument sign: 8’ L x 3’ 11” H.
- 1.03. RCP Drain Line Easement – The Lot 3 Parcel. RREEF grants to Atlantic an easement to install and maintain an RCP drain line over The Lot 3 Parcel, in the location shown on the Plan as “Article 1 – Section 1.03 RCP Drain Line Easement Area.”
- 1.04. RCP Drain Line Easement – The 3 Federal Street Parcel. Atlantic grants to RREEF an easement to install and maintain an RCP drain line over The 3 Federal Street Parcel, in the location shown on the Plan as “Article 1 – Section 1.04 RCP Drain Line Easement Area.”
- 1.05. Utility Easement. Atlantic grants to RREEF, for the benefit of The Lot 1 Parcel, a non-exclusive easement and right to the use the area shown on the Plan as “Article 1 – Section 1.05 15’ Wide Utility Easement Area Book 4592, Page 170” over The 3 Federal Street Parcel, for purposes of installation and use of utilities, including but not limited to storm drains, sanitary sewer lines, water, gas, electric, fire protection, telephone, cable and data.
- 1.06. Electric Easement. RREEF grants to Atlantic, for the benefit of The 3 Federal Street Parcel, a non-exclusive easement and right to use the area on the Lot 3 Parcel shown on the Plan as “Article 1 – Section 1.06 Electric Line Easement Area” to install and maintain an underground electric line.
- 1.07. All Purpose Easement. The parties are each subject to that certain document entitled “Declaration of Easement: All Purpose 25 Foot Easement,” recorded with Middlesex County (North) Registry of Deeds in Book 4592, Page 188 (the “All Purpose Easement”). The location of the All Purpose Easement is shown on the Plan as “All Purpose Easement Area.” The parties agree that certain parking spaces of RREEF encroach onto the All Purpose Easement Area, and that certain parking spaces of Atlantic also encroach on to the All Purpose Easement Area, all as shown on the plan as (i) “Article 1 – Section 1.07 Encroaching Parking Spaces 20 Spaces,” and (ii) Article 1, Section 1.07 Encroaching Parking Space 5 Spaces.” The parties grant to each other permission for such Encroaching Parking Spaces to encroach onto the All Purpose Easement Area, and permission for each party to continue to use, maintain and repair the Encroaching Parking Spaces, within the All Purpose Easement Area.

- 1.08. Parking Easement. Twenty two parking spaces utilized by Atlantic encroach onto The Lot 3 Parcel, in the location shown on the plan as the “Article 1 – Section 1.08 Parking Easement Area 22 Spaces.” RREEF grants to Atlantic an easement to continue to utilize such Parking Easement Area for the parking of vehicles, but only in the location shown on the Plan as the Parking Easement Area.
- 1.09. Use of Easements/Access. In the use of the easements provided for herein, each party shall have the right of access over the easement areas provided for above, to enter, install, construct, operate, maintain, repair, replace drainage systems, electric lines, paved areas or utilities, as the case may be. Any construction or maintenance activities undertaken shall only be undertaken after commercially reasonable notice to the other party, and shall be undertaken in a good and workmanlike manner, and that after, any work performed hereunder, the party performing such work shall forthwith restore the surface of such easement area to the condition it was in immediately prior to such construction.

ARTICLE II - LIABILITY AND INDEMNIFICATION

Section 2.01. Liability; Indemnification. Atlantic hereby indemnifies and holds RREEF harmless (except for loss or damage resulting from the gross negligence of such other parties) from and against any damages, liability actions, claims, and expenses (including attorneys' fees in a reasonable amount) in connection with the loss of life, personal injury and/or damage to property arising from or out of any occurrence in or upon The Lot 1 Parcel or The Lot 3 Parcel, or occasioned wholly or in part by any act or omission of Atlantic, its tenants, agents, contractors, employees, or licensees. RREEF hereby indemnifies and holds Atlantic harmless (except for loss or damage resulting from the gross negligence of such other parties) from and against any damages, liability actions, claims, and expenses (including attorneys' fees in a reasonable amount) in connection with the loss of life, personal injury and/or damage to property arising from or out of any occurrence in or upon The 3 Federal Street Parcel or The 8 Federal Street Parcel, or occasioned wholly or in part by any act or omission of RREEF, its tenants, agents, contractors, employees, or licensees.

Section 2.02. Liability Insurance. Both RREEF and Atlantic shall maintain or cause to be maintained public liability insurance insuring against claims on account of loss of life, bodily injury or property damage that may arise from, or be occasioned by the condition, use or occupancy of The Lot 1 Parcel, The Lot 3 Parcel, The 3 Federal Street Parcel and The 8 Federal Street Parcel by RREEF and Atlantic and their respective tenants, agents, contractors, employees, licensees, customers and invitees, except as herein provided. Said insurance shall be carried by a reputable insurance company or companies qualified to do business in the Commonwealth of Massachusetts, and having limits for loss of life or bodily injury and damage to property in the amounts and with deductibles customary and reasonable for similar retail facilities in the Billerica area. Each of RREEF and Atlantic shall maintain or cause to be maintained contractual liability insurance specifically endorsed to cover the agreement to indemnify as set out in Section 2.01. Such insurance may be carried under a "blanket" policy or policies covering other properties of the party and its subsidiaries, controlling or affiliated corporations. Each of Atlantic or RREEF shall, upon written request from the other party, furnish to the party making such

request certificates of insurance evidencing the existence of the insurance required to be carried pursuant to this Section.

ARTICLE III - EFFECT OF INSTRUMENT

Section 3.01. Mortgage Subordination. Any mortgage or deed of trust affecting any portion of the Parcels shall at all times be subject and subordinate to the terms of this Agreement, except to the extent expressly otherwise provided herein, and any party foreclosing any such mortgage or deed of trust, or acquiring title by deed in lieu of foreclosure or trustee's sale shall acquire title subject to all of the terms and provisions of this Agreement. Each party hereto represents and warrants to the other parties that there is no presently existing mortgage or deed of trust lien on its Parcel, other than mortgage or deed of trust liens that are expressly subordinate to the lien of this Agreement.

Section 3.02. Binding Effect. Every agreement, covenant, promise, undertaking, condition, easement, right, privilege, option and restriction made, granted or assumed, as the case may be, by either party to this Agreement is made by such party not only personally for the benefit of the other party, but shall also constitute an equitable servitude on The Lot 1 Parcel, The Lot 3 Parcel, The 3 Federal Street Parcel and The 8 Federal Street Parcel. Any transferee of any part of the parcels that are subject to this Agreement shall automatically be deemed, by acceptance of the title to any portion of the parcels, to have assumed all obligations of this Agreement relating thereto to the extent of its interest in its parcel and to have agreed with the then owner or owners of all other portions of the parcels to execute any and all instruments and to do any and all things reasonably required to carry out the intention of this Agreement and the transferor shall upon the completion of such transfer be relieved of all further liability under this Agreement except liability with respect to matters that may have arisen during its period of ownership of the portion of the parcels that remain unsatisfied. The easements and agreements set forth herein shall run to the benefit of, and bind the respective Parcels, and the owners from time to time of the respective Parcels or any portion thereof. The terms "Atlantic" and "RREEF" shall be deemed to refer to such parties and the respective heirs, successors, grantees and assigns of such parties, and any net lessee of any Parcel or part thereof who has assumed all of the obligations of the owning party.

Section 3.03. Non-Dedication. Nothing contained in this Agreement shall be deemed to be a gift or dedication of any portion of the parcels to the general public or for any public use or purpose whatsoever, it being the intention of the parties hereto and their successors and assigns and that nothing in this Agreement, expressed or implied, shall confer upon any person, other than the parties hereto and their successors and assigns, any rights or remedies under or by reason of this Agreement.

Section 3.04. Responsibility. Notwithstanding anything to the contrary contained in this instrument, each party to this Agreement shall be liable and responsible for the obligations, covenants, agreements and responsibilities created by this Agreement and for any judgment rendered hereon only to the extent of its respective interest in the land and improvements on its parcel.

ARTICLE IV - NOTICES

Section 4.01. Notices. Any notice, report or demand required, permitted or desired to be given under this Agreement shall be in writing and shall be deemed to have been sufficiently given or served for all purposes if it is mailed by registered or certified mail, return receipt requested, to the parties at the addresses shown below or at such other address as the respective parties may from time to time designate by like notice, on the third business day following the date of such mailing:

If to RREEF: RREEF America REIT III Corp. Z1
c/o RREEF Alternative Investments
4 Technology Drive
Westborough, MA 01581
Attn: Robert D. Seaman
Assistant Vice President, Asset Management

With a copy to: Lawrence J. Moss, Esq.
Seyfarth Shaw, LLP
131 South Dearborn Street, Suite 2400
Chicago, IL 60603

If to Atlantic: Atlantic-Philadelphia Realty LLC
David A. Capobianco, Manager
205 Newbury Street
Framingham, MA 01701

With a copy to: Robert Orsi, Esq.
Orsi, Arone, Rothenberg, Iannuzzi & Turner, LLP
160 Gould Street
Needham, MA 02494

ARTICLE V - MISCELLANEOUS

Section 5.01. Miscellaneous

- (a) If any provision of this Agreement, or portion thereof, or the application thereof to any person or circumstances, shall to any extent be held invalid, inoperative or unenforceable, the remainder of this Agreement, or the application of such provision or portion thereof to any other persons or circumstances, shall not be affected thereby; it shall not be deemed that any such invalid provision affects the consideration for this Agreement; and each provision of this Agreement shall be valid and enforceable to the fullest extent permitted by law.
- (b) This Agreement shall be construed in accordance with the laws of The Commonwealth of Massachusetts.

- (c) The Article headings in this Agreement are for convenience only, shall in no way define or limit the scope or content of this Agreement, and shall not be considered in any construction or interpretation of this Agreement or any part hereof.
- (d) Nothing in this Agreement shall be construed to make the parties hereto partners or joint venturers or render either of said parties liable for the debts or obligations of the other.
- (e) This Agreement shall be binding upon and inure to the benefit of the successors and assigns of the parties hereto.
- (f) This Agreement may be amended, modified, or terminated at any time by a declaration in writing, executed and acknowledged by all the parties to the Agreement or their successors or assigns; this Agreement shall not be otherwise amended, modified or terminated during the term hereof.

[Remainder of Page Intentionally Blank, Signatures on Following Page]

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed as of the day and year first above written.

Atlantic-Philadelphia Realty LLC

By: 
Name: David A. Capobianco
Title: Manager

RREEF America REIT III-Z1 LLC

By: 
Name: Robert D. Seaman
Title: Assistant Vice President

Marginal References Requested

Book 23763, Page 156

Book 23763, Page 167

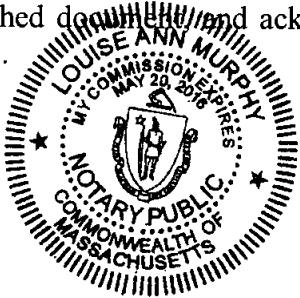
Book 19524, Page 56

Book 19524, Page 66

COMMONWEALTH OF MASSACHUSETTS

Middlesex, ss

On this 31st day of March, 2011, before me, the undersigned notary public, personally appeared David A. Capobianco, Manager of Atlantic-Philadelphia Realty LLC, proved to me through satisfactory evidence of identification, which was his Massachusetts Drivers License, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed voluntarily for its stated purpose.



Louise Ann Murphy
Notary Public - Commonwealth of
Massachusetts
My Commission Expires: 5/20/16

STATE OF Massachusetts

Worcester, ss

On this 31st day of March, 2011, before me, the undersigned notary public, personally appeared Robert D. Seaman, the Assistant Vice President of RREEF America REIT III-Z1 LLC, proved to me through satisfactory evidence of identification, which was MA Drivers License, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed voluntarily for its stated purpose.

Pauline M. Nicolletto
Notary Public -
My Commission Expires:

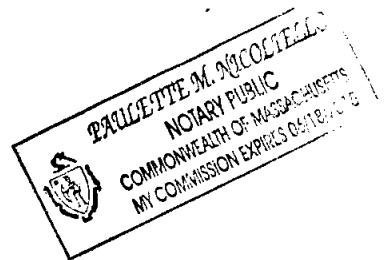


Exhibit A

3 Federal Street Parcel

A certain parcel of land, together with the buildings and other improvements now or hereafter located thereon, situated in the Town of Billerica, County of Middlesex, Commonwealth of Massachusetts, shown as Lot 2 on a plan entitled "Plan of Land in Billerica, Mass. (Middlesex County) For: The Fields Realty Trust, Scale: 1"=40'," dated April 30, 1984, by Joseph W. Moore Co., Land Surveyors, Civil Engineers which plan is recorded with the Middlesex North District Registry of Deeds in Plan Book 144 as Plan 26 and to which plan reference may be made for a more particular description of said Lot 2.

Lot 2 contains approximately 182, 531 square feet of land (comprising approximately 4.1903 acres) according to said plan.

Together with the benefit of a non-exclusive right to use the two (2) Twenty-Five Foot (25') All Purpose Easements which are shown on the aforesaid plan, as more particularly set forth in the instruments recorded with said Deeds in Book 4592, Page 166 and in Book 4592, Page 168.

Together with the right to use a parking easement on a portion of Lot 5 more particularly set forth in the Access and Parking Easement by and between William J. Callahan and William J. Callahan, Jr., Trustees of The Fields Realty Trust (as the owner of Lot 5) and William J. Callahan and William J. Callahan, Jr., Trustees of the Fields Realty Trust (as the owner of Lot 2) dated as of October 7, 1999 and recorded with said Deeds in Book 10452, Page 39, subject to the terms and provisions of said Access and Parking Easement.

Together with the benefit of the rights and easements set forth in the following documents:

- a.) Declaration of Easements dated as of July 14, 1987 and recorded with said Deeds in Book 4424, Page 101; and
- b.) Declaration of Easements dated as of July 22, 1988 by William J. Callahan, Sr. and William J. Callahan, Jr. and recorded with said Deeds in Book 4592, Page 173.

8 Federal Street Parcel

A certain parcel of land with the buildings and improvements thereon shown as Lot 4 on a plan entitled "Plan of Land in Billerica, MA (Middlesex County), for: William J. Callahan, "Scale:1"=60' dated October 13, 1983, prepared by Joseph W. Moore Co., Land Surveyors-Civil Engineers- 16 Railroad Ave., Bedford, MA, recorded with the Middlesex North District Registry of Deeds in Plan Book 141, Plan 60 and more particularly bounded and described as follows:

BEGINNING: at a point at the southwesterly corner of said parcel, same point on the

- northerly sideline of Federal Street and at Lot 5 as shown on said plan;
- THENCE: running N60° 40' 22" E one hundred twenty four and 52/100 (124.52) feet to a point;
- THENCE: turning and running N48° 47' 46" E three hundred thirty and 44/100 (330.44) feet to a point;
- THENCE: turning and running N89° 24' 22" E four hundred thirty nine and 92/100 (439.92) feet to a point;
- THENCE: turning and running S00° 19' 50" W two hundred seventy six and 07/100 (276.07) feet to a point;
- THENCE: turning and running S30° 22' 41" W six hundred fifty eight and 04/100 (658.04) feet to a point;
- THENCE: turning and running N33° 44' 30" W four hundred thirty two and 35/100 (432.35) feet to a point;
- THENCE: turning and running N76° 41' 59" W one hundred twenty two and 41/100 (122.41) feet to a point on Federal Street;
- THENCE: running along a curved line having an arc of one hundred ninety eight and 24/100 (198.24) and a radius of sixty (60.00) feet to a point of reverse curvature;
- THENCE: running along a curved line having an arc of thirty four and 84/100 (34.84) feet and a radius of twenty five (25.00) feet to a point of tangency;
- THENCE: turning and running N33° 44' 30" W sixty and 95/100 (60.95) feet to the point of beginning, the last three (3) courses being by the sideline of Federal Street.

Together with the benefit of the rights and easements set forth in the following documents:

- (a.) Declaration of Easements dated July 22, 1988 and recorded with said Deeds in Book 4592, Page 173;
- (b.) Easement dated December 23, 1985 and recorded with said Deeds in Book 3303, Page 72;
- (c.) Declaration of Easements by William J. Callahan, Sr. et al, Trustees of Fields Realty Trust dated July 14, 1987 and recorded with said Deeds in Book 4424, Page 101.
- (d.) Easement Agreement between WRC Properties Inc. and The Travelers Insurance

Company dated November 30, 1993 and recorded with said Deeds in Book 6854,
Page 277.

EXHIBIT BThe Lot 1 Parcel

A certain parcel of land together with the buildings and other improvements thereon situated in the Town of Billerica, County of Middlesex, Commonwealth of Massachusetts, Known as Lot 1, as shown on a plan entitled, "Plan of Land in Billerica, Mass. For: The Fields Realty Trust, dated April 4, 1984, by Joseph W. Moore Co., Land Surveyors and Civil Engineers, 16 Railroad Ave, Bedford, Mass." recorded with the Middlesex North Registry of Deeds in Plan Book 143, Page 86 and more particularly described as follows:

- Beginning: at a stone bound on the easterly sideline of Concord Road and at the Ramp as shown on said plan;
- Thence: running along the easterly sideline of Concord Road N11°49'37"E Two Hundred Two (202.00) feet to a point of curvature;
- Thence: by a curved line having a length of Thirty-Nine and 27/100 (39.27) feet and a radius of Twenty-Five (25.00) feet to a point of tangency;
- Thence: running S78°10'23"E Seventy-Five (75.00) feet to a point of curvature;
- Thence: by a curved line having a length of Fifty-Six and 90/100 (56.90) feet and a radius of One Hundred Six and 37/100 (106.37) feet to a point of tangency;
- Thence: running S47°31'27"E Four Hundred Sixty-One and 23/100 (461.23) feet to point at Lot A, last four (4) courses being by the southerly sideline of Federal Street;
- Thence: turning and running S48°06'42"W Two Hundred Ninety-Five and 78/100 (295.78) feet to a point on the Ramp;
- Thence: by a curved line having a length of Two Hundred Thirty (230.00) feet and a radius of Eight Hundred Eighty (880.00) feet to a stone bound at a point of tangency;
- Thence: running N54°27'17"W One Hundred Forty and 10/100 (140.10) feet to a stone bound at an angle point;
- Thence: turning and running N19°02'53"W One Hundred and 46/100 (100.46) feet to the point of beginning, last three (3) courses being along the northerly sideline of the Ramp.
- Containing: 3,4987 acres, more or less.

Said Lot 1 is also shown on a plan entitled "The Fields in Billerica, Massachusetts. Definitive Plan, Scale: 1"=40', dated March 10, 1983 by Joseph W. Moore Co., Land Surveyors and Civil Engineers, 16 Railroad Ave., Bedford, Massachusetts. Recorded with North Middlesex Registry of Deeds in Plan Book 139, Plan 150 (the "Definitive Plan"). Said Lot 1 is conveyed together with the right and easement to use Federal Street as shown on the Definitive Plan for all purposes for which ways are used in the Town of Billerica including but not limited to the installation, use, maintenance, repair and replacement of utility lines, pipes, and conduits in and over said Federal Street. Together also with (i) the right and easement to use those portions of the premises shown on the Definitive Plan as "Proposed Drainage Easement" and "Proposed Utility Easement" and (ii) the right and easement to use, maintain, replace and repair all existing water, electrical, telephone, drainage and sewer lines and pipes that serve Lot 1 and the improvements thereon and that are located in or over Federal Street, and the areas designated "Proposed Drainage Easement" and "Proposed Utility Easement" on the Definitive Plan.

The Lot 3 Parcel

A certain parcel of land situated in the Town of Billerica, County of Middlesex, Commonwealth of Massachusetts known as Lot 3, as shown on a plan entitled "Plan of Land in Billerica, Mass. (Middlesex County). For: The Fields Realty Trust, Scale 1"=40', dated April 30, 1984, by Joseph W. Moore Co., Land Surveyors and Civil Engineers. 16 Railroad Avenue, Bedford, Mass." recorded with the Middlesex North District Registry of Deeds in Plan Book 144, Plan 26 and more particularly described as follows:

BEGINNING: at a point on Federal Street at Lot 4, as shown on said plan;

THENCE: running S76°-41'59" E One Hundred Twenty-Two and 41/100 (122.41) feet to a point;

THENCE: turning and running S33°-44'30" E Four Hundred Thirty-Two and 35/100 (432.35) feet to a point;

THENCE: turning and running S30°22'41" W Seven Hundred Eighty-One and 79/100 (781.79) feet to a point;

THENCE: turning and running S52°44'20" W Two Hundred Eighty-Eight and 59/100 (288.59) feet to a point on the easterly sideline of Route 3;

THENCE: turning and running along the easterly sideline of Route 3 N26°30'40" W One Hundred Forty-Nine and 50/100 (149.50) feet to a point;

THENCE: turning and running N76°08'40" E One Hundred Eight and 20/100 (108.20) feet to a point;

- THENCE : turning and running N10°56'07" W One Hundred Fifty-Four and 19/100 (154.19) feet to a point;
- THENCE: turning and running N11°50'56"W One Hundred Sixty and 01/100 (160.01) feet to a point, last three (3) courses being by a stonewall;
- THENCE: turning and running N28°41'18" E One Hundred Fourteen and 69/100 (114.69) feet to a stonebound;
- THENCE: turning and running S6°15'30"E Three Hundred Thirty-Six and 34/100 (336.34) feet to a point;
- THENCE: turning and running N33°44'30" W One Hundred Sixty-Two and 87/100 (162.87) feet to a point;
- THENCE: turning and running N56°15'30"E Twenty (20.00) feet to a point;
- THENCE: turning and running N33°44'30"W Two Hundred Ten (210.00) feet to a point;
- THENCE: turning and running N56°15'30"E One Hundred Sixty (160.00) feet to a point;
- THENCE: turning and running N33°44'30"W Two Hundred (200.00) feet to a point;
- THENCE: turning and running N56°15'30"E Ten (10.00) feet to a point;
- THENCE: turning and running S33°44'30"E Ninety and 60/100 (90.60) feet to a point;
- THENCE: turning and running along a curved line having an arc of Seventy-Three and 86/100 (73.86) feet and a radius of Sixty (60.00) feet to a point of beginning.

BEING the same premises as shown on "Plan of Land in Billerica, Mass. (Middlesex County) For: The Fields Realty Trust, January 12, 1987, BSC-Bedford Land Surveyors- Civil Engineers."

EASEMENT AGREEMENT

This EASEMENT AGREEMENT is entered into as of the 10th day of November, 1993, by and between WILLIAM J. CALLAHAN and WILLIAM J. CALLAHAN, JR., as trustees of THE FIELDS REALTY TRUST u/d/t dated November 1, 1983 and recorded with the Middlesex County North District Registry of Deeds (the "Registry") in Book 2673, Page 604 (the "Fields"), with a mailing address of P.O. Box 269, Bedford, Massachusetts 01730 and THE TRAVELERS INSURANCE COMPANY, a Connecticut corporation having a business address of One Tower Square, Hartford, Connecticut 06183 ("Travelers").

WITNESSETH:

Reference is hereby made to the following facts which constitute the background to this Agreement:

A. By Deed dated November 1, 1983, as recorded with the Registry in Book 2673, Page 612, the Fields acquired certain real property located in Billerica, Middlesex County, Massachusetts, which property is shown as Lot 6 ("Lot 6") on the plan (the "Plan") entitled "PLAN OF LAND IN BILLERICA, MASS. (Middlesex County) FOR: William J. Callahan, SCALE 1"=60', Oct. 13, 1983, which Plan was recorded with said Registry in Plan Book 141, Page 60.

B. By Deed dated November 17, 1992, as recorded with said Registry in Book 6290, Page 275, Travelers acquired certain real property located in Billerica, Middlesex County, Massachusetts, which property is shown as Lot 7 ("Lot 7") on said Plan.

C. The Fields and Travelers have agreed to confirm the granting and creation of certain rights and easements burdening and benefiting Lot 6 and Lot 7, all upon the terms and conditions set forth herein.

NOW, THEREFORE, in consideration of the respective rights and easements granted herein, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Fields and Travelers hereby agree as follows:

1. The Fields hereby grants to Travelers, with QUITCLAIM COVENANTS, the following perpetual, non-exclusive rights and easements, each of which shall be appurtenant to and run with Lot 7:

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(a) the right and easement to use that portion of Lot 6 shown on the Plan as the "25' WIDE ALL PURPOSE EASEMENT" (the "Easement Area") for vehicular and pedestrian access, ingress and egress to and from Lot 7, and in connection therewith, to pave, repave, maintain, repair, restore, reconstruct and replace the curb-cut and driveway located therein; and

(b) the right and easement to use the Easement Area for the location, relocation, construction, reconstruction, addition to, extension, repair, replacement, maintenance, operation, inspection, removal, and use of any and all pipes, pipelines, wires, lines, water lines, water mains, cables, conduits, and poles, together with all other equipment, fixtures and facilities appurtenant thereto (collectively, the "Utility Easement Facilities") relating to the connection with and transmission and distribution of any and all utilities (public or otherwise), including, without limitation, electricity, intelligence, telephone, cable television, data, natural gas, water, sewerage, drainage, and all other utilities now or hereafter servicing said Lot 7. Also included is the further perpetual, non-exclusive right and easement to enter into the Easement Area to exercise the foregoing rights and easements and to make such excavations in said Easement Area as may be reasonably necessary in connection therewith.

2. Travelers hereby grants to the Fields, with QUITCLAIM COVENANTS, the following perpetual non-exclusive right and easement, which shall be appurtenant to and run with Lot 6:

(a) the right and easement to use that portion of Lot 7 shown on the Plan as the "25' WIDE ALL PURPOSE EASEMENT" (the "Easement Area") for vehicular and pedestrian access, ingress and egress to and from Lot 6, and in connection therewith, to pave, repave, maintain, repair, restore, reconstruct and replace the curb-cut and driveway located therein; and

(b) the right and easement to use the Easement Area for the location, relocation, construction, reconstruction, addition to, extension, repair, replacement, maintenance, operation, inspection, removal, and use of any and all pipes, pipelines, wires, lines, water lines, water mains, cables, conduits, and poles, together with all other equipment, fixtures and facilities appurtenant thereto (collectively, the "Utility Easement Facilities") relating to the connection with and transmission and distribution of any and all utilities (public or otherwise), including, without limitation, electricity, intelligence, telephone, cable television, data, natural gas, water, sewerage, drainage, and all other utilities now or hereafter servicing said Lot 6. Also included is the further

perpetual, non-exclusive right and easement to enter into the Easement Area to exercise the foregoing rights and easements and to make such excavations in said Easement Area as may be reasonably necessary in connection therewith.

3. The rights and easements created and granted hereunder are non-exclusive and shall be exercisable in common with others entitled thereto from time to time. The Fields expressly reserves and retains the right to use, or to grant to others the right to use the surface and subsurface of, and the air space above all portions of Lot 6 (including, without limitation, the areas subject to the rights and easements herein granted), provided only that such use shall not materially and adversely affect the exercise by Travelers of the rights and easements herein granted. Travelers expressly reserves and retains the right to use or to grant to others the right to use the surface and subsurface of, and the air space above all portions of Lot 7 (including, without limitation, the areas subject to the rights and easements herein granted), provided only that such use shall not materially and adversely affect the exercise by The Fields of the rights and easements herein granted.

4. Whenever any work (including, without limitation, any excavation work) is to be performed by The Fields on Lot 7 or by Travelers on Lot 6 pursuant to the provisions of a right or easement granted hereunder, such work (i) excepting only in the case of emergencies, shall not be undertaken until the party undertaking such work shall have provided reasonable prior notice to the other party either by telephone or in writing of the manner and extent of such work, (ii) shall not be undertaken until the party undertaking such work shall have procured all required municipal and other governmental permits and authorizations, and all consents for any activity proposed by such party from other parties having rights in the applicable easement area if and to the extent such consents are required, (iii) shall be performed in a safe, diligent and workmanlike manner and in compliance with all applicable laws, ordinances, orders, rules, regulations and requirements of all governmental authorities having jurisdiction thereover and with all necessary permits and approvals having been issued therefor, and (iv) shall be performed as expeditiously as possible and in any event in a manner that causes the minimum of interference with the use and enjoyment of the applicable grantor's property.

5. The right of either party to make such excavations as may be reasonable and proper in connection with the exercise of the rights and easements granted hereunder is expressly conditioned upon the agreement of the performing party to properly backfill any such excavations and to restore the surface of the affected area to substantially similar condition as before the performance of such excavation, including, without limitation, repaving or restriping the surface thereof

if the surface thereof had been paved or striped prior to said excavation.

6. All of the Utility Easement Facilities made by or on behalf of Travelers and serving Lot 7 shall be entirely below the surface of the ground, as the same shall be improved from time to time in accordance with the terms hereof. All of the Utility Easement Facilities serving Lot 7 shall be and remain the property of Travelers, and Travelers shall pay all real property taxes assessed thereon. All of the Utility Easement Facilities made by or on behalf of The Fields and serving Lot 6 shall be entirely below the surface of the ground, as the same shall be improved from time to time in accordance with the terms hereof. All of the Utility Easement Facilities serving Lot 6 shall be and remain the property of The Fields and the Fields shall pay all real property taxes assessed thereon.

7. Travelers shall be and remain responsible for the maintenance of any and all Utility Easement Facilities serving Lot 7, including, without limitation, any Utility Easement Facilities which it constructs pursuant to the rights and easements granted hereunder. Travelers agrees to indemnify and save harmless The Fields and all those claiming by, under or through The Fields from all loss, claim, cost, damage and expense arising out of or in connection with the use by Travelers, and all parties claiming by, through or under Travelers, of the rights and easements granted to Travelers herein (including, without limitation, the construction of the Utility Easement Facilities), excepting consequential damages and except as and to the extent that any such loss, claim, cost, damage or expense is the result of the negligence or willful misconduct of The Fields, or any party acting by, through or under The Fields.

8. The Fields shall be and remain responsible for the maintenance of any and all Utility Easement Facilities serving Lot 6, including, without limitation, any Utility Easement Facilities which it constructs pursuant to the rights and easements granted hereunder. The Fields agrees to indemnify and save harmless Travelers and all those claiming by, under or through Travelers from all loss, claim, cost, damage and expense arising out of or in connection with the use by The Fields, and all parties claiming by, through or under The Fields, of the rights and easements granted to The Fields herein (including, without limitation, the construction of the Utility Easement Facilities), excepting consequential damages and except as and to the extent that any such loss, claim, cost, damage or expense is the result of the negligence or willful misconduct of Travelers, or any party acting by, through or under Travelers.

9. Travelers shall be and remain responsible for the maintenance and operation of the surface of the Easement Area, including, without limitation, repairing, restriping, snow plowing, landscaping and operating the driveway and curb cuts located therein.

10. If the future use of Lot 7 by Travelers shall from time to time require the relocation of all or any portion of the Utility Easement Facilities serving Lot 6, or if the future use of Lot 6 by The Fields shall from time to time require the relocation of all or any portion of the Utility Easement Facilities serving Lot 7, then the party electing to relocate the Utility Easement Facilities shall send written notice to the non-electing party to that affect. Thereafter, the parties shall attempt in good faith to agree upon an alternate location for said Utility Easement Facilities. Within 120 days after the date on which the parties so agree, the non-electing party shall, in cooperation with the electing party and at the sole cost and expense of the electing party, relocate all or said portion of said Utility Easement Facilities to such alternate location as shall be agreed upon by both parties. Upon the recording at the Registry of Deeds of a certificate indicating the relocation of the Utility Easement Facilities, and a plan showing such relocation, the rights and easements herein granted with respect to the utility easements granted pursuant to Sections 1(b) and/or 2(b) of this Agreement (as applicable) shall cease and terminate and shall attach to the relocated easement area as if originally granted with respect thereto, and such relocated easement area shall be treated as the land subject to the utility easement herein granted pursuant to Section 2(b) for all purposes. Except as expressly and specifically set forth in this Section 10, neither Travelers nor the Fields may relocate the areas subject to the rights and easements granted by this Agreement.

11. HARTFORD LIFE INSURANCE COMPANY, a Connecticut Corporation, with an office at Hartford Plaza, Hartford, CT 06115 Attn: Real Estate Department, holder of a mortgage on Lot 6, which mortgage was granted pursuant to that certain "Mortgage and Security Agreement", dated June 25, 1990 and recorded with said Registry in Book 5260, Page 1, for consideration paid, hereby joins in and consents to the execution of this Agreement solely for the purpose of agreeing that it and its successors and assigns will hold said mortgage (and in the event of foreclosure thereof or other acquisition of title to Lot 6, the premises encumbered thereby), subject and subordinate to the rights and easements granted hereby with the same force and effect as if this instrument were dated, executed and recorded prior to the execution and recordation of said mortgage. THE TRAVELERS INSURANCE COMPANY as the holder of a mortgage on Lot 7, which mortgage was granted pursuant that certain "Mortgage and Security Agreement," dated February 3, 1987 and recorded with said Registry in Book 3906, Page 17, as affected by an Amendment thereto, dated April 26, 1989, recorded with said Registry in Book 5032, Page 118, agrees that it and its successors and assigns as holders of said mortgage will hold said mortgage (and in the event of foreclosure thereof, the premises encumbered thereby), subject and

subordinate to the rights and easements granted hereby with the same force and effect as if this instrument were dated, executed and recorded prior to the execution and recordation of said mortgage.

12. The rights and easements created hereby shall run with the land and shall be binding upon and inure to the benefit of the Fields and Travelers, and their respective successors and assigns, as owners of the respective parcels benefitting from and burdened by the respective rights and easements created herein; provided, however, that the owners of the parcels burdened by the respective rights and easements granted above shall only be responsible hereunder for matters occurring and claims arising during their respective periods of ownership of such burdened parcels. All references herein to "The Fields" shall refer to and mean William J. Callahan and William J. Callahan, Jr., as trustees of The Fields Realty Trust, as aforesaid, and their successors or assigns, as well as all successors or assigns as owners of Lot 6, and all references herein to "Travelers" shall refer to and mean Travelers and its successors or assigns. The provisions of this agreement may not be modified, amended, cancelled or terminated except by a written instrument executed by both Travelers and The Fields.

13. In no event shall a breach of any obligation hereunder result in a forfeiture, reversion or reverter of the rights and easements created hereby. There shall be no merger of the rights and easements created hereby notwithstanding that Lots 6 and 7 may from time-to-time be owned by the same person or persons or entities benefited or burdened hereby.

14. Notwithstanding anything to the contrary in this Agreement, The Fields agrees to look solely to Travelers' interest in Lot 7 for the collection of any judgment or other judicial process requiring the payment of money by Travelers in the event of any breach or default by Travelers hereunder, and no other assets of Travelers shall be subject to levy, execution or other procedures for satisfaction of the Fields's remedies. In no event shall Travelers or any agents or employees thereof, ever be personally liable to the Fields for any damages under this Agreement.

Notwithstanding anything to the contrary in this Agreement, Travelers agrees to look solely to the interest of The Fields in Lot 6 for the collection of any judgment or other judicial process requiring the payment of money by the Fields in the event of any breach or default by The Fields hereunder, and no other assets of The Fields shall be subject to levy, execution or other procedures for satisfaction of Travelers' remedies.

15. Whenever by the terms of this Agreement notice shall or may be given, such notice shall be in writing, and shall be sent by registered or certified mail, postage prepaid or by recognized overnight delivery service, to The Fields at the address set forth on the first page of this instrument (or such

future address as may be designated in writing) and to Travelers at the address set forth on the first page of this instrument (or such future address as may be designated in writing), with a copy to: The Travelers Insurance Company, c/o Travelers Realty Investment Company, 125 High Street, Boston, MA 02110-2217, Attention: Asset Management - RE Number 12669. All such notices shall be deemed given two (2) business days after dispatch, by certified or registered mail, or on the date of delivery if sent by overnight service.

16. The rights and easements herein granted are subject to all restrictions, covenants, easements and other encumbrances of record to the extent force and applicable as of the date hereof.

Executed as an instrument under seal as of the date and year set forth above.

THE FIELDS REALTY TRUST u/d/t
dated November 1, 1983 and
recorded with the Middlesex North
District Registry of Deeds in Book
2673, Page 604

By: William J. Callahan
William J. Callahan
Trustee
Hereunto duly authorized
by all of the beneficiaries of
said Trust

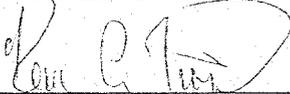
By: William J. Callahan, Jr.
William J. Callahan, Jr.
Trustee
Hereunto duly authorized
by all of the beneficiaries of
said Trust

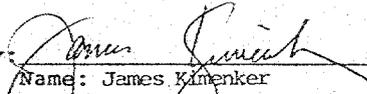
^{CSK}
THE TRAVELERS ~~LIFE~~ INSURANCE
COMPANY, a Connecticut corporation

By: Christy J. Kelly
Name: Christy J. Kelly
Its: Asst. Secretary
Hereunto duly authorized

HARTFORD LIFE INSURANCE COMPANY

MURP

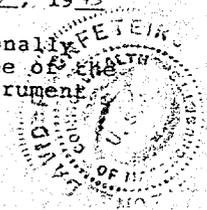
By: 
Name: Kevin A. North
Its: Vice President
Hereunto duly authorized

By: 
Name: James Kamenker
Its: Secretary
Hereunto duly authorized

STATE OF Massachusetts)
)ss.
COUNTY OF Middlesex)

November 10, 1993

On this 10th day of November, before me personally appeared the above-named William J. Callahan, as Trustee of the Fields Realty Trust who acknowledged the foregoing instrument to be (his)(her) free act and deed, in his capacity as aforesaid.

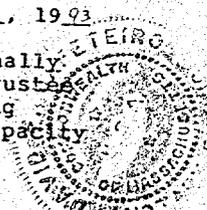


David F. Cabete
Notary Public
My Commission expires: 9/11/98

STATE OF Massachusetts)
)ss.
COUNTY OF Middlesex)

November 10, 1993

On this 10th day of November, before me personally appeared the above-named William J. Callahan, Jr., as Trustee of the Fields Realty Trust who acknowledged the foregoing instrument to be (his)(her) free act and deed, in his capacity as aforesaid.



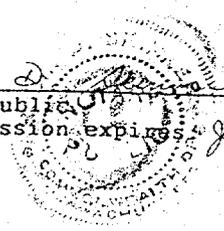
David F. Cabete
Notary Public
My Commission expires: 9/11/98

COMMONWEALTH OF MASSACHUSETTS)
)ss.
COUNTY OF SUFFOLK)

November 17, 1993

On this day, before me, personally appeared CHRISTOPHER J. KELLY who being by me duly sworn did say that (he)(~~she~~) is ASST. SECRETARY of the TRAVELERS INSURANCE COMPANY; that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors; and said ASST. SECRETARY acknowledged said instrument to be the free act and deed of said corporation.

Anton D. [Signature]
Notary Public
My Commission expires: Jan 8, 1999



STATE OF Connecticut)
COUNTY OF Hartford) ss.

November 29, 1993

On this day, before me, personally appeared Kevin A. Kerth who being by me duly sworn did say that (he)(she) is Vice President of HARTFORD LIFE INSURANCE CORPORATION; that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors; and said Vice President acknowledged said instrument to be the free act and deed of said corporation.

Lauran Chipta
Notary Public
My Commission expires:
LAURAN CHIPTA
NOTARY PUBLIC
MY COMMISSION EXPIRES APR. 30, 1995

STATE OF Connecticut)
COUNTY OF Hartford) ss.

November 29, 1993

On this day, before me, personally appeared James A. Kamenker who being by me duly sworn did say that (he)(she) is Secretary of HARTFORD LIFE INSURANCE CORPORATION; that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors; and said Secretary acknowledged said instrument to be the free act and deed of said corporation.

Lauran Chipta
Notary Public
My Commission expires:
LAURAN CHIPTA
NOTARY PUBLIC
MY COMMISSION EXPIRES APR. 30, 1995

/2508

Attachment O – Site Plan

ZONING SUMMARY CHART PROPOSED USE: MULTIFAMILY RESIDENTIAL		
ITEM	REQUIRED	PROPOSED
MINIMUM LOT AREA	60,000 SF	341,780 SF
MINIMUM LOT FRONTAGE	150'	1,200.44'
MINIMUM FRONT SETBACK	15'	74±
MINIMUM SIDE SETBACK	15'	41±
MINIMUM REAR SETBACK	45'	N/A
BUILDING HEIGHT	40', 3 STORIES	40', 3 STY
MIN. OPEN SPACE (WITH BANKED SPACES CONSTRUCTED)	20%	48%
MIN. OPEN SPACE (WITH BANKED SPACES CONSTRUCTED)	20%	52%
GROSS DENSITY	25 UNITS/ACRE	22.6
AFFORDABLE UNITS 10%	17	17

SITE IS WITHIN INDUSTRIAL ZONE AND MBTA COMMUNITIES MULTIFAMILY OVERLAY SUB-DISTRICT C FEDERAL STREET

PARKING & LOADING REQUIREMENTS #2 FEDERAL STREET		
PARKING USE	REQUIRED	PROVIDED
STUDIO AND 1-BEDROOM (1.5 UNIT)	1.5 x 106 = 159	
2-BEDROOM AND 3-BEDROOM (2 SPACES PER UNIT)	2 x 72 = 144	300*
EV CHARGING STATIONS (1 PER 20 PARKING SPACES)	300 ÷ 20 = 15	60**
BICYCLE PARKING (1 PER UNIT)	178	178

- NOTES:
- 35 COMPACT SPACES ARE PROPOSED REPRESENTING 12% OF THE TOTAL SPACES (15% MAXIMUM ALLOWED) 31 OF COMPACT SPACES ARE PART OF BANKED PARKING AREAS.
 - 7 SURFACE ADA SPACES ARE PROVIDED; 1 GARAGE ADA SPACE IS PROVIDED FOR A TOTAL OF 8 SPACES. (7 REQUIRED)

SIGHT TRIANGLE AREA NOTE
SIGNS, LANDSCAPING AND OTHER FEATURES LOCATED WITHIN SIGHT TRIANGLE AREAS SHALL BE DESIGNED, INSTALLED, AND MAINTAINED TO NOT EXCEED 2.5 FEET IN HEIGHT. SNOW ACCUMULATION (WINDROWS) LOCATED WITHIN SIGHT TRIANGLE AREAS THAT EXCEED 2.5 FEET IN HEIGHT OR THAT WOULD OTHERWISE INHIBIT SIGHT LINES SHALL BE PROMPTLY REMOVED.

* 52 OF THE 300 SPACES ARE SHOWN AS BANKED PARKING, FOR FUTURE CONSTRUCTION IF DEEMED NECESSARY.
** 30 EV CHARGING SPACES ARE PROVIDED, WITH AN ADDITIONAL 30 FUTURE EV-READY SPACES SHOWN TO MEET ENERGY STRETCH CODE REQUIREMENTS.

PARKING & LOADING REQUIREMENTS #1 AND #2 FEDERAL STREET		
PARKING USE	REQUIRED	PROVIDED
STUDIO AND 1-BEDROOM (1.5 UNIT)	1.5 x 155 = 233	
2-BEDROOM AND 3-BEDROOM (2 SPACES PER UNIT)	2 x 111 = 222	456
EV CHARGING STATIONS (1 PER 20 PARKING SPACES)	330 ÷ 20 = 16.5	89
BICYCLE PARKING (1 PER UNIT)	266	266

LEGEND

- PROPERTY LINE
- SIGN
- BOLLARD
- BUILDING
- BUILDING ARCHITECTURE
- CURB
- RETAINING WALL
- PARKING STRIPING
- ROADWAY STRIPING
- TRAFFIC ARROWS
- SETBACK LINE
- PROP. CAR CHARGING
- FUTURE CAR CHARGING
- SIDEWALK
- ADA ACCESSIBLE RAMP
- CHAIN LINK FENCE
- BASELINE
- SAW-CUT LINE
- BASELINE DATA LABEL
- PARKING COUNT
- COMPACT PARKING STALL
- TREE LINE
- LIGHTING

ISSUED FOR REVIEW
DECEMBER 11, 2025 - REV. 2 - FEBRUARY 9, 2026

PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
2	02-09-2026	PER REVIEW COMMENTS
1	01-21-2026	PER REVIEW COMMENTS

APPLICANT/OWNER:
JLB REALTY, LLC
2310 WASHINGTON STREET
NEWTON, MA 02462

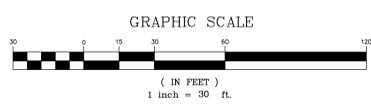
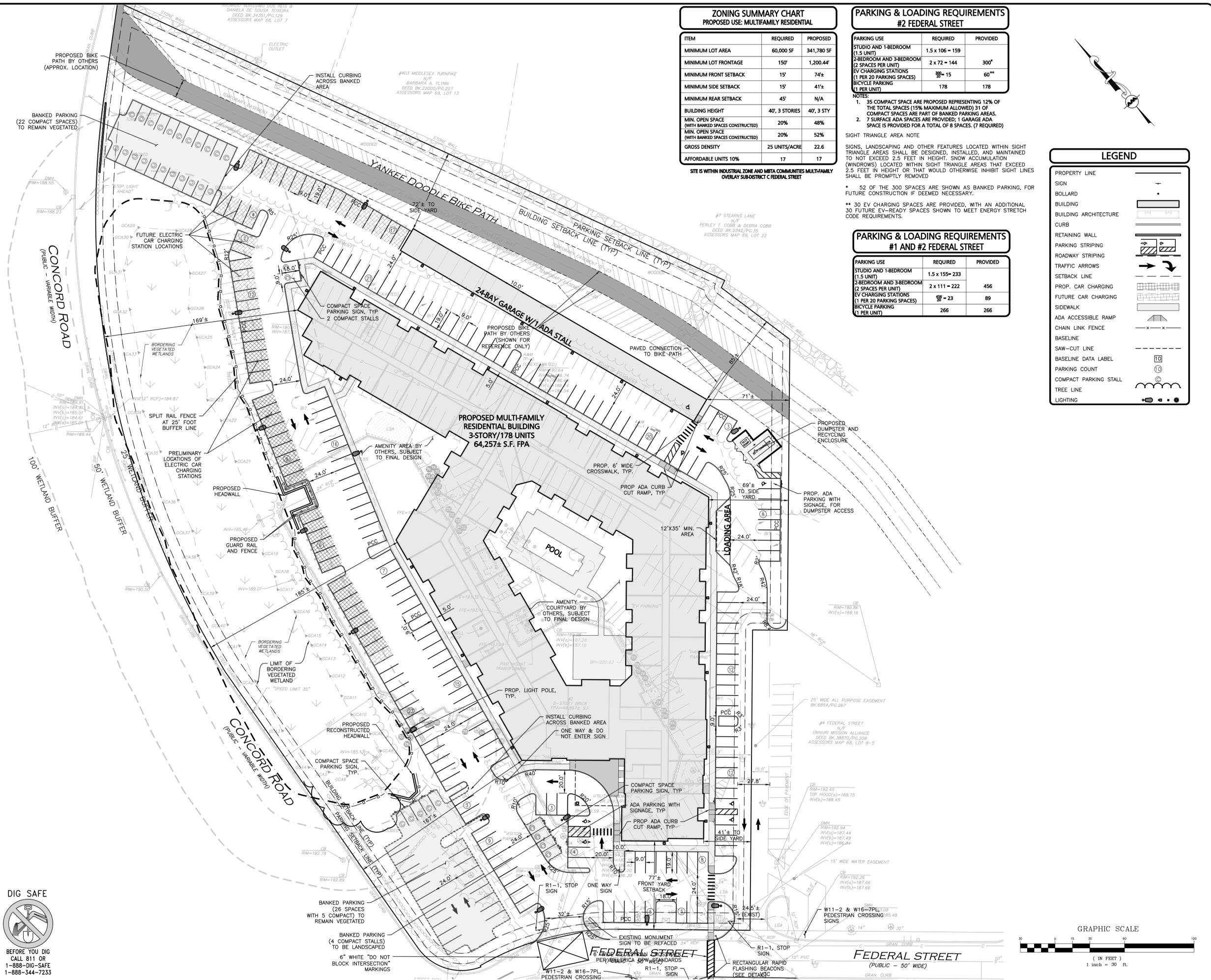
PROJECT:
JLB BILLERICA
1 & 2 FEDERAL STREET
BILLERICA, MA

PROJECT NO. 3490-03 DATE: 11-03-2025
SCALE: 1" = 30' DWG. NAME: C3490-03
DESIGNED BY: SF/JAP CHECKED BY: PLC

ALLEN & MAJOR ASSOCIATES, INC.
civil engineering • land surveying
environmental consulting • landscape architecture
www.allenmajor.com
10 MAIN STREET
LAKEVILLE, MA 02347
TEL: (508) 923-0110
FAX: (508) 923-6309

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DRAWING TITLE: LAYOUT & MATERIALS PLAN SHEET NO. C-105



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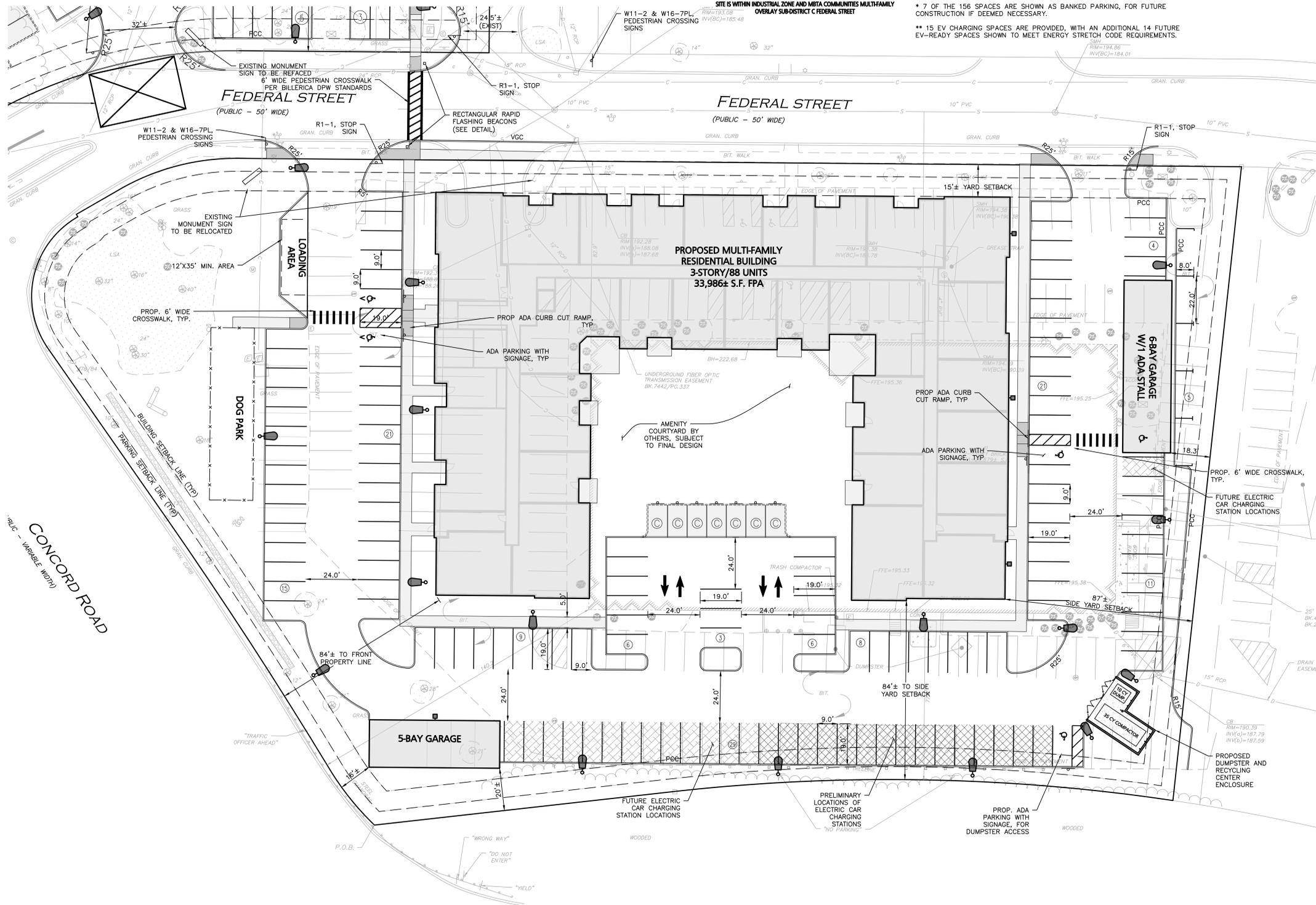
ZONING SUMMARY CHART PROPOSED USE: MULTIFAMILY RESIDENTIAL		
ITEM	REQUIRED	PROPOSED
MINIMUM LOT AREA	60,000 SF	141,107 SF
MINIMUM LOT FRONTAGE	150'	878.95'
MINIMUM FRONT SETBACK	15'	15'±
MINIMUM SIDE SETBACK	15'	87'±
MINIMUM REAR SETBACK	45'	N/A
BUILDING HEIGHT	40', 3 STORIES	40', 3 STY
MIN. OPEN SPACE	20%	35%
GROSS DENSITY	25 UNITS/ACRE	27.2
AFFORDABLE UNITS 10%	8	8

PARKING & LOADING REQUIREMENTS #1 FEDERAL STREET		
PARKING USE	REQUIRED	PROVIDED
STUDIO AND 1-BEDROOM (1.5 UNIT)	1.5 x 49 = 74	156*
2-BEDROOM AND 3-BEDROOM (2 SPACES PER UNIT)	2 x 39 = 78	156*
EV CHARGING STATIONS (1 PER 20 PARKING SPACES)	39 = 8	29**
BICYCLE PARKING (1 PER UNIT)	88	88

PARKING & LOADING REQUIREMENTS #1 AND #2 FEDERAL STREET		
PARKING USE	REQUIRED	PROVIDED
STUDIO AND 1-BEDROOM (1.5 UNIT)	1.5 x 155 = 233	456
2-BEDROOM AND 3-BEDROOM (2 SPACES PER UNIT)	2 x 111 = 222	456
EV CHARGING STATIONS (1 PER 20 PARKING SPACES)	39 = 23	89
BICYCLE PARKING (1 PER UNIT)	266	266

NOTES:
1. 4 SURFACE ADA SPACES ARE PROVIDED; 1 GARAGE ADA SPACE IS PROVIDED FOR A TOTAL OF 5 SPACES. (5 REQUIRED)
SIGHT TRIANGLE AREA NOTE
SIGNS, LANDSCAPING AND OTHER FEATURES LOCATED WITHIN SIGHT TRIANGLE AREAS SHALL BE DESIGNED, INSTALLED, AND MAINTAINED TO NOT EXCEED 2.5 FEET IN HEIGHT. SNOW ACCUMULATION (WINDROWS) LOCATED WITHIN SIGHT TRIANGLE AREAS THAT EXCEED 2.5 FEET IN HEIGHT OR THAT WOULD OTHERWISE INHIBIT SIGHT LINES SHALL BE PROMPTLY REMOVED.
* 7 OF THE 156 SPACES ARE SHOWN AS BANKED PARKING, FOR FUTURE CONSTRUCTION IF DEEMED NECESSARY.
** 15 EV CHARGING SPACES ARE PROVIDED, WITH AN ADDITIONAL 14 FUTURE EV-READY SPACES SHOWN TO MEET ENERGY STRETCH CODE REQUIREMENTS.

LEGEND	
PROPERTY LINE	---
SIGN	+
BOLLARD	•
BUILDING	[Hatched Area]
BUILDING ARCHITECTURE	[Hatched Area]
CURB	—
RETAINING WALL	[Hatched Area]
PARKING STRIPING	[Hatched Area]
ROADWAY STRIPING	[Hatched Area]
TRAFFIC ARROWS	[Arrow]
SETBACK LINE	---
PROP. CAR CHARGING	[Symbol]
FUTURE CAR CHARGING	[Symbol]
SIDEWALK	---
ADA ACCESSIBLE RAMP	[Symbol]
CHAIN LINK FENCE	[Symbol]
BASELINE	---
SAW-CUT LINE	---
BASELINE DATA LABEL	[Symbol]
PARKING COUNT	[Symbol]
COMPACT PARKING STALL	[Symbol]
TREE LINE	---
LIGHTING	[Symbol]



ISSUED FOR REVIEW
DECEMBER 11, 2025 -
REV. 2 - FEBRUARY 9, 2026

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
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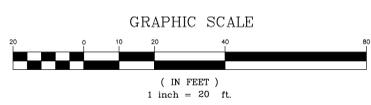
PROJECT:
JLB BILLERICA
1 & 2 FEDERAL STREET
BILLERICA, MA

PROJECT NO.	3490-03	DATE:	11-03-2025
SCALE:	1" = 20'	DWG. NAME:	C3490-03
DESIGNED BY:	SF/JAP	CHECKED BY:	PLC

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