Woburn Street Corridor Study

City of Lowell, Town of Tewksbury and the Town of Billerica

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I. Introduction

The Woburn Street Corridor Study Area lies within the communities of Tewksbury, Lowell and Billerica, and spans a distance of approximately 1.75 miles. The study area begins north of the I-495 interchange, at the intersection of Easton Street/Gaudreau Street in Lowell, and extends southeasterly along Woburn Street and Billerica Avenue, through the towns of Tewksbury and Billerica, terminating at the intersection of Mt. Pleasant Street in Billerica, as shown on Map 1.

The report examines land use, transportation and economic development issues along the corridor with an eye toward addressing any land use conflicts that might exist and identifying opportunities where the communities of Billerica, Lowell and Tewksbury can work together to promote the corridor and plan for the future. Future development and redevelopment within the study area will depend to a great extent on: the uses allowed within each community's zoning bylaw or ordinance; available infrastructure; and overall market conditions. The corridor is nearly built-out and there is little vacant land available for future development. However, the redevelopment of existing and underutilized parcels will provide future economic opportunities, particularly within the communities of Billerica and Tewksbury.

In order to determine where land is readily available for redevelopment and/or development a parcel-level inventory was conducted. The inventory included information on parcel size, zoning and land use, based on the information obtained from the Assessor Departments within the three communities. The land use and zoning section identifies present land uses, and examines remaining opportunities for development and redevelopment. (The zoning analysis tables contained in Appendix B and C detail permitted uses and dimensional requirements within the different zoning districts across municipal boundaries.)

The transportation section of this report analyzes existing traffic conditions along the corridor and makes recommendations for future improvements. The transportation section also addresses bicycle and pedestrian issues within the study and public transportation.

Land Use

A. Land Use Characteristics of Existing Parcels

The parcel inventory database contains 122 parcels comprising 545.95 acres of land within the three communities. The detailed inventory can be found in Appendix A. Due to the extensive number of commercial/industrial condominiums located in the Study Area, it was important to differentiate between parcels and tax properties. Based upon the assessing records, acreage information is generally assigned to individual parcels and not to tax properties, such as for each unit in a condominium. Therefore, the database contained in Appendix A provides acreage information for the entire condominiums complex, and there is no acreage assigned to individual condo units.

The communities of Billerica, Tewksbury and Lowell utilize the standardized three-digit land use codes to provide a description of use for each tax parcel. (Information pertaining to the land use categories for each community is available in Appendix A.) For this study, NMCOG organized land use codes by property type (e.g. Residential, Commercial, Industrial and Exempt) for each of the three communities.

Approximately 82.50% (450.39 acres) of the total land area within the Study Area is used for industrial purposes. Residential land uses comprise only 5.94% (32.41 acres) of the study area corridor. Exempt (municipal and institutional, etc.) land uses represent 4.39% (23.98 acres) of the Study Area. Developable and potentially developable vacant industrial land represented 9.42% (51.44 acres) of the total area, and undevelopable industrial land represented 11.66% (63.68 acres). Due to wetlands constraints, the City of Lowell contains the largest undevelopable industrial parcel. Located just south of the I-495 Interchange this parcel contains 38.57 acres.

Table 1: Current Land Use by Community (2009)

Class of Use	Billerica (Acres)	% Total Acreage	Tewksbury (Acres)	% Total Acreage	Lowell (Acres)	% Total Acreage	Total Acreage
Residential							
Single-family dwellings (101)	20.85 (29)	5.39%	3.24(8)	2.89%	4.18 (18)	8.91%	28.27 (55)
Two-family dwellings (104)	2.06 (3)	0.53%	0.11 (1)	0.10%	0.77 (4)	1.64%	2.94 (8)
Three-family dwellings (105)	--	--	--	--	0.18 (1)	0.38%	0.18 (1)
Child care facility (140)	0.52 (1)	0.13%	--	--	--	--	0.52 (1)
Developable vacant land (130)	--	--	--	--	0.13 (1)	0.28%	0.13 (1)
Potentially developable land (131)	--	--	--	--	0.37 (1)	0.79%	0.37(1)
Total	**23.43 (33)**	**6.05%**	**3.35 (9)**	**2.99%**	**5.63 (25)**	**12.00%**	**32.41 (67)**
Commercial							
Motor vehicle services (338)	25.80 (2)	6.66%	--	--	--	--	25.80 (2)
Lumber Yards (313)	2.44 (2)	0.63%	--	--	--	--	2.44 (2)
Storage, warehouse and distribution facility (316)	--	--	2.76 (1)	2.46%	--	--	2.76(1)
Discount/Department store (322)	--	--	5.28 (2)	4.71%	--	--	5.28 (2)
Commercial retail building (325)	--	--	--	--	1.60 (2)	3.41%	1.60 (2)
Auto repair facilities (332)	--	--	1.29 (1)	1.15%	--	--	1.29 (1)
Total	**28.24 (4)**	**7.30%**	**9.33 (4)**	**8.32%**	**1.60 (2)**	**3.41%**	**39.17 (10)**
Industrial							
Buildings for manufacturing (400)	167.30 (2)	43.22%	6.32 (1)	5.63%	--	--	173.62 (3)
Warehouses for storage of manufactured goods (401)	4.12 (1)	1.06%	--	--	--	--	4.12 (1)
Office building – part of manufacturing (402)	25.35 (4)	6.55%	39.59 (7)	35.28%	--	--	64.94 (11)
R & D facilities (404)	5.37 (1)	1.39%	30.84 (1)	27.48%	--	--	36.21 (2)
Electric transmission right-of-way (423)	54.39 (6)	14.05%	--	--	--	--	54.39 (6)
Developable vacant land (440)	--	--	22.68 (6)	20.21%	--	--	22.68 (6)
Potentially developable vacant land (441)	28.76 (7)	7.43%	--	--	--	--	28.76 (7)
Undevelopable vacant land (442)	25.00 (1)	6.46%	0.11 (1)	0.10%	38.57 (1)	82.19%	63.68 (3)
Commercial condo (445?)	1.99 (1)	0.51%	--	--	--	--	1.99 (1)
Total	**312.28 (23)**	**80.67%**	**99.54 (16)**	**88.70%**	**38.57 (1)**	**82.19%**	**450.39 (40)**
Exempt							
Public Service (901)	2.74 (1)	0.71%	--	--	--	--	2.74 (1)
Municipal (903)	20.41 (2)	5.27%	--	--	0.83 (2)	1.77%	21.24 (4)
Total	**23.15 (3)**	**5.98%**	**N/A**	**N/A**	**0.83 (2)**	**1.77%**	**23.98 (5)**
Total acreage	**387.10 (63)**	**100%**	**112.22 (29)**	**100%**	**46.63 (30)**	**100%**	**545.95 (122)**

Source: Tewksbury, Billerica and Lowell Assessor's Database for FY 2009
Note: 25.80 (2) = Acreage (Parcels)
-- Denotes that municipality does not have parcels in the Study Area under the specified class of use.

B. Residential Land Uses

Billerica

Only 6.05% of Billerica's land area within the Study Area (387.10 acres) is used for residential purposes. However, over 70% of the total land within the Study Area used for residential purposes is located in Billerica, where there are 23.34 acres containing both single-family (29 units) and two-family (6 units) dwellings. The majority of the residential uses are located south of the electric transmission right-of-way. There is one child care facility situated on 0.52 acres that the town considers to be a residential use (Land Use Code 140) for assessment purposes, however, in most communities these facilities are classified as commercial uses.

Tewksbury

Only 10.34% (3.35 acres) of the Study Area acreage used for residential purposes lies within Tewksbury. Single-family dwellings occupy 8 parcels covering 3.24 acres, while there is only one (1) two-family dwelling occupying 0.11 acres. Only 2.99% of the 112.22 total acres of land located within the Tewksbury portion of the study area is used for residential purposes. Tewksbury is the only community along the corridor where all of the residential land uses are located on parcels that are zoned for industrial purposes.

Lowell

Approximately 17.37% of the residential land uses in the Study Area are located in Lowell, with 5.63 acres containing single-family dwellings (18 units), two-family dwellings (8 units) and one (1) three-family dwelling. Only 12% of the 46.63 total acres located within the Lowell portion if study area is used for residential purposes. There are two parcels comprising .50 acres of land that are classified by the Assessor's office as being developable or potentially developable.

C. Commercial Land Uses

Billerica

Billerica contains 72.1% (28.24 acres) of the commercially utilized land within the study area. This represents 7.3% of the 387.10 study area acreage located within Billerica. This area contains two (2) parcels comprising 25.80 acres that are currently used for the storage of junk motor vehicles. Although these parcels do not immediately abut Billerica Avenue, they have significant potential to be redeveloped for residential, commercial or industrial purposes. In addition, the former Hughes Lumber Company is situated on two (2) parcels consisting of 2.44 acres, located north of the North Billerica MBTA Station parking lot on Letchworth Avenue.

Tewksbury

Tewksbury has the most diverse mix of commercial land uses of the three study area communities. Tewksbury contains 23.82% (9.33 acres) of the total commercial land uses within the study area. Commercial land uses comprise 8.32% of the 112.22 commercial acres located within the Study Area. Commercial uses include a warehouse and distribution facility, auto repair facility and two (2) discount/convenient stores. There are several large commercial office

buildings bordering the Billerica town-line. However, these buildings are classified as industrial office buildings by the Assessor's office. The former Raytheon building is situated on a 66.71 acres site of which 30.84 acres lie in Tewksbury. The former Raytheon manufacturing building is classified as an industrial research and development (R&D) facility, and provides significant potential for future redevelopment/reuse.

Lowell

Commercial land uses located in Lowell occupy 4.08% (1.60 acres) of the total commercial land uses in the overall study area. Of the 46.63 total acres located within the Lowell portion of the Study Area, 3.43% consist of commercial uses. There appear to be limited future opportunities for additional commercial development within Lowell, given the residential nature of this portion of the corridor.

D. Industrial Land Uses

Billerica

Billerica has the largest acreage of industrially used land among the three study area communities, representing 69.34% (312.28 acres) of the total 450.39 industrial acres. This land comprises 80.67% of Billerica's total acreage within the Study Area.

Billerica has several vacant and partially-vacant buildings located in a major 25.35- acre commercial office park that extends into the Town of Tewksbury. Overall, manufacturing buildings comprise Billerica's largest industrial land use classification, representing approximately 43.22% (167.3 acres) of Billerica's industrial uses within the study area.

Industrial Redevelopment/Development Opportunities

Baker Commodities, Inc. is situated on a 131.43-acre parcel, which could be sub-divided to provide additional development opportunities. The former Raytheon building is located on a 66.71 acre site, including the parking lot in the rear of the building. Approximately 35.87 acres of this site lies within Billerica and contains the majority of the building. However, sewer and water service to the site is provided by the Town of Tewksbury.

Image 1: Former Raytheon building site

In addition to redevelopment opportunities, Billerica has approximately 28.76 acres of potentially developable land, located on seven (7) separate parcels. There is one parcel, comprising 25 acres, located behind the automobile junkyard and abutting the Concord River, that is classified as undevelopable vacant land.

The Town of Billerica has been designated as an Economic Target Area (ETA) under the state's Economic Development Incentive Program (EDIP) with the former Raytheon missile plant being

an approved Economic Opportunity Area (EOA). The EDIP program will allow the Town to offer real estate tax incentives on additional tax base growth in exchange for business investment and local employment.

Electrical transmission rights-of-way comprise approximately 54.39 acres of land or 14% of the total industrial area. Although this land is not developable, it provides an important wildlife corridor that extends from the Concord River through Billerica and Tewksbury.

Tewksbury

Tewksbury's industrial land uses represent 22.10% (99.54 acres) of the total 450.39 industrial acres contained within the study area. Industrial uses occupy 88.70% of the total acreage within the Tewksbury's portion of the overall Study Area. There are six (6) parcels representing 22.68 acres, which include the 13-acre parking lot parcel located in front of the former Raytheon building, that are considered to be developable vacant land.

As discussed above, the former Raytheon building (30.84 acres), including the front parking lot, represents a significant redevelopment and development opportunity that will require a cooperative and collaborative working relationship between the three communities. Tewksbury also has several vacant and partly-vacant industrial office buildings located on Billerica Industrial Park Road, which total approximately 20 acres. When these properties are combined with Billerica's vacant office properties, there are nearly 50 acres of industrial land available for redevelopment within the overall study area.

Lowell

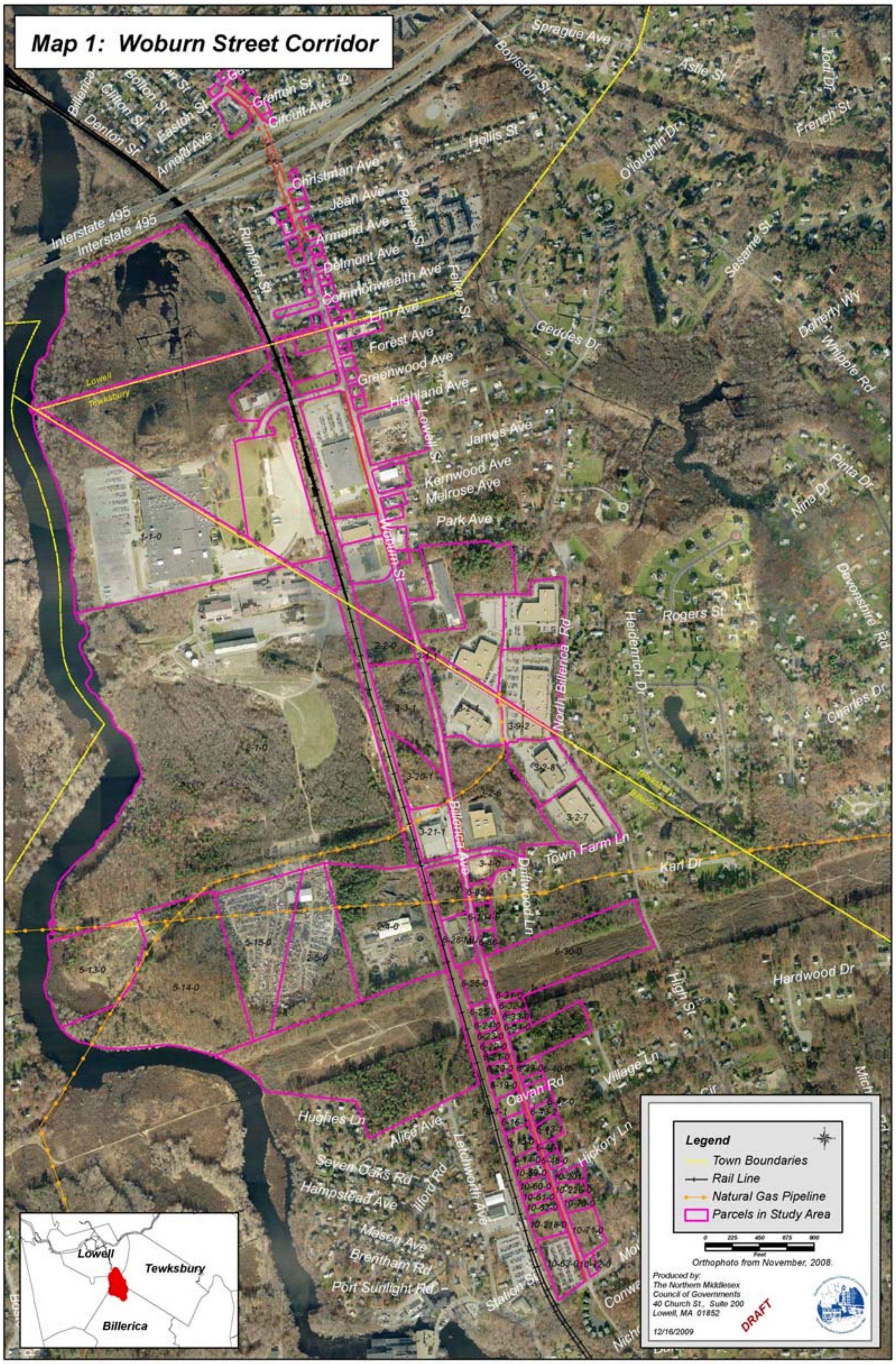
The City of Lowell contains the largest undevelopable industrial parcel which is located south of the I-495 Interchange and consists of 38.57 acres of land. This parcel consists mostly of wetlands and has no roadway frontage.

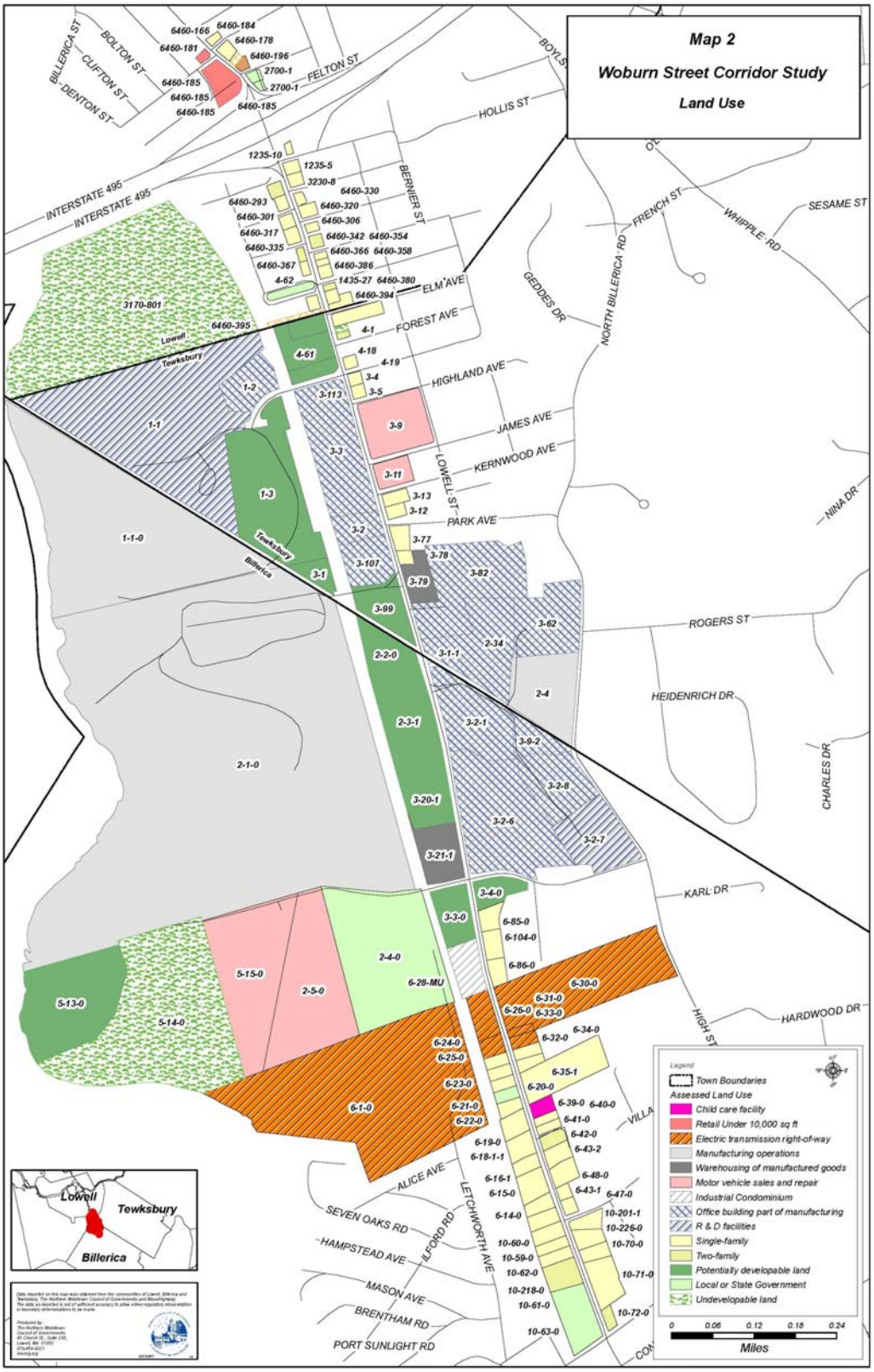
E. Municipal/Institutional Land Uses

Billerica's portion of the study area contains most of the municipal land uses, with 96.54% (23.15 acres) of the study area's 23.98 municipal acres. Of the Billerica portion of the study area, municipal land comprises 5.98% of the 387.10 total acres. Most of this land is occupied by the town's Wastewater Treatment Plant, which is situated on 20 acres east of the automotive junkyard and north of the electric transmission right-of-way. In addition, a 2.74- acre parking lot, owned by the MBTA and used for the North Billerica commuter rail station, is located northwest of the Mount Pleasant intersection. The City of Lowell's municipal land represents 3.46% (0.83 acres) of the total 23.98 acres of municipal land located in the study area. There are no municipal land uses found within the Tewksbury portion of the Study Area.

F. Open Space

According to the property type classification codes and the land use inventory, the Study Area does not contain any open space lands. Although there are several vacant residential, commercial and industrial parcels within the Study Area that are undeveloped, they are not classified as open space and recreational land according to assessing records. While there are several parcels that have the potential for passive and active recreation, these parcels are privately owned. Additionally, there are no Chapter 61, 61A or 61B lands.


Map 1: Woburn Street Corridor
Interstate 495
Interstate 495
Grafton St
Circuit Ave
Christman Ave
Jean Ave
Armand Ave
Delmont Ave
Commonwealth Ave
Elm Ave
Forest Ave
Greenwood Ave
Highland Ave
James Ave
Kenwood Ave
Melrose Ave
Park Ave
Woburn St
Lowell St
Rumford St
Bernier St
Felker St
Sprague Ave
Boylston St
Hollis St
Astle St
French St
O'loughlin Dr
Sesame St
Geddes Dr
Doherty Wy
Whipple Rd
Pinta Dr
Nina Dr
Devonshire Rd
Rogers St
Heidenrich Dr
Charles Dr
North Billerica Rd
Billerica Ave
Town Farm Ln
Karl Dr
Dillwood Ln
Hardwood Dr
High St
Village Ln
Oavan Rd
Hickory Ln
Hughes Ln
Alice Ave
Seven Oaks Rd
Hampstead Ave
Letchworth Ave
Mason Ave
Brentham Rd
Port Sunlight Rd
Station St
Denton St
Easton St
Arnold Ave
Lowell
Tewksbury
1-1-0
2-1-0
5-13-0
5-14-0
5-15-0
6-30-0
3-2-7
Legend
Town Boundaries
Rail Line
Natural Gas Pipeline
Parcels in Study Area
Feet
Orthophoto from November, 2008.
Produced by:
The Northern Middlesex
Council of Governments
40 Church St., Suite 200
Lowell, MA 01852
12/16/2009
DRAFT
Lowell
Tewksbury
Billerica


Map 2
Woburn Street Corridor Study
Land Use
INTERSTATE 495
BILLERICA ST
BOLTON ST
CLIFTON ST
DENTON ST
FELTON ST
HOLLIS ST
BERNIER ST
ELM AVE
FOREST AVE
HIGHLAND AVE
JAMES AVE
KERNWOOD AVE
LOWELL ST
PARK AVE
ROGERS ST
HEIDENRICH DR
KARL DR
HARDWOOD DR
NINA DR
CHARLES DR
SESAME ST
WHIPPLE RD
FRENCH ST
NORTH BILLERICA RD
GEDDES DR
ALICE AVE
SEVEN OAKS RD
HAMPSTEAD AVE
MASON AVE
BRENTHAM RD
PORT SUNLIGHT RD
ILFORD RD
LETCHWORTH AVE
Lowell
Tewksbury
Billerica
Legend
Town Boundaries
Assessed Land Use
Child care facility
Retail Under 10,000 sq ft
Electric transmission right-of-way
Manufacturing operations
Warehousing of manufactured goods
Motor vehicle sales and repair
Industrial Condominium
Office building part of manufacturing
R & D facilities
Single-family
Two-family
Potentially developable land
Local or State Government
Undevelopable land
0 0.06 0.12 0.18 0.24
Miles

II. Zoning Overview and Characteristics

Zoning regulations are used by the study area communities to control and direct the development and redevelopment activities. Development is also regulated through subdivision control, Board of Health regulations, and wetland regulations. Each zoning district has dimensional and use requirements (See Appendices B and C), and many uses require a special permit, i.e., an approval granted at the discretion of the Zoning Board of Appeals (ZBA), Planning Board, Board of Selectmen or City Council.

Billerica and Tewksbury assigns jurisdiction over development to either the Planning Board or ZBA, while the City of Lowell splits this responsibility between the Planning Board, City Council and ZBA. Policies and procedures set in place over the years by each community have influenced the development of the Corridor, and will continue to impact the quality and appearance of future development and redevelopment endeavors. The capacity of a zoning bylaw or ordinance to steer redevelopment is as important as its capacity to guide the development of vacant land.

Zoning Characteristics

Zoning classification data for every parcel in the Study Area has been compiled and is available in Appendix A. Map __ delineates the zoning districts within the study area. Table 2 below provides an overview of the nine (9) different zoning districts and the number of parcels and acreage represented within each zoning district for each community. There are 51 industrially zoned (I, HI and LI) parcels within the Study Area that account for 455.81 acres or 83.49% of the total acreage. There are 65 residentially zoned (RR, VR, TSF and TTF) parcels that account for 85.02 acres or 15.57% of the total acreage. There are only six commercially zoned (NB and RR) parcels within the study area, which account for 5.12 acres or 0.94% of the total acreage.

Table 2: Zoning District Classifications by Community

Zoning Classification	Number of Parcels	Total Acreage	Percentage
Billerica			
Industrial (I)	21	305.02	55.87%
Rural Residential (RR*)	29	35.49	6.50%
Village Residential (VR)	12	43.85	8.03%
Neighborhood Business (NB)	1	2.74	0.50%
Total	**63**	**387.10**	**70.90%**
Tewksbury			
Heavy Industrial (HI)	29	112.22	20.55%
Total	**29**	**112.22**	**20.55%**
Lowell			
Traditional Neighborhood Single-Family (TSF)	22	5.36	0.98%
Traditional Neighborhood Two-Family (TTF)	2	0.32	0.06%
Regional Retail District (RR)	5	2.38	0.44%
Light Industrial (LI)	1	38.57	7.06%
Total	**30**	**46.63**	**8.54%**
Zoning District Summary			
Residential (RR*, VR, TSF, TTF)	65	85.02	15.57%
Commercial (NB, RR)	6	5.12	0.94%
Industrial (I, HI, LI)	51	455.81	83.49%
TOTAL	**122**	**545.95**	**100%**

Source: NMCOG based on data provided by the Billerica, Lowell and Tewksbury Tax Assessor Records.

Billerica

The Billerica portion of the study area contains four zoning districts and is predominately zoned for industrial development. The Industrial (I) zoning district comprises 21 parcels and 305.02 acres, which represents more than half of the entire Study Area in terms of acreage. The Rural Residential (RR) and Village Residential (VR) zoning districts comprise 41 parcels and cover 79.34 acres of land. Within the study area, Billerica's Neighborhood Business (NB) district consists of only one parcel totaling 2.74 acres of land. The former Hughes Lumber Company has split zoning, consisting of the VR and I zoning districts, however, the parcel is listed as VR zoning according to assessing records.

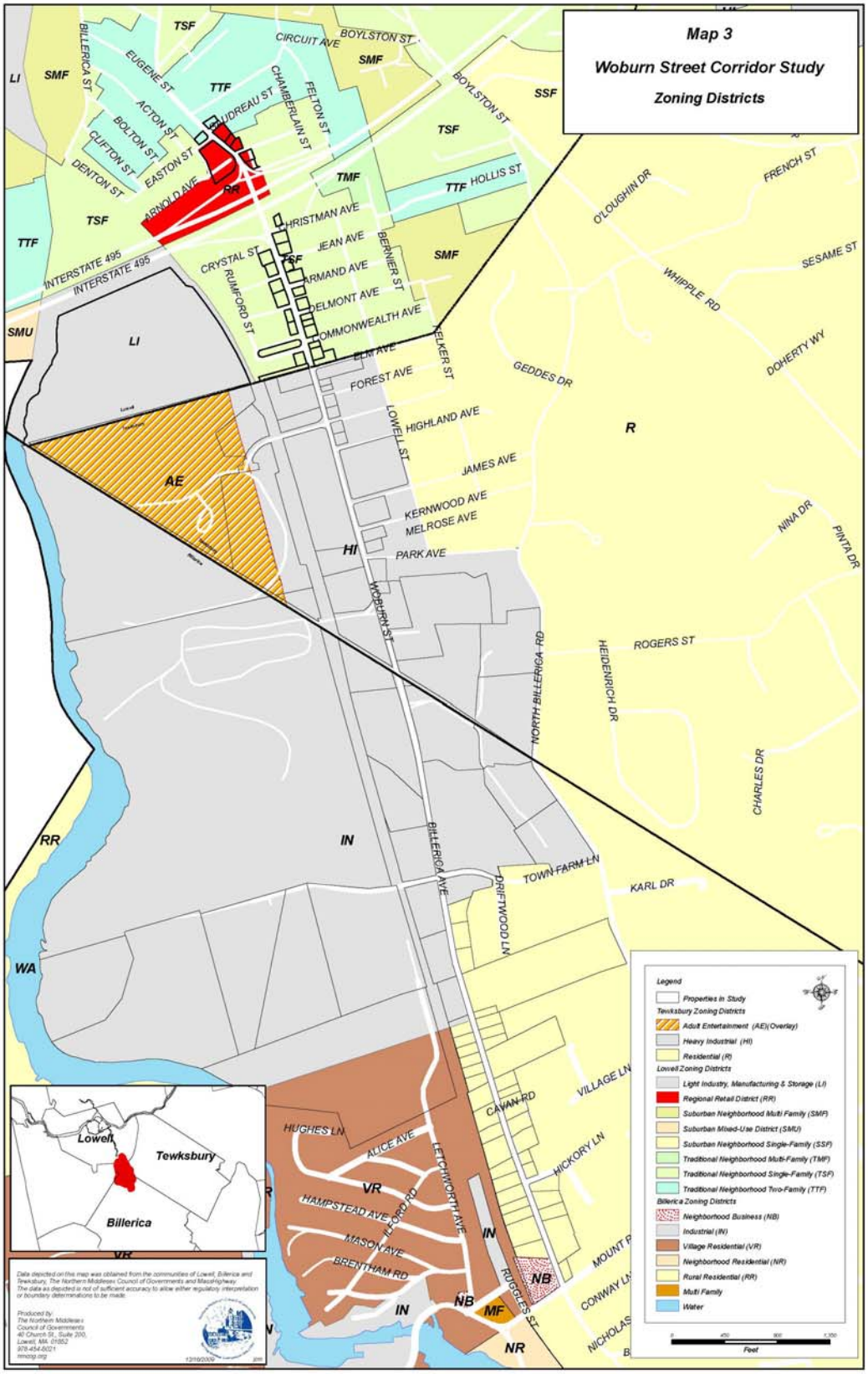
Billerica's Elderly Housing and Townhouse Overlay Districts may both be applied to the VR, RR and NB zoning districts. Residential Cluster Developments are permitted on parcels of land that have a minimum contiguous area of 10 acres and are located within the VR or RR zoning districts. Currently, within the study area, there is only one parcel zoned VR which contains 36.17 acres. This parcel abuts the electric transmission right-of-way and potential access could be achieved via Letchworth Avenue. Residential cluster or open space developments have fairly stringent requirements, thus making it difficult to achieve when faced with minimal land area issues.

The Self-Service (storage facilities) Overlay District may only be applied to the Industrial zoning district, with a minimum lot area of 10 acres. The Mill Conversion and Reuse Overlay District (MCROD) is a multifaceted overlay district designed to benefit the area of the North Billerica around the Commuter Rail Station. The MCROD specifically addresses the reuse of the Talbot and Faulkner Mills.

Tewksbury

The Heavy Industrial (HI) zoning district applies to all 29 parcels located within the Town of Tewksbury, covering 112.22 acres of 20.55% of the entire Study Area. The former Raytheon building is Tewksbury's largest parcel covering 30.84 acres.

Although there are no overlay districts located in the Tewksbury portion of the Study Area, the town has expressed an interest in exploring the option of creating a mixed-use overlay district. A mixed-use overlay district could provide significant development and redevelopment opportunities for the area and would establish the parameters for how certain parcels could be developed, outline a process for the review and approval of each project, and provide design guidelines for future development projects initiated under the overlay bylaw. There are numerous examples where such zoning changes have facilitated the redevelopment of an abandoned property. For example, in 2006 the Town of Wayland, Massachusetts, rezoned the Former Raytheon Property, also known as Wayland Business Center Property near the Town Center, to allow for the development of a mixed-use project. The Town established a mixed-use overlay district to establish parameters on how the property could be redeveloped. The Town is currently in the Site Plan review process for Phase I of a proposed Town Center mixed-use development.


Map 3
Woburn Street Corridor Study
Zoning Districts
BILLERICA ST
EUGENE ST
ACTON ST
BOLTON ST
CLIFTON ST
DENTON ST
EASTON ST
ARNOLD AVE
TSF
TTF
SMF
LI
SMU
RR
CIRCUIT AVE
BOYLSTON ST
AUDREAU ST
CHAMBERLAIN ST
FELTON ST
TMF
TTF HOLLIS ST
SSF
O'LOUGHIN DR
FRENCH ST
SESAME ST
WHIPPLE RD
DOHERTY WY
GEDDES DR
R
CHRISTMAN AVE
JEAN AVE
ARMAND AVE
DELMONT AVE
COMMONWEALTH AVE
BERNIER ST
CRYSTAL ST
RUMFORD ST
INTERSTATE 495
ELM AVE
FOREST AVE
ELKER ST
LOWELL HIGHLAND AVE
LOWELL ST
JAMES AVE
KERNWOOD AVE
MELROSE AVE
PARK AVE
HI
AE
WOBURN ST
NORTH BILLERICA RD
HEIDENRICH DR
ROGERS ST
NINA DR
PINTA DR
CHARLES DR
IN
BILLERICA AVE
DRIFTWOOD LN
TOWN FARM LN
KARL DR
WA
VILLAGE LN
CAWAN RD
HICKORY LN
HUGHES LN
ALICE AVE
VR
HAMPSTEAD AVE
ELLFORD RD
LETCHWORTH AVE
MASON AVE
BRENTHAM RD
NB
MF
NR
RUGGLES ST
MOUNT P
CONWAY LN
NICHOLAS
Lowell
Tewksbury
Billerica
Legend
Properties in Study
Tewksbury Zoning Districts
Adult Entertainment (AE)(Overlay)
Heavy Industrial (HI)
Residential (R)
Lowell Zoning Districts
Light Industry, Manufacturing & Storage (LI)
Regional Retail District (RR)
Suburban Neighborhood Multi Family (SMF)
Suburban Mixed-Use District (SMU)
Suburban Neighborhood Single-Family (SSF)
Traditional Neighborhood Multi-Family (TMF)
Traditional Neighborhood Single-Family (TSF)
Traditional Neighborhood Two-Family (TTF)
Billerica Zoning Districts
Neighborhood Business (NB)
Industrial (IN)
Village Residential (VR)
Neighborhood Residential (NR)
Rural Residential (RR)
Multi Family
Water
Feet

Lowell

Residentially zoned land covers 5.68 acres or 12.18% of Lowell's total acreage within the study area. There are five parcels that are zoned Regional Retail District (RR), which cover 2.38 (0.44%) acres of land. Lowell's largest parcel consists of 38.57 acres of land and is zoned as Light Industrial (LI). However, this parcel is considered undevelopable due to the large wetland system which occupies most of the site.

The City of Lowell has several overlay zoning districts, however, there are none within the Study Area. Although there is very little land for development or redevelopment in Lowell's portion of the Study Area, the City may want to consider a proposed mixed-use overlay district in certain portions of the study area to provide additional services to neighborhood residents and businesses.

III. Vacant and Underutilized Parcels

In addition to the parcel-level inventory (see Appendix A), Table 3 below identifies the undeveloped/vacant parcels that lie within the Study Area, while Table 4 on page 13 outlines parcels that are considered to be underutilized. Of the 122 parcels that make up the Study Area, there are 22 parcels, comprising 155.42 acres considered to be undeveloped or vacant. After factoring in wetland resource areas and other development constraints, the amount of vacant land for suitable for development is significantly reduced. The corridor presents significant redevelopment opportunities for underutilized parcels. Table 4 concludes that redevelopment opportunities of existing, underutilized parcels holds greater potential for economic development than development of vacant undeveloped land. There are currently 21 parcels representing 314.64 acres of underutilized land within the Study Area.

Table 3: Undeveloped/Vacant Parcels

Map/Block/Lot	Acreage	Land Use Code	Description	Zoning	Address	Status
Billerica						
2-2-0	2.00	441	Potentially Developable Vacant Land	Industrial	Billerica Ave.	Parcel abuts Tewksbury town-line and on eastern side of railroad tracks in front of Baker Commodities, Inc.
2-3-1	6.87	441	Potentially Developable Vacant Land	Industrial	Billerica Ave.	Parcel on the western side of Billerica Avenue, across from the vacant Billerica Business Center Building
3-1-1	0.12	441	N/A	Industrial	Billerica Ave.	Parcel abutting Tewksbury town-line near Billerica Business Center
3-4-0	1.51	441	Potentially Developable Vacant Land	Industrial	Billerica Ave.	Parcel immediately south of Town Farm Lane. Land looks to have been recently excavated and staging area for construction equipment
3-3-0	2.60	441	Potentially Developable Vacant Land	Industrial	Billerica Ave.	Parcel on western side of Billerica Ave. and in front of the Sewer/Wastewater Treatment Plant.
3-20-1	3.76	441	Potentially Developable Vacant Land	Industrial	Billerica Ave.	Vacant land for sale. Across from the vacant Billerica Business Center Building.

Map/Block/Lot	Acreage	Land Use Code	Description	Zoning	Address	Status
5-14-0	25.00	442	Undevelopable Land	Industrial	Town Farm Lane	Vacant land behind junkyard. Wetlands on the southwestern portion of parcel. Northern portion seems to have some development potential.
6-30-0	15.44	423	Electric transmission right-of-way	Rural Residential	Billerica Ave.	Vacant Land/Powelines
5-13-0	11.90	441	Potentially Developable Vacant Land	Industrial	Town Farm Lane	Parcel west of the junkyard, which abuts the River. Wetland issues. Parcel has abandoned vehicles and trailers on it.
6-26-0	1.33	423	Electric transmission right-of-way	Industrial	Billerica Ave.	Vacant Land/Powelines
6-1-0	36.17	423	Electric transmission right-of-way	Village Residential	Billerica Ave./Rear	Vacant Land/Powelines
6-31-0	0.28	423	Electric transmission right-of-way	Rural Residential	Billerica Ave.	Vacant Land/Powelines
6-32-0	0.47	423	Electric transmission right-of-way	Rural Residential	Billerica Ave.	Vacant Land/Powelines
6-25-0	0.70	423	Electric transmission right-of-way	Rural Residential	Billerica Ave.	Vacant Land/Powelines
14 Parcels	**108.15 Acres**					
Tewksbury						
3-99	3.06	440	Developable vacant land	Heavy Industrial	525 Woburn Street/Adjacent	Vacant industrial land abutting Billerica and in front of Baker Commodities on the eastern side of railroad tracks
3-113	1.49	440	Developable vacant land	Heavy Industrial	451 Woburn Street	Rectangular parcel on the northern side of Raytheon Building access drive
4-61	2.32	440	Developable vacant land	Heavy Industrial	Woburn Street	Parcel north of 3-113. Vacant commercial land for sale.
4-62	1.01	440	Developable vacant land	Heavy Industrial	395 Woburn Street	Vacant parcel abutting Lowell City line.
4 Parcels	**7.88 Acres**					
Lowell						
2700-1	0.32	903	Municipal	Regional Retail District	1 Grafton Street	Vacant parcel north of interchange between Grafton Street and Circuit Avenue.
6460-395	0.37	131	Potentially Developable Vacant Land	Traditional Neighborhood Single-Family	395 Woburn Street	Vacant strip abutting Tewksbury town-line.
3170-801	38.57	442	Undevelopable land(industrial)	Light Industrial	801 Interstate Route 495	Wetlands abutting I-495. Undevelopable to vast amount of wetland resource areas.
6460-184	0.13	130	Developable vacant land	Regional Retail District	184 Woburn Street	Residential vacant land.
4 Parcels	**39.39 Acres**					
22 Total Parcels				**155.42 Total Acres**		

Table 4: Underutilized Parcels

Map/Block/Lot	Acreage	Land Use Code	Status	Zoning	Address	Status
Billerica						
1-1-0	35.87	400	Manufacturing Operations	Industrial	495 Billerica Ave./Rear	Former Raytheon Building - Current Tenants: Solitec Wafer Processing, Jabil Defense and Aerospace (occupies 81,000 +/- sq. ft.), Teleplan Radiowaves (590,724 gross bldging area)
2-1-0	131.43	400	Manufacturing Operations	Industrial	134 Billerica Ave.	Baker Commodities Inc. parcel. There is a significant amount of developable land south of the buildings.
2-5-0	12.90	338	Motor vehicle sales and service	Industrial	Town Farm Lane/ROW	Junkyard: Development potential.
5-15-0	12.90	338	Motor vehicle sales and service	Industrial	Town Farm Lane/ROW	Junkyard: Development potential.
3-2-1	5.54	402	Office building part of manufacturing	Industrial	101 Billerica Ave., Building 2	Vacant commercial building
3-2-6	13.21	402	Office building part of manufacturing	Industrial	95 Billerica Ave.	Vacant commercial building
3-2-7	5.37	404	R&D facilities	Industrial	101 Billerica Ave., Building 4	Vacant commercial building. There may be one or two tenants remaining in the building.
3-2-8	4.84	402	Office building part of manufacturing	Industrial	101 Billerica Ave., Building 5	Vacant commercial building. There may be few tenants remaining in the building.
3-9-2	1.76	402	Office building part of manufacturing	Industrial	101 Billerica Ave., Building 6	Commercial building is partially in Billerica and Tewksbury. Although this may be the most occupied commercial building in complex, there may be some vacant office space.
3-21-1	4.12	401	Warehousing for manufactured goods	Industrial	100 Billerica Ave.	D.J. Reardon, Tev Tech & Andes Imports Building. Appears to be some vacancy or infill development potential.
10-225-1-1	1.45	313	Lumber Yard	Village Residential/Industrial	15 Letchworth Ave.	Vacant Lumber Yard (Former Hughes Lumber)
10-45	0.99	313	Lumber Yard	Village Residential/Industrial	Letchworth Ave.	Vacant Lumber Yard (Former Hughes Lumber)
12 Parcels	**230.38 Acres**					
Tewksbury						
1-1	30.84	404	R&D facilities	Heavy Industrial	495 Woburn Street	Former Raytheon Building
2-4	6.32	400	Manufacturing operations	Heavy Industrial	Billerica Ind. Park Road/Off	Commercial building is partially in Billerica and Tewksbury. Although this may be the most occupied commercial building in complex, there may be some vacant office space.

Map/Block/Lot	Acreage	Land Use Code	Status	Zoning	Address	Status
3-62	6.03	402	Office building part of manufacturing	Heavy Industrial	Billerica Ind. Park Road	Nearly vacant commercial building.
2-34	7.90	402	Office building part of manufacturing	Heavy Industrial	632 Woburn Street	Nearly vacant commercial building.
3-82	10.00	402	Office building part of manufacturing	Heavy Industrial	600 Woburn Street	Parcel north of commercial office park. Underutilized building and land.
3-1	1.80	440	Developable vacant land	Heavy Industrial	Woburn Street/Off	Parking lot abutting Billerica. Lot for Baker Commodities.
1-3	13.00	440	Developable vacant land	Heavy Industrial	Woburn Street	Parking Lot in front of former Raytheon Building
3-3	8.21	402	Office building part of manufacturing	Heavy Industrial	515 Woburn Street	Saltor Training and Merrill Corp. Building. Infill development potential
8 Parcels	**84.10 Acres**					
Lowell						
6460-181	0.16	325	Retail under 10,000 sq. ft.	Traditional Neighborhood Single-Family	181 Woburn Street	Commercial/Retail building. Infill/development potential.
1 Parcel	**0.16 Acres**					
21 Total Parcels				**314.64 Total Acres**		

1. Undeveloped/Vacant Parcels

Billerica

Image 2: Parcels 5-14-0 and 5-13-0 are located to the west of the junkyard.

Billerica contains 69.59% (108.15 acres) of the total 155.42 acres within the Study Area considered to be vacant or undeveloped. According to the Assessor's records, there are only seven (7) parcels consisting of 28.76 acres that are considered *potentially developable vacant land.* However, after factoring in development constraints, such as wetland resources areas, this number would be significantly reduced. Parcel 5-14-0 consisting of 25 acres is considered undevelopable due to the wetland resource areas, while parcel 5-13-0 (11.9 acres) is considered developable vacant land.

Tewksbury

The Tewksbury portion of the study area contains the less vacant/undeveloped land than the other two study area communities - 7.88 acres in 4 parcels. All four (4) parcels are at least an acre in size and have frontage on Woburn Street, with the largest being 3.06 acres in size and zoned as Heavy Industrial.

Image 3: These 3 parcels are located north of the access road to the former Raytheon building consisting of 4.82 acres.

The parcel abuts the Billerica town-line and an industrial zoned parcel in Billerica consisting of 2 acres, which is also zoned for industrial uses. The other three (3) parcels have frontage on Woburn Street and are contiguous lots totaling 4.82 acres and north of the access road to the former Raytheon building. These vacant parcels are all zoned for Heavy Industrial uses and there appears to be no development constraints, such as wetland resource areas.

Lowell

Lowell has a total of four (4) parcels representing 39.39 acres or 25.34% of the total vacant land within the Study Area. The City of Lowell contains the largest undeveloped industrial parcel, which is located south of the I-495 Interchange and consists of 38.57 acres of land. This parcel consists mostly of wetlands and has no roadway frontage, and is considered to be undevelopable. The other three (3) account for less than one acre after being combined.

Image 4: Lowell's largest vacant parcel consisting of 38.57 acres is considered undevelopable, however, provides sanctuary for various wildlife species.

2. Underutilized Parcels

The Study Area presents a significant opportunity for economic development for the redevelopment of the underutilized parcels. A complete list of these parcels can be found in Table 4 above. There are currently 21 parcels representing 314.64 acres of underutilized land within the Study Area.

Billerica

Billerica contains 73.22% (230.38 acres) of the total 314.64 acres within the Study Area that is considered to be underutilized. Baker Commodities, Inc. is situated on a 131.43-acre parcel, which could be sub-divided to provide additional development opportunities.

The former Raytheon building is located on 66.71 acres, with approximately 35.87 acres lying in Billerica and the other 30.84 acres lying in Tewksbury. The majority of the building, including the rear parking lot is located in Billerica. The former Raytheon building sits on a footprint of 590,724 sq. ft., with only 40,000 sq. ft. of the building being occupied by Solitec Wafer Processing and Teleplan Radiowaves. As discussed in the previous section, the former Raytheon missile plant has been designated as an approved Economic Opportunity Area (EOA). This program will allow the Town to offer real estate tax incentives on additional tax base growth in exchange for business investment and local employment.

Image 5: Former Raytheon building with approximately 550,000 available sq. ft. in addition to parking lot (1-3), which offers 13 acres of development potential. The underutilized vacant land owned by Baker Commodities, Inc. represents significant development potential.

There are two (2) parcels consisting of 25 acres located behind the Sewer/Wastewater Treatment Plant that is used as an automobile junkyard (See Image 5). Although these parcels present redevelopment opportunities, the site has been reported to have chemical contamination of aliphatic hydrocarbons, PCBs and waste motor oil.

The former Hughes Lumber Yard located near the North Billerica Commuter Rail Station is situated on two parcels totaling 2.44 acres. As you can see in Image 6, the location presents significant redevelopment opportunities.

Image 6: Automobile junkyard located on Town Farm Lane totaling 25

Billerica Business Center, which is located on the Tewksbury town-line has five (5) parcels consisting of 30.72 acres. The Business Center is currently facing an extremely high vacancy rate and holds significant opportunities for economic development. There are 5 commercial buildings, which are zoned for industrial uses.

Image 7: Former Hughes Lumber Yard near the intersection of Billerica Avenue and Mount Pleasant Street

Tewksbury

Tewksbury contains 26.73% (84.10 acres) of the total 314.64 acres within the Study Area that is considered to be underutilized. The former Raytheon building parcel (30.84 acres), including the front parking lot (13 acres), represents a significant redevelopment and development opportunity that will require a cooperative and collaborative working relationship between the three communities (See Image 5 above). Tewksbury also has several vacant and partly-vacant industrial office buildings located on Billerica Industrial Park Road, which total approximately 20 acres. When these properties are combined with Billerica's vacant office properties, there is nearly 50 acres of industrial land available for redevelopment within the overall study area.

Image 8: Several of the commercial office buildings are fully vacant as you can see at parcel 3-2-6 and 3-2-1.

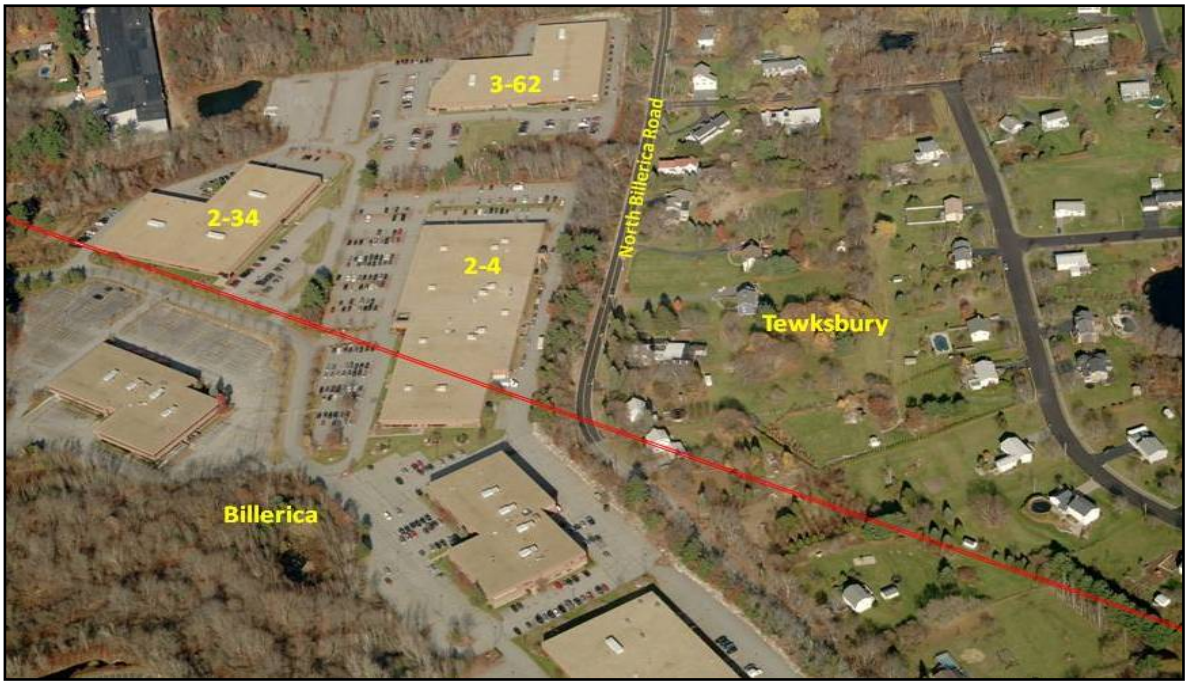


Image 9: Three nearly vacant commercial buildings within Billerica Business Center totaling 20.25 acres

Lowell

Of all the land that is considered underutilized, Lowell has only one (1) parcel representing 0.16 acres or 0.05% of the total 314.64 acres within the Study Area. Predominantly all the parcels within Lowell are residential uses. The parcel is located on the corner of Easton Street and is currently being used for retail purposes. Corners such as this in neighborhoods are important in defining the character and functionality of the area, and this structure should be evaluated for future redevelopment opportunities.

Image 10: Commercial structure located at the corner of Easton Street has some potential to be redeveloped.

IV. Transportation

1. Transportation Overview and Analysis

The Woburn Street corridor study area, as shown on Map 1, extends 1.75 miles from the Exit 37 interchange at I-495 in the City of Lowell, southeasterly through the Town of Tewksbury to Mount Pleasant Street in Billerica. Woburn Street known as Billerica Avenue in Tewksbury is classified as an urban minor arterial. A two-lane roadway with a general north-south orientation, Woburn Street is approximately 32-34 feet wide with a posted speed limit ranging from 30-35 mph. Average daily traffic volumes range from 5,900 to 10,900 vehicles per day. The highest traffic volumes are found at the I-495 interchange, while the lowest volumes are found near the intersection with Mt. Pleasant Street in Billerica.

The study focuses on the existing transportation conditions including; safety, traffic volumes, existing and projected levels of service at identified intersections, pavement condition, bicycle and pedestrian accommodations, and signage. The transit services along the corridor are also evaluated, including connections to the North Billerica Commuter Rail Station and the LRTA system. The communities of Tewksbury and Billerica are actively pursuing the redevelopment of vacant and underutilized industrial and commercial areas along the corridor. This study will also project traffic conditions based on the revitalization of these properties. Recommended improvements strategies are outlined based on an evaluation of current and projected deficiencies along the corridor.

1.1. Methodology

The study was prepared in consultation with the City of Lowell, the Towns of Tewksbury and Billerica, and MassDOT. The transportation component of this report is presented in five sections. The first section assesses existing operating conditions along the corridor, and includes an analysis of key intersections. The existing conditions section contains an inventory of roadway and intersection geometries, existing traffic volumes, peak hour turning movement counts, public transportation access, pedestrian and bicycle facilities, and crash data analysis.

The following intersections have been included in the study area analysis:

- I-495 Southbound ramp at Woburn Street
- I-495 Northbound Ramp/Christman Avenue at Woburn Street
- Riverview Commerce Center Entrance at Woburn Street
- Billerica Business Center Entrance at Billerica Avenue
- Billerica Avenue at Mount Pleasant Street

The second section includes a future conditions report, with travel demand projections for a ten year planning horizon. Using baseline growth forecasts and adding additional traffic expected from re-occupying vacant properties, future traffic volumes have been established. The third section includes the traffic operations analysis under existing conditions. The evaluation of the roadway and its major intersections is presented and traffic issues are discussed. The fourth section includes a traffic signal warrant analysis performed for those intersections identified needing signalization. The final section outlines conclusions and makes recommendations for improving the roadway network.

2. Existing Conditions

A physical inventory of transportation operating and infrastructure conditions in the study area has been compiled. The following section provides: a brief description of the study roadway and the critical intersections along the route; a discussion of traffic volumes and data collected; and geometric and sight distance issues along the corridor.

2.1. Roadway Description

Woburn Street/Billerica Avenue's Federal Functional Classification is as an urban minor arterial. Woburn Street is a two lane roadway with a general north-south orientation, approximately 32-34 feet wide in most places and 1.7 miles in length. The corridor runs through the three communities of Lowell, Tewksbury, and Billerica from I-495 in the North ending at Mount Pleasant Street near the North Billerica Commuter Rail Station. The corridor sees a mix of land uses both residential and commercial/industrial in nature. Speed limits along the corridor range from 30-35 mph and daily traffic volumes range from 5,900 to 10,900 vehicles per day.

Pavement conditions vary along the corridor. North of the I-495 interchange, the pavement is in good condition with light transverse and longitudinal cracking evident. In the I-495 area, which is located in a construction zone at data collection time, pavement condition deteriorate with block cracking, alligator cracking, transverse and longitudinal cracking, and raveling evident throughout. Near the Tewksbury Town Line in Billerica, Billerica Avenue is in need of pavement maintenance as well with block cracking, potholes, and transversal and longitudinal cracking evident. Pavement is in better condition in the residential areas of Billerica and a recently repaved section in Tewksbury.

Pedestrian accommodations tend to be broken and segmented throughout the corridor. In Lowell, sidewalks run along both sides of Woburn Street until the intersection with Bristol Street. At this point the sidewalk ends and no accommodations exist until the intersection of Riverview Commerce Center and Woburn Street. At this point, the sidewalk runs along the west side of the roadway through the property at 515 Woburn Street in Tewksbury where it ends again. Another small sidewalk segment exists in front of a vacant office building on the east side

of Billerica Avenue just north of Tower Lane. The sidewalk begins again in the mainly residential section of Billerica south of the power line crossing and ends at the intersection of Billerica Avenue and Mount Pleasant Street. There are two existing crosswalk areas in the corridor. One crosses Woburn Street in Lowell at a mid block location across from the Commonwealth Avenue playground. Sidewalks do not exist leading to this crosswalk. The other visible crosswalk area is at the intersection of Billerica Avenue and Mount Pleasant Street at the southern end of the study area.

Bicycle Facilities are limited in the corridor. The roadway is generally wide enough that bicyclists are able to share the road with vehicles; however there are no pavement markings showing a bicycle lane. There are a high percentage of large trucks accessing industrial areas along the corridor, making bicycling along the corridor uncomfortable. The North Billerica MBTA Commuter Rail Station located just north of the Billerica Avenue/Mount Pleasant Street intersection provides designated parking facilities for up to 14 bicycles. It should be noted that the MBTA does not allow bicycles on the commuter rail trains during weekday morning and evening peak service hours.

2.2. Public Transportation

The Lowell Regional Transit Authority operates eighteen fixed bus routes within the LRTA service area including the communities of Lowell, Billerica, Chelmsford, Dracut, Tewksbury, and Westford, as well as five communities beyond the service area including Andover, Bedford, Burlington, Littleton and Wilmington. All of the LRTA bus routes originate at the Gallagher Intermodal Transportation Center in Lowell, providing a direct link to the MBTA commuter rail station. Bus service is available Monday through Friday from approximately 6:00 am to 8:00 pm, and on Saturdays from 7:30 am to 6:00 pm. There is no bus service available on Sundays and most holidays. The full price fare for a ride on an LRTA fixed route bus is $1.00 in-town and $1.50 between two or more communities, for those over 60 years old and individuals with a handicap, the fare is 50 cents and 75 cents. Additionally, there is a transfer fare to connect between buses at the Gallagher Intermodal Transportation Center of 25 cents in-town and 50 cents between communities. Monthly passes are also available including the “Passport” for the general public for $35.00, the student “Ride Pass” for $20.00 and the $20.00 “Gold Pass” for seniors and individuals with disabilities.

The Lowell Regional Transit Authority provides fixed route bus service along the Woburn Street Corridor via the South Lowell (Route 3) on weekdays, and the South Lowell – Shaw / Stevens (Route 3-4) on Saturdays. Map 4 provides a look into the public transportation and sidewalk amenities along the corridor. Descriptions of the two routes are as follows:

- The #3 South Lowell bus route departs the Gallagher Intermodal Transit Center via Route 3A south, turning north onto Gorham Street then right onto Church Street and turns right onto Lawrence Street. The bus route turns onto Andrews Street then left on Moore Street returning to Lawrence Street and turns right onto Woburn Street. The route continues along Woburn Street through Tewksbury and into Billerica terminating at the North Billerica MBTA Commuter Rail Station. The inbound trip leaves the North Billerica Station following the outbound route to the Gallagher Intermodal Transportation Center. There are 17 round trip buses each weekday.

- The #3-4 South Lowell – Shaw / Stevens bus route is a Saturday combination loop route. The outbound portion of the route follows the #3 South Lowell service, however, the inbound departs the North Billerica Train Station turning onto Lowell Street and Boston Road (Rte 3A) in Billerica. The Bus enters Chelmsford along Rte 3A turning onto Carlisle Road and entering Lowell on Edison Street to Swan Street to Industrial Ave and back to Gallagher Intermodal Transportation Center via the weekday #4 bus route. There are five bus runs on each Saturday.

About half of the LRTA buses are equipped with bicycle racks, with plans to include them on all future bus replacements. Additionally if a bus in not equipped with bike racks and space allows, bicycles can be brought on the buses.

In addition to LRTA bus service, the Massachusetts Bay Transit Authority (MBTA) serves the area with the North Billerica commuter rail station just north of the intersection of Mount Pleasant Street and Billerica Avenue. As part of the Lowell Commuter rail line, this station provides parking for 541 vehicles in two surface lots and serves a ridership of approximately 1,000 inbound daily boarding's. Table 5 provides historical daily ridership numbers for the MBTA North Billerica commuter rail station.

Table 5: Ridership Figures for North Billerica MBTA Commuter Rail Station

Date of Count	North Billerica One Way Daily Inbound Passenger Total[1]
February 2005	1,150
May 2005	821
August 2005	1004
November 2005	941
April 2006	780
July 2006	1,100
December 2006	1,256
June 2007	856
October 2007	929
February 2008	1,043
June 2008	937
December 2008	938
February 2009	996
May 2009	1,027

Parking has decreased from historical numbers at the commuter rail station. With a capacity of 541 vehicles in two surface lots, the station sees approximately 380-400 vehicles per day. This has decreased from past data showing the number of vehicles reaching the capacity of the two lots. This may be due to price increases for parking and rail passes as well as economic downturns in the region. Table 6 on the following page provides figures on parking lot utilization.

[1] Data from Massachusetts Bay Transit Authority figures for ridership, May 2009

Table 6: Parking Lot Utilization at North Billerica MBTA Commuter Rail Station[2]

Total # of Spaces	Parking Costs	Date Surveyed	Occupancy	% Full
541	$2.00/day	10/21/2008	538	99.4
	$4.00/day	1/27/2009	508	93.9
	$4.00/day	4/15/2009	416	76.9
	$4.00/day	7/22/2009	410	75.8
	$4.00/day	10/28/2009	401	74.1
	$4.00/day	1/13/2010	381	70.4
	$4.00/day	4/14/2010	419	77.4

2.3. Key Intersections

Five key intersections have been identified along the Woburn Street Corridor and are located on Map 3. This section includes a physical description of each intersection and any associated issues. The study area key intersections are as follows:

- I-495 Southbound ramp at Woburn Street
- I-495 Northbound Ramp/Christman Avenue at Woburn Street
- Riverview Commerce Center Entrance at Woburn Street
- Billerica Business Center Entrance at Billerica Avenue
- Billerica Avenue at Mount Pleasant Street

I-495 Southbound Ramp and Woburn Street

Interchange Exit 37 off I-495 in Lowell is a full diamond design with stop control at the intersection of the southbound off ramp with Woburn Street. Average Daily Traffic on I-495 in this area reaches nearly 140,000 vehicles per day. Three travel lanes exist for each direction of I-495 in the area. Woburn Street at the interchange is a two lane roadway, approximately 40 feet wide and has a speed limit of 35 mph.

Image 11: I-495 SB Ramps at Woburn Street in Lowell, MA (Pictometry International, 2008)

Pedestrian accommodations include an existing five foot wide concrete sidewalk on each side of the street. There are crosswalks at the ends of the ramp, but they are faded to the point of not being useful to pedestrians. The area is currently under construction due to the I-495 bridge rehabilitation project in Lowell and Tewksbury and an accurate condition of the sidewalk network could not be determined. Prior to the construction project, the sidewalks were in fair to good condition. Any improvements would be made after construction is completed. The road is wide enough to have bicyclists comfortably sharing the road.

I-495 Northbound Ramp and Woburn Street

[2] Data from NMCOG Congestion Management Process

This intersection is part of the Exit 37 interchange, and has stop control for the Ramp from I-495 and Christman Avenue approaches. In this location Woburn Street is a two lane minor arterial with average daily traffic volumes reaching 10,900 vehicles per day. The I-495 northbound ramp to Woburn Street has a two lane approach with exclusive right and left turn lanes at the intersection. Christman Avenue, designated as a minor arterial has a single lane approach with all movements stop controlled. Christman Avenue has a 30 mph speed limit and is approximately 34 feet wide near the intersection. Woburn Street is approximately 42 feet wide and has a speed limit of 35 mph.

Image 12: I-495 NB Ramps/Christman Avenue at Woburn Street in Lowell, MA. (Pictometry International, 2008)

Pedestrian accommodations at this intersection include five foot wide concrete sidewalks on both sides of Woburn Street crossing Christman Avenue and the northbound I-495 ramp. Any crosswalks in the area have faded and condition of the sidewalks is fair to good. The road is wide enough to have bicyclists comfortably sharing the road.

Woburn Street at Riverview Commerce Center Entrance

The intersection of Woburn Street with the Riverview commerce center forms a "T" intersection with all turns allowed. Stop control exists for the driveway exit at Woburn Street with designated left and right turn lanes. Woburn Street is a two lane minor arterial with a speed limit of 35 mph and a roadway width of 36 feet. Average daily traffic in this segment reaches 10,900 vehicles per day. The Riverview Commerce Center driveway entrance is 36 feet wide with no designated speed limit posted. This roadway provides access to the commercial businesses located in the center within. This office park used to be occupied mainly by Raytheon, but is now mostly vacant. This area is where the three communities would like to see development.

Image 13: Riverview Commerce Center Driveway looking East toward Woburn Street.

Pedestrian accommodations include a west side five foot wide concrete sidewalk beginning to the south of the Riverview Commerce Center entrance driveway. There is no sidewalk north of the intersection until Bristol Street in Lowell. The existing sidewalk is in good condition and appears to be maintained. The roadway is 36 feet wide, with only a one foot shoulders, leaving bicyclists to travel in the roadway.

Billerica Avenue at Billerica Business Center Entrance

Image 14: Billerica Business Center Driveway looking west toward Billerica Avenue

The intersection of Billerica Avenue and the Billerica Business Center forms a "T" with all turns allowed. Stop control exists for turns from the Billerica Business Center. Billerica Avenue is a two lane minor arterial with a speed limit of 30 mph and a roadway width of 32 near the intersection. Average daily traffic along Billerica Avenue is 6,400 vehicles per day. At the intersection, the roadway widens by 10 feet to accommodate a southbound exclusive left turn lane. The Billerica Business Center has designated exclusive lanes for left and right turning vehicles. The roadway has no designated speed limit as its main purpose is to provide access to businesses within the office park.

There are no pedestrian accommodations are at this intersection. Pedestrians were observed walking along Billerica Avenue to access the Billerica Business Center. The roadway is narrow in this area and any bicyclists would have to share the road with vehicles.

Billerica Avenue at Mount Pleasant Street

Image 15: Billerica Avenue at Mount Pleasant Street in Billerica, MA.

Billerica Avenue and Mount Pleasant Street is a four lane two way stop controlled intersection with all turns allowed. All movements from Billerica Avenue must stop before entering the intersection. Billerica Avenue has a 30 mph speed limit and is approximately 32 feet wide approaching the intersection while Mount Pleasant Street has a speed limit of 30 mph and is approximately 34 feet wide near the intersection. Both Mount Pleasant Street and Billerica Avenue have one lane approaches from each direction. Average daily traffic for Mount Pleasant Street and Billerica Avenue is 3,900 and 5,900 vehicles per day respectively. The North Billerica commuter rail station parking lot is located on the northeast corner of the intersection. All other land uses at this intersection are residential. It should also be noted that the commuter rail line crosses over Mount Pleasant Street just east of the intersection.

Pedestrian accommodations at this location include a sidewalk along the west side of Billerica Avenue from Mount Pleasant Street north to the power line crossing covering this mostly residential area in Billerica. North of the intersection there is a five foot wide section of sidewalks that does not currently meet ADA accessibility standards due to numerous curb cuts and placement of utility poles. The sidewalk in front of the North Billerica Commuter Rail station is in excellent condition and is ADA compliant. Due to limited roadway width, bicyclists share the road with vehicles in this area.

2.4. Existing Traffic Volumes

Average daily traffic (ADT) volumes were collected along the Woburn Street corridor in October and November of 2009 and are presented in Table 7. Traffic count data provides information on the movement of people and goods along the roadway. This is essential in evaluating current operational conditions and assisting in identify any congestion issues. As noted below, the largest traffic volume area occurs near the I-495 interchange with Woburn Street in the Lowell section of the study area Appendix D.

Table 7: Woburn Street Corridor Average Daily Traffic Volumes

Location	Community	Year Counted	Average Daily Traffic (ADT), vehicles per day (vpd)
Woburn St W of I-495	Lowell	2009	7,700
Woburn St S of I-495	Lowell	2009	10,900
Woburn St @ Billerica T.L. (Billerica Ave)	Tewksbury	2009	6,400
Billerica Ave N of "T" Station Entrance	Billerica	2009	5,900
Mount Pleasant Street N of Billerica Ave	Billerica	2009	3,900

Truck percentages along the corridor were noted as part of the Average Daily Traffic (ADT) determination. It is essential to collect truck data along this corridor because of the industrial and commercial uses throughout the study area. Table 8 provides a snapshot of truck percentages in the study area.

Table 8: Truck Percentages along the Woburn Street/Billerica Avenue Corridor

Location	Community	ADT	Truck Percentage
Woburn St W of I-495	Lowell	7,700	6%
Woburn St S of I-495	Lowell	10,900	7%
Woburn St @ Billerica T.L. (Billerica Ave)	Tewksbury	6,400	6%
Billerica Ave N of "T" Station Entrance	Billerica	5,900	5%

2.5. Turning Movements

Turning movement data was collected in October and November 2009 at three locations along the Woburn Street/Billerica Avenue corridor. Data was also ascertained from the I-495 Corridor Study completed in 2008. All turning movement counts were conducted during AM (7:00-9:00) and PM (4:00-6:00) peak periods of an average day. Figures 1 and 2 on the following pages depict the turning movement volumes during each peak period. The complete counts can be found in the Appendix E.

2.6. Sight Distance

Sight distance is determined as the length of roadway ahead that is visible to the driver. Sufficient sight distances at intersections greatly reduce the potential for vehicular conflicts on the roadway. With adequate sight distance a driver has the ability to judge a conflict and react to the situation. Stopping sight distance, measured on the major street is the measurement of the

amount of visible roadway needed for a driver to react to a conflict and come to a stop. Intersection sight distance is the amount of roadway that a stopped vehicle at an intersection can view in either direction. Adequate sight distance allows a motorist to make a decision as when to enter the intersection roadway or cross it.

Each intersection in the Woburn Street/Billerica Avenue study area has been evaluated to determine whether there is adequate sight distance for turning and through movements. The results are shown in Table 9. The two I-495 intersections were not included in the sight distance determination because of the construction at the time of data collection. However, visual observations noted at the time would indicate that the sight distance was sufficient at each location.

Table 9: Sight Distance Measurements along Woburn Street/Billerica Avenue

Intersection/Sight Distance Type	Required Minimum Standard (ft)*	Measured Distance (ft)
Woburn Street at Riverview Commerce Driveway		
Stopping Sight Distance		
Riverview Eastbound	250	700
Intersection Sight Distance		
Riverview EB looking north	390	>1000
Riverview EB looking south	390	>1000
Billerica Avenue at Billerica Business Center Drive		
Stopping Sight Distance		
BBC Drive Westbound	250	400
Intersection Sight Distance		
BBC Drive looking north	390	>1000
BBC Drive looking south	390	>1000
Billerica Avenue at Mt. Pleasant Street		
Stopping Sight Distance		
Billerica Ave Southbound	250	>1000
Intersection Sight Distance		
Billerica Avenue SB looking east	390	930
Billerica Avenue SB looking west	390	430
Billerica Avenue NB looking east	390	>1000
Billerica Avenue NB looking west	390	620

*****Minimum standards provided by A Policy on Geometric Design of Highways and Streets by American Association of State Highway and Transportation Officials (AASHTO) for a 35 mph design speed.

Figure 1: 2009 AM Peak Hour Volumes along Woburn Street Corridor

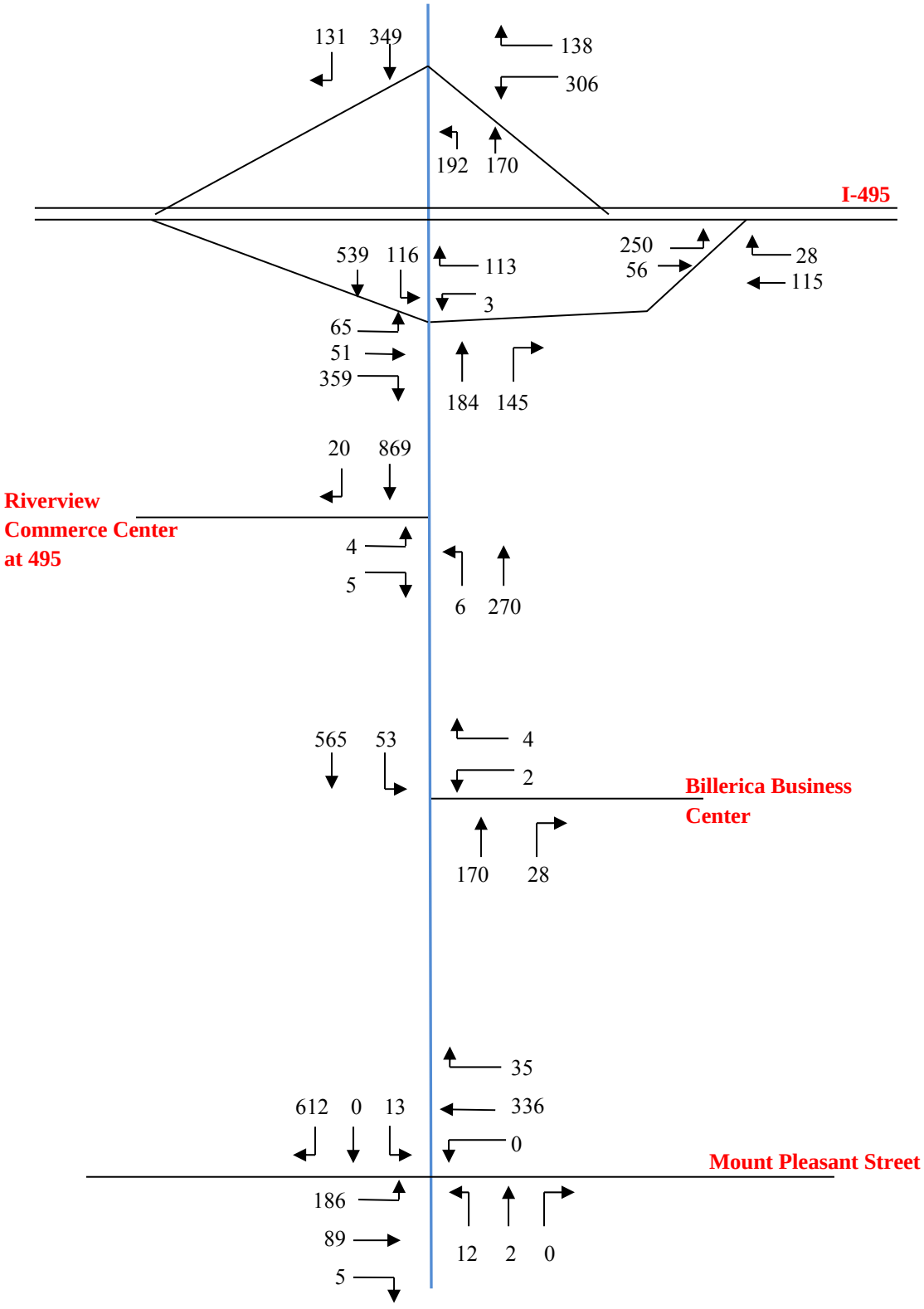
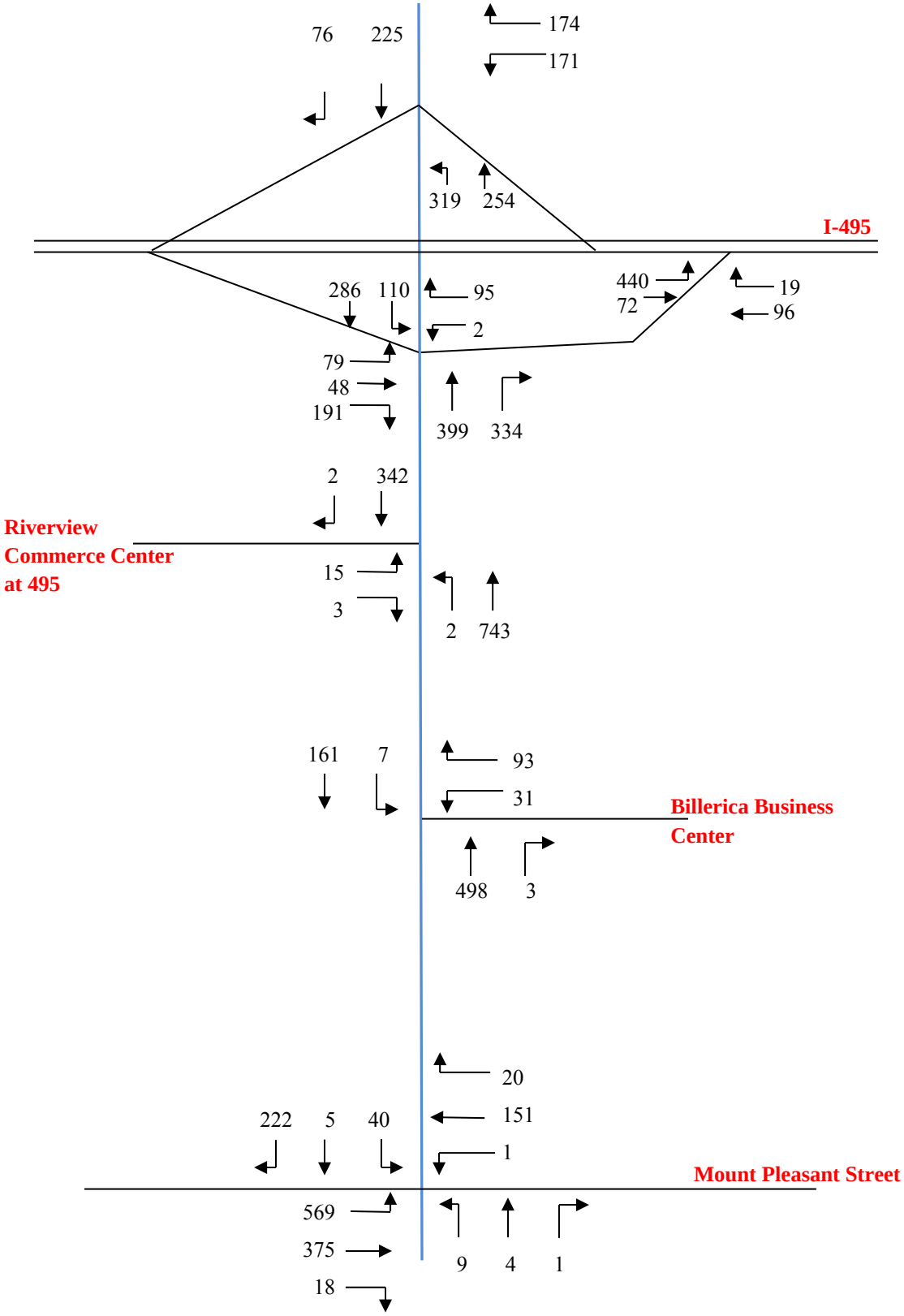


Figure 2: 2009 PM Peak Hour Volumes along Woburn Street Corridor



Results of sight distance measurements show that each intersection has sufficient stopping sight distance and intersection sight distance for all motorists. The intersection sight distance measurement for Billerica Avenue southbound looking west onto Mount Pleasant Street is the shortest measured distance, but is slightly above minimum standards.

2.7. Crash Analysis

Crashes along the Woburn Street/Billerica Avenue corridor were reviewed for the three most recent years (2005-2007) available from MassDOT. Table 10 summarizes the data for each of the key intersections in the study area Appendix F.

There were a total of 26 crashes at key intersections along the corridor. Most were angle type crashes (62%) occurring during non peak hours (73%) and under dry conditions (69%). Severity of crashes at key intersections is evenly split between property damage only and injury related incidents. No fatalities were reported in the study area.

A discussion of safety related issues at each of the key intersections in the Woburn Street/Billerica Avenue corridor is presented below.

I-495 Southbound Ramp at Woburn Street

A total of six crashes were reported over the three year crash data study period. The majority of the crashes were property damage only angle type incidents occurring under dry pavement conditions. It should be noted that half of the reported crashes occurred during the morning peak period of travel. The equivalent property damage only rating was 14 and the intersection had a lower than average crash rate when compared to similar unsignalized intersections in MassDOT Highway District 4.

Woburn Street at I-495 Northbound Ramp/Christman Avenue

This intersection sees the highest number of crashes in the corridor with a total of 12 incidents occurring between 2005 and 2007. Because of the high number of crashes, the crash rate was calculated at 0.71 crashes per million vehicles entering the intersection; this is higher than the MassDOT Highway District 4 average crash rate of 0.58 for unsignalized intersections. The majority of the crashes were angle type incidents (8) occurring under dry pavement conditions (9) at non peak periods of the day (10). The notable statistic was that 9 of the 12 crashes (75%) involved injuries to persons in the vehicles.

Woburn Street at Riverview Commerce Center Entrance

One crash was reported at this intersection during the study period. This incident was a property damage only rear end crash in 2007 under dry pavement conditions. Crash rate analysis showed a lower than average rate of 0.08 crashes per million vehicles entering the intersection. The Equivalent Property Damage Only (EPDO) was one.

Billerica Avenue at Billerica Business Center

No crashes were reported at this location during the study period.

Mount Pleasant Street at Billerica Avenue

There were seven crashes reported over three years study period. The crash rate at this location is 0.26 and is considered lower than MassDOT's average crash rate for unsignalized intersections. The majority were angle type incidents occurring at off peak hours. There were 3 reported injury crashes and nearly half occurred under wet or icy conditions.

Table 10: Woburn Street Corridor Crash Summary

Major Street	Woburn St	Woburn St	Woburn St	Billerica Ave	Mount Pleasant St
Minor Street	**I-495 SB Ramp**	**I-495 NB Ramp/Christman Ave**	**Riverview Commerce Center Entrance**	**Billerica Business Center Entrance**	**Billerica Ave**
Year					
2005	3	3	0	0	4
2006	1	4	0	0	2
2007	2	5	1	0	1
Total	**6**	**12**	**1**	**0**	**7**
MassDOT District 4 Crash Rate	0.58	0.58	0.58	0.58	0.58
Calculated Crash Rate	0.45	0.71	0.08	0.00	0.26
Higher than expected?	No	Yes	No	No	No
EPDO	14	48	1	0	19
Type					
• Angle	5	8	0	0	3
• Rear-End	1	2	1	0	1
• Run off Rd	0	0	0	0	0
• Other	0	2	0	0	3
Total	**6**	**12**	**1**	**0**	**7**
Time of Day					
• AM Peak	3	2	0	0	1
• PM Peak	0	0	0	0	1
• Other	3	10	1	0	5
Total	**6**	**12**	**1**	**0**	**7**
Pavement Conditions					
• Dry	5	9	1	0	3
• Wet	1	3	0	0	2
• Snow	0	0	0	0	0
• Icy	0	0	0	0	1
• Other	0	0	0	0	1
Total	**6**	**12**	**1**	**0**	**7**
Damage					
• Property Damage Only	4	3	1	0	4
• Personal Injury	2	9	0	0	3
• Fatal	0	0	0	0	0
• Hit and Run	0	0	0	0	0
• Other	0	0	0	0	0
Total	**6**	**12**	**1**	**0**	**7**

3. Future Year Conditions

Traffic volumes within the study area have been forecasted to 2020 reflecting a ten-year planning projection. This section introduces a 2020 no build scenario in which volumes will be projected based on outside growth and unforeseen projects. In addition to the no build scenario, there will be a build scenario in which traffic generated from specific projects will be added to the baseline projections for 2020. This projection will help the communities evaluate the traffic impacts from proposed developments along the corridor.

3.1. 2020 No Build Scenario

Traffic growth trends were determined using historic growth patterns and past traffic studies in the City of Lowell and the towns of Billerica and Tewksbury. Because this project traverses three communities in the Northern Middlesex region, traffic growth projections for the region are being used as the baseline. Regional traffic growth rates have averaged approximately 0.50% annually over the past ten years. To be conservative, a 1.0% annual traffic growth rate has been deemed appropriate and is used in the 2020 no build scenario. This is consistent with historical growth data and traffic studies performed in these communities in the past. Figures 3 and 4 on the following pages illustrate the peak hour traffic volumes for the no build scenario.

3.2. 2020 Build Scenario

Potential development sites have been identified through discussions with the three communities involved in the study, as well as through field observations made during data collection. The following locations are included in the build scenario:

- The former Raytheon building at Riverview Commerce Center (550,000 sf existing building with an additional 250,000 sf. parcel in front of building available for development). The total developable area is around 800,000 sf.
- The Billerica Business Center Properties:
    - Building 2: 40,543-81,086 sf. available for lease
    - Building 3: 26,000 sf. available for lease
    - Building 4: 60,992 sf. available for lease
    - Building 5: 2,000-12,540 sf. available for lease
    - Building 6: 12,557-42,960 sf. available for lease

The Build scenario includes the no build figures plus the development of the Riverview Commerce Center building and full occupation at the Billerica Business Center to present a maximum traffic impact scenario. Figures 5 and 6 on the following pages depict the peak hour traffic volumes for the build scenario.

Figure 3: 2020 AM Peak Hour Volumes along Woburn Street Corridor, No Build Scenario

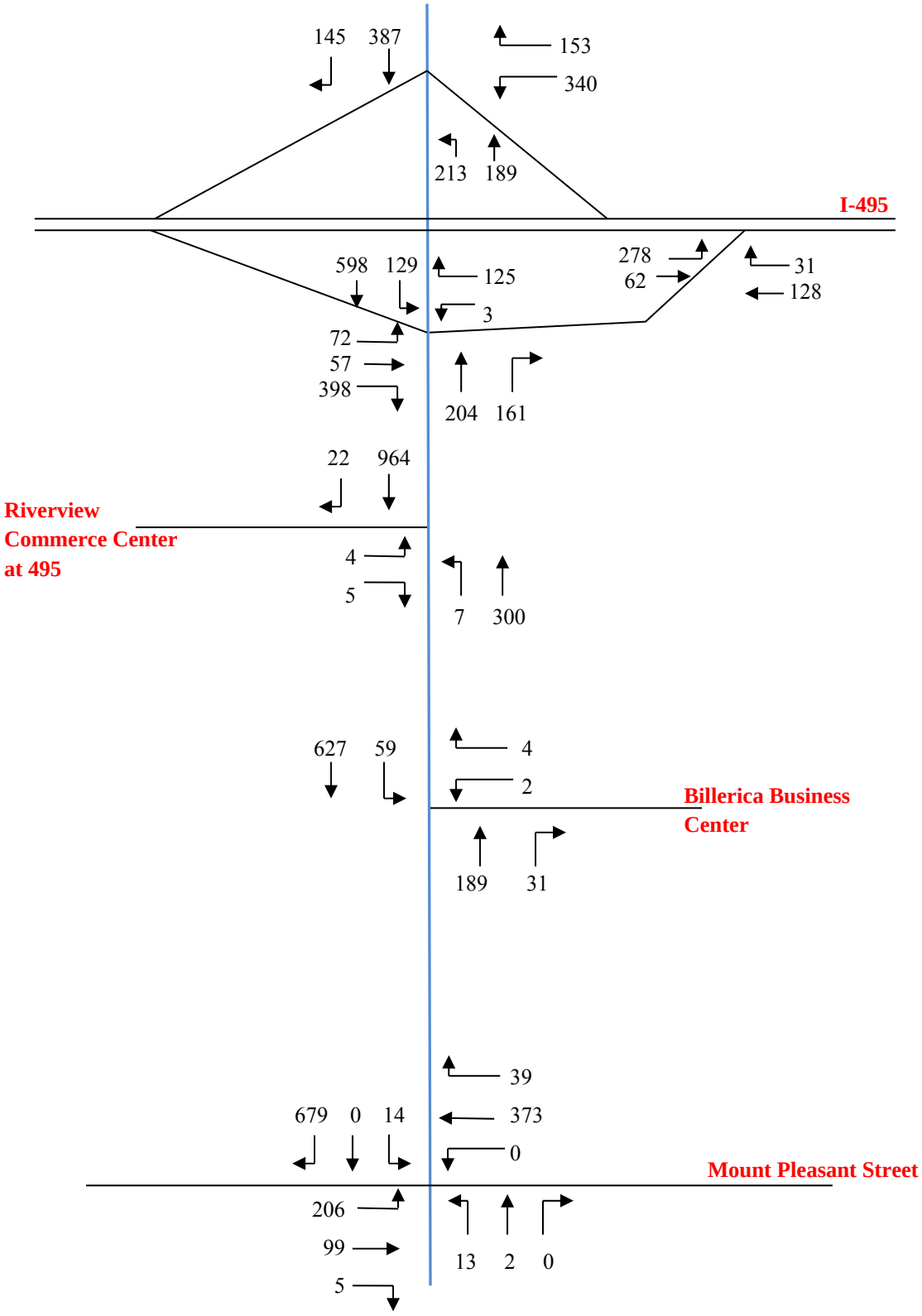


Figure 4: 2020 PM Peak Hour Volumes along Woburn Street Corridor, No Build Scenario

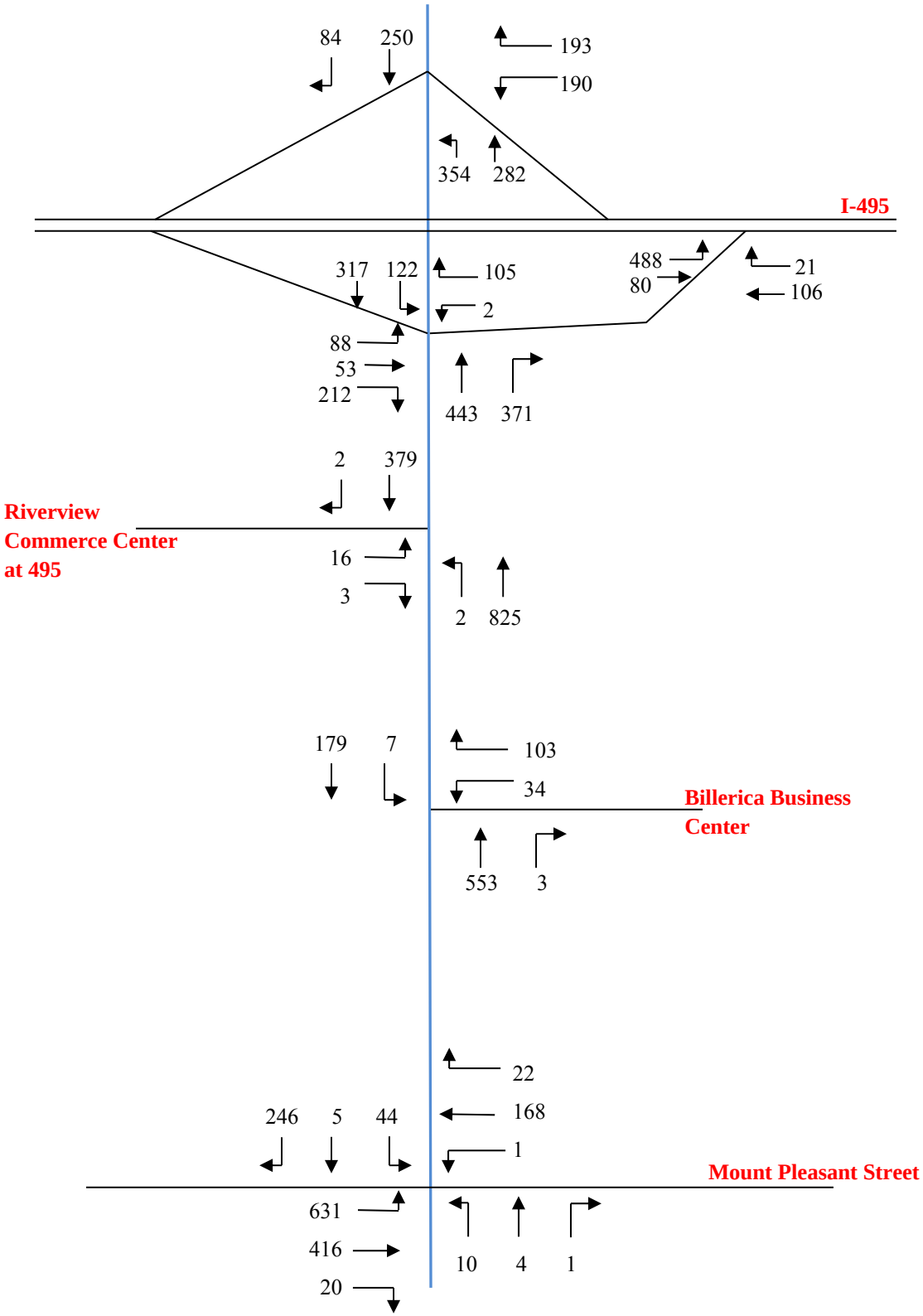


Figure 5: 2020 AM Peak Hour Volumes along Woburn Street Corridor, Build Scenario

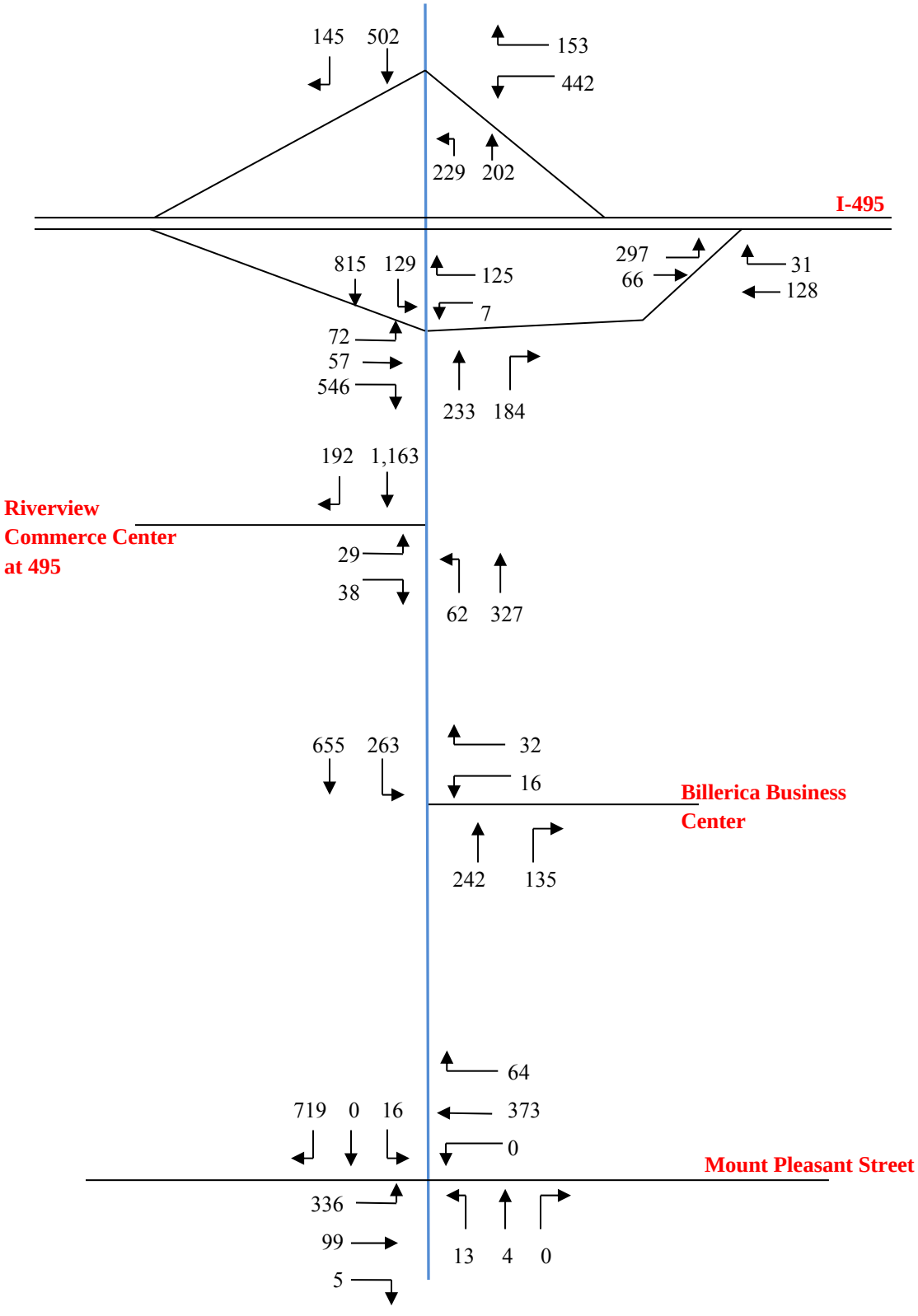
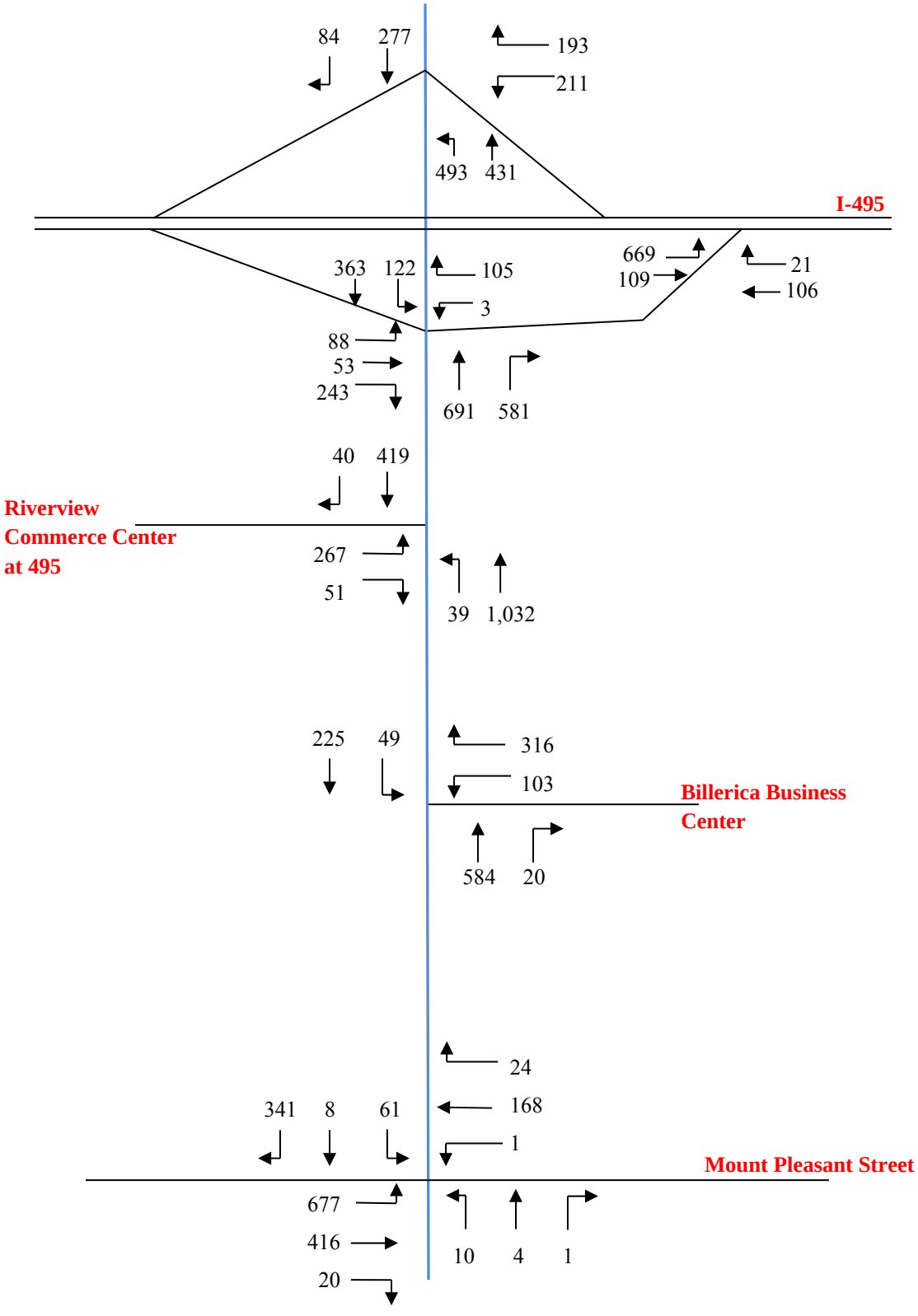


Figure 6: PM Peak Hour Volumes along Woburn Street Corridor, Build Scenario



3.3. Trip Generation

Traffic volumes for the 2020 build scenario has been generated using the baseline 1.0% annual growth and adding estimated traffic volumes from potential developments using trip generation techniques. The Institute of Transportation Engineers (ITE) publishes trip generation statistics based on various land uses[3]. The following provides a list of the projects with corresponding ITE land use and independent variables:

- Riverview Commerce Center building: LUC 120, General Heavy Industrial, 1000 sf. Gross Floor Area
- Billerica Business Center: LUC 710, General Office Building, 1000 sf. of Gross Floor Area

The result of the trip generation analysis provides an estimation of vehicle trips generated by the potential developments. The results of the trip generation for the build scenario at the Billerica Business Center are provided in Table 11:

Table 11: Trip Generation Results for Woburn Street Developments

Time Period/ Direction	Vehicle Trips for Potential Developments	
	Riverview Commerce Center Building	Billerica Business Center (2020 Build Scenario)
Daily Vehicle Trips Generated	825	2,462
Morning Peak Hour	281	347
Entering	224	305
Exiting	56	42
Evening Peak Hour	374	333
Entering	75	57
Exiting	299	276

3.4. Trip Distribution

The directional distribution of traffic along the Woburn Street corridor is based on analysis of existing roadway traffic volume conditions. In the morning peak hour, 75% of the traffic travels south along Woburn Street from the Interstate area to businesses along the corridor and the commuter rail station. The evening peak hour shows that 65% of traffic is moving north along the corridor. Trip distribution analysis reflects this directional distribution of traffic.

Trip generation and distribution analysis results have been entered into the existing traffic network along the Woburn Street Corridor during the two peak periods of the day. The AM and PM peak hour networks for the 2020 No Build and Build scenarios are presented in Figures 3-6.

4. Traffic Operations Analysis

Traffic operations within the Woburn Street corridor are determined from the study of several unsignalized intersections interspersed throughout the study area. Levels of Service (LOS)

[3] Trip Generation, 7th Edition, Institute of Transportation Engineers, 2003.

identified in the Highway Capacity Manual (HCM 2000 Edition), is a commonly used method to measure traffic operating conditions along a roadway and is based on average delay at each intersection within the roadway network.

4.1. Level of Service

Capacity analysis results in the assignment of levels of service to roadways under various traffic conditions. Level of service (LOS) is a qualitative measure of traffic conditions ranging from free flow to major congestion. There are six levels of service ranging from A (free flow conditions) to F (highly delayed conditions). LOS accounts for various factors including traffic volume, roadway capacity, speed, roadway grade, traffic control devices, roadway types and geometry, and roadway delays. LOS A through D is considered acceptable within an urban area, while LOS E and F indicates unacceptable delays and congestion in need of mitigation.

Conditions along the Woburn Street Corridor include only unsignalized intersections throughout the study area. Traffic operations at unsignalized intersections are somewhat different from signalized intersections in that LOS is only calculated for conflicted movements generally from the minor street. Through movements on the mainline generally do not have to yield the right of way and LOS usually is not determined for this movement. Thus an overall intersection LOS will not be determined for an unsignalized intersection.

Stop controlled intersections use control delay as the performance measure for operational level of service analysis. Control delay at an unsignalized intersection is a quantitative result of motorist delay associated with the traffic control device. Control delay includes initial deceleration delay, stopped delay, queue move up time, and final acceleration delay. The LOS criteria are presented in the *2000 Highway Capacity Manual* and are provided in Table 12.

Table 12: Level of Service Criteria for Unsignalized Intersections

LOS	Control Delay per Vehicle (s/veh)
A	≤ 10
B	> 10-15
C	>15-25
D	> 25-35
E	> 35-50
F	> 50

The results of the level of service analysis are presented in Table 13(page 40) for the five unsignalized intersections under existing conditions (2010), 2020 No-Build conditions, and 2020 Build conditions. See Appendix G for LOS worksheets for existing conditions.

Because the interchange of I-495 and Woburn Street is currently undergoing construction to repair bridges in the area, existing conditions intersection operations analysis for Woburn Street and I-495 is taken from the I-495 Corridor Transportation Study completed in 2008. The data collected around the interchange is from 2006 and has been determined to be appropriate for use in this study. All other intersections use data collected specifically for this study and collected in 2009. The following is a summary of the traffic operational analysis for each intersection.

I-495 Southbound Ramp at Woburn Street

During each of the peak hours under all scenarios, I-495 Southbound ramp left turns operate at a level of service F at this unsignalized intersection with Woburn Street. Queues can often be seen backing up the entire length of the off ramp nearly onto mainline I-495. Other movements at this intersection operate at acceptable levels of service.

I-495 Northbound Ramp at Woburn Street

In a similar fashion to the southbound ramp, the I-495 Northbound ramp to Woburn Street sees unacceptable conditions for left and through movements during peak traffic hours. Though not quite as delayed as the other interchange these movements see average delays of over a minute per vehicle and have a reported level of service F. In addition, left turns from Christman Avenue onto Woburn Street experience unacceptable delays in the future year scenarios. Other movements at this two-way stop controlled intersection experience acceptable operating conditions.

Woburn Street at the Riverview Commerce Center Entrance

This intersection sees most delays in the morning for eastbound left turning vehicles from the Riverview Commerce Center to Woburn Street northbound. The level of service is E and has average delays of 45 seconds per vehicle. However this turning movement currently has very low volumes reported and the volume/capacity ratio shows that the movement is well below full capacity. The poor level of service is due to high volumes along Woburn Street and the lack of sufficient gaps for turning movements.

Billerica Avenue at the Billerica Business Center Entrance

The intersection of Billerica Avenue and the Billerica Business Center operates at acceptable levels of service under existing and 2020 no build scenarios. With the various businesses interspersed throughout the office park, it was observed that staggered work hours were in effect.

There were no observed queues of vehicles entering or exiting the business center during typical peak hours of the day.

The 2020 build scenario includes a full occupation of the office park. With this occupancy, turning vehicles out of the center will experience unacceptable delays during both the morning and afternoon peak periods of the day.

Billerica Avenue at Mount Pleasant Street

This intersection sees unacceptable delays for minor street movements during both peak hours of the day under all scenarios. Currently, Billerica Avenue delays can reach over six minutes during the evening peak hour due to long queues at the intersection. The volume to capacity rations are greater than one, meaning that the amount of traffic entering the intersection is greater than the capacity available at a two way stop controlled intersection. A Traffic Signal warrant analysis will be presented to determine if a traffic signal is applicable at this intersection.

Table 13: Intersection Level of Service Summary

Intersection	2010 Existing		2020 No-Build		2020 Build	
	Control Delay (sec/veh)	LOS	Control Delay (sec/veh)	LOS	Control Delay (sec/veh)	LOS
Woburn Street at I-495 SB						
AM Peak Period						
Exit Ramp SB L	622.0	F	369.9	F	949.1	F
Exit Ramp SB R	10.0	B	10.1	B	10.2	B
Woburn St. WB L	6.0	A	9.3	A	10.0	B
PM Peak Period						
Exit Ramp SB L	576.0	F	301.8	F	--	F
Exit Ramp SB R	12.0	B	11.3	B	13.2	B
Woburn St. WB L	6.0	A	9.1	A	10.0	B
Woburn Street at I-495 NB						
AM Peak Period						
Exit Ramp NB LT	68.0	F	139.5	F	378.5	F
Exit Ramp NB R	28.0	D	33.5	D	236.7	F
Woburn St. EB L	2.0	A	8.3	A	8.5	A
Christman Ave. SB L	15.0	C	257.6	F	--	F
PM Peak Period						
Exit Ramp NB LT	234.0	F	744.4	F	--	F
Exit Ramp NB R	12.0	B	9.9	A	13.1	B
Woburn St. EB L	3.0	A	12.1	B	13.3	B
Christman Ave. SB L	18.0	C	228.6	F	--	F
Woburn Street at Riverview Commerce Center Driveway						
AM Peak Period						
Woburn St. NB LT	9.7	A	10.1	B	13.0	B
RCC Drive EB L	45.4	E	60.1	F	--	F
RCC Drive EB R	15.4	C	16.9	C	25.9	D
PM Peak Period						
Woburn St. NB LT	8.0	A	8.1	A	8.4	A
RCC Drive EB L	22.3	C	26.0	D	798.5	F
RCC Drive EB R	10.3	B	10.5	B	11.5	B
Billerica Avenue at Billerica Business Center Entrance						
AM Peak Period						
Billerica Ave. SB L	7.8	A	7.9	A	9.7	A
BBC Entrance WB L	18.2	C	20.5	C	94.0	F
BBC Entrance WB R	9.4	A	9.5	A	10.9	B
PM Peak Period						
Billerica Ave. SB L	8.5	A	8.7	A	9.4	A
BBC Entrance WB L	15.4	C	16.8	C	44.7	E
BBC Entrance WB R	13.8	B	15.2	C	78.8	F
Billerica Avenue at Mt. Pleasant Street						
AM Peak Period						
Mt. Pleasant EB LTR	8.7	A	8.9	A	9.7	A
Mt. Pleasant WB LTR	7.4	A	7.4	A	7.4	A
Billerica Ave. NB LTR	--	F	--	F	--	F
Billerica Ave. SB LTR	61.0	F	119.4	F	186.0	F
PM Peak Period						
Mt. Pleasant EB LTR	9.4	A	10.0	A	10.3	B
Mt. Pleasant WB LTR	8.1	A	8.2	A	8.2	A
Billerica Ave. NB LTR	264.7	F	630.7	F	--	F
Billerica Ave. SB LTR	377.4	F	911.9	F	--	F

NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound, L = Left Turn Movement, T = Through Movement, R = Right Turn Movement, LOS = Level of Service

-- Roadway capacity was exceeded; therefore, the methodology does not compute delay.

5. Traffic Signal Warrant Analysis

The standard for justification of a traffic signal is outlined in the 2009 Manual of Uniform Traffic Control Devices (MUTCD) published by the Federal Highway Administration (FHWA) and the United States Department of Transportation (USDOT). The following excerpt outlines the standards written in the manual:

1. An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is justified at a particular location.

2. The investigation of a need for a traffic control signal shall include an analysis of factors related to the existing operation and safety at the study location and the potential to improve these conditions, and the applicable factors contained in the following traffic signal warrants:
    a) Warrant 1: Eight-Hour Vehicular Volume;
    b) Warrant 2: Four-Hour Vehicular Volume;
    c) Warrant 3: Peak Hour;
    d) Warrant 4: Pedestrian Volume,
    e) Warrant 5: School Crossing;
    f) Warrant 6: Coordinated Signal System;
    g) Warrant 7: Crash Experience;
    h) Warrant 8: Roadway Network; and
    i) Warrant 9: Intersection Near a Grade Crossing

3. The satisfaction of a traffic signal warrant or warrants shall not in itself require installation of a traffic control signal.

A complete description of the traffic signal justification warrant section of the MUTCD is included in the Appendix H to this report.

The I-495 Corridor study recommends the installations of traffic control signal systems at the intersection of Woburn Street and I-495 southbound ramps and at the intersection of Woburn Street and I-495 northbound ramps/Christman Avenue. In addition, the intersection of Mount Pleasant Street and Billerica Avenue currently meets warrant 2, four-hour vehicular volume for justification of a traffic control signal. Under future conditions, the intersections of Billerica Avenue at the Billerica Business Center Entrance and Woburn Street at Riverview Commerce Center would pass the peak hour warrant for justification of a traffic control signal.

6. Intersection Operations Analysis with Traffic Signal Installation

The recommendations from the I-495 Corridor Study include the installation of a traffic signal system at the two intersections of Woburn Street and I-495 as part of potential mid-term project recommendations. At the intersection of Woburn Street and southbound ramp of I-495, the installation of a traffic signal system and added left turn lane on Woburn Street would improve the level of service from F to C in the AM and from F to D in the PM peak hours. At the intersection of Woburn Street and the I-495 northbound ramp/Christman Avenue, the installation

of a traffic signal system and added left turn lane on Woburn Street would improve LOS from F to B in the AM and from F to D in the PM peak hours.

The intersection of Billerica Avenue and Mount Pleasant Street benefits from added capacity and installation of a traffic control signal as well. The added capacity includes an exclusive left turn lane for eastbound Mount Pleasant Street and an exclusive right turn lane for southbound Billerica Avenue. Under existing conditions the intersection improves from a LOS F to B in both the AM and PM peak hours. The level of service will continue to be acceptable under 2020 build conditions with a reported LOS B for the AM and LOS C for the PM peak hours. Table 14 provides a LOS summary with traffic signals in place and worksheets are provided in Appendix I.

The intersection of Woburn Street and Riverview Commerce Center experiences unacceptable delays for left turns from the industrial park under the 2020 build scenario. Installation of a traffic control signal would improve the LOS from F to C for left turns but hinder the mainline movement along Woburn Street from LOS A to D during each peak period.

The intersection of Billerica Avenue and the Billerica Business Center Entrance experiences unacceptable delays for turning vehicles under the 2020 build scenario. Installation of a traffic signal would improve the intersection to an overall LOS B for both AM and PM peak time periods.

Table 14: Intersection Level of Service Summary with Traffic Signal Mitigation

Intersection	2010 Conditions with added Traffic Signal		2020 Build Conditions with added Traffic Signal	
	Control Delay (sec/veh)	LOS	Control Delay (sec/veh)	LOS
Billerica Avenue at Mt. Pleasant Street				
AM Peak Period				
Mt. Pleasant EB LTR	11.2	B	9.7	A
Mt. Pleasant WB LTR	38.7	D	53.3	D
Billerica Ave. NB LTR	10.9	B	14.5	B
Billerica Ave. SB LTR	0.4	A	0.6	A
PM Peak Period				
Mt. Pleasant EB LTR	23.6	C	40.0	D
Mt. Pleasant WB LTR	15.1	B	17.6	B
Billerica Ave. NB LTR	12.6	B	14.5	B
Billerica Ave. SB LTR	2.2	A	2.6	A
Billerica Avenue at Billerica Business Center Entrance				
AM Peak Period				
Billerica Ave. SB TL	--	--	14.7	B
Billerica Ave. NB TR	--	--	9.1	A
BBC Entrance WB L	--	--	12.6	B
BBC Entrance WB R	--	--	12.8	B
PM Peak Period				
Billerica Ave. SB TL	--	--	9.8	A
Billerica Ave. NB TR	--	--	21.5	C
BBC Entrance WB L	--	--	8.8	A
BBC Entrance WB R	--	--	11.2	B
Woburn Street at Riverview Commerce Center Driveway				
AM Peak Period				
Woburn St. NB LT	--	--	3.2	A
Woburn St. SB TR	--	--	51.6	D

Intersection	2010 Conditions with added Traffic Signal		2020 Build Conditions with added Traffic Signal	
	Control Delay (sec/veh)	LOS	Control Delay (sec/veh)	LOS
RCC Drive EB L	--	--	26.3	C
RCC Drive EB R	--	--	26.7	C
PM Peak Period				
Woburn St. NB LT	--	--	43.3	D
Woburn St. SB TR	--	--	4.9	A
RCC Drive EB L	--	--	28.9	C
RCC Drive EB R	--	--	15.8	B

-- Denotes that there is no traffic signal in place

V. Recommendations

➢ Tewksbury Recommendations

Land Use and Zoning

- Modify zoning to allow for allow for additional commercial support services that meet the needs of office and industrial uses.
- Address potential conflicts between industrial and residential uses through down zoning, transitional zoning and/or the use of an overlay district.
- Improve the quality of development through the use of design guidelines.

Economic Development

- Focus on the development opportunities related to the former Raytheon site and the Billerica Business Center properties.
- Work with the Greater Lowell Workforce Investment Board (GLWIB) and the Career Center in Lowell to match prospective employees with available positions. Utilize the workforce development incentives available through the GLWIB.
- Focus upon the redevelopment opportunities available through the underutilized properties.
- Utilize the Economic Target Area (ETA) status to develop Tax Increment Financing (TIF) agreements with prospective businesses. Establish an Economic Opportunity Area (EOA) on the Tewksbury side of the former Raytheon plant to complement the EOA on the Billerica side of this site.
- Work with NMCOG to address brownfield and petroleum issues at the former Raytheon site, the former Corenco Corporation site and railroad tracks abutting the parcels in the study area. Access brownfield funds from MassDevelopment as a result of the ETA designation.
- Work with the Town of Billerica to develop properties and to address the permit streamlining issues across communities.
- Encourage commercial development opportunities that would address the consumer needs of employees and residents in the target area.

Transportation

- Pavement markings throughout the corridor are lacking and should be restriped as part of any pavement maintenance program.
- Alternative transportation options should be offered as way to improve traffic operations along the corridor. Such strategies should include alternative work schedules and ridesharing programs, as well as improved transit options and improved accommodations for non- motorized forms of travel.
- There are no designated bus stops along the corridor as the LRTA uses a flagging system for picking up passengers. Redevelopment of the former Raytheon building and the Billerica Business Center may result in a need for a designated stop at each location, in addition to shuttle service to North Billerica station.
- Improving the sidewalk network would promote alternative modes of transportation and increase pedestrian and bicyclist's safety.
- Woburn Street at I-495 Southbound Ramps: installation of a fully actuated traffic signal system and the addition of a left turn lane for movements from Woburn Street to the I-495 southbound ramp.
- Woburn Street at I-495 Northbound Ramp/Christman Avenue: installation of a fully actuated traffic signal system and construction an exclusive left turn lane for Woburn Street turning movements to Christman Avenue.
- Woburn Street at Riverview Commerce Center Entrance: A traffic signal will be needed upon occupation of the now largely vacant office park to improve the level of service for left turning vehicles. Improved pedestrian accommodations should be part of the overall improvement plan along the corridor. The installation of sidewalks north of the intersection as well as along the Riverview Commerce Center roadway will help to encourage transportation alternatives.
- Billerica Avenue at Billerica Business Center Entrance: Future build out of the Billerica Business Center will result in increased delays. Traffic conditions should be monitored until such time as installation of a traffic signal is warranted.
- Billerica Avenue at Mount Pleasant Street: The addition of an exclusive right turn lane on Billerica Avenue and an exclusive left turn lane for eastbound Mount Pleasant Street is recommended along with a fully actuated traffic signal system.

➢ Billerica Recommendations

A. Land Use and Zoning

- Modify zoning to allow for additional commercial support services that meet the needs of office and industrial uses.

- Address potential conflicts between industrial and residential uses through zoning revisions.

- Improve the quality of development through the use of design guidelines.

B. Economic Development

- Focus on the development opportunities related to the former Raytheon site and the Billerica Business Center properties.

- Work with the Greater Lowell Workforce Investment Board (GLWIB) and the Career Center in Lowell to match prospective employees with available positions. Utilize the workforce development incentives available through the GLWIB.

- Focus upon the redevelopment opportunities available through the underutilized properties.

- Expand the Economic Opportunity Area (EOA) on the Billerica side of the former Raytheon plant to include the Tewksbury portion of the site. Identify other Tax Increment Financing (TIF) opportunities along the corridor.

- Work with NMCOG to address brownfield and petroleum issues at the former Raytheon site and other parcels in Billerica.

- Work with the Town of Tewksbury to develop properties and to address the permit streamlining issues across communities.

- Encourage commercial development opportunities that would address the consumer needs of employees and residents in the target area.

C. Transportation

- Pavement markings throughout the corridor are lacking and should be restriped as part of any pavement maintenance program.

- Alternative transportation options should be offered as way to improve traffic operations along the corridor. Such strategies should include alternative work schedules and ridesharing programs, as well as improved transit options and improved accommodations for non- motorized forms of travel.

- There are no designated bus stops along the corridor as the LRTA uses a flagging system for picking up passengers. Redevelopment of the former Raytheon building and the Billerica Business Center may result in a need for a designated stop at each location, in addition to shuttle service to North Billerica station.

- Improving the sidewalk network would promote alternative modes of transportation and increase pedestrian and bicyclist's safety.

- Woburn Street at I-495 Southbound Ramps: installation of a fully actuated traffic signal system and the addition of a left turn lane for movements from Woburn Street to the I-495 southbound ramp.

- Woburn Street at I-495 Northbound Ramp/Christman Avenue: installation of a fully actuated traffic signal system and construction an exclusive left turn lane for Woburn Street turning movements to Christman Avenue.

- Woburn Street at Riverview Commerce Center Entrance: A traffic signal will be needed upon occupation of the now largely vacant office park to improve the level of service for left turning vehicles. Improved pedestrian accommodations should be part of the overall improvement plan along the corridor. The installation of sidewalks north of the intersection as well as along the Riverview Commerce Center roadway will help to encourage transportation alternatives.

- Billerica Avenue at Billerica Business Center Entrance: Future build out of the Billerica Business Center will result in increased delays. Traffic conditions should be monitored until such time as installation of a traffic signal is warranted.

- Billerica Avenue at Mount Pleasant Street: The addition of an exclusive right turn lane on Billerica Avenue and an exclusive left turn lane for eastbound Mount Pleasant Street is recommended along with a fully actuated traffic signal system.

Woburn Street
Corridor Study

APPENDIX A

Land Use Inventory by Community

APPENDIX A: WOBURN STREET CORRIDOR STUDY: LAND INVENTORY BY COMMUNITY

Map-Block-Lot	Acres	Land Use Code	Description	Address	Status	Zoning District
Billerica						
1-1-0	35.87	400	Manufacturing operations	495 Billerica Avenue/Rear	**Former Raytheon Site**	Industrial
2-1-0	131.43	400	Manufacturing operations	134 Billerica avenue	Building next Raytheon	Industrial
3-2-7	5.37	404	R & D facilities	101 Billerica Avenue , Bldg. 4	Office Building/R & D	Industrial
3-2-8	4.84	402	Office building part of manufacturing	101 Billerica Avenue , Bldg. 5	Industrial Office Building	Industrial
3-2-9	1.76	402	Office building part of manufacturing	101 Billerica Avenue , Bldg. 6	Industrial Office Building	Industrial
3-21-1	4.12	401	Warehousing of manufactured goods	100 Billerica Avenue	Commercial Building	Industrial
2-4-0	20.00	903	Municipal	70 Letchworth Avenue	Sewer/Wastewater Treatment Plant	Industrial
2-5-0	12.90	338	Motor vehicle sales and services	Town Farm Lane/ROW	Junkyard	Industrial
5-15-0	12.90	338	Motor vehicle sales and services	Town Farm Lane/ROW	Junkyard	Industrial
6-85-0	0.71	101	Single-family	87 Billerica Avenue	Residential	Rural Residential
6-104-0	0.71	101	Single-family	85 Billerica Avenue	Residential	Rural Residential
6-86-0	0.58	101	Single-family	79 Billerica Avenue	Residential	Rural Residential
6-35-1	3.50	101	Single-family	55 Billerica Avenue	Residential	Rural Residential
6-33-0	0.43	101	Single-family	61-63 Billerica Avenue	Residential	Rural Residential
6-24-0	0.39	101	Single-family	62 Billerica Avenue	Residential	Village Residential
6-34-0	0.39	101	Single-family	57 Billerica Avenue	Residential	Rural Residential
6-23-0	0.39	101	Single-family	60 Billerica Avenue	Residential	Village Residential
6-22-0	0.40	101	Single-family	58 Billerica Avenue	Residential	Village Residential
6-21-0	0.41	903	Municipal	Billerica Avenue	Residential	Village Residential
6-39-0	0.52	140	Child care facility	49 Billerica Avenue	Residential	Rural Residential
6-20-0	0.48	101	Single-family	52 Billerica Avenue	Residential	Village Residential
6-19-0	1.00	101	Single-family	46 Billerica Avenue	Residential	Rural Residential
6-40-0	0.27	101	Single-family	45 Billerica Avenue	Residential	Rural Residential
6-41-0	0.29	101	Single-family	43 Billerica Avenue	Residential	Rural Residential
6-42-0	0.51	104	Two-family	39-41 Billerica Avenue	Residential	Rural Residential
6-18-1-1	0.91	101	Single-family	42 Billerica Avenue	Residential	Village Residential
6-43-2	0.63	101	Single-family	33 Billerica Avenue	Residential	Rural Residential
6-16-1	0.56	101	Single-family	34 Billerica Avenue	Residential	Village Residential
6-43-1	0.75	101	Single-family	31 Billerica Avenue	Residential	Rural Residential
6-15-0	1.11	101	Single-family	30 Billerica Avenue	Residential	Village Residential
6-47-0	0.25	101	Single-family	27 Billerica Avenue	Residential	Rural Residential
6-14-0	0.59	101	Single-family	22 Billerica Avenue	Residential	Village Residential
6-48-0	0.29	101	Single-family	25 Billerica Avenue	Residential	Rural Residential
10-59-0	0.71	101	Single-family	20 Billerica Avenue	Residential	Rural Residential
10-201-1	0.69	101	Single-family	3 Hickory Lane	Residential	Rural Residential
10-60-0	0.70	101	Single-family	18 Billerica Avenue	Residential	Rural Residential
10-226-0	0.69	101	Single-family	19 Billerica Avenue	Residential	Rural Residential
10-61-0	0.50	101	Single-family	16 Billerica Avenue	Residential	Rural Residential
10-70-0	0.56	101	Single-family	15 Billerica Avenue	Residential	Rural Residential
10-62-0	0.55	101	Single-family	14 Billerica Avenue	Residential	Rural Residential
10-71-0	1.82	101	Single-family	2 Billerica Avenue	Residential	Rural Residential
10-218-0	1.23	104	Two-family	10 Billerica Avenue	Residential	Rural Residential
10-63-0	2.74	901	Commonwealth	Billerica Avenue	North Billerica T Station/Parking Lot	Neighborhood Business
10-72-0	0.32	104	Two-family	16 Mt. Pleasant Street	Residential	Rural Residential
6-28-1	1.99	445	N/A	86 Billerica Avenue	Industrial Condo.	Industrial
45 Parcels	**257.76**					
Vacant Land/Buildings within Billerica						
2-2-0	2.00	441	Potentially developable land	Billerica Avenue	Vacant Land	Industrial
2-3-1	6.87	441	Potentially developable land	Billerica Avenue	Vacant Land	Industrial
3-1-1	0.12	441	N/A	Billerica Avenue	Vacant Land	Industrial
3-2-1	5.54	402	Office building part of manufacturing	101 Billerica Avenue, Bldg. 2	Vacant Commercial Building	Industrial
3-2-6	13.21	402	Office building part of manufacturing	95 Billerica Avenue	Vacant Commercial Building	Industrial

Map-Block-Lot	Acres	Land Use Code	Description	Address	Status	Zoning District
3-4-0	1.51	441	Potentially developable land	Billerica Avenue	Vacant Land	Industrial
3-3-0	2.60	441	Potentially developable land	Billerica Avenue	Vacant Land	Industrial
3-20-1	3.76	441	Potentially developable land	Vacant Land for Sale	Vacant Land for Sale	Industrial
5-14-0	25.00	442	Undevelopable land	Town Farm Lane	Vacant land behind Junkyard	Industrial
6-30-0	15.44	423	Electric transmission right-of-way	Billerica Avenue	Vacant Land/Powerlines	Rural Residential
5-13-0	11.90	441	Potentially developable land	Town Farm Lane	Vacant Land near River	Industrial
6-26-0	1.33	423	Electric transmission right-of-way	Billerica Avenue	Vacant Land/Powerlines	Industrial
6-1-0	36.17	423	Electric transmission right-of-way	Billerica Avenue /Rear	Vacant Land/Powerlines	Village Residential
6-31-0	0.28	423	Electric transmission right-of-way	Billerica Avenue	Vacant Land/Powerlines	Rural Residential
6-32-0	0.47	423	Electric transmission right-of-way	Billerica Avenue	Vacant Land/Powerlines	Rural Residential
6-25-0	0.70	423	Electric transmission right-of-way	Billerica Avenue	Vacant Land/Powerlines	Rural Residential
10-45-0	0.99	313	Lumber Yard	Letchworth Avenue	Vacant Lumber Yard Building/Warehouse	Village Residential/Industrial
10-225-1-1	1.45	313	Lumber Yard	15 Letchworth Avenue	Vacant Lumber Yard Building/Warehouse	Village Residential/Industrial
18 Parcels	**129.34**					
Tewksbury						
1-1	30.84	404	R & D facilities	495 Woburn Street	***Former Raytheon Site***	Heavy Industrial
2-4	6.32	400	Manufacturing operations	Billerica Ind. Park Road/Off	Industrial/Commercial Building	Heavy Industrial
3-62	6.03	402	Office building part of manufacturing	Billerica Ind. Park Road	Industrial/Commercial Building	Heavy Industrial
3-107	2.76	402	Office building part of manufacturing	555 Woburn Street	Commercial Building	Heavy Industrial
3-2	1.85	402	Office building part of manufacturing	525 Woburn Street	Commercial Building	Heavy Industrial
3-3	8.21	402	Office building part of manufacturing	515 Woburn Street	Commercial Building	Heavy Industrial
1-2	2.84	402	Office building part of manufacturing	Woburn Street	Commercial/Industrial Building	Heavy Industrial
2-34	7.90	402	Office building part of manufacturing	632 Woburn Street	Industrial/Commercial Building	Heavy Industrial
3-82	10.00	402	Office building part of manufacturing	600 Woburn Street	Commercial Building	Heavy Industrial
3-79	2.76	316	Warehouse & distribution facility	572 Woburn Street	Residential	Heavy Industrial
3-78	0.23	101	Single-family	550 Woburn Street	Residential	Heavy Industrial
3-77	0.60	101	Single-family	1 Park Avenue	Commercial Building	Heavy Industrial
3-13	0.34	101	Single-family	522 Woburn Street	Residential	Heavy Industrial
3-12	0.46	101	Single-family	512 Woburn Street	Residential/Commercial	Heavy Industrial
3-11	1.29	332	Auto repair facility	500 Woburn Street	Commercial Building	Heavy Industrial
3-9	5.05	322	Discount/Department store	25 Highland Avenue	Industrial/Commercial Building	Heavy Industrial
3-5	0.23	101	Single-family	444 Woburn Street	Residential	Heavy Industrial
3-4	0.23	101	Single-family	434 Woburn Street	Residential	Heavy Industrial
4-19	0.23	101	Single-family	426 Woburn Street	Residential	Heavy Industrial
4-18	0.23	322	Discount/Department store	420 Woburn Street	Commercial Building	Heavy Industrial
4-3	0.11	104	Two-family	410 Woburn Street	Residential	Heavy Industrial
4-2	0.11	442	Undevelopable land (Industrial)	404 Woburn Street	Commercial Building	Heavy Industrial
4-1	0.92	101	Single-family	396 Woburn Street	Commercial Building	Heavy Industrial
23 Parcels	**89.54**					
Vacant Land/Buildings within Tewksbury						
3-99	3.06	440	Developable vacant land (Industrial)	525 Woburn Street/Adjacent	Developable Industrial Vacant Land	Heavy Industrial
3-113	1.49	440	Developable vacant land (Industrial)	451 Woburn Street	Vacant Land	Heavy Industrial
4-61	2.32	440	Developable vacant land (Industrial)	0 Woburn Street	Developable Industrial Vacant Land	Heavy Industrial
4-62	1.01	440	Developable vacant land (Industrial)	395 Woburn Street	Vacant Developable Land	Heavy Industrial
3-1	1.80	440	Developable vacant land (Industrial)	0 Woburn Street/Off	Vacant Developable Land	Heavy Industrial
1-3	13.00	440	Developable vacant land (Industrial)	Woburn Street	Parking Lot/Vacant Lot	Heavy Industrial
6 Parcels	**22.68**					
Lowell						
6460-293	0.28	104	Two-family	293 Woburn Street	Two-Family Residential Dwelling	Traditional Neighborhood Single-Family
6460-301	0.23	101	Single-family	301 Woburn Street	Single-Family Residential Dwelling	Traditional Neighborhood Single-Family
6460-317	0.28	101	Single-family	317 Woburn Street	Single-Family Residential Dwelling	Traditional Neighborhood Single-Family
6460-335	0.32	101	Single-family	335 Woburn Street	Single-Family Residential Dwelling	Traditional Neighborhood Single-Family
6460-345	0.15	104	Two-family	345 Woburn Street	Two-Family Residential Dwelling	Traditional Neighborhood Single-Family
6460-359	0.16	101	Single-family	395 Woburn Street	Single-Family Residential Dwelling	Traditional Neighborhood Single-Family

Map-Block-Lot	Acres	Land Use Code	Description	Address	Status	Zoning District
1435-27	0.23	101	Single-family	27 Commonwealth Avenue	Single-Family Residential Dwelling	Traditional Neighborhood Single-Family
6460-394	0.32	101	Single-family	394 Woburn Street	Single-Family Residential Dwelling	Traditional Neighborhood Single-Family
6460-386	0.23	101	Single-family	386 Woburn Street	Single-Family Residential Dwelling	Traditional Neighborhood Single-Family
6460-380	0.11	104	Two-family	380 Woburn Street	Two-Family Residential Dwelling	Traditional Neighborhood Single-Family
6460-366	0.23	101	Single-family	366 Woburn Street	Single-Family Residential Dwelling	Traditional Neighborhood Single-Family
6460-358	0.11	101	Single-family	358 Woburn Street	Single-Family Residential Dwelling	Traditional Neighborhood Single-Family
6460-354	0.11	101	Single-family	354 Woburn Street	Single-Family Residential Dwelling	Traditional Neighborhood Single-Family
6460-342	0.23	104	Two-family	342 Woburn Street	Two-Family Residential Dwelling	Traditional Neighborhood Single-Family
6460-330	0.23	101	Single-family	330 Woburn Street	Single-Family Residential Dwelling	Traditional Neighborhood Single-Family
6460-320	0.31	101	Single-family	320 Woburn Street	Commercial Building	Traditional Neighborhood Single-Family
6460-306	0.16	101	Single-family	306 Woburn Street	Single-Family Residential Dwelling	Traditional Neighborhood Single-Family
3230-8	0.26	101	Single-family	8 Jean Avenue	Single-Family Residential Dwelling	Traditional Neighborhood Single-Family
1235-5	0.27	101	Single-family	5 Christmas Avenue	Single-Family Residential Dwelling	Traditional Neighborhood Single-Family
1235-10	0.26	101	Single-family	10 Christmas Avenue	Single-Family Residential Dwelling	Traditional Neighborhood Single-Family
6460-184	0.13	130	Developable vacant land (Residential)	184 Woburn Street	Developable Residential Vacant Land	Regional Retail District
6460-367	0.51	903	Municipal	367 Woburn Street	Municipal Vacant Land	Traditional Neighborhood Single-Family
6460-185	1.44	325	Retail under 10,000 sq. ft.	185 Woburn Street	Commercial/Retail Building	Regional Retail District
6460-196	0.18	105	Three-family	196 Woburn Street	Three-Family Residential Dwelling	Regional Retail District
6460-178	0.31	101	Single-family	178 Woburn Street	Single-Family Residential Dwelling	Regional Retail District
6460-166	0.16	101	Single-family	166 Woburn Street	Single-Family Residential Dwelling	Traditional Neighborhood Two-Family
26 Parcels	**6.93**					
Vacant Land/Buildings within Lowell						
2700-1	0.32	903	Municipal	1 Grafton Street	Municipal	Regional Retail District
6460-395	0.37	131	Potentially developable land (Residential)	395 Woburn Street	Vacant Land	Traditional Neighborhood Single-Family
6460-181	0.16	325	Retail under 10,000 sq. ft.	181 Woburn Street	Commercial/Retail Building	Traditional Neighborhood Two-Family
3170-801	38.57	442	Undevelopable land (Industrial)	801 Interstate Route 495	Industrial Vacant Land (Undevelopable)	Light Industrial
4 Parcels	**39.42**					

Woburn Street
Corridor Study

APPENDIX B

Permitted Uses by Zoning District and Community

Permitted Uses by Zoning District and Community

Permitted Use	Lowell				Tewksbury	Billerica			
	Traditional Neighborhood Single-Family (TSF)	Traditional Neighborhood Two-Family (TTF)	Regional Retail District (RR)	Light Industry, Manufacturing, & Storage (LI)	Heavy Industrial (HI)	Industrial (I)	Neighborhood Business (NB)	Village Residential (VR)	Rural Residential (RR)
Residential Uses by Zoning District by Community									
Single-Family Dwelling	Yes	Yes	No	No	SP - PB	No	Yes	Yes	Yes
Two-Family Dwelling	No	Yes	No	No	No	No	No	No	No
Three-Family	No	No	No	No	--	--	--	--	--
Multi-Family Dwelling	Allowed: Broken out into finer categories in the rows below				No	No	No	No	No
Multi-family (4-6 units)	No	No	No	No	--	--	--	--	--
Multi-family (7 or more units)	No	No	No	No	--	--	--	--	--
Townhouse development (4-6 units) (Billerica Bylaw doesn't specify number of units for townhouses)	No	No	No	No	--	No	No	No	No
Townhouse development (7 or more units)	No	No	No	No	--	--	--	--	--
One or two dwelling units in a building with a legal non-residential use on the ground floor	No	Yes	SP-ZBA	SP-ZBA	--	--	--	--	--
Multi-Family/55 (referred to as *Elderly Housing* in Billerica's Zoning Bylaw)	--	--	--	--	No	No	No	No	No
Community Development Project	--	--	--	--	No	--	--	--	--

Residential Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Cluster Development	--	--	--	--	No	No	No	No	No
Planned Unit Development	No	No	SP-ZBA	SP-ZBA	--	--	--	--	--
Planned Residential Development	SP-CC	SP-CC	No	No	--	--	--	--	--
Open Space Residential Design	--	--	--	--	No	--	--	--	--
Conversion of a dwelling	Allowed: Broken out into finer categories in the 3 rows below				--	--	--	--	--
Conversion of a single family dwelling unit for not more than 2 families (referred to as *In-Law Apartment* in Billerica's Zoning Bylaw)	No	Yes	No	No	--	SP-ZBA	SP-ZBA	SP-ZBA	No
Other dwellings converted for more than 2 families	No	No	No	No	--	--	--	--	--
Buildings located in historic mill complexes or religious or educational buildings converted for more than 2 families	SP-PB	SP-PB	SP-PB	No	--	--	--	--	--
Boardinghouse (Within Lowell's bylaw this category also includes *fraternity and lodging house*)	No	No	No	No	--	--	--	--	--
Group residence (Dormitory within Lowell Bylaw)	No	No	No	No	--	--	--	--	--
Facilitated and Independent senior living (referred to as *Senior Congregate Housing* in Lowell's Zoning Bylaw and a *Nursing Home* by Billerica)	No	SP-ZBA	SP-ZBA	No	--	SP-ZBA	SP-ZBA	SP-ZBA	SP-ZBA

Residential Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Non-family accommodations: Tourist home, bed &breakfast, inn (Bed & Breakfast only for Tewksbury)	No	No	SP-ZBA	No	No	--	--	--	--
The renting of rooms or the furnishing of table board by a resident owner to not more than two (2) non-transient roomers or boarders	Yes	Yes	Yes	Yes	--	--	--	--	--
The renting of rooms or the furnishing of table board by a resident owner to more than two (2) non-transient roomers or boarders as an accessory use	No	No	No	No	--	--	--	--	--
Assisted living residence	--			--	--	SP-ZBA	SP-ZBA	SP-ZBA	SP-ZBA
Room rental (5 or less)	--	--	--	--	--	Yes	Yes	Yes	No
Room rental (5 or more)	--	--	--	--	--	SP-ZBA	SP-ZBA	SP-ZBA	No
Accessory residential use	--	--	--	--	--	Yes	Yes	Yes	No
Affordable housing on an undersized lot	--	--	--	--	--	No	Yes	SP-ZBA	SP-ZBA
Temp. manufactured home while residence is being constructed	--	--	--	--	--	Yes	Yes	Yes	Yes
Temporary building or use incidental to a building development	Yes	Yes	Yes	Yes	--	--	--	--	--
Storage of more than one vehicle or trailer	--	--	--	--	--	No	SP-ZBA	SP-ZBA	SP-ZBA
Accessory dwelling Unit, added to a single-family home subject to minimum lot area per dwelling unit requirements	No	No	No	No	--	--	--	--	--

Residential Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Common accessory facilities to exclusively serve the residents of an on-site multi-family res. bldging or complex of buildings, including but not limited to: a mgmnt./maintenance office, exercise facility, common meeting area or computer room	No	No	Yes	No	--	--	--	--	--
Trailer	No	No	No	No	--	--	--	--	--
Exempt, Institutional and Public Uses by Zoning District by Community									
Use of land or structures for religious purposes (Billerica's Zoning Bylaw refers Religious Uses as *For Profit and Non-Profit)*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Use of land or structures for educational purposes on land owned or leased by the Commonwealth or any of its agencies, subdivisions or bodies politic or by a religious sect or denomination, or by a nonprofit educational corporation	Yes	Yes	Yes	Yes	Yes	--	--	--	--
Educational Uses (For profit and non-profit)	--	--	--	--	--	Yes	Yes	Yes	Yes
Child care facility in existing building	--	--	--	--	Yes	--	--	--	--
Child care facility in new building	--	--	--	--	SP - PB	--	--	--	--

Exempt Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Licensed child care facility	Yes	Yes	Yes	Yes	--	--	--	--	--
Forestry	--	--	--	--	--	Yes	Yes	Yes	Yes
Use of land for the primary purpose of agriculture, horticulture, floriculture, or viticulture on a parcel of more than five (5) acres in area (Billerica's Zoning Bylaw does not have an acreage requirement)	--	--	--	--	Yes	Yes	Yes	Yes	Yes
Facilities for the sale of produce, and wine and dairy products on exempt agricultural sites	--	--	--	--	Yes	--	--	--	--
Cemeteries, private	SP-ZBA	SP-ZBA	No	No	SP - ZBA	SP-ZBA	SP-ZBA	SP-ZBA	SP-ZBA
Keeping of horses (Refer to Billerica Zoning Bylaw for more details)	--	--	--	--	--	No	No	Yes	Yes
Municipal parks and playgrounds	--	--	--	--	Yes	--	--	--	--
Municipal facilities	Yes	Yes	Yes	Yes	SP - PB	--	--	--	--
Essential services	--	--	--	--	SP - PB	--	--	--	--
Public utility or service facilities	SP-ZBA	SP-ZBA	Yes	Yes	--	--	--	--	--
Water towers and reservoirs	--	--	--	--	SP - PB	--	--	--	--
Hospital	No	No	Yes	SP-ZBA	SP - PB	--	--	--	--
Club or lodge, private	No	No	SP-ZBA	No	--	--	--	--	--
Other health care facility	No	No	SP-ZBA	No	--	--	--	--	--

Exempt Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
State, County and Municipal	--	--	--	--	--	Yes	Yes	Yes	Yes
Municipal service facilities operated by the City of Lowell DPW, Lowell Water Utility, or Lowell Wastewater Utility	SP-ZBA	SP-ZBA	Yes	Yes	--	--	--	--	--
Club, Lodge and Other Philanthropic	--	--	--	--	--	No	SP-ZBA	SP-ZBA	SP-ZBA
Alcohol and drug rehabilitation hospital	--	--	--	--	--	No	No	No	No
Institutional use not listed in any other use category	No	No	SP-ZBA	No	--	--	--	--	--
Community center, settlement house, humane society, or other similar facility operated by an educational, non-profit, public, or religious institution	SP-ZBA	SP-ZBA	Yes	No	--	--	--	--	--
Library or museum open to the public or connected with a permitted educational use and not conducted as a gainful business.									
Commercial Uses by Zoning District by Community									
Non-exempt farm stand for wholesale or retail sale of products	--	--	--	--	SP - PB	--	--	--	--
Non-exempt educational use (Lowell lists Use under *Institutional, Recreational & Educational Uses*)	No	No	Yes	SP-ZBA	SP - PB	--	--	--	--
Non-exempt agricultural use	--	--	--	--	No	--	--	--	--

Commercial Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Greenhouse (non-agricultural)	--	--	--	--	--	Yes	No	SP-ZBA	SP-ZBA
Dog daycare or training	--	--	--	--	--	SP-ZBA	No	No	No
Animal clinic or hospital; kennel (*Pet Shops* are included under Billerica's Zoning Bylaw)	No	No	SP-ZBA	SP-ZBA	SP - PB	No	No	No	No
Personal service establishment	--	--	--	--	Yes	Yes	Yes	No	No
Service business	--	--	--	--	--	--	--	--	--
Funeral home	No	No	SP-ZBA	Yes	SP - PB	No	SP-ZBA	No	No
Hotel/motel (Considered a residential use within Lowell's Bylaw)	No	No	Yes	SP-ZBA	SP - PB	SP-ZBA	SP-ZBA	No	No
Retail food or drug store	No	No	Yes	SP-ZBA	SP - PB	No	No	No	No
Retail sale of alcoholic beverages	--	--	--	--	Yes	--	--	--	--
Retail sales not elsewhere set forth	--	--	--	--	Yes	--	--	--	--
Bar, saloon, or other establishment where alcohol beverages are sold and consumed, but which is not licensed to prepare or serve food, with or without an entertainment license	No	No	Yes	SP-ZBA	--	--	--	--	--
Retail operation with 5,000 sq. ft. or less of g.f.l. per establishment	No	No	Yes	SP-ZBA	--	--	--	--	--
Retail operation with greater than 5,000 sq. ft. of g.f.l. per establishment	No	No	Yes	SP-ZBA	--	--	--	--	--

Commercial Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Motor vehicle, motorcycle, trailer, snowmobile, or boat sales and rental	--	--	--	--	No	No	No	No	No
Motor vehicle light service; Motor vehicle general and body repair	No	No	SP-ZBA	Yes	No	No	No	No	No
Lot for stowing towed vehicles	No	No	No	SP-ZBA	--	--	--	--	--
Truck washing	--	--	--	--	--	Yes	No	No	No
Car wash	No	No	SP-ZBA	Yes	No	No	No	No	No
Truck: body shop, leasing, parking, repair, sales, service	--	--	--	--	--	No	No	No	No
Repair shop	No	No	SP-ZBA	Yes	--	SP-ZBA	Yes	No	No
Garage for automotive storage (considered a Residential Use within Billerica's Bylaw)	--	--	--	--	SP - ZBA	SP-ZBA	SP-ZBA	SP-ZBA	No
Limousine, taxicab or livery business	--	--	--	--	SP - ZBA	--	--	--	--
Automotive stereo systems installation	--	--	--	--	SP - ZBA	--	--	--	--
Restaurant (For Lowell, this includes take-out restaurants and ones less and greater than 5,000 sq. ft. of g.f.l.	No	No	SP-ZBA	SP-ZBA	SP - PB	SP-ZBA	SP-ZBA	No	No
Restaurant, fast-food or drive-through	--	--	--	--	SP - PB	--	--	--	--
Fast-Order Food Establishment	--	--	--	--	--	Yes	Yes	No	No
Drive-up/through restaurant	--	--	--	--	--	No	No	No	No

Commercial Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Business or professional office (with a gross floor area of greater or lesser than 5,000 sq. ft. under Lowell's Zoning Bylaw)	No	No	SP-ZBA	Yes	Yes	Yes	Yes	No	No
Medical or dental center or clinic, including laboratories incidental thereto	No	No	Yes	SP-ZBA	--	--	--	--	--
Freestanding ATM or kiosk for public use	--	--	--	--	No	--	--	--	--
Bank	--	--	--	--	--	SP-ZBA	Yes	No	No
Adult day care	Broken out into finer categories in the 2 rows below				No	--	--	--	--
Adult day care, small	Yes	Yes	No	No	--	--	--	--	--
Adult day care, large	SP-ZBA	SP-ZBA	No	No	--	--	--	--	--
Family day care, small	Yes	Yes	No	No	--	--	--	--	--
Family day care, large	SP-ZBA	SP-ZBA	No	No	--	--	--	--	--
Adult use establishment	No	No	No	No	SP - PB	No	No	No	No
Golf course and riding stable	--	--	--	--	--	SP-ZBA	SP-ZBA	SP-ZBA	S-ZBA
In multi-family dwellings, hospitals or hotels with more than thirty (30) sleeping rooms, a newsstand, barbershop, dining room or similar service for occupants thereof (Lowell considers this an accessory use)	Yes	Yes	Yes	Yes	--	--	--	--	--

Commercial Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Indoor commercial recreation (considered an Institutional, Recreational and Educational Use with Lowell's Bylaw)	No	No	Yes	Yes	SP - PB	No	Yes	No	No
Outdoor Commercial recreation (considered an Institutional, Recreational and Educational Use with Lowell's Bylaw)	SP-ZBA	SP-ZBA	Yes	SP-ZBA	SP - PB	SP-ZBA	SP-ZBA	SP-ZBA	S-ZBA
Membership club, civic, social, professional or fraternal organization	--	--	--	--	SP - ZBA	--	--	--	--
Conservation, driving range, fairs and bazaar, non-municipal athletics and other recreational events	--	--	--	--	--	Yes	Yes	Yes	Yes
Wireless Communications Facility	--	--	--	--	See Section 6400 of the Zoning Bylaw	SP-PB	SP-PB	SP-PB	SP-PB
Telephone Answering Service/Call Center	No	No	Yes	Yes	--	--	--	--	--
Radio or television studio and transmission stations (including towers related to said use)	No	No	Yes (SP-ZBA for transmission stations)	Yes	--	--	--	--	--
Telecommunications facilities	SP-ZBA	SP-ZBA	SP-ZBA	SP-ZBA	--	--	--	--	--
Antique shows and bowling alley	--	--	--	--	--	Yes	Yes	No	No
Airport, airfield or airstrip	--	--	--	--	No	--	--	--	--
Swimming pool, non-accessory	--	--	--	--	--	Yes	Yes	SP-ZBA	SP-ZBA
Mobile parked food service	--	--	--	--	No	--	--	--	--
Itinerant roadside vending	--	--	--	--	No	--	--	--	--
Massage parlor	No	No	SP-ZBA	SP-ZBA	No	--	--	--	--

Commercial Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Body art establishment	No	No	SP-ZBA	SP-ZBA	--	--	--	--	--
Art/craft studio	No	No	SP-ZBA	SP-ZBA	--	--	--	--	--
Major Commercial Project	--	--	--	--	SP - PB	--	--	--	--
Massage Therapy (Licensed)	--	--	--	--	No	--	--	--	--
Drive-through facility	No	No	SP-ZBA	SP-ZBA	SP - PB	--	--	--	--
Garaging or parking of one light commercial vehicle (Accessory Use Only) (Billerica's Zoning Bylaw does not specify "Accessory Use Only")	--	--	--	--	Yes	Yes	Yes	Yes	Yes
Garaging or parking of two light commercial vehicle (Accessory Use Only) (Billerica's Zoning Bylaw does not specify "Accessory Use Only")	--	--	--	--	Yes	Yes	Yes	SP-ZBA	SP-ZBA
Garaging or parking of three or more light commercial vehicle (Accessory Use Only)	--	--	--	--	Yes	--	--	--	--
Garaging or parking of one heavy commercial vehicle (Accessory Use Only) (Billerica's Zoning Bylaw does not specify "Accessory Use Only")	--	--	--	--	Yes	Yes	SP-ZBA	S-ZBA	SP-ZBA
Garaging or parking of two or more heavy commercial vehicle (Accessory Use Only) (Billerica's Zoning Bylaw does not specify "Accessory Use Only")	--	--	--	--	Yes	Yes	No	No	No

Commercial Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Provision of a garage or parking space for occupants, employees, customers, or visitors (Lowell considers this an accessory use)	Yes	Yes	yes	Yes	--	--	--	--	--
Parking lots and structures other than those provided as an accessory use to the principal use being conducted on the lot	No	No	SP-ZBA	SP-ZBA	--	--	--	--	--
A private parking structure or parking area, used solely for the parking of passenger cars of residents of other lots located within 400 feet or their guests, owned or operated by private individual(s), trust(s), associations(s), or corporation(s); and by a registered not-for-profit or public entity and not operated as a gainful business	No	No	SP-ZBA	No	--	--	--	--	--
A parking area, as an accessory use, located within 1000 feet of the primary use and for the parking of passenger cars of employees, customers or guests of commercial or institutional establishments	No	No	Yes	Yes	--	--	--	--	--

Commercial Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Parking or allowing to stand any motor vehicle and/or motor vehicle attachment (excluding recreational vehicles) having a gross vehicle weight of twelve thousand (12,000) pounds or more, or exceeding 24 feet in length, or having three (3) or more axles, for more than one-half (1/2) hour, on any day, at any time	No	No	SP-ZBA	SP-ZBA	--	--	--	--	--
Auto parking	--	--	--	--	--	No	No	No	No
Casino, gambling facility	--	--	--	--	NOT APPLICABLE	--	--	--	--
Loan agency	--	--	--	--	--	Yes	Yes	No	No
Home occupation	Broken out into finer categories in the 2 rows below				--	No	No	Yes	Yes
Home occupation per section 4.3.3 (Accessory use per Lowell's Zoning Bylaw)	Yes	Yes	Yes	Yes	--	--	--	--	--
Home occupation per section 4.3.4(Accessory use per Lowell's Zoning Bylaw)	SP-ZBA	SP-ZBA	SP-ZBA	SP-ZBA	--	--	--	--	--
Garden shop and open air sales	--	--	--	--	--	No	No	No	No
Open air or drive-in retail and service	Broken out into finer categories in the 3 rows below				--	--	--	--	--
Place for exhibition, lettering or sale of gravestones	No	No	SP-ZBA	SP-ZBA	--	--	--	--	--

Commercial Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Fully automated business	--	--	--	--	--	SP-ZBA	No	No	No
Open air or drive-in theater or other open air place of entertainment or athletics conducted for profit	No	No	SP-ZBA	SP-ZBA	--	--	--	--	--
Open lot storage of new building material, machinery and new metals but not including junk, scrap metal, rags, waster paper and similar material provided the area so used is enclosed by a 6 foot high wall or tight fence	No	No	No	SP-ZBA	--	--	--	--	--
Sales place for flowers, garden supplies, agricultural produce conducted partly or wholly outdoors, commercial green house or nursery not exempt pursuant to G.L. c. 40A, s. 3	No	No	Yes	Yes	--	--	--	--	--
Open lot storage of used lumber or other building materials, provided that the area so used is surrounded by a 6 foot high wall or tight fence	No	No	No	SP-ZBA	--	--	--	--	--

Industrial Uses by Zoning District by Community									
Open lot storage of coal, coke, sand or other similar materials, or such storage in silos or hoppers, provided the area is surrounded by a 6 foot high wall or tight fence	No	No	No	SP-ZBA	--	--	--	--	--
Processing of sand and gravel and the manufacture of bituminous concrete	No	No	No	No	--	--	--	--	--
Portable storage unit or shipping container larger than 120 sf (as a primary or accessory use)	No	No	SP-ZBA	Yes	--	--	--	--	--
Research laboratories, manufacture of equipment, electronics industry, assembling of electrical appliances (Billerica's Zoning Bylaw refers to only *Research Facilities)*	--	--	--	--	Yes	SP—PB Requires Site Plan Approval	SP-PB Requires Site Plan Approval	No	No
Accessory uses to Scientific Research or development	--	--	--	--	--	SP-ZBA	SP-ZBA	No	No
Scientific uses which are necessary in connection with scientific research, scientific development or related production activities	No	No	No	SP-ZBA	--	--	--	--	--

Industrial Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Laboratories or research facilities, provided any manufacturing is incidental to the operation of the facility, does not exceed fifty percent of the gross floor area of the building and is not injurious to the surrounding area by nature of dust, noise, smoke and odors	No	No	Yes	Yes	--	--	--	--	--
Welding shop	--	--	--	--	Yes	--	--	--	--
Machine shop	--	--	--	--	Yes	--	--	--	--
Tradesman's shop	--	--	--	--	--	Yes	Yes	No	No
Automotive sales and services (Refer to *Commercial Uses* for Auto repair, sales and service for Billerica)	No	No	SP-ZBA	Yes	--	SP-ZBA	No	No	No
Stone or monument works	No	No	No	No	Yes	--	--	--	--
Ceramic products manufactured by electric kilns	--	--	--	--	No	--	--	--	--
Farm supply warehouse	--	--	--	--	SP - PB	--	--	--	--
Manufacturing (Billerica's Zoning Bylaw refers to *Light Manufacturing*)	--	--	--	--	SP - PB	Yes	No	No	No
Sale of products at retail manufactured on the premises	--	--	--	--	SP - PB	--	--	--	--

Industrial Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Wholesale, warehouse, self-storage, mini-warehouse, or distribution facility *(Wholesale* only applies to Billerica)	No	No	No	Yes	SP - PB	SP-ZBA	No	No	No
Distribution center, parcel delivery center, delivery warehouse	No	No	No	Yes	--	--	--	--	--
Self-storage service facility	No	No	No	Yes	--	No	No	No	No
Heating fuel storage and sales	--	--	--	--	SP - PB	--	--	--	--
Contractor's yard or landscaping business	--	--	--	--	SP - PB	Yes	No	No	No
Contractor garage	No	No	SP-ZBA	Yes	--	--	--	--	--
Junkyard or automobile salvage yard	--	--	--	--	No	--	--	--	--
Steam laundry or dry cleaning plant, food and beverage manufacturing, bottling or processing and commissary, or storage building, manufacturing, assembly, reconditioning and processing plant	No	No	SP-ZBA	Yes	--	--	--	--	--
Commercial storage warehouse, cold storage plant,	No	No	No	Yes	--	--	--	--	--
Transportation or freight terminal (Lowell's Zoning Bylaw refers to RR freight terminals, shops and yards)	No	No	No	No	No	--	--	--	--

Industrial Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Truck or bus terminal, yard or building for storage or servicing of trailers, trucks, shipping containers, or buses and parking lot for trucks	No	No	No	Yes	--	--	--	--	--
Truck stop	--	--	--	--	No	--	--	--	--
Steel Fabrication	--	--	--	--	SP - PB	--	--	--	--
Warehousing	--	--	--	--	See above for warehousing in Tewksbury	--	--	--	--
Removal of loam, sand or gravel	SP-ZBA	SP-ZBA	SP-ZBA	SP-ZBA	SP - PB	--	--	--	--
Earth migration over 500 cubic yards	--	--	--	--	--	SP-ZBA	SP-ZBA	SP-ZBA	S-ZBA
Earth migration of less than 500 cubic yards for: Construction or repair of roads, utilities, public works, and infrastructure; Installation or repair of underground sewage disposal systems; and Excavation for foundations	--	--	--	--	--	Yes	Yes	Yes	Yes
Composting facilities, private sewage treatment plant, refuse composting plant, refuse incinerator, refuse transfer station, residual waste storage, truck terminal, and waste treatment plant	--	--	--	--	--	No	No	No	No

Industrial Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Rendering or preparation of grease tallow, fats and oils, manufacture of shortening, table and other food oils but not including garbage, dead animals, offal or refuse reductions	No	No	No	No	--	--	--	--	--
Accessory service and repair	--	--	--	--	--	SP-ZBA	No	No	No
Temp. Construction Trailer	--	--	--	--	--	Yes	Yes	No	No
Underground utilities and above-ground utilities (municipal)	--	--	--	--	--	Yes	Yes	Yes	Yes
Above-ground utilities, non-municipal	--	--	--	--	--	SP-ZBA	SP-ZBA	SP-ZBA	S-ZBA
Recycling facility	No	No	No	SP-ZBA	--	--	--	--	--
Dismantling or wrecking of used motor vehicles and storage and sale of the parts provided that open lot storage shall not exceed 12 feet in height and that the area so used shall be enclosed by a tight wall or fence of at least the same height as the material so stored	No	No	No	No	--	--	--	--	--
Open lot storage of junk, scrap, rags, paper, junked vehicles and other similar salvage articles provided that open lot storage shall not exceed 12 feet in height and that the area so used shall be enclosed by a tight wall or fence of at least the same height of the material stored	No	No	No	No	--	--	--	--	--

Industrial Uses Con't	TSF	TTF	RR	LI	HI	I	NB	VR	RR
Manufacture, processing, assembly or other industrial operations subject to Building and Health Dept. regulations without limit as to category or product except as otherwise listed in the table below, or as hereinafter prohibited, provided that (a) all dust, fumes, odors, smoke or vapor are effectively confined to the premises or so disposed of as to avoid air pollution, and (b) any noise, vibration or flashing are not normally perceptible without instruments at a distance of 500 feet from the premises, but the following are expressly prohibited: a) Stockyard or abattoir b) Petroleum refining c) Smelting of zinc, copper or iron ores d) Incineration or reduction of garbage, offal or dead animals except as conducted by the City of Lowell e) Cement, lime or gypsum manufacture f) Explosives or fireworks manufacture	SP-ZBA	SP-ZBA	SP-ZBA	SP-ZBA	--	--	--	--	--

Key to symbols in table:

--Denotes that there are no requirements in place
Yes – Permitted Use
No – Prohibited Use
SP-PB – Special Permit/Planning Board
SP-ZBA – Special Permit/Zoning Board of Appeals
SP-CC – Special Permit/City Council (Lowell only)

Woburn Street
Corridor Study

APPENDIX C

Dimensional Requirements by Zoning District and Community

Dimensional Requirements by Zoning District and Community

	Lowell				Tewksbury	Billerica			
	Traditional Neighborhood Single-Family (TSF)	Traditional Neighborhood Two-Family (TTF)	Regional Retail District (RR)	Light Industry, Manufacturing, & Storage (LI)	Heavy Industrial (HI)	Industrial (I)	Neighborhood Business (NB)	Village Residential (VR)	Rural Residential (RR)
Minimum Lot Requirements									
Area (sq. ft.)	7,000 sq. ft.	7,000 sq. ft.	--	--	43,560	60,000 sq. ft.	25,000 sq. ft.	30,000 sq. ft.	50,000 sq. ft.
Width (feet)	--	--	--	--	--	--	--	--	--
Depth (feet)	--	--	--	--	--	--	--	--	--
Frontage (feet)	55	55	25	25	150	150	125	150	200
Minimum Yard Requirements									
Front (feet)	15 (max 20)	15 (max 20)	--	--	50	100	50	35	35
Side (feet)	10 (sum 25)	10	--	--	50	35	25	15	15
Rear (feet)	20	20	40	--	50	50	35	20	20
Maximum Building									
Coverage	--	--	--	--	35%	50%	25%	25%	25%
Stories	2.5	2.5	--	--	2.5	45 above grade plane (5)	2.5	2.5	2.5
Height (feet)	32	32	--	--	35	--	35	35	35
Floor area ratio (FAR)	0.35	--	2	2	--	--	--	--	--

-- Denotes that there are no requirements in place

Information provided below corresponds with each individual zoning district described above for each municipality and is provided for informational purposes only.

Lowell

Traditional Neighborhood Single-Family (TSF) and Two-Family (TTF) District

TSF falls under the Traditional Neighborhood Residential District designation and designed to preserve, promote, and enhance the pedestrian-scale character of Lowell's historic residential neighborhoods. The TSF District encourages single-family homes and the TTF also allows two-family homes on moderately-sized lots and prohibits large-scale developments (Section 3.1.1 (2)).

In the Traditional Neighborhood Districts, the lot coverage for a residential dwelling shall not exceed thirty-five (35) percent of the lot area (section 5.1.1).

In all Traditional Neighborhood Residential Districts at least twenty-five (25) percent of every lot area shall be yard areas. Every part of a required yard shall be open to the sky and unobstructed except for ordinary projections of the belt courses, cornices, sills, skylights and ornamental features projecting from the building not more than twelve (12) inches. Awnings, arbors, fences, flagpoles, recreational and laundry drying equipment and similar objects shall not be considered obstructions when located within the required yard. Open or lattice-enclosed fire escapes for emergency use only are permitted. In measuring a yard for the purpose of determining the width of a side yard, the depth of a rear yard, or the depth of a front yard, the minimum horizontal distance between the corresponding lot line and the building shall be used. The following shall be allowed to be placed within the minimum side and rear yard requirements, but are subject to all applicable front yard requirements (Section 5.1.6):

1. One story accessory buildings up to 120 square feet and 16 feet in height;
2. Above ground pools up to 500 square feet in surface area;
3. One unroofed porch (deck) per dwelling unit, up to 200 square feet in area, may be placed within the rear yard only. This deck may be no closer than five (5) feet from the rear lot line in the TSF District. Decks greater than five (5) feet in height above the mean ground level must be at least ten (10) feet from a rear lot line in the TSF District. Unroofed porches or decks are subject to all applicable side yare requirements; and
4. Garages and accessory buildings that comply with all applicable provisions of section 4.3.5 (4).

Usable Open Space: For the TSF District a minimum Usable Open Space/Dwelling Unit (UOS/DU) is 300. Where a minimum usable open space is required in addition to landscaped open space, there shall be included in every lot, used in whole or in part for dwelling units intended for family occupancy, an area of usable open space, as defined in Section 2, provided at the rate specified in the Table of Dimensional Regulations. Where open space is provided to serve more than one (1) family, it shall be deemed usable only if:

1. Each open space area is at least 15 feet square (i.e. 225 sq. ft.);
2. Such space is at least five (5) feet from any lot lines; and
3. The area designated as usable open space does not include any surface drainage structures or designated wetland areas.

Defined: The parts of a lot designed and developed for outdoor use by the occupants of the lot for recreation, including swimming pools, tennis courts or similar facilities, for gardens or for household service activities such as clothes drying, which space is at least seventy-five (75) percent open to the sky, free of automotive traffic and parking and readily accessible to all those for whom it is required. Open space shall be deemed usable only if at least seventy-five (75) percent of the area has a grade of less than eight (8) percent.

Lot Width: Each lot shall have a width of not less than eighty (80%) percent of the required frontage at all points between the sideline of the right of way along which the frontage of the lot is measured and the nearest point on the front wall of the structure upon such lot. Such width shall be measured along lines which are parallel to such sideline. This provision may be varied upon the grant of a special permit by the Planning Board (Section 5.1.10).

Special Dimensional Regulations

For residential uses permitted in Residential Districts which are not divided into dwelling units, each one thousand (1,000) square feet of gross floor area of the building shall be considered equivalent to one (1) dwelling unit for purposes of computing minimum lot area (Section 5.2.1).

No more than one (1) primary residential dwelling structure shall be built on a lot in the TSF and TTF Districts (Section 5.2.2).

Provisions of a garage or parking space for occupants, employees, customers, or visitors shall be considered as an accessory use, provided where accessory to residential uses in Residential TSF and TTF Districts such garage or parking space shall be limited to the accommodation of five (5) passenger vehicles, or two (2) passenger vehicles for each dwelling unit, which is greater. The storage of any unregistered vehicle and/or repair of a vehicle is prohibited unless otherwise permitted by the respective use district (Section 4.3.5 (2)).

Regional Retail District (RR) District

Retail districts are designed to promote and strengthen retail and related commercial development at key nodal areas where commercial uses should be specifically emphasized (Section 3.1.2).

Side and rear setbacks in the RR district must be at least 15 feet when abutting a residentially zoned lot (Section 5.1.1)

Rear yards in a RR district may be reduced to ten (10) feet by special permit provided there are no residential abutters to the rear of the property and the property does not abut a residential zoning district to the rear (Section 5.1.1 (4)).

Light Industry, Manufacturing, & Storage (LI) District

Industrial Districts are designed to encourage the location of commercial and industrial activities in locations which best serve the needs of these land uses while also protecting the health, safety, and welfare of the occupants of residential properties for whom these activities may constitute nuisances. The LI District allows a broad range of cleaner industrial uses as well as storage activities (Section 3.1.3).

In an Industrial District, an off-site parking area, as an accessory, located within 1000 feet of a primary ise on a separate lot and for the parking of passenger cars of employees, customers or guests of commercial or institutional establishments, provided no charge is made for parking, and no automotive sales or service operations are performed in the parking area, may be allowed by special permit (Section 4.3.5(5)).

The Lowell City Council has adopted the provisions of Massachusetts General Law Chapter 43D and established ***Priority Development Sites*** as shown on the City of Lowell Massachusetts Zoning Map. The purpose of these districts is to promote commercial, industrial, and mixed-use economic development projects on sites that have been identified as priority site for such a development (Section 9.5.1).

No new building or structure shall be constructed nor shall any existing building or structure be enlarged within fifty (50) feet of an existing wetland or body of water, except by special permit, and with the express written approval of the Lowell Conservation Commission, following a public hearing. No septic field shall be constructed or an existing septic field enlarged within seventy-five (75) feet of an existing wetland or body of water. No building permits for construction within one hundred (100) feet of a wetland or within the boundaries of floodplain shall be valid prior to the effective date of a wetlands determination of the applicability and/or the issuance of an order of conditions (Section 5.2.3).

See Section 5-120 of the Code of Ordinances of the City of Lowell for the Lowell Wetlands Regulations.

Tewksbury

Heavy Industrial District

A. Structures may be allowed in excess of 35 feet or two and one-half stories in the Heavy Industrial District upon the issuance of a special permit from the Planning Board. In no event shall a special permit be issued for structures in excess of 60 feet or 5 stories (Section 4210).

B. The minimum side rear-yard setbacks for all buildings shall be fifty (50) feet except where said lots abuts an R40 or R80 Zone in which case the side and rear-yard setbacks shall be one hundred (100) feet minimum, however, that this provision shall not be construed to regulate lots across a public way from lots located in the R40 or R80 Zone (Section 4220).

C. The required front yard setback shall be suitably landscaped and shall not be used for parking, storage or other purposes inconsistent with the landscaped effect (Section 5414).

D. Each lot shall have access only at designated driveways; each lot may have not more than two (2) driveways and one (1) additional driveway for each 200 feet of street frontage above the minimum required; driveways shall conform to Section 5171 of the Zoning Bylaw (Section 5414).

E. A strip not less than 30 feet wide in all side and rear yards where adjacent to any R40 or R80 zone shall be suitably landscaped and not used for parking or any use prohibited in such an adjacent area.

F. In the HI District where a business or industrial use abuts a residential district, a landscape buffer of a minimum of 30 feet up to a maximum 60 feet in depth designed to mitigate the impact of the business or industrial use on abutting residential districts shall be required by the Planning Board between the business or industrial use and the residential district, and that this provision shall be construed to regulate lots across a public way from lots located in the R40 or R80 Zone (Section 5412).

G. Towers and structures for Wireless Communication facilities including a base station for a Distributed Antenna System (DAS) may be allowed within 200 feet of Federal Highways Route 93 and 495 in the Heavy Industrial Zoning District, as shown on the Wireless Communications Facilities Overlay Map (Section 6402, b.).

A single-family building designed exclusively for residential occupancy may be allowed in a HI District upon the issuance of a special permit from the Planning Board; provided, however, the Planning Board, after hearing and as a condition precedent to the granting of such special permit, shall find that the lot in question was in existence and on record on or before the date of adoption of Section 4240 of the Zoning Bylaw (Section 4240).

The Interstate Overlay District is an overlay district that may be superimposed on all Heavy Industrial (HI) zoning districts. All uses permitted in the underlying HI District shall be allowed in the Interstate Overlay District by-right and special permit requirements (See Appendix A of the Zoning Bylaw). The following additional uses shall also be allowed in the Interstate Overlay District upon the issuance of a Special Permit from the Planning Board: (a) Automotive Refueling Station and accessory uses incidental thereto; (b) Car Wash; and (c) Garaging and Towing of Motor Vehicles (Section 8402).

Billerica

The following list of Overlay Districts described below pertains directly to the zoning districts that are found within the Woburn Corridor Study Area for the Town of Billerica.

Overlay Districts

1. ***Historic Overlay District*** (Section 8.E (2)).

All uses permitted by right or by special permit in the underlying districts are permitted by right or by special permit in the Historic Overlay District. In order to foster development that is both compatible and appropriate within historic areas of the Town, the following dimensional requirements shall apply and shall override the dimensional requirements set forth in this Zoning By-Law.

- In the Village Residential and Rural Residential Districts, a minimum side yard of 7 ½ feet and a minimum averaged front yard shall be provided.
- In the Neighborhood Business and Industrial Districts a minimum side yard of 7 ½ feet and an averaged front yard shall be provided. In these districts, the green strip and green space requirements of the Zoning By-law shall not apply.
- In all districts, any building or structure destroyed by fire or natural disaster may be rebuilt with the minimum yard spaces existing prior to such an event notwithstanding other limitations in the Zoning By-law.

2. ***Residential Cluster Overlay District*** (Section 8.E (3)).

All uses permitted by right or by special permit in the underlying districts are permitted by right or by special permit in the Residential Cluster Overlay District, which is intended to encourage the conservation of open space and the efficient use of land in harmony with its natural features.

Dimensional Requirements

- Residential cluster development shall be allowed on parcels of land having a minimum contiguous area of 10 acres located within Village Residence or Rural Residence Districts.
- Lot area may be reduced to 20,000 square feet in Rural Residence Districts, and to 15,000 square feet in the Village Residence District. The land designated as open space must equal or surpass the total area by which all lots have been reduced.
- The minimum frontage in all residential districts may be reduced to100 feet, except the frontage on a cul-de-sac turnaround may be reduced to 75 feet provided the entire frontage is located on the cul-de-sac radius and the lot width parallel to the street at the front building line is a minimum of 100 feet.
- All yards shall conform to the yard requirements set forth in the Zoning By-law for the District in which the use is located.

- No residence, temporary structure, driveway, accessory structure, swimming pool, parking area, filling, paving or fencing shall be located within 100 feet of the perimeter of the applicable Residential Cluster Overlay District, except for utility easements or roadways.
- All contiguous areas within any one discrete Residential Cluster Overlay District shall be utilized in the design of the residential cluster development. No overlay district shall be split so as to render one portion cluster and the other conventional. Any such discrete area shall be developed exclusively as either a conventional subdivision or a residential cluster development.
- The total number of building lots in a residential cluster development shall be no greater that the number of building lots that would otherwise be permitted in the district where the land is located.

Open Space

- The area of open space shall equal at least 40% of the total area of the residential cluster development tract.
- The minimum required open space area may contain ponds, marshes, or other protected wetlands, but a minimum of 40% of the entire site's non-wetland area shall be located within the open space area.
- Parking areas, streets, or other areas associated with the residential cluster development shall not be included in the open space area.
- For open space areas, minimum frontage on a public way or subdivision may be reduced to 40 feet.
- Any area designated as open space must contain at least four acres of contiguous open space land.
- Open space areas shall remain undeveloped but may be subject to easements for the construction, maintenance, and repair of utility and drainage facilities serving the residential cluster development or adjacent parcels.
- Open space areas shall have a shape, dimension, character, and location suitable for passive recreation, conservation, or agricultural purposes.
- Open space areas may not be excavated or filled and must be maintained in their natural state.
- Provisions shall be made so that the open space areas are readily accessible to the owners or occupants of the lots in the residential cluster development, or, if the open space areas are under Town ownership, to the residents of the Town.

3. Townhouse Overlay District

The Townhouse Overlay District may be applied to the Village Residence, Rural Residence, and Neighborhood Business Districts. See Section 8.E (4) in the Zoning Bylaw for Dimensional Requirements pertaining to the Townhouse Overlay District.

4. Elderly Housing Overlay District

The Elderly Housing Overlay District may be applied to the Village Residence, Rural Residence, and Neighborhood Business Districts. The site shall have not less than five contiguous acres of land and not less than 150 feet of frontage. See Section 8.E (5) in the Zoning Bylaw for Dimensional Requirements pertaining to the Elderly Housing Overlay District.

5. Self-Service Overlay District

The Self-Service (Self-Service Storage Facility) Overlay District may be applied to the Industrial District (Section 8.E (6)).

6. Mill Conversion and Reuse Overlay District (MCROD)

The Mill Conversion and Reuse Overlay District (MCROD) may be applied to Neighborhood Business and Industrial Districts. This requires a rezoning of land pursuant to the procedures outlined under Section 17 of the Zoning Bylaw and to M.G.L. C. 40A Section 5. See Section 8.E (7) in the Zoning Bylaw for Dimensional Requirements pertaining to the MCROD District.

The purpose of the Mill Conversion and Overlay District is to: facilitate and encourage the reuse of the North Billerica historic mill buildings in a fashion that is appropriate for the individual properties and compatible with the surrounding land uses; promote diverse housing choices in the Town of Billerica; provide flexibility in meeting the Town's housing and economic development needs; prevent disinvestment and deterioration of historic structures; and encourage sustainable mixed-use development, including transit-oriented development, in the area of the North Billerica Commuter Rail Station.

Woburn Street
Corridor Study

APPENDIX D

ATR Volume Data

Northern Middlesex Council of Governments
WEEKLY SUMMARY FOR LANE
Starting: 5/18/09

Site Reference: Rd Class u5
Site ID: 000000013258
Location: Woburn St W of I-495, 436-2009-4146
Direction: ROAD TOTAL

File: woburnW495.prn
City: Lowell
County: MHD 4146

TIME	MON 18	TUE 19	WED 20	THU 21	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		42	45	68		51			51	155
02:00		27	39	33		33			33	99
03:00		25	31	33		29			29	89
04:00		21	16	31		22			22	68
05:00		55	60	83		66			66	198
06:00		211	210	226		215			215	647
07:00		513	525	545		527			527	1583
08:00		604	613	642		619			619	1859
09:00		476	508	558		514			514	1542
10:00		371	410			390			390	781
11:00	381	401	397			393			393	1179
12:00	414	395	408			405			405	1217
13:00	435	471	445			450			450	1351
14:00	453	416	433			434			434	1302
15:00	525	539	557			540			540	1621
16:00	640	693	688			673			673	2021
17:00	617	679	699			665			665	1995
18:00	583	701	694			659			659	1978
19:00	499	547	586			544			544	1632
20:00	372	416	413			400			400	1201
21:00	297	345	412			351			351	1054
22:00	221	280	278			259			259	779
23:00	145	207	184			178			178	536
24:00	103	120	129			117			117	352
TOTALS	5685	8555	8780	2219	0	8534	0	0	8534	25239
% AVG WKDY	66.6	100.2	102.8	26						
% AVG WEEK	66.6	100.2	102.8	26						
AM Times	12:00	08:00	08:00	08:00		08:00			08:00	
AM Peaks	414	604	613	642		619			619	
PM Times	16:00	18:00	17:00			16:00			16:00	
PM Peaks	640	701	699			673			673	

AWD = 8,534

Factors = (0.90)(NA)

ADT = 7,700

Northern Middlesex Council of Governments
WEEKLY SUMMARY FOR LANE 1 Page: 1
Starting: 5/18/09

Site Reference: Rd Class u5
Site ID: 000000013258
Location: Woburn St W of I-495, 436-2009-4146
Direction: EAST

File: woburnW495.prn
City: Lowell
County: MHD 4146

TIME	MON 18	TUE 19	WED 20	THU 21	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		31	32	48		37			37	111
02:00		14	21	28		21			21	63
03:00		9	15	16		13			13	40
04:00		8	10	16		11			11	34
05:00		13	10	22		15			15	45
06:00		48	42	54		48			48	144
07:00		131	152	149		144			144	432
08:00		195	215	234		214			214	644
09:00		198	195	273		222			222	666
10:00		166	175			170			170	341
11:00	159	199	180			179			179	538
12:00	220	219	217			218			218	656
13:00	238	245	231			238			238	714
14:00	225	211	229			221			221	665
15:00	305	301	299			301			301	905
16:00	361	411	394			388			388	1166
17:00	372	458	438			422			422	1268
:00	375	427	413			405			405	1215
:00	291	346	341			326			326	978
20:00	226	238	256			240			240	720
21:00	178	216	245			213			213	639
22:00	143	163	176			160			160	482
23:00	91	124	112			109			109	327
24:00	71	81	86			79			79	238
TOTALS	3255	4452	4484	840	0	4394	0	0	4394	13031
% AVG WKDY	74	101.3	102	19.1						
% AVG WEEK	74	101.3	102	19.1						
AM Times	12:00	12:00	12:00	09:00		09:00			09:00	
AM Peaks	220	219	217	273		222			222	
PM Times	18:00	17:00	17:00			17:00			17:00	
PM Peaks	375	458	438			422			422	

Site Reference: Rd Class u5
Site ID: 000000013258
Location: Woburn St W of I-495, 436-2009-4146
Direction: WEST

File: woburnW495.prn
City: Lowell
County: MHD 4146

TIME	MON 18	TUE 19	WED 20	THU 21	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		11	13	20		14			14	44
02:00		13	18	5		12			12	36
03:00		16	16	17		16			16	49
04:00		13	6	15		11			11	34
05:00		42	50	61		51			51	153
06:00		163	168	172		167			167	503
07:00		382	373	396		383			383	1151
08:00		409	398	408		405			405	1215
09:00		278	313	285		292			292	876
10:00		205	235			220			220	440
11:00	222	202	217			213			213	641
12:00	194	176	191			187			187	561
13:00	197	226	214			212			212	637
14:00	228	205	204			212			212	637
15:00	220	238	258			238			238	716
16:00	279	282	294			285			285	855
17:00	245	221	261			242			242	727
18:00	208	274	281			254			254	763
19:00	208	201	245			218			218	654
20:00	146	178	157			160			160	481
21:00	119	129	167			138			138	415
22:00	78	117	102			99			99	297
23:00	54	83	72			69			69	209
24:00	32	39	43			38			38	114
TOTALS	2430	4103	4296	1379	0	4136	0	0	4136	12208
% AVG WKDY	58.7	99.2	103.8	33.3						
% AVG WEEK	58.7	99.2	103.8	33.3						
AM Times	11:00	08:00	08:00	08:00		08:00			08:00	
AM Peaks	222	409	398	408		405			405	
PM Times	16:00	16:00	16:00			16:00			16:00	
PM Peaks	279	282	294			285			285	

Northern Middlesex Council of Governments
CLASSIFICATION SUMMARY
MON 05/18/2009

Site Reference: Rd Class u5
Site ID: 000000013258
Location: Woburn St W of I-495, 436-2009-4146
Direction: EAST
Lane: 1

File: woburnW495.prn
City: Lowell
County: MHD 4146

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
11:00	2	106	44	0	0	2	1	0	1	0	1	0	0	0	2	159
12:00	0	175	37	0	2	2	1	0	1	0	0	0	0	0	2	220
13:00	1	189	35	0	2	1	1	3	1	0	0	0	0	0	5	238
14:00	1	171	40	1	2	1	0	2	2	0	0	0	0	0	5	225
15:00	1	235	53	0	3	1	1	1	2	0	1	1	0	0	6	305
16:00	0	276	56	1	6	3	1	2	2	0	1	1	0	0	12	361
17:00	0	291	59	1	1	2	0	2	1	0	3	1	0	0	11	372
18:00	1	298	58	0	2	2	1	0	2	0	2	1	0	0	8	375
19:00	0	246	34	0	1	3	0	0	0	0	1	0	0	0	6	291
20:00	1	180	38	0	0	1	0	0	2	0	1	0	0	0	3	226
21:00	0	150	24	0	0	1	0	0	2	0	0	0	0	0	1	178
22:00	0	131	11	0	0	0	0	0	0	0	0	0	0	0	1	143
23:00	0	81	7	0	0	1	0	0	0	0	0	0	0	0	2	91
24:00	0	64	6	0	0	1	0	0	0	0	0	0	0	0	0	71
DAY TOTAL	7	2593	502	3	19	21	6	10	16	0	10	4	0	0	64	3255
PERCENTS	0.3%	79.7%	15.5%	0.1%	0.6%	0.7%	0.1%	0.3%	0.4%	0.0%	0.3%	0.1%	0.0%	0.0%	1.9%	100%
Pa nger Vehicles		95.2%						Trucks & Buses		4.7%						
AM Times	10:00	11:15	10:15		11:00	10:00	10:00		09:30		09:45				09:45	11:15
AM Peaks	2	175	44		2	2	1		1		1				2	220
PM Times	12:15	16:45	17:00	13:15	15:15	18:00	15:00	12:15	19:30		16:15	15:45			16:45	16:45
PM Peaks	1	304	65	1	6	4	2	3	4		3	2			13	393

Site Reference: Rd Class u5
Site ID: 000000013258
Location: Woburn St W of I-495, 436-2009-4146
Direction: EAST
Lane: 1

File: woburnW495.prn
City: Lowell
County: MHD 4146

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	29	2	0	0	0	0	0	0	0	0	0	0	0	0	31
02:00	0	12	1	0	1	0	0	0	0	0	0	0	0	0	0	14
03:00	0	8	1	0	0	0	0	0	0	0	0	0	0	0	0	9
04:00	0	7	1	0	0	0	0	0	0	0	0	0	0	0	0	8
05:00	0	10	3	0	0	0	0	0	0	0	0	0	0	0	0	13
06:00	0	33	13	0	0	1	0	1	0	0	0	0	0	0	0	48
07:00	1	92	28	1	2	2	0	0	0	0	1	0	1	0	3	131
08:00	1	134	52	0	2	0	0	0	2	0	0	0	0	0	4	195
09:00	1	148	37	0	4	0	0	1	1	1	1	0	0	0	4	198
10:00	0	133	28	0	1	2	1	0	0	0	0	0	0	0	1	166
11:00	0	145	44	0	5	0	0	0	2	0	0	0	0	0	3	199
12:00	1	153	48	2	3	2	1	3	1	0	0	1	0	0	4	219
13:00	3	180	48	0	1	2	2	2	0	0	1	0	0	0	6	245
14:00	2	166	34	1	1	2	0	1	2	0	0	1	0	0	1	211
15:00	2	224	56	1	4	1	1	2	0	0	1	2	1	0	6	301
16:00	2	304	70	0	3	6	2	4	4	0	2	1	0	0	13	411
17:00	4	363	64	0	2	8	1	2	0	0	1	0	2	0	11	458
18:00	2	340	58	2	0	8	1	2	2	0	2	0	1	0	9	427
19:00	1	285	46	1	1	2	0	1	0	0	1	0	1	0	7	346
20:00	0	195	36	1	1	0	0	1	0	0	2	0	0	0	2	238
21:00	2	178	30	0	0	1	0	2	1	0	0	0	0	0	2	216
22:00	3	142	14	0	0	1	0	1	1	0	0	0	0	0	1	163
23:00	0	106	13	0	0	1	0	0	0	0	0	0	0	0	4	124
24:00	0	74	7	0	0	0	0	0	0	0	0	0	0	0	0	81
DAY TOTAL	25	3461	734	9	31	39	9	23	16	1	12	5	6	0	81	4452
PERCENTS	0.6%	77.8%	16.5%	0.3%	0.7%	0.9%	0.2%	0.5%	0.3%	0.0%	0.2%	0.1%	0.1%	0.0%	1.8%	100%
Passenger Vehicles	94.7%								Trucks & Buses	5.2%						
AM Times	06:00	08:30	11:00	11:15	10:30	06:00	08:30	11:15	07:00	07:45	05:45	10:45	06:00		06:30	11:15
AM Peaks	1	161	53	2	6	2	1	3	2	1	1	1	1		4	219
PM Times	13:45	16:45	15:00	13:30	14:30	16:45	12:15	15:15	15:15		14:30	13:30	16:00		15:30	16:45
PM Peaks	4	385	72	2	5	10	2	4	4		2	2	2		14	485

Site Reference: Rd Class u5
Site ID: 000000013258
Location: Woburn St W of I-495, 436-2009-4146
Direction: EAST
Lane: 1

File: woburnW495.prn
City: Lowell
County: MHD 4146

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	27	2	0	1	0	0	0	0	0	0	0	0	0	2	32
02:00	1	16	4	0	0	0	0	0	0	0	0	0	0	0	0	21
03:00	0	12	2	0	0	1	0	0	0	0	0	0	0	0	0	15
04:00	0	7	3	0	0	0	0	0	0	0	0	0	0	0	0	10
05:00	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	10
06:00	0	33	9	0	0	0	0	0	0	0	0	0	0	0	0	42
07:00	0	102	34	0	2	4	4	1	0	1	1	0	0	0	3	152
08:00	4	144	49	1	2	5	0	1	0	0	1	1	0	0	7	215
09:00	0	139	39	0	3	3	0	3	2	0	1	0	0	0	5	195
10:00	1	134	32	1	2	0	1	0	2	0	0	0	0	0	2	175
11:00	1	126	40	0	1	2	1	3	0	0	1	0	0	0	5	180
12:00	1	170	32	0	2	3	0	1	3	0	1	1	0	0	3	217
13:00	1	184	36	0	2	1	0	0	0	0	0	0	0	0	7	231
14:00	1	170	45	1	2	3	0	1	1	0	0	2	0	0	3	229
15:00	4	221	47	1	7	2	1	2	2	0	1	0	0	0	11	299
16:00	2	288	62	3	8	6	2	3	3	0	6	1	0	0	10	394
17:00	3	323	78	1	4	6	1	2	1	0	3	0	1	0	15	438
18:00	4	329	55	1	0	0	0	1	2	0	3	1	1	0	16	413
`:00	3	278	40	1	3	2	1	2	0	0	3	1	0	0	7	341
:00	2	212	33	0	0	2	0	1	1	0	0	0	0	0	5	256
21:00	2	217	21	0	0	2	0	1	0	0	1	0	0	0	1	245
22:00	3	145	18	1	1	1	0	3	0	0	0	0	0	0	4	176
23:00	1	98	11	0	1	0	1	0	0	0	0	0	0	0	0	112
24:00	0	76	9	0	1	0	0	0	0	0	0	0	0	0	0	86
DAY TOTAL	34	3456	706	11	42	43	12	25	17	1	22	7	2	0	106	4484
PERCENTS	0.8%	77.1%	15.8%	0.3%	1.0%	1.0%	0.3%	0.6%	0.3%	0.0%	0.4%	0.1%	0.0%	0.0%	2.3%	100%
Passenger Vehicles		93.5%							Trucks & Buses		6.4%					
AM Times	07:15	11:15	07:15	07:00	06:45	07:45	06:00	07:45	11:00	05:30	07:30	06:30			07:00	07:30
AM Peaks	4	170	49	1	3	6	4	3	3	1	2	1			7	220
PM Times	14:45	16:45	16:15	15:15	15:45	15:30	15:15	14:45	14:45		15:15	13:00	16:30		16:30	16:15
PM Peaks	6	334	78	3	9	8	2	3	5		6	2	2		18	438

Site Reference: Rd Class u5
Site ID: 000000013258
Location: Woburn St W of I-495, 436-2009-4146
Direction: EAST
Lane: 1

File: woburnW495.prn
City: Lowell
County: MHD 4146

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	46	2	0	0	0	0	0	0	0	0	0	0	0	0	48
02:00	0	24	3	0	0	1	0	0	0	0	0	0	0	0	0	28
03:00	0	15	1	0	0	0	0	0	0	0	0	0	0	0	0	16
04:00	0	14	2	0	0	0	0	0	0	0	0	0	0	0	0	16
05:00	1	15	4	0	0	2	0	0	0	0	0	0	0	0	0	22
06:00	0	38	15	0	0	1	0	0	0	0	0	0	0	0	0	54
07:00	4	104	37	0	2	0	0	1	0	0	0	0	0	0	1	149
08:00	2	174	43	1	3	3	1	1	2	0	0	0	0	0	4	234
09:00	2	198	53	1	6	3	2	0	1	0	1	0	0	0	6	273
DAY TOTAL	9	628	160	2	11	10	3	2	3	0	1	0	0	0	11	840
PERCENTS	1.1%	74.8%	19.1%	0.3%	1.4%	1.1%	0.3%	0.2%	0.3%	0.0%	0.1%	0.0%	0.0%	0.0%	1.3%	100%
Passenger Vehicles		94.8%						Trucks & Buses		5.1%						
AM Times	06:15	08:15	08:15	06:45	08:15	07:30	08:15	06:30	07:15		07:45				08:15	08:15
AM Peaks	4	198	53	1	6	4	2	2	2		1				6	273
PM Times																
PM Peaks																
GRAND TOTAL	75	10138	2102	25	103	113	30	60	52	2	45	16	8	0	262	13031
PERCENTS	0.6%	77.8%	16.2%	0.2%	0.8%	0.9%	0.3%	0.5%	0.3%	0.0%	0.3%	0.1%	0.0%	0.0%	2.0%	100%

Site Reference: Rd Class u5
Site ID: 000000013258
Location: Woburn St W of I-495, 436-2009-4146
Direction: WEST
Lane: 2

File: woburnW495.prn
City: Lowell
County: MHD 4146

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
11:00	1	173	38	0	2	4	2	0	0	0	1	0	0	0	1	222
12:00	1	156	33	0	1	1	1	1	0	0	0	0	0	0	0	194
13:00	1	143	41	0	3	1	3	0	1	0	1	0	1	0	2	197
14:00	0	169	38	0	3	0	1	1	2	0	1	0	0	0	13	228
15:00	2	172	27	1	4	1	0	4	0	0	2	1	0	0	6	220
16:00	0	211	50	2	3	6	2	2	0	0	0	0	0	0	3	279
17:00	1	192	34	0	0	1	0	3	2	1	1	0	0	0	10	245
18:00	2	147	41	1	2	6	2	1	0	0	3	1	0	0	2	208
19:00	0	166	30	0	1	1	1	1	0	0	0	0	2	0	6	208
20:00	1	117	20	0	1	3	0	1	0	0	1	0	0	0	2	146
21:00	1	103	12	0	0	0	1	0	1	0	0	0	0	0	1	119
22:00	0	68	8	0	0	1	0	0	0	0	0	0	0	0	1	78
23:00	0	46	7	0	0	0	0	0	0	0	0	0	0	0	1	54
24:00	0	28	4	0	0	0	0	0	0	0	0	0	0	0	0	32
DAY TOTAL	10	1891	383	4	20	25	13	14	6	1	10	2	3	0	48	2430
PERCENTS	0.5%	77.9%	15.8%	0.2%	0.9%	1.1%	0.5%	0.5%	0.2%	0.0%	0.4%	0.0%	0.1%	0.0%	1.9%	100%
Passenger Vehicles	94.9%							Trucks & Buses		6.0%						
AM Times	10:45	10:30	10:15		10:00	10:15	10:15	11:15			09:45				09:45	10:30
AM Peaks	2	179	38		2	4	2	1			1				1	225
PM Times	14:15	15:00	15:00	15:00	13:00	15:15	12:15	14:00	12:30	15:30	16:45	14:15	18:00		13:15	15:00
PM Peaks	2	225	54	2	4	6	3	4	2	1	3	1	2		13	301

Site Reference: Rd Class u5
Site ID: 000000013258
Location: Woburn St W of I-495, 436-2009-4146
Direction: WEST
Lane: 2

File: woburnW495.prn
City: Lowell
County: MHD 4146

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	11
02:00	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	13
03:00	0	14	2	0	0	0	0	0	0	0	0	0	0	0	0	16
04:00	0	11	2	0	0	0	0	0	0	0	0	0	0	0	0	13
05:00	0	37	5	0	0	0	0	0	0	0	0	0	0	0	0	42
06:00	1	121	34	0	0	1	0	1	2	0	0	0	0	0	3	163
07:00	1	280	73	3	5	4	0	6	0	0	3	0	0	0	7	382
08:00	1	326	63	1	2	3	1	3	0	0	0	0	0	0	9	409
09:00	0	215	43	0	3	3	2	2	2	1	1	0	1	0	5	278
10:00	0	171	26	1	2	1	0	1	1	0	0	0	0	0	2	205
11:00	0	155	28	0	2	2	1	3	3	0	1	0	0	0	7	202
12:00	1	134	31	0	1	3	1	2	0	0	0	0	0	0	3	176
13:00	1	165	37	1	2	3	1	0	1	1	1	1	0	0	12	226
14:00	0	159	44	0	0	1	0	1	0	0	0	0	0	0	0	205
15:00	2	182	31	1	5	2	1	2	4	0	2	0	0	0	6	238
16:00	1	210	34	0	5	4	2	4	4	0	0	1	1	0	16	282
17:00	2	169	42	0	1	0	0	3	0	0	1	0	0	0	3	221
18:00	4	211	42	1	1	3	3	2	0	0	0	2	0	0	5	274
?:00	1	165	27	1	1	2	0	1	1	0	0	0	0	0	2	201
?:00	1	140	29	1	0	2	0	2	2	0	0	0	0	0	1	178
21:00	1	110	15	1	0	0	1	0	0	0	0	0	0	0	1	129
22:00	3	89	19	0	0	1	0	2	1	0	0	0	0	0	2	117
23:00	1	70	8	1	0	2	0	0	0	0	0	0	0	0	1	83
24:00	0	36	3	0	0	0	0	0	0	0	0	0	0	0	0	39
DAY TOTAL	21	3194	638	12	30	37	13	35	21	2	9	4	2	0	85	4103
PERCENTS	0.6%	77.9%	15.6%	0.3%	0.8%	1.0%	0.3%	0.8%	0.5%	0.0%	0.2%	0.0%	0.0%	0.0%	2.0%	100%
Passenger Vehicles	93.9%							Trucks & Buses	6.0%							
AM Times	04:30	07:15	06:00	06:15	06:30	07:45	07:45	06:30	10:00	07:30	06:00		07:30		07:30	07:15
AM Peaks	1	326	75	3	6	6	2	7	3	1	3		1		11	409
PM Times	17:15	15:00	16:45	17:30	14:15	15:00	17:15	15:15	15:00	12:15	13:45	17:00	15:15		15:15	15:00
PM Peaks	4	211	51	2	5	5	3	4	5	1	2	2	1		16	282

Site Reference: Rd Class u5
Site ID: 000000013258
Location: Woburn St W of I-495, 436-2009-4146
Direction: WEST
Lane: 2

File: woburnW495.prn
City: Lowell
County: MHD 4146

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	13
02:00	0	13	4	0	1	0	0	0	0	0	0	0	0	0	0	18
03:00	1	14	1	0	0	0	0	0	0	0	0	0	0	0	0	16
04:00	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	6
05:00	1	44	5	0	0	0	0	0	0	0	0	0	0	0	0	50
06:00	3	125	32	0	1	0	1	2	1	0	1	0	0	0	2	168
07:00	0	277	80	0	4	1	3	3	0	0	1	0	0	0	4	373
08:00	4	302	65	1	4	5	2	4	1	0	0	0	0	0	10	398
09:00	2	254	38	1	3	3	4	1	1	0	0	0	0	0	6	313
10:00	2	176	41	0	3	3	2	2	0	0	0	0	0	0	6	235
11:00	2	155	47	0	2	3	1	2	0	0	0	1	0	0	4	217
12:00	3	150	26	0	1	2	2	2	0	1	0	0	0	0	4	191
13:00	4	156	44	0	4	1	0	1	0	1	0	0	0	0	3	214
14:00	2	155	35	0	2	1	0	2	2	0	0	0	0	0	5	204
15:00	0	203	36	0	4	2	2	0	1	0	0	1	2	0	7	258
16:00	3	229	45	3	2	2	1	0	1	0	2	0	0	0	6	294
17:00	0	210	33	0	3	0	1	2	0	0	0	0	0	0	12	261
18:00	1	211	40	3	0	5	1	1	2	0	3	0	2	0	12	281
:00	4	197	29	1	0	3	2	1	1	0	0	0	0	0	7	245
:00	6	127	23	0	0	0	0	0	0	0	0	0	0	0	1	157
21:00	1	139	23	0	0	0	0	0	1	0	0	0	0	0	3	167
22:00	1	87	9	0	2	1	0	0	0	0	0	0	0	0	2	102
23:00	0	61	10	0	0	1	0	0	0	0	0	0	0	0	0	72
24:00	0	36	7	0	0	0	0	0	0	0	0	0	0	0	0	43
DAY TOTAL	40	3338	675	9	36	33	22	23	11	2	7	2	4	0	94	4296
PERCENTS	1.0%	77.8%	15.8%	0.3%	0.9%	0.8%	0.5%	0.5%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	2.1%	100%
Passenger Vehicles		94.3%						Trucks & Buses		5.6%						
AM Times	10:45	07:30	06:15	07:00	06:30	07:30	06:45	07:45	07:30	11:00	04:45	09:30			07:15	06:45
AM Peaks	5	305	80	1	7	6	5	5	2	1	1	1			10	406
PM Times	19:15	15:30	12:45	15:00	12:15	17:00	14:30	12:30	17:45	12:15	17:15	14:15	14:00		16:30	15:30
PM Peaks	6	245	49	3	4	5	3	3	3	1	3	1	2		13	315

Site Reference: Rd Class u5
Site ID: 000000013258
Location: Woburn St W of I-495, 436-2009-4146
Direction: WEST
Lane: 2

File: woburnW495.prn
City: Lowell
County: MHD 4146

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	19	1	0	0	0	0	0	0	0	0	0	0	0	0	20
02:00	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5
03:00	2	12	3	0	0	0	0	0	0	0	0	0	0	0	0	17
04:00	2	11	2	0	0	0	0	0	0	0	0	0	0	0	0	15
05:00	1	53	6	0	0	0	0	0	0	0	0	0	0	0	1	61
06:00	1	129	36	0	1	0	0	2	1	0	0	0	0	0	2	172
07:00	1	278	95	2	5	5	0	4	1	0	0	0	0	0	5	396
08:00	1	311	68	3	3	5	2	4	1	0	0	0	1	0	9	408
09:00	2	219	44	2	3	2	2	4	1	0	0	1	0	0	5	285
DAY TOTAL	10	1037	255	7	12	12	4	14	4	0	0	1	1	0	22	1379
PERCENTS	0.8%	75.2%	18.5%	0.6%	0.9%	0.9%	0.3%	1.1%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	100%
Passenger Vehicles	94.4%							Trucks & Buses	5.5%							
AM Times	02:45	07:00	06:15	07:45	06:45	06:30	08:00	08:00	05:30			07:45	07:15		07:15	07:00
AM Peaks	3	320	95	4	7	7	4	5	2			1	1		9	422
PM Times																
PM Peaks																
GRAND TOTAL	81	9460	1951	32	98	107	52	86	42	5	26	9	10	0	249	12208
PERCENTS	0.7%	77.5%	16.0%	0.3%	0.9%	0.9%	0.5%	0.7%	0.3%	0.0%	0.2%	0.0%	0.0%	0.0%	2.0%	100%

Site Reference: Rd Class u5
Site ID: 000000013258
Location: Woburn St W of I-495, 436-2009-4146
Direction: ROAD TOTAL

File: woburnW495.prn
City: Lowell
County: MHD 4146

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
11:00	3	279	82	0	2	6	3	0	1	0	2	0	0	0	3	381
12:00	1	331	70	0	3	3	2	1	1	0	0	0	0	0	2	414
13:00	2	332	76	0	5	2	4	3	2	0	1	0	1	0	7	435
14:00	1	340	78	1	5	1	1	3	4	0	1	0	0	0	18	453
15:00	3	407	80	1	7	2	1	5	2	0	3	2	0	0	12	525
16:00	0	487	106	3	9	9	3	4	2	0	1	1	0	0	15	640
17:00	1	483	93	1	1	3	0	5	3	1	4	1	0	0	21	617
18:00	3	445	99	1	4	8	3	1	2	0	5	2	0	0	10	583
19:00	0	412	64	0	2	4	1	1	0	0	1	0	2	0	12	499
20:00	2	297	58	0	1	4	0	1	2	0	2	0	0	0	5	372
21:00	1	253	36	0	0	1	1	0	3	0	0	0	0	0	2	297
22:00	0	199	19	0	0	1	0	0	0	0	0	0	0	0	2	221
23:00	0	127	14	0	0	1	0	0	0	0	0	0	0	0	3	145
24:00	0	92	10	0	0	1	0	0	0	0	0	0	0	0	0	103
DAY TOTAL	17	4484	885	7	39	46	19	24	22	1	20	6	3	0	112	5685
PERCENTS	0.3%	78.9%	15.6%	0.2%	0.7%	0.9%	0.4%	0.4%	0.3%	0.0%	0.3%	0.1%	0.0%	0.0%	1.9%	100%
Passenger Vehicles		94.7%						Trucks & Buses		5.2%						
AM Times	10:45	11:00	10:15		11:15	10:15	10:15	11:15	09:30		09:45				09:45	11:00
AM Peaks	4	335	82		3	6	3	1	1		2				3	418
PM Times	14:15	15:00	15:00	15:00	14:30	15:15	12:15	14:45	12:45	15:30	16:45	14:15	18:00		16:15	15:00
PM Peaks	3	500	109	3	9	9	4	6	5	1	6	2	2		21	655

Site Reference: Rd Class u5
Site ID: 000000013258
Location: Woburn St W of I-495, 436-2009-4146
Direction: ROAD TOTAL

File: woburnW495.prn
City: Lowell
County: MHD 4146

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	40	2	0	0	0	0	0	0	0	0	0	0	0	0	42
02:00	0	25	1	0	1	0	0	0	0	0	0	0	0	0	0	27
03:00	0	22	3	0	0	0	0	0	0	0	0	0	0	0	0	25
04:00	0	18	3	0	0	0	0	0	0	0	0	0	0	0	0	21
05:00	0	47	8	0	0	0	0	0	0	0	0	0	0	0	0	55
06:00	1	154	47	0	0	2	0	2	2	0	0	0	0	0	3	211
07:00	2	372	101	4	7	6	0	6	0	0	4	0	1	0	10	513
08:00	2	460	115	1	4	3	1	3	2	0	0	0	0	0	13	604
09:00	1	363	80	0	7	3	2	3	3	2	2	0	1	0	9	476
10:00	0	304	54	1	3	3	1	1	1	0	0	0	0	0	3	371
11:00	0	300	72	0	7	2	1	3	5	0	1	0	0	0	10	401
12:00	2	287	79	2	4	5	2	5	1	0	0	1	0	0	7	395
13:00	4	345	85	1	3	5	3	2	1	1	2	1	0	0	18	471
14:00	2	325	78	1	1	3	0	2	2	0	0	1	0	0	1	416
15:00	4	406	87	2	9	3	2	4	4	0	3	2	1	0	12	539
16:00	3	514	104	0	8	10	4	8	8	0	2	2	1	0	29	693
17:00	6	532	106	0	3	8	1	5	0	0	2	0	2	0	14	679
18:00	6	551	100	3	1	11	4	4	2	0	2	2	1	0	14	701
19:00	2	450	73	2	2	4	0	2	1	0	1	0	1	0	9	547
20:00	1	335	65	2	1	2	0	3	2	0	2	0	0	0	3	416
21:00	3	288	45	1	0	1	1	2	1	0	0	0	0	0	3	345
22:00	6	231	33	0	0	2	0	3	2	0	0	0	0	0	3	280
23:00	1	176	21	1	0	3	0	0	0	0	0	0	0	0	5	207
24:00	0	110	10	0	0	0	0	0	0	0	0	0	0	0	0	120
DAY TOTAL	46	6655	1372	21	61	76	22	58	37	3	21	9	8	0	166	8555
PERCENTS	0.6%	77.8%	16.1%	0.3%	0.8%	0.9%	0.3%	0.6%	0.4%	0.0%	0.2%	0.1%	0.0%	0.0%	1.9%	100%
Passenger Vehicles		94.3%						Trucks & Buses		5.6%						
AM Times	06:15	07:45	07:15	06:15	06:30	06:15	08:30	06:30	10:00	07:45	06:00	10:45	06:00		07:30	07:15
AM Peaks	2	465	115	4	9	6	3	7	5	2	4	1	1		14	604
PM Times	13:45	17:00	16:45	16:45	14:30	17:00	15:15	15:15	15:15	12:15	13:45	12:45	16:00		15:15	17:00
PM Peaks	6	583	119	3	10	12	4	8	8	1	3	2	3		29	744

Site Reference: Rd Class u5
Site ID: 000000013258
Location: Woburn St W of I-495, 436-2009-4146
Direction: ROAD TOTAL

File: woburnW495.prn
City: Lowell
County: MHD 4146

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	40	2	0	1	0	0	0	0	0	0	0	0	0	2	45
02:00	1	29	8	0	1	0	0	0	0	0	0	0	0	0	0	39
03:00	1	26	3	0	0	1	0	0	0	0	0	0	0	0	0	31
04:00	0	11	5	0	0	0	0	0	0	0	0	0	0	0	0	16
05:00	1	49	10	0	0	0	0	0	0	0	0	0	0	0	0	60
06:00	3	158	41	0	1	0	1	2	1	0	1	0	0	0	2	210
07:00	0	379	114	0	6	5	7	4	0	1	2	0	0	0	7	525
08:00	8	446	114	2	6	10	2	5	1	0	1	1	0	0	17	613
09:00	2	393	77	1	6	6	4	4	3	0	1	0	0	0	11	508
10:00	3	310	73	1	5	3	3	2	2	0	0	0	0	0	8	410
11:00	3	281	87	0	3	5	2	5	0	0	1	1	0	0	9	397
12:00	4	320	58	0	3	5	2	3	3	1	1	1	0	0	7	408
13:00	5	340	80	0	6	2	0	1	0	1	0	0	0	0	10	445
14:00	3	325	80	1	4	4	0	3	3	0	0	2	0	0	8	433
15:00	4	424	83	1	11	4	3	2	3	0	1	1	2	0	18	557
16:00	5	517	107	6	10	8	3	3	4	0	8	1	0	0	16	688
17:00	3	533	111	1	7	6	2	4	1	0	3	0	1	0	27	699
18:00	5	540	95	4	0	5	1	2	4	0	6	1	3	0	28	694
`:00	7	475	69	2	3	5	3	3	1	0	3	1	0	0	14	586
:00	8	339	56	0	0	2	0	1	1	0	0	0	0	0	6	413
21:00	3	356	44	0	0	2	0	1	1	0	1	0	0	0	4	412
22:00	4	232	27	1	3	2	0	3	0	0	0	0	0	0	6	278
23:00	1	159	21	0	1	1	1	0	0	0	0	0	0	0	0	184
24:00	0	112	16	0	1	0	0	0	0	0	0	0	0	0	0	129
DAY TOTAL	74	6794	1381	20	78	76	34	48	28	3	29	9	6	0	200	8780
PERCENTS	0.9%	77.4%	15.8%	0.3%	0.9%	0.9%	0.4%	0.5%	0.3%	0.0%	0.3%	0.1%	0.0%	0.0%	2.2%	100%
Passenger Vehicles		94.9%							Trucks & Buses		6.0%					
AM Times	07:15	07:30	06:45	07:00	06:45	07:30	06:45	07:45	07:45	05:30	06:15	06:30			07:15	07:15
AM Peaks	8	461	118	2	10	11	8	8	4	1	2	1			17	613
PM Times	19:30	17:00	15:30	15:15	15:45	15:30	14:30	17:45	14:45	12:15	15:15	13:00	16:45		16:30	15:30
PM Peaks	9	560	117	6	13	10	4	5	6	1	8	2	4		31	727

Site Reference: Rd Class u5
Site ID: 000000013258
Location: Woburn St W of I-495, 436-2009-4146
Direction: ROAD TOTAL

File: woburnW495.prn
City: Lowell
County: MHD 4146

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	65	3	0	0	0	0	0	0	0	0	0	0	0	0	68
02:00	0	29	3	0	0	1	0	0	0	0	0	0	0	0	0	33
03:00	2	27	4	0	0	0	0	0	0	0	0	0	0	0	0	33
04:00	2	25	4	0	0	0	0	0	0	0	0	0	0	0	0	31
05:00	2	68	10	0	0	2	0	0	0	0	0	0	0	0	1	83
06:00	1	167	51	0	1	1	0	2	1	0	0	0	0	0	2	226
07:00	5	382	132	2	7	5	0	5	1	0	0	0	0	0	6	545
08:00	3	485	111	4	6	8	3	5	3	0	0	0	1	0	13	642
09:00	4	417	97	3	9	5	4	4	2	0	1	1	0	0	11	558
DAY TOTAL	19	1665	415	9	23	22	7	16	7	0	1	1	1	0	33	2219
PERCENTS	0.9%	75.1%	18.8%	0.5%	1.1%	0.9%	0.3%	0.7%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	100%
Passenger Vehicles	94.5%							Trucks & Buses	5.4%							
AM Times	08:00	07:00	06:15	08:00	06:45	07:00	08:00	06:30	07:15		07:45	07:45	07:15		07:15	07:00
AM Peaks	6	488	132	5	11	8	5	6	3		1	1	1		13	648
PM Times																
PM Peaks																
GRAND TOTAL	156	19598	4053	57	201	220	82	146	94	7	71	25	18	0	511	25239
PERCENTS	0.7%	77.7%	16.1%	0.3%	0.8%	0.9%	0.4%	0.6%	0.3%	0.0%	0.2%	0.0%	0.0%	0.0%	2.0%	100%

Site Reference: Rd Class u5
Site ID: 000000007787
Location: Woburn St South of I-495
Direction: ROAD TOTAL

File: WoburnS495.prn
City: Lowell
County: 435-2009

TIME	MON 18	TUE 19	WED 20	THU 21	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		47	67	70		61			61	184
02:00		28	34	43		35			35	105
03:00		27	20	34		27			27	81
04:00		38	33	44		38			38	115
05:00		95	82	110		95			95	287
06:00		235	256	240		243			243	731
07:00		774	771	776		773			773	2321
08:00		1078	1076	1065		1073			1073	3219
09:00		1009	957	944		970			970	2910
10:00		607	594	706		635			635	1907
11:00		497	480			488			488	977
12:00		608	567			587			587	1175
13:00	641	584	660			628			628	1885
14:00	564	559	600			574			574	1723
15:00	708	739	737			728			728	2184
16:00	881	923	906			903			903	2710
17:00	901	982	940			941			941	2823
:00	1024	1074	1089			1062			1062	3187
:00	701	763	794			752			752	2258
20:00	465	498	509			490			490	1472
21:00	369	387	467			407			407	1223
22:00	256	288	317			287			287	861
23:00	161	219	203			194			194	583
24:00	107	142	150			133			133	399
TOTALS	6778	12201	12309	4032	0	12124	0	0	12124	35320
% AVG WKDY	55.9	100.6	101.5	33.2						
% AVG WEEK	55.9	100.6	101.5	33.2						
AM Times		08:00	08:00	08:00		08:00			08:00	
AM Peaks		1078	1076	1065		1073			1073	
PM Times	18:00	18:00	18:00			18:00			18:00	
PM Peaks	1024	1074	1089			1062			1062	

AWD = 12,124

Factors = (0.90)(NA)

ADT = 10,900

Northern Middlesex Council of Governments
WEEKLY SUMMARY FOR LANE 1 Page: 1
Starting: 5/18/09

Site Reference: Rd Class u5
Site ID: 000000007787
Location: Woburn St South of I-495
Direction: SOUTH

File: WoburnS495.prn
City: Lowell
County: 435-2009

TIME	MON 18	TUE 19	WED 20	THU 21	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		30	45	36		37			37	111
02:00		15	18	19		17			17	52
03:00		18	14	20		17			17	52
04:00		16	14	17		15			15	47
05:00		67	57	78		67			67	202
06:00		141	150	142		144			144	433
07:00		574	560	562		565			565	1696
08:00		803	780	769		784			784	2352
09:00		722	637	650		669			669	2009
10:00		351	338	427		372			372	1116
11:00		238	240			239			239	478
12:00		304	267			285			285	571
13:00	313	304	303			306			306	920
14:00	261	296	345			300			300	902
15:00	314	330	343			329			329	987
16:00	387	384	352			374			374	1123
17:00	322	344	337			334			334	1003
?:00	386	419	369			391			391	1174
:00	261	267	313			280			280	841
20:00	213	223	223			219			219	659
21:00	170	185	242			199			199	597
22:00	140	145	180			155			155	465
23:00	93	130	115			112			112	338
24:00	47	65	69			60			60	181
TOTALS	2907	6371	6311	2720	0	6270	0	0	6270	18309
% AVG WKDY	46.3	101.6	100.6	43.3						
% AVG WEEK	46.3	101.6	100.6	43.3						
AM Times		08:00	08:00	08:00		08:00			08:00	
AM Peaks		803	780	769		784			784	
PM Times	16:00	18:00	18:00			18:00			18:00	
PM Peaks	387	419	369			391			391	

Site Reference: Rd Class u5
Site ID: 000000007787
Location: Woburn St South of I-495
Direction: NORTH

File: WoburnS495.prn
City: Lowell
County: 435-2009

TIME	MON 18	TUE 19	WED 20	THU 21	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		17	22	34		24			24	73
02:00		13	16	24		17			17	53
03:00		9	6	14		9			9	29
04:00		22	19	27		22			22	68
05:00		28	25	32		28			28	85
06:00		94	106	98		99			99	298
07:00		200	211	214		208			208	625
08:00		275	296	296		289			289	867
09:00		287	320	294		300			300	901
10:00		256	256	279		263			263	791
11:00		259	240			249			249	499
12:00		304	300			302			302	604
13:00	328	280	357			321			321	965
14:00	303	263	255			273			273	821
15:00	394	409	394			399			399	1197
16:00	494	539	554			529			529	1587
17:00	579	638	603			606			606	1820
18:00	638	655	720			671			671	2013
19:00	440	496	481			472			472	1417
20:00	252	275	286			271			271	813
21:00	199	202	225			208			208	626
22:00	116	143	137			132			132	396
23:00	68	89	88			81			81	245
24:00	60	77	81			72			72	218
TOTALS	3871	5830	5998	1312	0	5845	0	0	5845	17011
% AVG WKDY	66.2	99.7	102.6	22.4						
% AVG WEEK	66.2	99.7	102.6	22.4						
AM Times		12:00	09:00	08:00		12:00			12:00	
AM Peaks		304	320	296		302			302	
PM Times	18:00	18:00	18:00			18:00			18:00	
PM Peaks	638	655	720			671			671	

Northern Middlesex Council of Governments
CLASSIFICATION SUMMARY
MON 05/18/2009

Site Reference: Rd Class u5
Site ID: 000000007787
Location: Woburn St South of I-495
Direction: SOUTH
Lane: 1

File: WoburnS495.prn
City: Lowell
County: 435-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
13:00	2	205	70	0	8	4	2	3	6	2	0	3	1	0	7	313
14:00	0	165	69	3	7	2	1	1	3	1	0	3	0	0	6	261
15:00	4	202	74	1	7	4	1	5	5	1	1	0	1	0	8	314
16:00	4	224	94	8	3	5	4	5	13	0	2	5	4	0	16	387
17:00	3	205	68	3	4	5	5	4	4	1	3	0	3	0	14	322
18:00	2	276	63	0	4	6	3	3	5	0	4	4	2	0	14	386
19:00	2	191	44	0	2	5	2	5	1	1	0	2	1	0	5	261
20:00	0	175	24	1	0	3	2	1	3	0	0	1	0	0	3	213
21:00	1	126	37	0	0	5	1	0	0	0	0	0	0	0	0	170
22:00	1	105	24	0	2	0	1	0	3	0	1	0	0	0	3	140
23:00	1	71	15	0	0	2	0	0	1	0	1	0	0	0	2	93
24:00	1	41	4	0	0	0	1	0	0	0	0	0	0	0	0	47
DAY TOTAL	21	1986	586	16	37	41	23	27	44	6	12	18	12	0	78	2907
PERCENTS	0.8%	68.4%	20.2%	0.6%	1.3%	1.4%	0.7%	0.9%	1.5%	0.2%	0.4%	0.6%	0.4%	0.0%	2.6%	100%

Passenger Vehicles 89.1% Trucks & Buses 10.8%

AM Times
AM Peaks

PM Times	14:30	17:15	15:00	15:15	12:15	17:30	16:00	13:45	15:00	12:15	17:00	15:15	15:00		16:45	15:15
PM Peaks	7	276	98	8	8	7	7	5	14	2	5	5	4		20	387

Site Reference: Rd Class u5
Site ID: 000000007787
Location: Woburn St South of I-495
Direction: SOUTH
Lane: 1

File: WoburnS495.prn
City: Lowell
County: 435-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	25	5	0	0	0	0	0	0	0	0	0	0	0	0	30
02:00	0	12	3	0	0	0	0	0	0	0	0	0	0	0	0	15
03:00	0	11	5	0	1	0	0	0	1	0	0	0	0	0	0	18
04:00	0	10	5	0	1	0	0	0	0	0	0	0	0	0	0	16
05:00	0	50	14	0	0	1	0	0	1	0	0	0	0	0	1	67
06:00	3	98	29	0	0	8	0	0	1	0	0	0	1	0	1	141
07:00	4	394	135	5	3	6	1	5	4	1	2	0	0	0	14	574
08:00	6	567	149	5	6	8	3	7	9	0	7	2	6	0	28	803
09:00	5	545	121	3	9	6	3	2	3	0	4	1	3	0	17	722
10:00	1	232	83	1	9	9	1	2	8	0	3	0	1	0	1	351
11:00	0	144	64	2	6	4	0	4	2	2	2	1	1	0	6	238
12:00	3	198	65	0	6	9	1	4	6	1	3	1	0	0	7	304
13:00	0	198	76	1	1	4	1	4	4	0	3	0	4	0	8	304
14:00	0	196	74	0	6	5	2	0	5	0	3	1	0	0	4	296
15:00	2	214	68	4	5	10	0	8	9	1	3	0	1	0	5	330
16:00	4	241	89	4	5	5	3	5	8	0	4	3	0	0	13	384
17:00	4	218	78	2	4	9	5	1	3	1	4	2	1	0	12	344
18:00	4	282	74	3	4	7	8	4	1	2	4	3	2	0	21	419
`:00	3	194	41	0	3	9	2	3	2	0	0	2	1	0	7	267
:00	2	164	41	1	0	6	2	2	1	0	2	0	0	0	2	223
21:00	2	142	36	0	0	0	0	3	1	0	0	0	0	0	1	185
22:00	1	109	29	0	0	0	1	0	1	0	0	0	0	0	4	145
23:00	3	103	20	0	1	0	0	0	2	0	0	1	0	0	0	130
24:00	0	55	7	0	1	2	0	0	0	0	0	0	0	0	0	65
DAY TOTAL	47	4402	1311	31	71	108	33	54	72	8	44	17	21	0	152	6371
PERCENTS	0.8%	69.1%	20.6%	0.5%	1.2%	1.7%	0.6%	0.9%	1.1%	0.1%	0.6%	0.2%	0.3%	0.0%	2.3%	100%
Passenger Vehicles			90.4%						Trucks & Buses			9.5%				
AM Times	07:00	07:45	06:45	07:45	08:30	08:45	08:00	07:00	07:30	09:45	07:15	07:15	07:45		07:00	07:45
AM Peaks	7	623	164	8	12	11	4	8	11	2	7	2	7		28	852
PM Times	17:00	17:15	15:15	14:30	14:45	17:30	17:15	14:30	14:15	16:45	15:45	17:30	12:15		17:15	17:15
PM Peaks	5	282	89	5	7	11	8	10	9	3	7	4	4		21	419

Site Reference: Rd Class u5
Site ID: 000000007787
Location: Woburn St South of I-495
Direction: SOUTH
Lane: 1

File: WoburnS495.prn
City: Lowell
County: 435-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	36	4	0	1	2	0	1	1	0	0	0	0	0	0	45
02:00	0	12	5	0	1	0	0	0	0	0	0	0	0	0	0	18
03:00	0	10	4	0	0	0	0	0	0	0	0	0	0	0	0	14
04:00	0	10	3	0	1	0	0	0	0	0	0	0	0	0	0	14
05:00	1	41	12	0	1	0	0	1	1	0	0	0	0	0	0	57
06:00	6	99	36	0	1	1	1	0	2	0	1	1	0	0	2	150
07:00	7	398	109	2	6	14	2	1	1	0	2	4	2	0	12	560
08:00	9	524	154	8	6	10	3	11	7	1	9	2	3	0	33	780
09:00	7	470	86	3	6	7	3	9	6	1	6	1	4	0	28	637
10:00	4	240	72	1	3	7	0	2	2	0	1	1	1	0	4	338
11:00	2	152	69	1	3	6	0	3	0	0	1	0	0	0	3	240
12:00	3	171	64	1	4	6	1	5	5	1	1	1	0	0	4	267
13:00	5	191	75	1	3	6	3	5	5	0	1	1	2	0	5	303
14:00	0	230	76	2	6	7	1	9	5	0	1	1	2	0	5	345
15:00	3	219	72	3	5	8	0	9	6	0	0	2	3	0	13	343
16:00	6	205	78	1	5	6	3	9	9	2	5	3	4	0	16	352
17:00	2	222	72	2	6	10	3	3	3	0	1	0	1	0	12	337
18:00	3	237	78	5	4	11	4	3	2	0	4	3	2	0	13	369
':00	2	227	53	0	5	3	1	6	4	2	2	1	0	0	7	313
,:00	2	166	37	0	1	4	2	1	4	0	0	1	0	0	5	223
21:00	4	165	56	1	2	6	0	1	0	0	0	0	0	0	7	242
22:00	3	139	27	0	1	4	3	1	1	0	0	0	0	0	1	180
23:00	0	81	23	0	2	2	1	1	1	0	0	0	1	0	3	115
24:00	0	59	5	0	2	0	0	0	1	0	0	0	0	0	2	69
DAY TOTAL	69	4304	1270	31	75	120	31	81	66	7	35	22	25	0	175	6311
PERCENTS	1.1%	68.2%	20.2%	0.5%	1.2%	2.0%	0.5%	1.3%	1.1%	0.1%	0.5%	0.3%	0.3%	0.0%	2.7%	100%
Passenger Vehicles		89.4%						Trucks & Buses		10.5%						
AM Times	07:30	07:45	07:00	07:00	07:00	06:45	07:00	07:30	07:15	07:30	07:15	07:00	07:00		07:30	07:00
AM Peaks	12	570	164	9	9	17	4	14	7	2	9	5	4		40	807
PM Times	15:15	17:00	16:45	17:00	16:00	16:45	16:30	13:00	15:15	14:45	15:15	17:30	15:15		14:45	17:00
PM Peaks	6	249	87	5	8	13	4	10	9	2	5	4	4		18	391

Site Reference: Rd Class u5
Site ID: 000000007787
Location: Woburn St South of I-495
Direction: SOUTH
Lane: 1

File: WoburnS495.prn
City: Lowell
County: 435-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	29	4	0	0	1	0	1	1	0	0	0	0	0	0	36
02:00	1	12	6	0	0	0	0	0	0	0	0	0	0	0	0	19
03:00	1	11	5	0	1	1	0	0	1	0	0	0	0	0	0	20
04:00	1	9	3	0	2	1	0	0	1	0	0	0	0	0	0	17
05:00	1	55	18	0	1	0	0	0	2	0	1	0	0	0	0	78
06:00	3	97	35	0	1	2	0	2	1	0	0	0	0	0	1	142
07:00	5	396	112	4	7	9	1	4	0	0	7	0	0	0	17	562
08:00	12	562	126	2	4	9	4	7	6	2	2	0	6	0	27	769
09:00	4	500	100	0	7	6	3	2	9	0	5	2	2	0	10	650
10:00	6	296	76	2	3	7	2	4	2	3	4	2	4	0	16	427
DAY TOTAL	34	1967	485	8	26	36	10	20	23	5	19	4	12	0	71	2720
PERCENTS	1.3%	72.4%	17.9%	0.3%	1.0%	1.4%	0.4%	0.7%	0.8%	0.1%	0.6%	0.1%	0.4%	0.0%	2.6%	100%
Passenger Vehicles		91.3%						Trucks & Buses		8.6%						
AM Times	07:15	07:30	06:45	06:15	07:00	06:45	07:00	07:00	08:00	09:15	06:15	08:30	07:15		07:00	07:30
AM Peaks	12	599	134	4	8	11	5	8	9	3	7	3	6		27	808
PM Times																
PM Peaks																
GRAND TOTAL	171	12659	3652	86	209	305	97	182	205	26	110	61	70	0	476	18309
PERCENTS	1.0%	69.2%	20.0%	0.5%	1.2%	1.7%	0.6%	0.9%	1.1%	0.1%	0.6%	0.3%	0.3%	0.0%	2.5%	100%

Site Reference: Rd Class u5
Site ID: 000000007787
Location: Woburn St South of I-495
Direction: NORTH
Lane: 2

File: WoburnS495.prn
City: Lowell
County: 435-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
13:00	1	246	50	0	5	10	0	1	1	0	0	2	1	0	11	328
14:00	0	214	61	1	4	7	1	3	4	0	0	1	2	0	5	303
15:00	0	294	59	3	3	5	3	1	4	0	6	2	1	0	13	394
16:00	3	338	83	3	4	7	2	4	8	0	4	4	3	0	31	494
17:00	3	411	106	5	2	4	4	6	3	0	6	2	3	0	24	579
18:00	7	483	64	4	2	5	5	10	9	1	10	0	10	0	28	638
19:00	2	359	48	2	3	6	2	3	1	0	1	0	0	0	13	440
20:00	1	202	38	1	2	2	0	0	1	0	0	1	1	0	3	252
21:00	1	157	30	0	1	1	0	2	1	0	0	0	0	0	6	199
22:00	0	98	16	0	0	1	0	0	0	0	0	0	0	0	1	116
23:00	0	54	5	1	1	1	0	0	1	0	0	0	0	0	5	68
24:00	0	53	7	0	0	0	0	0	0	0	0	0	0	0	0	60
DAY TOTAL	18	2909	567	20	27	49	17	30	33	1	27	12	21	0	140	3871
PERCENTS	0.5%	75.2%	14.7%	0.6%	0.7%	1.3%	0.5%	0.7%	0.8%	0.0%	0.6%	0.3%	0.5%	0.0%	3.6%	100%

Passenger Vehicles 90.2% Trucks & Buses 9.7%

AM Times
AM Peaks

PM Times	17:15	17:00	16:15	16:30	12:30	12:15	17:45	17:00	17:15	16:45	16:45	14:45	17:15		15:15	17:00
PM Peaks	7	483	106	7	6	10	7	12	9	1	10	5	10		31	651

Site Reference: Rd Class u5
Site ID: 000000007787
Location: Woburn St South of I-495
Direction: NORTH
Lane: 2

File: WoburnS495.prn
City: Lowell
County: 435-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	13	3	0	0	1	0	0	0	0	0	0	0	0	0	17
02:00	0	12	0	0	0	1	0	0	0	0	0	0	0	0	0	13
03:00	0	7	2	0	0	0	0	0	0	0	0	0	0	0	0	9
04:00	0	14	3	0	1	2	0	0	2	0	0	0	0	0	0	22
05:00	0	19	5	0	0	2	0	0	2	0	0	0	0	0	0	28
06:00	1	56	22	0	5	4	0	1	2	0	0	1	0	0	2	94
07:00	1	137	43	1	1	8	0	4	1	0	0	0	2	0	2	200
08:00	1	175	60	6	4	3	5	1	6	0	5	0	2	0	7	275
09:00	2	192	50	1	4	6	4	2	4	1	3	3	2	0	13	287
10:00	0	169	50	2	4	8	2	4	5	0	0	2	4	0	6	256
11:00	0	166	53	1	8	4	1	3	9	0	1	3	4	0	6	259
12:00	0	220	55	1	7	6	2	4	3	1	0	1	0	0	4	304
13:00	1	197	47	1	7	7	1	5	0	0	1	0	4	0	9	280
14:00	4	163	64	0	4	1	4	2	6	1	0	2	2	0	10	263
15:00	3	313	56	0	8	2	3	7	1	1	4	1	3	0	7	409
16:00	7	370	91	4	4	4	1	6	7	1	5	3	9	0	27	539
17:00	8	467	99	2	3	8	2	9	6	0	7	2	2	0	23	638
18:00	1	499	85	2	2	11	1	6	6	0	6	1	7	0	28	655
:00	2	406	59	6	2	3	0	3	1	0	2	2	0	0	10	496
:00	2	219	37	0	2	4	2	2	1	0	1	0	0	0	5	275
21:00	1	167	26	0	0	1	0	2	2	0	0	0	0	0	3	202
22:00	5	115	16	0	0	0	0	4	1	0	0	0	1	0	1	143
23:00	1	77	8	0	0	0	0	0	1	0	0	1	0	0	1	89
24:00	0	68	7	0	0	0	0	0	1	0	0	0	0	0	1	77
DAY TOTAL	40	4241	941	27	66	86	28	65	67	5	35	22	42	0	165	5830
PERCENTS	0.7%	72.8%	16.2%	0.5%	1.2%	1.5%	0.5%	1.1%	1.1%	0.0%	0.6%	0.3%	0.7%	0.0%	2.8%	100%
Passenger Vehicles		89.5%						Trucks & Buses		10.4%						
AM Times	08:00	11:15	07:15	07:15	10:45	09:30	07:30	09:00	10:00	08:15	07:15	08:45	09:00		08:15	11:00
AM Peaks	3	220	60	6	11	9	6	5	10	1	5	4	5		13	305
PM Times	16:15	16:45	16:00	18:15	14:00	17:00	13:15	14:45	17:00	14:00	16:45	15:45	15:15		17:00	16:45
PM Peaks	8	550	106	6	10	13	4	10	9	2	8	4	9		32	728

Site Reference: Rd Class u5
Site ID: 000000007787
Location: Woburn St South of I-495
Direction: NORTH
Lane: 2

File: WoburnS495.prn.
City: Lowell
County: 435-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	18	2	0	0	2	0	0	0	0	0	0	0	0	0	22
02:00	0	12	2	0	0	1	0	0	1	0	0	0	0	0	0	16
03:00	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	6
04:00	0	11	2	0	2	1	0	0	3	0	0	0	0	0	0	19
05:00	1	15	6	0	1	2	0	0	0	0	0	0	0	0	0	25
06:00	1	56	27	0	6	6	1	0	6	0	0	0	1	0	2	106
07:00	2	133	48	2	1	6	1	0	3	0	3	1	2	0	9	211
08:00	1	186	47	7	1	7	4	5	11	0	2	0	3	0	22	296
09:00	2	216	56	2	2	5	3	5	5	0	5	2	2	0	15	320
10:00	3	174	44	1	3	6	3	2	5	1	1	1	2	0	10	256
11:00	2	165	46	0	5	9	1	4	0	1	1	0	0	0	6	240
12:00	5	218	46	2	3	6	2	2	6	1	3	1	1	0	4	300
13:00	3	242	57	1	12	4	2	8	6	0	3	2	3	0	14	357
14:00	0	166	54	3	7	6	2	5	4	0	1	1	1	0	5	255
15:00	1	257	69	6	7	8	2	6	4	1	5	1	5	0	22	394
16:00	4	372	104	4	8	6	7	9	6	2	1	5	4	0	22	554
17:00	8	448	84	3	5	5	3	10	8	1	0	3	3	0	22	603
18:00	9	550	84	2	7	7	2	6	8	0	6	2	4	0	33	720
[illegible]:00	2	375	61	5	1	4	1	5	3	0	3	0	2	0	19	481
[illegible]:00	4	225	39	0	2	1	1	1	3	0	1	0	0	0	9	286
21:00	1	185	26	0	0	5	3	2	1	0	0	0	0	0	2	225
22:00	4	102	24	0	1	2	0	2	0	0	0	0	1	0	1	137
23:00	0	72	10	0	1	0	1	0	1	0	0	0	0	0	3	88
24:00	0	62	14	0	0	1	0	1	0	0	0	0	1	0	2	81
DAY TOTAL	53	4266	952	38	75	100	39	73	84	7	35	19	35	0	222	5998
PERCENTS	0.9%	71.2%	15.9%	0.7%	1.3%	1.7%	0.6%	1.2%	1.4%	0.1%	0.5%	0.3%	0.5%	0.0%	3.7%	100%
Passenger Vehicles		87.8%							Trucks & Buses		12.1%					
AM Times	11:15	11:15	07:45	07:15	05:30	06:45	07:30	07:30	07:15	10:45	08:15	07:45	07:45		07:15	08:00
AM Peaks	5	218	58	7	7	10	6	7	11	2	5	2	4		22	325
PM Times	16:30	17:00	15:15	14:30	12:15	14:30	15:45	15:30	17:00	15:30	17:15	15:30	14:30		17:00	17:00
PM Peaks	10	562	104	7	12	10	8	12	11	3	6	6	9		37	744

Site Reference: Rd Class u5
Site ID: 000000007787
Location: Woburn St South of I-495
Direction: NORTH
Lane: 2

File: WoburnS495.prn
City: Lowell
County: 435-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	28	4	0	0	2	0	0	0	0	0	0	0	0	0	34
02:00	0	21	1	0	0	0	0	0	2	0	0	0	0	0	0	24
03:00	0	11	2	0	0	1	0	0	0	0	0	0	0	0	0	14
04:00	0	19	4	0	2	2	0	0	0	0	0	0	0	0	0	27
05:00	0	19	4	0	3	3	0	0	2	0	0	0	1	0	0	32
06:00	0	58	28	0	5	3	0	0	2	0	1	0	0	0	1	98
07:00	3	136	42	2	1	2	6	3	6	0	2	3	2	0	6	214
08:00	3	198	55	2	4	2	3	5	6	0	3	1	3	0	11	296
09:00	1	204	48	2	4	8	5	4	4	1	1	0	3	0	9	294
10:00	2	189	51	4	3	8	2	3	6	0	2	0	0	0	9	279
DAY TOTAL	9	883	239	10	22	31	16	15	28	1	9	4	9	0	36	1312
PERCENTS	0.7%	67.4%	18.3%	0.8%	1.7%	2.4%	1.3%	1.1%	2.1%	0.0%	0.6%	0.3%	0.6%	0.0%	2.7%	100%
Passenger Vehicles		86.2%						Trucks & Buses		13.7%						
AM Times	06:30	08:00	08:45	07:00	05:15	08:45	06:30	07:00	06:00	08:15	06:00	06:15	07:30		07:30	08:45
AM Peaks	4	209	59	4	5	9	7	6	7	1	3	3	5		13	302
PM Times																
PM Peaks																
GRAND TOTAL	120	12299	2699	95	190	266	100	183	212	14	106	57	107	0	563	17011
PERCENTS	0.8%	72.4%	15.9%	0.6%	1.2%	1.6%	0.5%	1.0%	1.2%	0.0%	0.6%	0.3%	0.6%	0.0%	3.3%	100%

Site Reference: Rd Class u5
Site ID: 000000007787
Location: Woburn St South of I-495
Direction: ROAD TOTAL

File: WoburnS495.prn
City: Lowell
County: 435-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
13:00	3	451	120	0	13	14	2	4	7	2	0	5	2	0	18	641
14:00	0	379	130	4	11	9	2	4	7	1	0	4	2	0	11	564
15:00	4	496	133	4	10	9	4	6	9	1	7	2	2	0	21	708
16:00	7	562	177	11	7	12	6	9	21	0	6	9	7	0	47	881
17:00	6	616	174	8	6	9	9	10	7	1	9	2	6	0	38	901
18:00	9	759	127	4	6	11	8	13	14	1	14	4	12	0	42	1024
19:00	4	550	92	2	5	11	4	8	2	1	1	2	1	0	18	701
20:00	1	377	62	2	2	5	2	1	4	0	0	2	1	0	6	465
21:00	2	283	67	0	1	6	1	2	1	0	0	0	0	0	6	369
22:00	1	203	40	0	2	1	1	0	3	0	1	0	0	0	4	256
23:00	1	125	20	1	1	3	0	0	2	0	1	0	0	0	7	161
24:00	1	94	11	0	0	0	1	0	0	0	0	0	0	0	0	107
DAY TOTAL	39	4895	1153	36	64	90	40	57	77	7	39	30	33	0	218	6778
PERCENTS	0.6%	72.3%	17.1%	0.6%	1.0%	1.4%	0.5%	0.8%	1.1%	0.1%	0.5%	0.4%	0.4%	0.0%	3.2%	100%
Passenger Vehicles		89.8%						Trucks & Buses		10.1%						
AM Times																
AM Peaks																
PM Times	17:15	17:15	15:15	15:15	12:30	15:00	16:00	17:00	15:15	12:15	17:00	15:15	17:00		17:00	17:00
PM Peaks	9	759	177	11	14	16	11	15	21	2	14	9	12		49	1034

Site Reference: Rd Class u5
Site ID: 000000007787
Location: Woburn St South of I-495
Direction: ROAD TOTAL

File: WoburnS495.prn
City: Lowell
County: 435-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	38	8	0	0	1	0	0	0	0	0	0	0	0	0	47
02:00	0	24	3	0	0	1	0	0	0	0	0	0	0	0	0	28
03:00	0	18	7	0	1	0	0	0	1	0	0	0	0	0	0	27
04:00	0	24	8	0	2	2	0	0	2	0	0	0	0	0	0	38
05:00	0	69	19	0	0	3	0	0	3	0	0	0	0	0	1	95
06:00	4	154	51	0	5	12	0	1	3	0	0	1	1	0	3	235
07:00	5	531	178	6	4	14	1	9	5	1	2	0	2	0	16	774
08:00	7	742	209	11	10	11	8	8	15	0	12	2	8	0	35	1078
09:00	7	737	171	4	13	12	7	4	7	1	7	4	5	0	30	1009
10:00	1	401	133	3	13	17	3	6	13	0	3	2	5	0	7	607
11:00	0	310	117	3	14	8	1	7	11	2	3	4	5	0	12	497
12:00	3	418	120	1	13	15	3	8	9	2	3	2	0	0	11	608
13:00	1	395	123	2	8	11	2	9	4	0	4	0	8	0	17	584
14:00	4	359	138	0	10	6	6	2	11	1	3	3	2	0	14	559
15:00	5	527	124	4	13	12	3	15	10	2	7	1	4	0	12	739
16:00	11	611	180	8	9	9	4	11	15	1	9	6	9	0	40	923
17:00	12	685	177	4	7	17	7	10	9	1	11	4	3	0	35	982
18:00	5	781	159	5	6	18	9	10	7	2	10	4	9	0	49	1074
`:00	5	600	100	6	5	12	2	6	3	0	2	4	1	0	17	763
:00	4	383	78	1	2	10	4	4	2	0	3	0	0	0	7	498
21:00	3	309	62	0	0	1	0	5	3	0	0	0	0	0	4	387
22:00	6	224	45	0	0	0	1	4	2	0	0	0	1	0	5	288
23:00	4	180	28	0	1	0	0	0	3	0	0	2	0	0	1	219
24:00	0	123	14	0	1	2	0	0	1	0	0	0	0	0	1	142
DAY TOTAL	87	8643	2252	58	137	194	61	119	139	13	79	39	63	0	317	12201
PERCENTS	0.8%	70.9%	18.5%	0.5%	1.2%	1.6%	0.5%	0.9%	1.1%	0.1%	0.6%	0.3%	0.5%	0.0%	2.5%	100%
Passenger Vehicles		90.0%						Trucks & Buses		9.9%						
AM Times	07:45	07:45	07:00	07:45	08:30	08:45	08:00	06:30	07:15	09:45	07:15	08:45	07:45		08:00	07:45
AM Peaks	8	803	218	12	16	18	10	11	15	2	12	5	9		37	1125
PM Times	16:15	16:45	16:00	14:30	14:00	17:00	16:45	14:30	15:15	14:00	15:45	16:00	15:15		17:00	17:00
PM Peaks	12	793	194	9	14	21	9	19	15	3	12	7	9		51	1102

Site Reference: Rd Class u5
Site ID: 000000007787
Location: Woburn St South of I-495
Direction: ROAD TOTAL

File: WoburnS495.prn
City: Lowell
County: 435-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	54	6	0	1	4	0	1	1	0	0	0	0	0	0	67
02:00	0	24	7	0	1	1	0	0	1	0	0	0	0	0	0	34
03:00	0	16	4	0	0	0	0	0	0	0	0	0	0	0	0	20
04:00	0	21	5	0	3	1	0	0	3	0	0	0	0	0	0	33
05:00	2	56	18	0	2	2	0	1	1	0	0	0	0	0	0	82
06:00	7	155	63	0	7	7	2	0	8	0	1	1	1	0	4	256
07:00	9	531	157	4	7	20	3	1	4	0	5	5	4	0	21	771
08:00	10	710	201	15	7	17	7	16	18	1	11	2	6	0	55	1076
09:00	9	686	142	5	8	12	6	14	11	1	11	3	6	0	43	957
10:00	7	414	116	2	6	13	3	4	7	1	2	2	3	0	14	594
11:00	4	317	115	1	8	15	1	7	0	1	2	0	0	0	9	480
12:00	8	389	110	3	7	12	3	7	11	2	4	2	1	0	8	567
13:00	8	433	132	2	15	10	5	13	11	0	4	3	5	0	19	660
14:00	0	396	130	5	13	13	3	14	9	0	2	2	3	0	10	600
15:00	4	476	141	9	12	16	2	15	10	1	5	3	8	0	35	737
16:00	10	577	182	5	13	12	10	18	15	4	6	8	8	0	38	906
17:00	10	670	156	5	11	15	6	13	11	1	1	3	4	0	34	940
18:00	12	787	162	7	11	18	6	9	10	0	10	5	6	0	46	1089
':00	4	602	114	5	6	7	2	11	7	2	5	1	2	0	26	794
:00	6	391	76	0	3	5	3	2	7	0	1	1	0	0	14	509
21:00	5	350	82	1	2	11	3	3	1	0	0	0	0	0	9	467
22:00	7	241	51	0	2	6	3	3	1	0	0	0	1	0	2	317
23:00	0	153	33	0	3	2	2	1	2	0	0	0	1	0	6	203
24:00	0	121	19	0	2	1	0	1	1	0	0	0	1	0	4	150
DAY TOTAL	122	8570	2222	69	150	220	70	154	150	14	70	41	60	0	397	12309
PERCENTS	1.0%	69.7%	18.1%	0.6%	1.3%	1.8%	0.6%	1.2%	1.2%	0.1%	0.5%	0.3%	0.4%	0.0%	3.2%	100%
Passenger Vehicles		88.6%							Trucks & Buses		11.3%					
AM Times	07:30	07:45	07:00	07:00	08:45	06:45	07:30	07:30	07:15	10:45	07:45	07:00	07:30		07:30	07:45
AM Peaks	13	769	203	15	10	27	9	21	18	3	13	6	7		62	1111
PM Times	15:45	17:00	15:15	14:30	12:15	16:45	15:45	15:30	15:15	15:15	17:00	15:15	14:30		17:00	17:00
PM Peaks	14	811	182	10	15	21	11	21	15	4	10	8	11		54	1135

Site Reference: Rd Class u5
Site ID: 000000007787
Location: Woburn St South of I-495
Direction: ROAD TOTAL

File: WoburnS495.prn
City: Lowell
County: 435-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	57	8	0	0	3	0	1	1	0	0	0	0	0	0	70
02:00	1	33	7	0	0	0	0	0	2	0	0	0	0	0	0	43
03:00	1	22	7	0	1	2	0	0	1	0	0	0	0	0	0	34
04:00	1	28	7	0	4	3	0	0	1	0	0	0	0	0	0	44
05:00	1	74	22	0	4	3	0	0	4	0	1	0	1	0	0	110
06:00	3	155	63	0	6	5	0	2	3	0	1	0	0	0	2	240
07:00	8	532	154	6	8	11	7	7	6	0	9	3	2	0	23	776
08:00	15	760	181	4	8	11	7	12	12	2	5	1	9	0	38	1065
09:00	5	704	148	2	11	14	8	6	13	1	6	2	5	0	19	944
10:00	8	485	127	6	6	15	4	7	8	3	6	2	4	0	25	706
DAY TOTAL	43	2850	724	18	48	67	26	35	51	6	28	8	21	0	107	4032
PERCENTS	1.1%	70.7%	18.0%	0.5%	1.2%	1.7%	0.7%	0.9%	1.3%	0.1%	0.6%	0.1%	0.5%	0.0%	2.6%	100%
Passenger Vehicles		89.7%						Trucks & Buses		10.2%						
AM Times	07:15	07:45	06:45	06:15	07:00	08:45	06:45	07:00	08:00	09:15	07:00	06:15	07:15		07:30	07:30
AM Peaks	15	785	183	6	13	17	10	14	14	3	10	3	9		39	1094
PM Times																
PM Peaks																
GRAND TOTAL	291	24958	6351	181	399	571	197	365	417	40	216	118	177	0	1039	35320
PERCENTS	0.9%	70.7%	18.0%	0.6%	1.2%	1.6%	0.5%	1.0%	1.1%	0.1%	0.6%	0.3%	0.5%	0.0%	2.9%	100%

Northern Middlesex Council of Governments
WEEKLY SUMMARY FOR LANE
Starting: 5/18/09

Site Reference: Rd Class u5
Site ID: 000000007584
Location: Billerica Ave at Tewksbury TL
Direction: ROAD TOTAL

File: icaATtewksburyTL.prn
City: Billerica
County: 7-2009

TIME	MON 18	TUE 19	WED 20	THU 21	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		15	25	29		23			23	69
02:00		9	11	18		12			12	38
03:00		14	13	11		12			12	38
04:00		21	24	24		23			23	69
05:00		43	28	37		36			36	108
06:00		156	150	152		152			152	458
07:00		513	514	474		500			500	1501
08:00		770	730	748		749			749	2248
09:00		569	566	604		579			579	1739
10:00		344	330	417		363			363	1091
11:00		327	295			311			311	622
12:00	329	342	336			335			335	1007
13:00	405	361	377			381			381	1143
14:00	313	347	330			330			330	990
15:00	392	393	382			389			389	1167
16:00	454	507	516			492			492	1477
17:00	595	608	599			600			600	1802
18:00	691	676	685			684			684	2052
19:00	433	410	409			417			417	1252
20:00	217	259	263			246			246	739
21:00	164	159	231			184			184	554
22:00	121	133	148			134			134	402
23:00	61	105	103			89			89	269
24:00	33	50	70			51			51	153
TOTALS	4208	7131	7135	2514	0	7092	0	0	7092	20988
% AVG WKDY	59.3	100.5	100.6	35.4						
% AVG WEEK	59.3	100.5	100.6	35.4						
AM Times	12:00	08:00	08:00	08:00		08:00			08:00	
AM Peaks	329	770	730	748		749			749	
PM Times	18:00	18:00	18:00			18:00			18:00	
PM Peaks	691	676	685			684			684	

AWD = 7,092

FACTORS = (0.90)(NA)

ADT = 6,400

Northern Middlesex Council of Governments
WEEKLY SUMMARY FOR LANE 1 Page: 1
Starting: 5/18/09

Site Reference: Rd Class u5
Site ID: 000000007584
Location: Billerica Ave at Tewksbury TL
Direction: NORTH

File: icaATtewksburyTL.prn
City: Billerica
County: 7-2009

TIME	MON	TUE	WED	THU	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
	18	19	20	21						
01:00		4	7	17		9			9	28
02:00		2	7	10		6			6	19
03:00		7	4	5		5			5	16
04:00		15	17	17		16			16	49
05:00		16	11	16		14			14	43
06:00		45	43	38		42			42	126
07:00		120	107	109		112			112	336
08:00		126	137	133		132			132	396
09:00		127	147	150		141			141	424
10:00		127	146	160		144			144	433
11:00		157	131			144			144	288
12:00	172	148	164			161			161	484
13:00	206	178	184			189			189	568
14:00	159	162	149			156			156	470
15:00	206	218	183			202			202	607
16:00	262	289	319			290			290	870
17:00	406	429	397			410			410	1232
8:00	463	463	471			465			465	1397
9:00	292	294	264			283			283	850
20:00	119	146	158			141			141	423
21:00	69	82	121			90			90	272
22:00	57	75	77			69			69	209
23:00	33	50	50			44			44	133
24:00	14	24	36			24			24	74
TOTALS	2458	3304	3330	655	0	3289	0	0	3289	9747
% AVG WKDY	74.7	100.4	101.2	19.9						
% AVG WEEK	74.7	100.4	101.2	19.9						
AM Times	12:00	11:00	12:00	10:00		12:00			12:00	
AM Peaks	172	157	164	160		161			161	
PM Times	18:00	18:00	18:00			18:00			18:00	
PM Peaks	463	463	471			465			465	

Site Reference: Rd Class u5
Site ID: 000000007584
Location: Billerica Ave at Tewksbury TL
Direction: SOUTH

File: icaATtewksburyTL.prn
City: Billerica
County: 7-2009

TIME	MON 18	TUE 19	WED 20	THU 21	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		11	18	12		13			13	41
02:00		7	4	8		6			6	19
03:00		7	9	6		7			7	22
04:00		6	7	7		6			6	20
05:00		27	17	21		21			21	65
06:00		111	107	114		110			110	332
07:00		393	407	365		388			388	1165
08:00		644	593	615		617			617	1852
09:00		442	419	454		438			438	1315
10:00		217	184	257		219			219	658
11:00		170	164			167			167	334
12:00	157	194	172			174			174	523
13:00	199	183	193			191			191	575
14:00	154	185	181			173			173	520
15:00	186	175	199			186			186	560
16:00	192	218	197			202			202	607
17:00	189	179	202			190			190	570
`:00	228	213	214			218			218	655
:00	141	116	145			134			134	402
20:00	98	113	105			105			105	316
21:00	95	77	110			94			94	282
22:00	64	58	71			64			64	193
23:00	28	55	53			45			45	136
24:00	19	26	34			26			26	79
TOTALS	1750	3827	3805	1859	0	3794	0	0	3794	11241
% AVG WKDY	46.1	100.8	100.2	48.9						
% AVG WEEK	46.1	100.8	100.2	48.9						
AM Times	12:00	08:00	08:00	08:00		08:00			08:00	
AM Peaks	157	644	593	615		617			617	
PM Times	18:00	16:00	18:00			18:00			18:00	
PM Peaks	228	218	214			218			218	

Northern Middlesex Council of Governments
CLASSIFICATION SUMMARY
MON 05/18/2009

Site Reference: Rd Class u5
Site ID: 000000007584
Location: Billerica Ave at Tewksbury TL
Direction: NORTH
Lane: 1

File: icaATtewksburyTL.prn
City: Billerica
County: 7-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
12:00	0	121	26	3	3	0	0	3	1	0	1	0	0	0	14	172
13:00	0	129	55	2	3	0	0	1	0	0	2	0	1	0	13	206
14:00	0	98	36	1	5	0	0	1	0	0	1	0	0	0	17	159
15:00	0	143	28	2	4	0	0	0	0	0	4	0	3	0	22	206
16:00	0	186	49	3	3	0	1	1	1	0	6	1	1	0	10	262
17:00	1	280	55	9	1	0	0	0	1	0	6	2	2	0	49	406
18:00	1	363	44	5	1	0	0	4	2	0	7	1	8	0	27	463
19:00	0	225	33	5	1	0	0	2	2	0	3	0	1	0	20	292
20:00	0	80	20	3	0	0	0	1	0	0	0	0	0	0	15	119
21:00	0	48	17	0	0	0	0	0	0	0	0	0	0	0	4	69
22:00	0	42	12	0	0	0	0	0	0	0	0	0	0	0	3	57
23:00	0	28	5	0	0	0	0	0	0	0	0	0	0	0	0	33
24:00	0	12	2	0	0	0	0	0	0	0	0	0	0	0	0	14
DAY TOTAL	2	1755	382	33	21	0	1	13	7	0	30	4	16	0	194	2458
PERCENTS	0.1%	71.4%	15.6%	1.4%	0.9%	0.0%	0.1%	0.6%	0.2%	0.0%	1.2%	0.1%	0.6%	0.0%	7.8%	100%
Passenger Vehicles	87.0%							Trucks & Buses			12.9%					
AM Times	11:15	11:15	11:15	11:00				11:15	10:30		10:30				11:15	11:15
AM Peaks		121	26	3	3			3	1		1				14	172
PM Times	15:30	17:00	15:45	16:30	13:30		15:00	17:30	17:30		15:00	16:15	17:15		16:15	17:00
PM Peaks	1	368	58	12	7		1	5	4		8	2	8		49	487

Site Reference: Rd Class u5
Site ID: 000000007584
Location: Billerica Ave at Tewksbury TL
Direction: NORTH
Lane: 1

File: icaATtewksburyTL.prn
City: Billerica
County: 7-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	4
02:00	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2
03:00	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	7
04:00	0	7	5	0	2	0	0	1	0	0	0	0	0	0	0	15
05:00	0	7	8	0	0	0	0	0	0	0	0	0	0	0	1	16
06:00	0	26	19	0	0	0	0	0	0	0	0	0	0	0	0	45
07:00	0	64	44	0	4	0	0	1	0	0	1	1	0	0	5	120
08:00	0	72	22	7	3	0	0	0	3	0	1	1	0	0	17	126
09:00	0	85	19	3	0	0	0	1	1	0	2	1	0	0	15	127
10:00	0	78	27	0	4	0	0	5	0	0	1	0	1	0	11	127
11:00	0	100	38	1	2	0	0	3	0	0	1	0	0	0	12	157
12:00	1	84	33	3	4	0	0	1	0	0	3	0	1	0	18	148
13:00	0	122	30	3	4	0	0	3	0	0	3	0	0	0	13	178
14:00	0	102	37	2	2	0	0	2	0	0	2	0	1	0	14	162
15:00	0	136	45	3	3	0	0	2	0	0	3	1	2	0	23	218
16:00	1	199	42	9	3	0	0	1	1	0	4	2	3	0	24	289
17:00	0	306	63	9	3	0	0	5	3	0	3	3	4	0	30	429
18:00	0	339	41	9	4	0	0	1	3	0	13	2	10	0	41	463
:00	0	224	27	2	0	0	0	1	2	0	3	0	4	0	31	294
:00	0	104	18	2	1	0	0	0	0	0	1	0	0	0	20	146
21:00	0	57	16	3	0	0	0	0	0	0	2	0	0	0	4	82
22:00	0	68	3	0	0	0	0	0	0	0	0	1	0	0	3	75
23:00	0	33	8	1	0	0	0	0	0	0	0	0	0	0	8	50
24:00	0	21	2	0	0	0	0	0	0	0	0	0	0	0	1	24
DAY TOTAL	2	2242	552	57	39	0	0	27	13	0	43	12	26	0	291	3304
PERCENTS	0.1%	67.9%	16.8%	1.8%	1.2%	0.0%	0.0%	0.8%	0.3%	0.0%	1.3%	0.3%	0.7%	0.0%	8.8%	100%
Passenger Vehicles		84.6%						Trucks & Buses		15.3%						
AM Times	11:15	10:30	06:15	07:30	10:45			08:45	07:30		10:45	05:45	08:30		11:00	11:00
AM Peaks	1	105	44	8	6			5	4		3	1	1		20	167
PM Times	15:15	17:00	16:15	15:45	12:15			15:45	17:00		17:15	16:00	16:45		17:15	17:00
PM Peaks	1	377	63	13	4			5	5		13	4	10		41	505

Site Reference: Rd Class u5
Site ID: 000000007584
Location: Billerica Ave at Tewksbury TL
Direction: NORTH
Lane: 1

File: icaATtewksburyTL.prn
City: Billerica
County: 7-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	3	2	0	0	0	0	0	0	0	0	0	0	0	2	7
02:00	0	3	4	0	0	0	0	0	0	0	0	0	0	0	0	7
03:00	0	2	1	0	0	0	0	0	0	0	0	0	0	0	1	4
04:00	0	13	2	0	1	0	0	1	0	0	0	0	0	0	0	17
05:00	0	6	3	0	0	0	0	0	0	0	0	0	0	0	2	11
06:00	0	21	17	1	1	0	0	1	0	0	0	0	0	0	2	43
07:00	0	56	42	0	0	0	0	1	0	0	3	0	0	0	5	107
08:00	1	84	32	2	2	0	0	2	0	0	2	1	2	0	9	137
09:00	0	93	31	3	3	0	0	1	1	0	0	0	3	0	12	147
10:00	0	95	30	2	2	0	0	6	0	0	2	0	0	0	9	146
11:00	0	84	31	1	1	0	0	2	0	0	1	0	0	0	11	131
12:00	0	111	32	2	4	0	0	1	0	0	2	0	0	0	12	164
13:00	0	120	33	2	5	0	0	3	1	0	3	1	2	0	14	184
14:00	0	93	37	2	3	0	0	1	0	0	4	0	1	0	8	149
15:00	0	130	32	2	5	0	0	2	0	0	0	0	0	0	12	183
16:00	0	229	47	1	4	0	0	6	1	0	4	1	2	0	24	319
17:00	0	294	48	4	1	0	0	8	3	0	4	0	4	0	31	397
18:00	2	356	40	8	1	1	0	2	2	0	8	2	7	0	42	471
9:00	0	194	33	8	1	0	0	0	0	0	4	1	0	0	23	264
0:00	0	116	20	2	1	0	0	1	0	0	2	0	0	0	16	158
21:00	0	90	18	2	0	0	0	1	0	0	2	0	0	0	8	121
22:00	0	57	10	2	0	0	0	0	0	0	0	0	0	0	8	77
23:00	0	36	7	0	1	0	0	0	0	0	0	0	0	0	6	50
24:00	0	27	7	0	0	0	0	0	0	0	0	0	0	0	2	36
DAY TOTAL	3	2313	559	44	36	1	0	39	8	0	41	6	21	0	259	3330
PERCENTS	0.1%	69.5%	16.8%	1.4%	1.1%	0.1%	0.0%	1.2%	0.2%	0.0%	1.2%	0.1%	0.6%	0.0%	7.7%	100%
Passenger Vehicles		86.3%						Trucks & Buses			13.6%					
AM Times	06:45	11:15	06:15	07:30	08:00			09:15	07:45		06:00	07:00	07:30		07:30	11:15
AM Peaks	1	111	42	3	4			6	1		3	1	4		14	164
PM Times	17:00	16:45	16:30	17:30	14:30	17:00		16:15	16:45		17:30	17:30	17:15		17:00	16:45
PM Peaks	2	372	52	10	6	1		8	4		9	3	7		47	499

Site Reference: Rd Class u5
Site ID: 000000007584
Location: Billerica Ave at Tewksbury TL
Direction: NORTH
Lane: 1

File: icaATtewksburyTL.prn
City: Billerica
County: 7-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	12	1	0	0	0	0	0	0	0	0	0	0	0	4	17
02:00	0	5	4	0	0	0	0	0	0	0	0	0	0	0	1	10
03:00	0	4	0	0	0	0	0	0	0	0	0	0	0	0	1	5
04:00	0	7	4	0	1	1	0	0	0	0	0	0	0	0	4	17
05:00	0	10	3	0	0	0	0	1	0	0	0	0	0	0	2	16
06:00	0	21	13	0	1	0	0	0	0	0	0	0	0	0	3	38
07:00	0	64	27	1	2	0	0	2	0	0	0	0	1	0	12	109
08:00	0	85	23	2	4	0	0	1	0	0	6	2	1	0	9	133
09:00	1	95	29	2	3	0	0	1	1	0	4	0	0	0	14	150
10:00	0	100	35	0	3	0	0	2	1	0	2	2	2	0	13	160
DAY TOTAL	1	403	139	5	14	1	0	7	2	0	12	4	4	0	63	655
PERCENTS	0.2%	61.6%	21.3%	0.8%	2.1%	0.1%	0.0%	1.0%	0.3%	0.0%	1.8%	0.6%	0.6%	0.0%	9.6%	100%
Passenger Vehicles		82.9%						Trucks & Buses			17.0%					
AM Times	08:15	08:30	08:30	07:00	07:45	02:30		05:45	07:45		07:30	07:15	08:45		08:00	08:30
AM Peaks	1	106	42	3	6	1		2	1		7	2	2		15	173
P. imes																
PM Peaks																
GRAND TOTAL	8	6713	1632	139	110	2	1	86	30	0	126	26	67	0	807	9747
PERCENTS	0.1%	68.9%	16.8%	1.5%	1.2%	0.1%	0.1%	0.8%	0.3%	0.0%	1.2%	0.2%	0.6%	0.0%	8.2%	100%

Site Reference: Rd Class u5
Site ID: 000000007584
Location: Billerica Ave at Tewksbury TL
Direction: SOUTH
Lane: 2

File: icaATtewksburyTL.prn
City: Billerica
County: 7-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
12:00	0	110	34	2	3	0	0	0	0	0	2	0	2	0	4	157
13:00	0	132	50	1	1	0	0	2	4	0	2	0	0	0	7	199
14:00	0	105	28	1	4	0	0	2	0	0	1	0	3	0	10	154
15:00	0	115	38	4	5	0	0	1	0	0	2	1	0	0	20	186
16:00	1	128	43	2	2	0	0	4	2	0	0	0	0	0	10	192
17:00	0	119	44	5	3	0	0	1	1	0	2	0	1	0	13	189
18:00	0	155	37	8	1	0	0	1	0	0	4	0	3	0	19	228
19:00	0	94	26	2	1	0	1	0	0	0	0	0	3	0	14	141
20:00	0	73	18	1	0	0	0	0	0	0	1	0	0	0	5	98
21:00	0	70	24	0	0	0	0	0	0	0	0	0	0	0	1	95
22:00	0	46	16	0	2	0	0	0	0	0	0	0	0	0	0	64
23:00	0	18	7	0	0	0	0	1	0	0	0	0	0	0	2	28
24:00	0	16	3	0	0	0	0	0	0	0	0	0	0	0	0	19
DAY TOTAL	1	1181	368	26	22	0	1	12	7	0	14	1	12	0	105	1750
PERCENTS	0.1%	67.5%	21.1%	1.5%	1.3%	0.0%	0.1%	0.6%	0.4%	0.0%	0.8%	0.0%	0.6%	0.0%	6.0%	100%
Passenger Vehicles		88.5%							Trucks & Buses		11.4%					
AM Times		11:15	11:15	11:15	11:15						11:15		11:15		10:45	11:15
AM Peaks		110	34	2	3						2		2		4	157
PM Times	15:00	17:15	12:15	17:15	13:30			17:30	15:00	12:15	17:00	13:45	17:45		17:30	17:15
PM Peaks	1	155	50	8	6			1	5	4	5	1	6		22	228

Site Reference: Rd Class u5
Site ID: 000000007584
Location: Billerica Ave at Tewksbury TL
Direction: SOUTH
Lane: 2

File: icaATtewksburyTL.prn
City: Billerica
County: 7-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	8	3	0	0	0	0	0	0	0	0	0	0	0	0	11
02:00	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	7
03:00	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	7
04:00	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	6
05:00	0	14	11	0	1	0	0	0	1	0	0	0	0	0	0	27
06:00	0	75	33	0	1	0	0	0	1	0	1	0	0	0	0	111
07:00	1	273	99	1	1	0	0	1	3	0	1	0	2	0	11	393
08:00	1	467	80	11	0	0	0	6	2	0	8	3	7	0	59	644
09:00	0	302	50	5	3	1	0	2	2	1	8	2	3	0	63	442
10:00	0	145	39	5	4	0	0	2	0	0	2	1	0	0	19	217
11:00	0	106	39	0	1	0	0	2	0	0	1	1	1	0	19	170
12:00	0	134	28	1	4	0	0	2	2	0	5	0	0	0	18	194
13:00	0	132	27	3	0	0	0	3	0	0	1	1	0	0	16	183
14:00	0	115	38	0	4	0	0	5	0	0	5	0	0	0	18	185
15:00	0	117	30	2	5	0	0	4	0	0	1	0	0	0	16	175
16:00	0	147	33	4	1	0	0	2	2	0	4	0	1	0	24	218
17:00	0	118	29	1	1	0	0	1	2	0	5	0	2	0	20	179
18:00	0	140	32	5	1	0	0	2	1	0	3	1	3	0	25	213
:00	0	77	21	4	1	0	0	0	1	0	0	0	0	0	12	116
:00	0	81	17	0	0	1	0	1	0	0	0	0	0	0	13	113
21:00	0	56	10	1	1	0	0	0	0	0	0	0	0	0	9	77
22:00	0	43	11	0	0	0	0	0	0	0	0	0	0	0	4	58
23:00	0	39	15	0	1	0	0	0	0	0	0	0	0	0	0	55
24:00	0	16	10	0	0	0	0	0	0	0	0	0	0	0	0	26
DAY TOTAL	2	2619	661	43	30	2	0	33	17	1	45	9	19	0	346	3827
PERCENTS	0.1%	68.5%	17.3%	1.2%	0.8%	0.1%	0.0%	0.9%	0.4%	0.0%	1.1%	0.2%	0.4%	0.0%	9.0%	100%
Passenger Vehicles		85.7%						Trucks & Buses		14.2%						
AM Times	06:30	07:15	06:30	07:15	11:00	08:00		07:15	06:00	08:00	07:45	08:00	07:30		07:45	07:15
AM Peaks	2	467	122	11	5	1		6	3	1	9	4	9		87	644
PM Times		15:00	15:45	17:30	14:00	19:00		13:45	15:00		16:00	12:15	16:45		16:45	15:00
PM Peaks		155	39	6	5	1		6	2		7	1	5		30	226

Site Reference: Rd Class u5
Site ID: 000000007584
Location: Billerica Ave at Tewksbury TL
Direction: SOUTH
Lane: 2

File: icaATtewksburyTL.prn
City: Billerica
County: 7-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	9	8	0	0	0	0	1	0	0	0	0	0	0	0	18
02:00	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	4
03:00	0	4	3	0	1	0	0	0	0	0	0	0	0	0	1	9
04:00	0	4	3	0	0	0	0	0	0	0	0	0	0	0	0	7
05:00	0	8	9	0	0	0	0	0	0	0	0	0	0	0	0	17
06:00	0	72	30	0	0	0	0	2	0	0	0	0	0	0	3	107
07:00	1	283	85	2	1	0	0	3	5	0	6	1	0	0	20	407
08:00	0	437	64	13	4	0	0	5	6	0	10	0	4	0	50	593
09:00	0	302	48	8	3	0	0	1	3	0	5	0	3	0	46	419
10:00	0	124	31	1	2	0	0	1	1	0	5	0	0	0	19	184
11:00	1	112	33	0	4	0	0	2	0	0	1	0	2	0	9	164
12:00	1	98	36	2	4	0	0	3	2	0	4	0	1	0	21	172
13:00	0	119	40	2	4	0	0	5	0	0	1	0	0	0	22	193
14:00	0	119	33	1	4	0	0	6	0	0	1	1	1	0	15	181
15:00	0	126	41	0	6	0	0	1	0	0	2	0	2	0	21	199
16:00	0	119	30	7	1	0	0	2	0	0	3	1	3	0	31	197
17:00	0	133	35	4	5	0	0	1	1	0	3	1	0	0	19	202
18:00	2	136	36	8	5	0	0	1	5	0	2	0	2	0	17	214
9:00	0	95	23	3	3	0	0	0	0	0	3	0	0	0	18	145
0:00	1	70	15	1	0	0	0	0	0	0	0	0	1	0	17	105
21:00	0	84	19	0	0	0	0	0	0	0	1	0	0	0	6	110
22:00	0	49	16	0	0	0	0	0	0	0	0	0	0	0	6	71
23:00	0	36	9	1	1	0	0	0	0	0	0	0	0	0	6	53
24:00	0	26	2	0	1	0	0	0	0	0	0	0	0	0	5	34
DAY TOTAL	6	2567	651	53	49	0	0	34	23	0	47	4	19	0	352	3805
PERCENTS	0.2%	67.5%	17.2%	1.4%	1.3%	0.0%	0.0%	0.9%	0.6%	0.0%	1.2%	0.1%	0.4%	0.0%	9.2%	100%

Passenger Vehicles 84.7% Trucks & Buses 15.2%

AM Times	06:00	07:15	06:30	07:00	07:00			06:30	06:45		07:30	06:15	07:30		07:30	07:00
AM Peaks	1	437	93	14	4			6	9		12	1	5		52	594
PM Times	17:15	16:45	12:30	15:30	14:15			12:45	17:00		16:45	13:15	13:45		15:15	17:00
PM Peaks	2	142	42	9	6			7	5		5	1	3		31	219

Site Reference: Rd Class u5
Site ID: 000000007584
Location: Billerica Ave at Tewksbury TL
Direction: SOUTH
Lane: 2

File: icaATtewksburyTL.prn
City: Billerica
County: 7-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	10	0	0	0	0	0	0	0	0	0	0	0	0	2	12
02:00	0	5	3	0	0	0	0	0	0	0	0	0	0	0	0	8
03:00	0	4	1	0	0	0	0	0	0	0	0	0	0	0	1	6
04:00	0	1	4	0	1	0	0	0	0	0	0	0	0	0	1	7
05:00	0	12	9	0	0	0	0	0	0	0	0	0	0	0	0	21
06:00	0	70	37	0	0	0	0	2	0	0	0	0	0	0	5	114
07:00	0	253	66	7	1	0	0	1	0	0	4	0	2	0	31	365
08:00	0	450	66	13	2	0	0	5	2	0	8	2	4	0	63	615
09:00	0	317	52	6	1	0	0	3	1	0	9	3	10	0	52	454
10:00	0	170	42	7	2	0	0	5	2	0	0	1	1	0	27	257
DAY TOTAL	0	1292	280	33	7	0	0	16	5	0	21	6	17	0	182	1859
PERCENTS	0.0%	69.5%	15.1%	1.8%	0.4%	0.0%	0.0%	0.9%	0.3%	0.0%	1.1%	0.3%	0.9%	0.0%	9.7%	100%
Passenger Vehicles		84.5%						Trucks & Buses		15.4%						
AM Times		07:15	07:45	07:00	06:30			07:15	08:30		08:00	07:45	08:15		07:30	07:15
AM Peaks		450	70	13	2			5	3		11	4	10		76	615
PM Times																
PM Peaks																
GRAND TOTAL	9	7659	1960	155	108	2	1	95	52	1	127	20	67	0	985	11241
PERCENTS	0.1%	68.2%	17.5%	1.4%	1.0%	0.1%	0.1%	0.8%	0.4%	0.0%	1.1%	0.1%	0.5%	0.0%	8.7%	100%

Site Reference: Rd Class u5
Site ID: 000000007584
Location: Billerica Ave at Tewksbury TL
Direction: ROAD TOTAL

File: icaATtewksburyTL.prn
City: Billerica
County: 7-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
12:00	0	231	60	5	6	0	0	3	1	0	3	0	2	0	18	329
13:00	0	261	105	3	4	0	0	3	4	0	4	0	1	0	20	405
14:00	0	203	64	2	9	0	0	3	0	0	2	0	3	0	27	313
15:00	0	258	66	6	9	0	0	1	0	0	6	1	3	0	42	392
16:00	1	314	92	5	5	0	1	5	3	0	6	1	1	0	20	454
17:00	1	399	99	14	4	0	0	1	2	0	8	2	3	0	62	595
18:00	1	518	81	13	2	0	0	5	2	0	11	1	11	0	46	691
19:00	0	319	59	7	2	0	1	2	2	0	3	0	4	0	34	433
20:00	0	153	38	4	0	0	0	1	0	0	1	0	0	0	20	217
21:00	0	118	41	0	0	0	0	0	0	0	0	0	0	0	5	164
22:00	0	88	28	0	2	0	0	0	0	0	0	0	0	0	3	121
23:00	0	46	12	0	0	0	0	1	0	0	0	0	0	0	2	61
24:00	0	28	5	0	0	0	0	0	0	0	0	0	0	0	0	33
DAY TOTAL	3	2936	750	59	43	0	2	25	14	0	44	5	28	0	299	4208
PERCENTS	0.1%	69.8%	17.9%	1.5%	1.1%	0.0%	0.0%	0.5%	0.3%	0.0%	1.0%	0.1%	0.6%	0.0%	7.1%	100%
Passenger Vehicles		87.6%						Trucks & Buses		12.3%						
AM Times		11:15	11:15	11:15	11:15			11:15	10:30		11:15		11:15		11:15	11:15
AM Peaks		231	60	5	6			3	1		3		2		18	329
PM Times	15:30	17:15	12:15	16:30	13:30		15:00	15:00	12:15		17:00	16:15	17:30		16:15	17:00
PM Peaks	2	518	105	17	13		1	6	4		11	2	12		62	700

Site Reference: Rd Class u5
Site ID: 000000007584
Location: Billerica Ave at Tewksbury TL
Direction: ROAD TOTAL

File: icaATtewksburyTL.prn
City: Billerica
County: 7-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	10	5	0	0	0	0	0	0	0	0	0	0	0	0	15
02:00	0	6	3	0	0	0	0	0	0	0	0	0	0	0	0	9
03:00	0	10	4	0	0	0	0	0	0	0	0	0	0	0	0	14
04:00	0	11	7	0	2	0	0	1	0	0	0	0	0	0	0	21
05:00	0	21	19	0	1	0	0	0	1	0	0	0	0	0	1	43
06:00	0	101	52	0	1	0	0	0	1	0	1	0	0	0	0	156
07:00	1	337	143	1	5	0	0	2	3	0	2	1	2	0	16	513
08:00	1	539	102	18	3	0	0	6	5	0	9	4	7	0	76	770
09:00	0	387	69	8	3	1	0	3	3	1	10	3	3	0	78	569
10:00	0	223	66	5	8	0	0	7	0	0	3	1	1	0	30	344
11:00	0	206	77	1	3	0	0	5	0	0	2	1	1	0	31	327
12:00	1	218	61	4	8	0	0	3	2	0	8	0	1	0	36	342
13:00	0	254	57	6	4	0	0	6	0	0	4	1	0	0	29	361
14:00	0	217	75	2	6	0	0	7	0	0	7	0	1	0	32	347
15:00	0	253	75	5	8	0	0	6	0	0	4	1	2	0	39	393
16:00	1	346	75	13	4	0	0	3	3	0	8	2	4	0	48	507
17:00	0	424	92	10	4	0	0	6	5	0	8	3	6	0	50	608
18:00	0	479	73	14	5	0	0	3	4	0	16	3	13	0	66	676
9:00	0	301	48	6	1	0	0	1	3	0	3	0	4	0	43	410
.0:00	0	185	35	2	1	1	0	1	0	0	1	0	0	0	33	259
21:00	0	113	26	4	1	0	0	0	0	0	2	0	0	0	13	159
22:00	0	111	14	0	0	0	0	0	0	0	0	1	0	0	7	133
23:00	0	72	23	1	1	0	0	0	0	0	0	0	0	0	8	105
24:00	0	37	12	0	0	0	0	0	0	0	0	0	0	0	1	50
DAY TOTAL	4	4861	1213	100	69	2	0	60	30	1	88	21	45	0	637	7131
PERCENTS	0.1%	68.2%	17.1%	1.5%	1.0%	0.0%	0.0%	0.8%	0.4%	0.0%	1.2%	0.2%	0.6%	0.0%	8.9%	100%
Passenger Vehicles		85.2%						Trucks & Buses		14.7%						
AM Times	06:30	07:15	06:30	07:30	10:45	08:00		08:45	07:30	08:00	07:45	07:15	07:30		07:45	07:15
AM Peaks	2	539	165	19	10	1		8	6	1	10	4	9		104	770
PM Times	15:15	17:00	16:15	15:45	14:00	19:00		13:00	16:45		17:15	16:30	16:45		16:45	17:00
PM Peaks	1	514	92	17	8	1		8	6		16	5	15		68	714

Site Reference: Rd Class u5
Site ID: 000000007584
Location: Billerica Ave at Tewksbury TL
Direction: ROAD TOTAL

File: icaATtewksburyTL.prn
City: Billerica
County: 7-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	12	10	0	0	0	0	1	0	0	0	0	0	0	2	25
02:00	0	5	6	0	0	0	0	0	0	0	0	0	0	0	0	11
03:00	0	6	4	0	1	0	0	0	0	0	0	0	0	0	2	13
04:00	0	17	5	0	1	0	0	1	0	0	0	0	0	0	0	24
05:00	0	14	12	0	0	0	0	0	0	0	0	0	0	0	2	28
06:00	0	93	47	1	1	0	0	3	0	0	0	0	0	0	5	150
07:00	1	339	127	2	1	0	0	4	5	0	9	1	0	0	25	514
08:00	1	521	96	15	6	0	0	7	6	0	12	1	6	0	59	730
09:00	0	395	79	11	6	0	0	2	4	0	5	0	6	0	58	566
10:00	0	219	61	3	4	0	0	7	1	0	7	0	0	0	28	330
11:00	1	196	64	1	5	0	0	4	0	0	2	0	2	0	20	295
12:00	1	209	68	4	8	0	0	4	2	0	6	0	1	0	33	336
13:00	0	239	73	4	9	0	0	8	1	0	4	1	2	0	36	377
14:00	0	212	70	3	7	0	0	7	0	0	5	1	2	0	23	330
15:00	0	256	73	2	11	0	0	3	0	0	2	0	2	0	33	382
16:00	0	348	77	8	5	0	0	8	1	0	7	2	5	0	55	516
17:00	0	427	83	8	6	0	0	9	4	0	7	1	4	0	50	599
18:00	4	492	76	16	6	1	0	3	7	0	10	2	9	0	59	685
:00	0	289	56	11	4	0	0	0	0	0	7	1	0	0	41	409
,:00	1	186	35	3	1	0	0	1	0	0	2	0	1	0	33	263
21:00	0	174	37	2	0	0	0	1	0	0	3	0	0	0	14	231
22:00	0	106	26	2	0	0	0	0	0	0	0	0	0	0	14	148
23:00	0	72	16	1	2	0	0	0	0	0	0	0	0	0	12	103
24:00	0	53	9	0	1	0	0	0	0	0	0	0	0	0	7	70
DAY TOTAL	9	4880	1210	97	85	1	0	73	31	0	88	10	40	0	611	7135
PERCENTS	0.2%	68.4%	17.0%	1.4%	1.2%	0.1%	0.0%	1.0%	0.4%	0.0%	1.2%	0.1%	0.5%	0.0%	8.5%	100%
Passenger Vehicles	85.4%							Trucks & Buses	14.5%							
AM Times	06:45	07:15	06:30	07:30	11:15			06:30	06:45		07:30	07:00	07:30		07:30	07:15
AM Peaks	2	521	135	17	8			7	9		14	2	9		66	730
PM Times	17:15	16:45	16:00	17:30	14:15	17:00		12:45	16:45		16:45	16:45	17:15		17:00	16:45
PM Peaks	4	514	88	19	11	1		10	8		12	3	9		68	715

Site Reference: Rd Class u5
Site ID: 000000007584
Location: Billerica Ave at Tewksbury TL
Direction: ROAD TOTAL

File: icaATtewksburyTL.prn
City: Billerica
County: 7-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	22	1	0	0	0	0	0	0	0	0	0	0	0	6	29
02:00	0	10	7	0	0	0	0	0	0	0	0	0	0	0	1	18
03:00	0	8	1	0	0	0	0	0	0	0	0	0	0	0	2	11
04:00	0	8	8	0	2	1	0	0	0	0	0	0	0	0	5	24
05:00	0	22	12	0	0	0	0	1	0	0	0	0	0	0	2	37
06:00	0	91	50	0	1	0	0	2	0	0	0	0	0	0	8	152
07:00	0	317	93	8	3	0	0	3	0	0	4	0	3	0	43	474
08:00	0	535	89	15	6	0	0	6	2	0	14	4	5	0	72	748
09:00	1	412	81	8	4	0	0	4	2	0	13	3	10	0	66	604
10:00	0	270	77	7	5	0	0	7	3	0	2	3	3	0	40	417
DAY TOTAL	1	1695	419	38	21	1	0	23	7	0	33	10	21	0	245	2514
PERCENTS	0.1%	67.5%	16.7%	1.6%	0.9%	0.0%	0.0%	0.9%	0.2%	0.0%	1.3%	0.3%	0.8%	0.0%	9.7%	100%
Passenger Vehicles		84.1%						Trucks & Buses			15.8%					
AM Times	08:15	07:15	06:00	07:00	07:45	02:30		07:30	08:30		07:30	07:30	08:15		07:30	07:15
AM Peaks	1	535	93	16	7	1		7	4		17	5	10		89	748
P. imes																
PM Peaks																
GRAND TOTAL	17	14372	3592	294	218	4	2	181	82	1	253	46	134	0	1792	20988
PERCENTS	0.1%	68.5%	17.2%	1.5%	1.1%	0.0%	0.0%	0.8%	0.3%	0.0%	1.2%	0.2%	0.6%	0.0%	8.5%	100%

Northern Middlesex Council of Governments
WEEKLY SUMMARY FOR LANE
Starting: 5/18/09

Site Reference: Rd Class u5
Site ID: 000000013256
Location: Billerica Ave North of T Station entranc
Direction: ROAD TOTAL

File: caaveNmtpleasant.prn
City: Billerica
County: 6-2009

TIME	MON 18	TUE 19	WED 20	THU 21	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		16	23	29		22			22	68
02:00		9	16	20		15			15	45
03:00		16	14	11		13			13	41
04:00		21	26	27		24			24	74
05:00		31	22	31		28			28	84
06:00		130	138	133		133			133	401
07:00		451	457	425		444			444	1333
08:00		703	686	692		693			693	2081
09:00		535	498	560		531			531	1593
10:00		302	294	403		333			333	999
11:00		270	266			268			268	536
12:00	255	310	263			276			276	828
13:00	337	304	307			316			316	948
14:00	276	275	294			281			281	845
15:00	341	344	319			334			334	1004
16:00	417	444	460			440			440	1321
17:00	536	555	551			547			547	1642
:00	670	689	681			680			680	2040
:00	442	432	434			436			436	1308
20:00	238	248	256			247			247	742
21:00	155	175	236			188			188	566
22:00	119	131	149			133			133	399
23:00	71	104	102			92			92	277
24:00	42	60	65			55			55	167
TOTALS	3899	6555	6557	2331	0	6529	0	0	6529	19342
% AVG WKDY	59.7	100.3	100.4	35.7						
% AVG WEEK	59.7	100.3	100.4	35.7						
AM Times	12:00	08:00	08:00	08:00		08:00			08:00	
AM Peaks	255	703	686	692		693			693	
PM Times	18:00	18:00	18:00			18:00			18:00	
PM Peaks	670	689	681			680			680	

AWD = 6,529

factors = (0.90)(NA)

ADT = 5,900

Northern Middlesex Council of Governments
WEEKLY SUMMARY FOR LANE 1
Starting: 5/18/09

Site Reference: Rd Class u5
Site ID: 000000013256
Location: Billerica Ave North of T Station entranc
Direction: SOUTH

File: caaveNmtpleasant.prn
City: Billerica
County: 6-2009

TIME	MON 18	TUE 19	WED 20	THU 21	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		11	14	11		12			12	36
02:00		7	8	8		7			7	23
03:00		8	9	6		7			7	23
04:00		6	8	8		7			7	22
05:00		18	14	17		16			16	49
06:00		90	92	92		91			91	274
07:00		337	324	322		327			327	983
08:00		574	522	543		546			546	1639
09:00		402	325	379		368			368	1106
10:00		184	168	251		201			201	603
11:00		131	140			135			135	271
12:00	123	169	138			143			143	430
13:00	169	159	154			160			160	482
14:00	126	137	153			138			138	416
15:00	167	164	154			161			161	485
16:00	198	175	182			185			185	555
17:00	181	180	191			184			184	552
`:00	233	243	220			232			232	696
:00	137	144	171			150			150	452
20:00	113	115	121			116			116	349
21:00	86	84	118			96			96	288
22:00	67	56	70			64			64	193
23:00	33	51	53			45			45	137
24:00	23	32	35			30			30	90
TOTALS	1656	3477	3384	1637	0	3421	0	0	3421	10154
% AVG WKDY	48.4	101.6	98.9	47.8						
% AVG WEEK	48.4	101.6	98.9	47.8						
AM Times	12:00	08:00	08:00	08:00		08:00			08:00	
AM Peaks	123	574	522	543		546			546	
PM Times	18:00	18:00	18:00			18:00			18:00	
PM Peaks	233	243	220			232			232	

Site Reference: Rd Class u5
Site ID: 000000013256
Location: Billerica Ave North of T Station entranc
Direction: NORTH

File: caaveNmtpleasant.prn
City: Billerica
County: 6-2009

TIME	MON 18	TUE 19	WED 20	THU 21	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		5	9	18		10			10	32
02:00		2	8	12		7			7	22
03:00		8	5	5		6			6	18
04:00		15	18	19		17			17	52
05:00		13	8	14		11			11	35
06:00		40	46	41		42			42	127
07:00		114	133	103		116			116	350
08:00		129	164	149		147			147	442
09:00		133	173	181		162			162	487
10:00		118	126	152		132			132	396
11:00		139	126			132			132	265
12:00	132	141	125			132			132	398
13:00	168	145	153			155			155	466
14:00	150	138	141			143			143	429
15:00	174	180	165			173			173	519
16:00	219	269	278			255			255	766
17:00	355	375	360			363			363	1090
`:00	437	446	461			448			448	1344
:00	305	288	263			285			285	856
20:00	125	133	135			131			131	393
21:00	69	91	118			92			92	278
22:00	52	75	79			68			68	206
23:00	38	53	49			46			46	140
24:00	19	28	30			25			25	77
TOTALS	2243	3078	3173	694	0	3098	0	0	3098	9188
% AVG WKDY	72.4	99.3	102.4	22.4						
% AVG WEEK	72.4	99.3	102.4	22.4						
AM Times	12:00	12:00	09:00	09:00		09:00			09:00	
AM Peaks	132	141	173	181		162			162	
PM Times	18:00	18:00	18:00			18:00			18:00	
PM Peaks	437	446	461			448			448	

Northern Middlesex Council of Governments
CLASSIFICATION SUMMARY
MON 05/18/2009

Site Reference: Rd Class u5
Site ID: 000000013256
Location: Billerica Ave North of T Station entranc
Direction: SOUTH
Lane: 1

File: caaveNmtpleasant.prn
City: Billerica
County: 6-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
12:00	1	86	26	0	4	1	0	1	1	0	0	0	0	0	3	123
13:00	2	111	40	1	3	2	2	1	2	0	0	1	0	0	4	169
14:00	0	90	28	0	3	2	0	1	1	0	0	0	0	0	1	126
15:00	0	114	31	3	8	2	0	1	2	0	0	1	1	0	4	167
16:00	2	132	45	0	1	1	1	6	3	0	0	0	0	0	7	198
17:00	0	127	37	1	2	3	0	2	0	0	1	0	1	0	7	181
18:00	1	171	39	2	1	3	0	1	0	0	1	0	2	0	12	233
19:00	1	99	30	0	0	2	0	0	0	0	1	0	0	0	4	137
20:00	1	97	11	0	0	1	0	0	1	0	0	0	0	0	2	113
21:00	0	69	16	0	0	0	0	0	0	0	0	0	0	0	1	86
22:00	1	52	9	0	2	2	0	0	0	0	0	0	0	0	1	67
23:00	0	25	7	0	0	0	0	0	1	0	0	0	0	0	0	33
24:00	0	21	1	0	0	0	0	0	0	0	0	0	0	0	1	23
DAY TOTAL	9	1194	320	7	24	19	3	13	11	0	3	2	4	0	47	1656
PERCENTS	0.6%	72.2%	19.4%	0.5%	1.5%	1.2%	0.1%	0.7%	0.6%	0.0%	0.1%	0.1%	0.2%	0.0%	2.8%	100%
Passenger Vehicles	92.9%							Trucks & Buses	8.0%							
AM Times	10:30	11:15	11:15		11:15	10:45		11:15	11:15						10:30	11:15
AM Peaks	1	86	26		4	1		1	1						3	123
PM Times	12:15	17:15	15:30	14:15	14:15	17:30	12:15	15:15	13:45		15:30	12:15	16:45		17:15	17:15
PM Peaks	2	171	46	3	8	4	2	6	3		1	1	2		12	233

Site Reference: Rd Class u5
Site ID: 000000013256
Location: Billerica Ave North of T Station entranc
Direction: SOUTH
Lane: 1

File: caaveNmtpleasant.prn
City: Billerica
County: 6-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	11
02:00	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	7
03:00	0	6	2	0	0	0	0	0	0	0	0	0	0	0	0	8
04:00	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	6
05:00	0	9	7	0	0	0	0	0	2	0	0	0	0	0	0	18
06:00	2	74	11	0	0	1	0	0	0	0	0	0	0	0	2	90
07:00	3	248	63	0	2	0	0	2	5	0	1	0	1	0	12	337
08:00	4	446	67	4	1	2	1	9	4	0	7	0	2	0	27	574
09:00	1	328	45	1	5	3	3	3	6	0	1	0	0	0	6	402
10:00	1	137	34	0	3	2	0	1	2	0	1	0	0	0	3	184
11:00	0	87	29	0	2	1	0	2	4	1	1	1	0	0	3	131
12:00	1	130	22	1	3	1	1	1	1	0	1	0	1	0	6	169
13:00	2	121	27	1	2	1	0	1	2	0	0	0	0	0	2	159
14:00	1	94	30	0	6	0	0	0	1	0	0	1	0	0	4	137
15:00	0	115	30	0	6	2	0	3	4	0	0	0	1	0	3	164
16:00	3	127	28	1	3	2	1	3	2	0	1	0	0	0	4	175
17:00	3	124	28	1	1	6	1	2	6	0	2	0	1	0	5	180
18:00	4	180	34	1	0	2	3	0	6	1	2	0	2	0	8	243
?:00	3	105	21	1	1	1	2	1	1	0	0	1	0	0	7	144
.:00	3	83	23	0	0	1	1	1	0	0	0	0	0	0	3	115
21:00	1	64	17	0	0	0	0	0	1	0	0	0	0	0	1	84
22:00	0	43	11	0	0	0	0	0	1	0	0	0	0	0	1	56
23:00	1	37	11	0	1	0	1	0	0	0	0	0	0	0	0	51
24:00	0	28	3	0	0	1	0	0	0	0	0	0	0	0	0	32
DAY TOTAL	33	2607	546	11	36	26	14	29	48	2	17	3	8	0	97	3477
PERCENTS	1.0%	75.0%	15.8%	0.4%	1.1%	0.8%	0.5%	0.8%	1.3%	0.0%	0.4%	0.0%	0.2%	0.0%	2.7%	100%
Passenger Vehicles		91.6%							Trucks & Buses		8.3%					
AM Times	06:30	07:30	06:45	07:00	08:00	08:00	08:00	07:15	08:00	09:30	07:15	10:15	06:30		07:15	07:30
AM Peaks	5	462	78	4	5	3	3	9	6	1	7	1	2		27	583
PM Times	17:45	17:30	13:45	15:30	13:00	16:15	17:00	14:00	16:45	16:45	16:45	13:00	17:15		16:30	17:30
PM Peaks	6	183	38	2	6	6	4	3	8	1	3	1	2		10	246

Site Reference: Rd Class u5
Site ID: 000000013256
Location: Billerica Ave North of T Station entranc
Direction: SOUTH
Lane: 1

File: caaveNmtpleasant.prn
City: Billerica
County: 6-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	1	11	0	0	1	0	0	0	1	0	0	0	0	0	0	14
02:00	0	5	3	0	0	0	0	0	0	0	0	0	0	0	0	8
03:00	1	6	2	0	0	0	0	0	0	0	0	0	0	0	0	9
04:00	0	5	2	0	1	0	0	0	0	0	0	0	0	0	0	8
05:00	1	6	7	0	0	0	0	0	0	0	0	0	0	0	0	14
06:00	4	78	8	0	0	0	1	0	1	0	0	0	0	0	0	92
07:00	4	252	46	1	2	3	0	3	4	1	0	0	0	0	8	324
08:00	7	382	75	2	4	1	4	3	3	1	7	3	4	0	26	522
09:00	9	241	36	5	1	4	3	1	8	2	3	1	1	0	10	325
10:00	5	118	32	1	1	4	2	0	4	0	0	0	0	0	1	168
11:00	3	94	32	0	3	1	0	2	0	0	0	0	0	0	5	140
12:00	5	84	33	0	1	4	0	5	3	0	0	0	0	0	3	138
13:00	4	106	26	0	4	1	2	2	4	0	1	1	0	0	3	154
14:00	2	101	32	0	3	1	2	4	5	1	1	0	1	0	0	153
15:00	1	99	36	1	4	3	1	4	2	1	1	0	0	0	1	154
16:00	6	139	25	1	2	3	1	1	1	0	0	0	0	0	3	182
17:00	1	149	31	0	1	0	0	2	0	1	1	0	0	0	5	191
18:00	2	161	32	0	3	5	2	1	3	0	2	1	0	0	8	220
`:00	4	126	22	0	1	2	1	2	3	1	1	0	0	0	8	171
:00	3	98	15	1	0	0	0	1	1	0	0	0	0	0	2	121
21:00	2	85	21	0	1	0	2	1	1	1	0	0	0	0	4	118
22:00	2	54	11	0	0	0	1	0	0	0	0	0	0	0	2	70
23:00	0	40	9	0	2	1	0	0	0	0	1	0	0	0	0	53
24:00	0	32	1	0	1	0	0	0	0	0	0	0	0	0	1	35
DAY TOTAL	67	2472	537	12	36	33	22	32	44	9	18	6	6	0	90	3384
PERCENTS	2.0%	73.1%	15.9%	0.4%	1.1%	1.0%	0.7%	1.0%	1.3%	0.2%	0.5%	0.1%	0.1%	0.0%	2.6%	100%
Passenger Vehicles		90.8%						Trucks & Buses		9.1%						
AM Times	07:45	07:00	07:00	08:15	06:45	07:45	07:30	11:15	08:15	07:30	07:30	07:45	07:00		07:30	07:00
AM Peaks	12	396	79	5	5	4	6	5	8	3	8	4	4		27	543
PM Times	15:15	17:00	14:15	13:45	14:45	17:30	12:45	13:00	12:45	13:45	12:30	12:15	13:15		17:00	17:00
PM Peaks	6	174	36	1	6	6	3	5	5	2	2	1	1		9	235

Site Reference: Rd Class u5
Site ID: 000000013256
Location: Billerica Ave North of T Station entranc
Direction: SOUTH
Lane: 1

File: caaveNmtpleasant.prn
City: Billerica
County: 6-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	10	1	0	0	0	0	0	0	0	0	0	0	0	0	11
02:00	1	6	1	0	0	0	0	0	0	0	0	0	0	0	0	8
03:00	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	6
04:00	1	2	3	0	1	0	0	0	1	0	0	0	0	0	0	8
05:00	1	9	6	0	0	1	0	0	0	0	0	0	0	0	0	17
06:00	8	72	7	0	0	0	1	1	0	0	0	0	1	0	2	92
07:00	6	228	49	2	3	8	2	4	6	0	3	1	2	0	8	322
08:00	8	418	60	8	0	4	4	6	4	0	6	1	2	0	22	543
09:00	3	283	49	3	4	1	4	2	7	1	3	2	0	0	17	379
10:00	2	188	34	3	2	4	3	3	1	1	3	1	0	0	6	251
DAY TOTAL	30	1221	211	16	10	18	14	16	19	2	15	5	5	0	55	1637
PERCENTS	1.9%	74.6%	12.9%	1.0%	0.7%	1.1%	0.9%	0.9%	1.1%	0.1%	0.9%	0.3%	0.3%	0.0%	3.3%	100%
Passenger Vehicles		89.3%						Trucks & Buses		10.6%						
AM Times	05:45	07:30	07:30	07:15	08:15	06:15	07:30	07:00	06:30	08:00	07:00	07:45	06:30		07:30	07:30
AM Peaks	9	425	66	8	4	8	5	9	8	1	7	3	3		23	556
PM Times																
PM Peaks																
GRAND TOTAL	139	7494	1614	46	106	96	53	90	122	13	53	16	23	0	289	10154
PERCENTS	1.4%	73.9%	15.9%	0.5%	1.1%	1.0%	0.5%	0.8%	1.2%	0.1%	0.5%	0.1%	0.2%	0.0%	2.8%	100%

Site Reference: Rd Class u5
Site ID: 000000013256
Location: Billerica Ave North of T Station entranc
Direction: NORTH
Lane: 2

File: caaveNmtpleasant.prn
City: Billerica
County: 6-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
12:00	0	90	27	1	2	1	0	0	4	1	0	0	0	0	6	132
13:00	0	115	36	0	7	1	1	1	0	0	1	0	0	0	6	168
14:00	0	110	33	0	2	2	0	1	1	0	0	0	0	0	1	150
15:00	2	131	30	1	4	1	2	1	0	0	0	1	0	0	1	174
16:00	1	157	48	0	3	3	0	1	4	0	0	0	0	0	2	219
17:00	2	263	56	3	0	5	2	4	3	0	2	2	1	0	12	355
18:00	4	354	47	1	2	5	0	3	2	0	4	1	0	0	14	437
19:00	2	252	38	0	1	3	0	1	0	0	0	1	1	0	6	305
20:00	1	100	21	1	0	0	0	0	1	0	0	0	0	0	1	125
21:00	0	60	9	0	0	0	0	0	0	0	0	0	0	0	0	69
22:00	0	45	6	0	0	1	0	0	0	0	0	0	0	0	0	52
23:00	0	35	3	0	0	0	0	0	0	0	0	0	0	0	0	38
24:00	0	17	2	0	0	0	0	0	0	0	0	0	0	0	0	19
DAY TOTAL	12	1729	356	7	21	22	5	12	15	1	7	5	2	0	49	2243
PERCENTS	0.6%	77.1%	15.9%	0.4%	1.0%	1.0%	0.3%	0.5%	0.6%	0.0%	0.3%	0.2%	0.0%	0.0%	2.1%	100%
Passenger Vehicles		93.4%						Trucks & Buses		6.5%						
AM Times		11:15	11:15	10:30	11:00	11:00			11:00	11:15					11:15	11:15
AM Peaks		90	27	1	2	1			4	1					6	132
PM Times	16:45	17:30	15:45	16:15	12:15	15:45	14:15	15:45	15:00		16:45	15:45	16:15		17:00	17:30
PM Peaks	5	375	63	3	7	7	2	4	4		5	2	1		18	457

Site Reference: Rd Class u5
Site ID: 000000013256
Location: Billerica Ave North of T Station entranc
Direction: NORTH
Lane: 2

File: caaveNmtpleasant.prn
City: Billerica
County: 6-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	5
02:00	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2
03:00	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	8
04:00	0	11	3	0	0	0	0	0	1	0	0	0	0	0	0	15
05:00	0	8	5	0	0	0	0	0	0	0	0	0	0	0	0	13
06:00	0	28	10	0	0	0	0	0	0	0	0	0	0	0	2	40
07:00	2	64	38	1	1	2	0	0	2	1	1	0	0	0	2	114
08:00	2	85	30	1	3	2	0	1	1	0	0	0	0	0	4	129
09:00	0	100	24	0	4	1	0	1	1	0	0	0	0	0	2	133
10:00	0	86	20	0	5	2	0	1	4	0	0	0	0	0	0	118
11:00	1	97	25	1	2	1	0	3	5	0	0	0	1	0	3	139
12:00	1	104	27	0	2	1	1	1	2	1	0	0	0	0	1	141
13:00	1	110	26	0	5	0	0	1	2	0	0	0	0	0	0	145
14:00	4	91	31	0	7	2	0	2	0	0	1	0	0	0	0	138
15:00	1	139	26	0	6	1	0	3	0	2	0	0	0	0	2	180
16:00	7	199	46	0	2	0	1	0	1	0	1	1	0	0	11	269
17:00	3	276	67	0	2	0	0	4	3	0	2	2	2	0	14	375
18:00	1	379	40	3	1	3	0	3	2	0	2	2	1	0	9	446
19:00	1	230	41	0	0	1	0	1	0	0	1	1	1	0	11	288
20:00	1	103	18	0	1	0	0	5	0	0	0	0	0	0	5	133
21:00	1	71	13	0	0	1	0	2	0	0	0	0	0	0	3	91
22:00	2	67	5	0	0	0	0	0	0	0	0	0	0	0	1	75
23:00	2	43	8	0	0	0	0	0	0	0	0	0	0	0	0	53
24:00	0	26	2	0	0	0	0	0	0	0	0	0	0	0	0	28
DAY TOTAL	30	2326	511	6	41	17	2	28	24	4	8	6	5	0	70	3078
PERCENTS	1.0%	75.6%	16.7%	0.2%	1.4%	0.6%	0.1%	1.0%	0.7%	0.1%	0.2%	0.1%	0.1%	0.0%	2.2%	100%
Passenger Vehicles		93.1%						Trucks & Buses		6.8%						
AM Times	07:00	11:00	06:15	06:00	08:30	09:00	11:00	10:15	10:00	06:00	06:15		09:45		05:30	11:00
AM Peaks	3	116	38	1	6	3	1	3	6	1	1		1		4	158
PM Times	15:15	17:00	16:15	17:15	13:15	17:15	15:00	19:15	15:45	14:00	16:00	17:00	17:00		15:45	17:00
PM Peaks	7	398	67	3	7	3	1	5	3	2	3	3	3		17	473

Site Reference: Rd Class u5
Site ID: 000000013256
Location: Billerica Ave North of T Station entranc
Direction: NORTH
Lane: 2

File: caaveNmtpleasant.prn
City: Billerica
County: 6-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	8	1	0	0	0	0	0	0	0	0	0	0	0	0	9
02:00	0	5	2	0	0	0	0	0	1	0	0	0	0	0	0	8
03:00	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	5
04:00	0	14	2	0	1	0	0	0	1	0	0	0	0	0	0	18
05:00	0	5	3	0	0	0	0	0	0	0	0	0	0	0	0	8
06:00	1	31	10	0	0	1	0	1	1	0	0	0	0	0	1	46
07:00	1	84	37	1	2	1	0	0	3	0	0	0	0	0	4	133
08:00	2	100	32	1	4	1	2	2	2	0	1	1	1	0	15	164
09:00	0	124	35	0	5	1	0	0	1	0	0	1	0	0	6	173
10:00	1	86	26	0	1	2	1	2	3	1	2	0	0	0	1	126
11:00	1	95	23	0	3	0	0	0	0	0	0	0	0	0	4	126
12:00	3	89	22	0	3	2	0	1	2	0	1	0	0	0	2	125
13:00	2	118	27	0	3	0	0	0	2	0	0	0	0	0	1	153
14:00	2	101	27	1	3	1	0	1	3	0	0	0	0	0	2	141
15:00	2	119	30	0	4	0	0	1	1	0	1	0	1	0	6	165
16:00	2	200	51	0	7	5	0	4	1	0	2	0	0	0	6	278
17:00	2	277	58	0	2	5	1	2	2	0	1	1	0	0	9	360
18:00	9	361	54	2	2	4	3	3	3	0	5	0	1	0	14	461
:00	5	207	32	2	0	0	0	3	0	0	2	0	0	0	12	263
:00	4	109	20	0	0	0	0	1	0	0	0	0	0	0	1	135
21:00	3	94	17	0	0	2	0	0	0	0	0	0	0	0	2	118
22:00	3	61	11	0	1	0	1	0	0	0	0	0	0	0	2	79
23:00	1	39	8	0	1	0	0	0	0	0	0	0	0	0	0	49
24:00	0	26	4	0	0	0	0	0	0	0	0	0	0	0	0	30
DAY TOTAL	44	2357	533	7	42	25	8	21	26	1	15	3	3	0	88	3173
PERCENTS	1.4%	74.3%	16.8%	0.3%	1.4%	0.8%	0.3%	0.7%	0.9%	0.0%	0.4%	0.0%	0.0%	0.0%	2.7%	100%

Passenger Vehicles 92.4% Trucks & Buses 7.5%

AM Times	07:00	08:00	06:30	06:00	07:45	06:45	07:15	07:15	06:15	09:15	09:15	06:45	07:15		07:15	08:00
AM Peaks	3	128	39	1	8	2	2	2	3	1	2	1	1		15	194
PM Times	17:30	17:00	16:45	17:30	15:00	16:00	16:45	14:45	13:30		17:15	16:00	13:30		17:45	17:00
PM Peaks	10	365	65	3	9	8	3	5	4		5	1	1		18	467

Site Reference: Rd Class u5
Site ID: 000000013256
Location: Billerica Ave North of T Station entranc
Direction: NORTH
Lane: 2

File: caaveNmtpleasant.prn
City: Billerica
County: 6-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	17	1	0	0	0	0	0	0	0	0	0	0	0	0	18
02:00	0	10	2	0	0	0	0	0	0	0	0	0	0	0	0	12
03:00	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	5
04:00	0	14	4	0	1	0	0	0	0	0	0	0	0	0	0	19
05:00	0	9	4	0	0	0	0	0	1	0	0	0	0	0	0	14
06:00	0	31	9	0	0	1	0	0	0	0	0	0	0	0	0	41
07:00	0	69	27	1	1	1	1	0	1	0	0	0	0	0	2	103
08:00	1	89	39	0	1	4	1	1	0	0	3	0	0	0	10	149
09:00	2	120	35	1	6	2	3	3	3	0	1	1	0	0	4	181
10:00	2	114	27	0	3	1	2	1	0	1	0	0	0	0	1	152
DAY TOTAL	5	477	149	2	12	9	7	5	5	1	4	1	0	0	17	694
PERCENTS	0.8%	68.8%	21.5%	0.3%	1.8%	1.3%	1.0%	0.7%	0.7%	0.1%	0.5%	0.1%	0.0%	0.0%	2.4%	100%
Passenger Vehicles		90.9%						Trucks & Buses		9.0%						
AM Times	08:45	08:30	07:00	05:30	08:15	07:15	08:30	08:00	08:15	08:45	07:30	08:15			06:45	08:30
AM Peaks	4	125	39	1	6	4	4	4	3	1	4	1			10	183
PM Times																
PM Peaks																
GRAND TOTAL	91	6889	1549	22	116	73	22	66	70	7	34	15	10	0	224	9188
PERCENTS	1.0%	75.0%	16.9%	0.3%	1.3%	0.8%	0.3%	0.8%	0.7%	0.0%	0.3%	0.1%	0.1%	0.0%	2.4%	100%

Site Reference: Rd Class u5
Site ID: 000000013256
Location: Billerica Ave North of T Station entranc
Direction: ROAD TOTAL

File: caaveNmtpleasant.prn
City: Billerica
County: 6-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
12:00	1	176	53	1	6	2	0	1	5	1	0	0	0	0	9	255
13:00	2	226	76	1	10	3	3	2	2	0	1	1	0	0	10	337
14:00	0	200	61	0	5	4	0	2	2	0	0	0	0	0	2	276
15:00	2	245	61	4	12	3	2	2	2	0	0	2	1	0	5	341
16:00	3	289	93	0	4	4	1	7	7	0	0	0	0	0	9	417
17:00	2	390	93	4	2	8	2	6	3	0	3	2	2	0	19	536
18:00	5	525	86	3	3	8	0	4	2	0	5	1	2	0	26	670
19:00	3	351	68	0	1	5	0	1	0	0	1	1	1	0	10	442
20:00	2	197	32	1	0	1	0	0	2	0	0	0	0	0	3	238
21:00	0	129	25	0	0	0	0	0	0	0	0	0	0	0	1	155
22:00	1	97	15	0	2	3	0	0	0	0	0	0	0	0	1	119
23:00	0	60	10	0	0	0	0	0	1	0	0	0	0	0	0	71
24:00	0	38	3	0	0	0	0	0	0	0	0	0	0	0	1	42
DAY TOTAL	21	2923	676	14	45	41	8	25	26	1	10	7	6	0	96	3899
PERCENTS	0.6%	75.0%	17.4%	0.4%	1.2%	1.1%	0.3%	0.6%	0.6%	0.0%	0.2%	0.1%	0.1%	0.0%	2.4%	100%
Passenger Vehicles	92.8%							Trucks & Buses	7.1%							
AM Times	10:30	11:15	11:15	10:30	11:15	11:00		11:15	11:15	11:15					11:15	11:15
AM Peaks	1	176	53	1	6	2		1	5	1					9	255
PM Times	16:45	17:30	15:45	17:00	14:15	16:00	12:15	15:30	15:00		16:45	14:15	16:45		17:00	17:30
PM Peaks	5	533	101	5	12	10	3	9	7		6	2	3		29	674

Site Reference: Rd Class u5
Site ID: 000000013256
Location: Billerica Ave North of T Station entranc
Direction: ROAD TOTAL

File: caaveNmtpleasant.prn
City: Billerica
County: 6-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	15	1	0	0	0	0	0	0	0	0	0	0	0	0	16
02:00	0	6	3	0	0	0	0	0	0	0	0	0	0	0	0	9
03:00	0	10	6	0	0	0	0	0	0	0	0	0	0	0	0	16
04:00	0	16	4	0	0	0	0	0	1	0	0	0	0	0	0	21
05:00	0	17	12	0	0	0	0	0	2	0	0	0	0	0	0	31
06:00	2	102	21	0	0	1	0	0	0	0	0	0	0	0	4	130
07:00	5	312	101	1	3	2	0	2	7	1	2	0	1	0	14	451
08:00	6	531	97	5	4	4	1	10	5	0	7	0	2	0	31	703
09:00	1	428	69	1	9	4	3	4	7	0	1	0	0	0	8	535
10:00	1	223	54	0	8	4	0	2	6	0	1	0	0	0	3	302
11:00	1	184	54	1	4	2	0	5	9	1	1	1	1	0	6	270
12:00	2	234	49	1	5	2	2	2	3	1	1	0	1	0	7	310
13:00	3	231	53	1	7	1	0	2	4	0	0	0	0	0	2	304
14:00	5	185	61	0	13	2	0	2	1	0	1	1	0	0	4	275
15:00	1	254	56	0	12	3	0	6	4	2	0	0	1	0	5	344
16:00	10	326	74	1	5	2	2	3	3	0	2	1	0	0	15	444
17:00	6	400	95	1	3	6	1	6	9	0	4	2	3	0	19	555
18:00	5	559	74	4	1	5	3	3	8	1	4	2	3	0	17	689
:00	4	335	62	1	1	2	2	2	1	0	1	2	1	0	18	432
:00	4	186	41	0	1	1	1	6	0	0	0	0	0	0	8	248
21:00	2	135	30	0	0	1	0	2	1	0	0	0	0	0	4	175
22:00	2	110	16	0	0	0	0	0	1	0	0	0	0	0	2	131
23:00	3	80	19	0	1	0	1	0	0	0	0	0	0	0	0	104
24:00	0	54	5	0	0	1	0	0	0	0	0	0	0	0	0	60
DAY TOTAL	63	4933	1057	17	77	43	16	57	72	6	25	9	13	0	167	6555
PERCENTS	1.0%	75.3%	16.2%	0.3%	1.2%	0.7%	0.3%	0.9%	1.1%	0.0%	0.3%	0.1%	0.1%	0.0%	2.5%	100%
Passenger Vehicles		92.3%						Trucks & Buses		7.6%						
AM Times	06:30	07:30	06:30	07:15	08:30	08:30	08:00	07:15	08:45	06:00	07:00	10:15	06:30		07:15	07:30
AM Peaks	7	554	113	5	11	5	3	10	10	1	7	1	2		31	717
PM Times	15:15	17:00	16:15	17:30	13:15	16:45	17:00	13:45	16:15	14:00	16:00	17:00	17:00		15:45	17:00
PM Peaks	10	561	95	5	13	7	4	6	9	2	5	3	4		23	699

Site Reference: Rd Class u5
Site ID: 000000013256
Location: Billerica Ave North of T Station entranc
Direction: ROAD TOTAL

File: caaveNmtpleasant.prn
City: Billerica
County: 6-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	1	19	1	0	1	0	0	0	1	0	0	0	0	0	0	23
02:00	0	10	5	0	0	0	0	0	1	0	0	0	0	0	0	16
03:00	1	10	3	0	0	0	0	0	0	0	0	0	0	0	0	14
04:00	0	19	4	0	2	0	0	0	1	0	0	0	0	0	0	26
05:00	1	11	10	0	0	0	0	0	0	0	0	0	0	0	0	22
06:00	5	109	18	0	0	1	1	1	2	0	0	0	0	0	1	138
07:00	5	336	83	2	4	4	0	3	7	1	0	0	0	0	12	457
08:00	9	482	107	3	8	2	6	5	5	1	8	4	5	0	41	686
09:00	9	365	71	5	6	5	3	1	9	2	3	2	1	0	16	498
10:00	6	204	58	1	2	6	3	2	7	1	2	0	0	0	2	294
11:00	4	189	55	0	6	1	0	2	0	0	0	0	0	0	9	266
12:00	8	173	55	0	4	6	0	6	5	0	1	0	0	0	5	263
13:00	6	224	53	0	7	1	2	2	6	0	1	1	0	0	4	307
14:00	4	202	59	1	6	2	2	5	8	1	1	0	1	0	2	294
15:00	3	218	66	1	8	3	1	5	3	1	2	0	1	0	7	319
16:00	8	339	76	1	9	8	1	5	2	0	2	0	0	0	9	460
17:00	3	426	89	0	3	5	1	4	2	1	2	1	0	0	14	551
18:00	11	522	86	2	5	9	5	4	6	0	7	1	1	0	22	681
`:00	9	333	54	2	1	2	1	5	3	1	3	0	0	0	20	434
:00	7	207	35	1	0	0	0	2	1	0	0	0	0	0	3	256
21:00	5	179	38	0	1	2	2	1	1	1	0	0	0	0	6	236
22:00	5	115	22	0	1	0	2	0	0	0	0	0	0	0	4	149
23:00	1	79	17	0	3	1	0	0	0	0	1	0	0	0	0	102
24:00	0	58	5	0	1	0	0	0	0	0	0	0	0	0	1	65
DAY TOTAL	111	4829	1070	19	78	58	30	53	70	10	33	9	9	0	178	6557
PERCENTS	1.7%	73.7%	16.4%	0.3%	1.2%	0.9%	0.5%	0.8%	1.0%	0.1%	0.5%	0.1%	0.1%	0.0%	2.7%	100%
Passenger Vehicles		91.6%						Trucks & Buses		8.3%						
AM Times	07:00	07:00	07:00	08:15	07:45	09:15	07:30	11:15	07:30	07:30	07:30	07:15	07:15		07:15	07:00
AM Peaks	14	491	116	5	10	6	8	6	10	3	9	4	5		41	697
PM Times	17:45	17:00	16:45	17:30	14:45	16:00	16:45	14:45	13:30	13:45	17:15	12:15	13:30		17:00	17:00
PM Peaks	13	539	94	3	14	9	5	9	9	2	7	1	2		25	702

Site Reference: Rd Class u5
Site ID: 000000013256
Location: Billerica Ave North of T Station entranc
Direction: ROAD TOTAL

File: caaveNmtpleasant.prn
City: Billerica
County: 6-2009

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
01:00	0	27	2	0	0	0	0	0	0	0	0	0	0	0	0	29
02:00	1	16	3	0	0	0	0	0	0	0	0	0	0	0	0	20
03:00	0	9	2	0	0	0	0	0	0	0	0	0	0	0	0	11
04:00	1	16	7	0	2	0	0	0	1	0	0	0	0	0	0	27
05:00	1	18	10	0	0	1	0	0	1	0	0	0	0	0	0	31
06:00	8	103	16	0	0	1	1	1	0	0	0	0	1	0	2	133
07:00	6	297	76	3	4	9	3	4	7	0	3	1	2	0	10	425
08:00	9	507	99	8	1	8	5	7	4	0	9	1	2	0	32	692
09:00	5	403	84	4	10	3	7	5	10	1	4	3	0	0	21	560
10:00	4	302	61	3	5	5	5	4	1	2	3	1	0	0	7	403
DAY TOTAL	35	1698	360	18	22	27	21	21	24	3	19	6	5	0	72	2331
PERCENTS	1.6%	72.9%	15.5%	0.8%	1.0%	1.1%	0.9%	0.9%	1.0%	0.1%	0.8%	0.2%	0.2%	0.0%	3.0%	100%
Passenger Vehicles		89.7%						Trucks & Buses		10.2%						
AM Times	07:30	07:30	07:00	07:15	08:15	06:15	08:30	07:00	08:15	08:45	07:30	08:30	06:30		07:00	07:30
AM Peaks	10	519	101	8	10	9	8	9	10	2	10	4	3		32	703
PM Times																
PM Peaks																
GRAND TOTAL	230	14383	3163	68	222	169	75	156	192	20	87	31	33	0	513	19342
PERCENTS	1.2%	74.4%	16.4%	0.4%	1.2%	0.9%	0.4%	0.9%	0.9%	0.1%	0.4%	0.1%	0.1%	0.0%	2.6%	100%

Site Reference: Rd Class u5
Site ID: 000000013257
Location: Mount Pleasant St E of Billerica Ave
Direction: ROAD TOTAL

File: easantEbillerica.prn
City: Billerica
County: 40-2009

TIME	MON 16	TUE 17	WED 18	THU 19	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		25	35	35		31			31	95
02:00		20	8	14		14			14	42
03:00		14	6	7		9			9	27
04:00		11	2	3		5			5	16
05:00		16	9	13		12			12	38
06:00		19	18	23		20			20	60
07:00		65	71	66		67			67	202
08:00		219	222	197		212			212	638
09:00		354	357	359		356			356	1070
10:00		316	320	305		313			313	941
11:00		208	208			208			208	416
12:00	197	168	177			180			180	542
13:00	205	219	214			212			212	638
14:00	213	221	199			211			211	633
15:00	207	220	172			199			199	599
16:00	240	267	257			254			254	764
17:00	297	301	291			296			296	889
18:00	422	417	365			401			401	1204
19:00	401	422	427			416			416	1250
20:00	279	280	271			276			276	830
21:00	162	157	167			162			162	486
22:00	94	124	108			108			108	326
23:00	69	83	84			78			78	236
24:00	49	49	55			51			51	153
TOTALS	2835	4195	4043	1022	0	4091	0	0	4091	12095
% AVG WKDY	69.2	102.5	98.8	24.9						
% AVG WEEK	69.2	102.5	98.8	24.9						
AM Times	12:00	09:00	09:00	09:00		09:00			09:00	
AM Peaks	197	354	357	359		356			356	
PM Times	18:00	19:00	19:00			19:00			19:00	
PM Peaks	422	422	427			416			416	

AWD = 4,091
Factors = (0.98)(0.98)
ADT = 3,900

Northern Middlesex Council of Governments
WEEKLY SUMMARY FOR LANE 1 Page: 1
Starting: 11/16/09

Site Reference: Rd Class u5
Site ID: 000000013257
Location: Mount Pleasant St E of Billerica Ave
Direction: EAST

File: easantEbillerica.prn
City: Billerica
County: 40-2009

TIME	MON 16	TUE 17	WED 18	THU 19	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		13	13	21		15			15	47
02:00		11	4	9		8			8	24
03:00		8	3	3		4			4	14
04:00		7	1	2		3			3	10
05:00		8	4	9		7			7	21
06:00		4	4	10		6			6	18
07:00		13	21	13		15			15	47
08:00		58	55	41		51			51	154
09:00		86	84	83		84			84	253
10:00		114	119	112		115			115	345
11:00		80	81			80			80	161
12:00	96	83	82			87			87	261
13:00	100	113	118			110			110	331
14:00	100	116	107			107			107	323
15:00	101	110	93			101			101	304
16:00	133	151	124			136			136	408
17:00	173	189	158			173			173	520
18:00	287	279	240			268			268	806
19:00	265	272	274			270			270	811
20:00	177	177	176			176			176	530
21:00	97	104	100			100			100	301
22:00	54	79	73			68			68	206
23:00	42	52	52			48			48	146
24:00	31	24	24			26			26	79
TOTALS	1656	2151	2010	303	0	2058	0	0	2058	6120
% AVG WKDY	80.4	104.5	97.6	14.7						
% AVG WEEK	80.4	104.5	97.6	14.7						
AM Times	12:00	10:00	10:00	10:00		10:00			10:00	
AM Peaks	96	114	119	112		115			115	
PM Times	18:00	18:00	19:00			19:00			19:00	
PM Peaks	287	279	274			270			270	

Site Reference: Rd Class u5
Site ID: 000000013257
Location: Mount Pleasant St E of Billerica Ave
Direction: WEST

File: easantEbillerica.prn
City: Billerica
County: 40-2009

TIME	MON 16	TUE 17	WED 18	THU 19	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		12	22	14		16			16	48
02:00		9	4	5		6			6	18
03:00		6	3	4		4			4	13
04:00		4	1	1		2			2	6
05:00		8	5	4		5			5	17
06:00		15	14	13		14			14	42
07:00		52	50	53		51			51	155
08:00		161	167	156		161			161	484
09:00		268	273	276		272			272	817
10:00		202	201	193		198			198	596
11:00		128	127			127			127	255
12:00	101	85	95			93			93	281
13:00	105	106	96			102			102	307
14:00	113	105	92			103			103	310
15:00	106	110	79			98			98	295
16:00	107	116	133			118			118	356
17:00	124	112	133			123			123	369
18:00	135	138	125			132			132	398
19:00	136	150	153			146			146	439
20:00	102	103	95			100			100	300
21:00	65	53	67			61			61	185
22:00	40	45	35			40			40	120
23:00	27	31	32			30			30	90
24:00	18	25	31			24			24	74
TOTALS	1179	2044	2033	719	0	2026	0	0	2026	5975
% AVG WKDY	58.1	100.8	100.3	35.4						
% AVG WEEK	58.1	100.8	100.3	35.4						
AM Times	12:00	09:00	09:00	09:00		09:00			09:00	
AM Peaks	101	268	273	276		272			272	
PM Times	19:00	19:00	19:00			19:00			19:00	
PM Peaks	136	150	153			146			146	

Woburn Street
Corridor Study

APPENDIX E

Manual Turning Movement Counts

Northern Middlesex Council of Governments
TURNING MOVEMENT SUMMARY
ENDING: THU 10/08/2009

Site Reference: 000000000001
Site ID: BILLMTPAM
Location: Billerica Ave at Mount Pleasant

File: billATmtpleasAM.prn
City: Billerica
County:

TIME	NORTH BOUND Ped	Right	Thru	Left	EAST BOUND Ped	Right	Thru	Left	SOUTH BOUND Ped	Right	Thru	Left	WEST BOUND Ped	Right	Thru	Left	TOTA
07:15	0	0	3	0	0	1	14	25	0	130	1	5	0	4	68	0	251
07:30	0	0	0	5	0	0	16	34	0	153	0	3	0	18	87	0	316
07:45	0	0	0	3	0	1	34	46	0	164	0	3	0	5	79	0	335
08:00	0	0	2	2	0	1	24	53	0	162	0	4	0	7	101	0	356
Hour Total	0	0	5	10	0	3	88	158	0	609	1	15	0	34	335	0	1258
08:15	0	0	0	2	0	3	15	53	0	133	0	3	0	5	69	0	283
08:30	0	0	1	3	0	0	27	46	0	101	0	3	0	5	83	0	269
08:45	0	0	1	2	0	1	33	31	0	92	0	5	0	3	62	0	230
09:00	0	0	0	2	0	1	22	35	0	76	0	1	0	2	53	0	192
Hour Total	0	0	2	9	0	5	97	165	0	402	0	12	0	15	267	0	974
DAY TOTAL	0	0	7	19	0	8	185	323	0	1011	1	27	0	49	602	0	2232
PERCENTS	0.0%	0.0%	0.4%	0.9%	0.0%	0.4%	8.3%	14.5%	0.0%	45.3%	0.0%	1.2%	0.0%	2.1%	26.9%	0.0%	100%
AM Times			07:15	07:30		07:30	07:45	07:45		07:30	06:30	07:15		07:30	07:30		
AM Peaks			5	12		5	100	198		612	1	15		35	336		
Factors			.41	.60		.41	.73	.93		.93	.25	.75		.48	.83		
PM Times																	
PM Peaks																	
Factors			.0	.0		.0	.0	.0		.0	.0	.0		.0	.0		

Northern Middlesex Council of Governments
TURNING MOVEMENT SUMMARY
ENDING: WED 11/18/2009

Site Reference: 000000000001
Site ID: BBC AM
Location: Billerica Ave at Billerica Business Cent

File: BillBCDriveAM.prn
City: Billerica
County:

	NORTH BOUND				EAST BOUND				SOUTH BOUND				WEST BOUND				
TIME	Ped	Right	Thru	Left	Ped	Right	Thru	Left	Ped	Right	Thru	Left	Ped	Right	Thru	Left	TOTA
07:15	0	7	34	0	0	0	0	0	0	0	117	10	0	0	0	2	170
07:30	0	4	33	0	0	0	0	0	0	0	148	12	0	1	0	0	198
07:45	0	5	44	0	0	0	0	0	0	0	151	11	0	0	0	1	212
08:00	0	8	48	0	0	0	0	0	0	0	153	14	0	1	0	0	224
Hour Total	0	24	159	0	0	0	0	0	0	0	569	47	0	2	0	3	804
08:15	0	11	45	0	0	0	0	0	0	0	113	16	0	2	0	1	188
08:30	0	15	45	0	0	0	0	0	0	0	76	18	0	3	0	0	157
08:45	0	10	41	0	0	0	0	0	0	0	79	17	0	1	0	0	148
09:00	0	7	38	0	0	0	0	0	0	0	81	20	0	2	0	1	149
Hour Total	0	43	169	0	0	0	0	0	0	0	349	71	0	8	0	2	642
DAY TOTAL	0	67	328	0	0	0	0	0	0	0	918	118	0	10	0	5	1446
PERCENTS	0.0%	4.7%	22.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	63.5%	8.2%	0.0%	0.6%	0.0%	0.3%	100%
AM Times		08:00	07:45								07:15	08:15		08:15		07:00	
AM Peaks		44	182								569	71		8		3	
Factors		.73	.94								.92	.88		.66		.37	
PM Times																	
PM Peaks																	
Factors		.0	.0								.0	.0		.0		.0	

Northern Middlesex Council of Governments
TURNING MOVEMENT SUMMARY
ENDING: WED 11/18/2009

Site Reference: 000000000002
Site ID: BBC PM
Location: Billerica Business Center Entrance

File: BillBBCDrivePM.prn
City: Billerica
County:

	NORTH BOUND				EAST BOUND				SOUTH BOUND				WEST BOUND				
TIME	Ped	Right	Thru	Left	Ped	Right	Thru	Left	Ped	Right	Thru	Left	Ped	Right	Thru	Left	TOTA
16:15	0	2	72	0	0	0	0	0	0	0	47	2	0	26	0	3	152
16:30	0	6	94	0	0	0	0	0	0	0	43	6	0	10	0	3	162
16:45	0	2	122	0	0	0	0	0	0	0	42	1	0	27	0	8	202
17:00	0	0	125	0	0	0	0	0	0	0	40	4	0	13	0	6	188
Hour Total	0	10	413	0	0	0	0	0	0	0	172	13	0	76	0	20	704
17:15	0	0	119	0	0	0	0	0	0	0	44	2	0	36	0	9	210
17:30	0	1	132	0	0	0	0	0	0	0	35	0	0	17	0	8	193
17:45	0	2	120	0	0	0	0	0	0	0	40	1	0	15	0	7	185
18:00	0	1	100	0	0	0	0	0	0	0	46	1	0	10	0	3	161
Hour Total	0	4	471	0	0	0	0	0	0	0	165	4	0	78	0	27	749
DAY TOTAL	0	14	884	0	0	0	0	0	0	0	337	17	0	154	0	47	1453
PERCENTS	0.0%	1.0%	60.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	23.2%	1.2%	0.0%	10.5%	0.0%	3.2%	100%
AM Times																	
AM Peaks																	
Factors																	
PM Times		16:00	16:45								16:15	16:15		16:45		16:45	
PM Peaks		10	498								172	13		93		31	
Factors																	

Northern Middlesex Council of Governments
TURNING MOVEMENT SUMMARY
ENDING: WED 10/21/2009

Site Reference: 000000000001
Site ID: wBNOPAM
Location: Woburn St at Riverview Commerce Center

File: rnatofficeparkam.prn
City: Tewksbury
County:

	NORTH BOUND				EAST BOUND				SOUTH BOUND				WEST BOUND				
TIME	Ped	Right	Thru	Left	Ped	Right	Thru	Left	Ped	Right	Thru	Left	Ped	Right	Thru	Left	TOTA
07:15	0	0	67	1	0	1	0	0	0	6	205	1	0	2	0	0	283
07:30	0	0	63	0	0	0	0	3	0	4	230	0	0	0	0	0	300
07:45	0	0	72	1	0	3	0	0	0	3	227	0	0	0	0	0	306
08:00	0	0	68	4	0	1	0	1	0	7	207	0	0	1	0	0	289
Hour Total	0	0	270	6	0	5	0	4	0	20	869	1	0	3	0	0	1178
08:15	0	0	60	2	0	0	0	0	0	8	208	0	0	0	0	0	278
08:30	0	1	80	1	0	0	0	1	0	6	187	0	0	0	0	1	277
08:45	0	0	62	3	0	1	0	3	0	9	153	0	0	0	0	0	231
09:00	0	2	72	0	0	0	0	1	0	5	122	1	0	2	0	0	205
Hour Total	0	3	274	6	0	1	0	5	0	28	670	1	0	2	0	1	991
DAY TOTAL	0	3	544	12	0	6	0	9	0	48	1539	2	0	5	0	1	2169
PERCENTS	0.0%	0.2%	25.1%	0.6%	0.0%	0.3%	0.0%	0.5%	0.0%	2.2%	70.9%	0.0%	0.0%	0.2%	0.0%	0.0%	100%
AM Times		08:15	07:45	08:00		07:15		08:00		08:00	07:30	06:30		07:15		07:45	
AM Peaks		3	280	10		5		5		30	872	1		3		1	
Factors		.37	.87	.62		.41		.41		.83	.94	.25		.37		.25	
PM Times																	
PM Peaks																	
Factors		.0	.0	.0		.0		.0		.0	.0	.0		.0		.0	

Site Reference: 000000000001
Site ID: (UNDEFINED
Location: Woburn Street at Riverview Commerce Cent

File: woburnATraytheon.prn
City: Tewksbury
County:

	NORTH BOUND				EAST BOUND				SOUTH BOUND				WEST BOUND				
TIME	Ped	Right	Thru	Left	Ped	Right	Thru	Left	Ped	Right	Thru	Left	Ped	Right	Thru	Left	TOTA
16:15	0	1	134	0	0	2	0	7	0	0	94	2	0	0	0	0	240
16:30	0	0	142	0	0	2	0	2	0	1	79	1	0	0	0	0	227
16:45	0	0	162	0	0	2	0	5	0	1	65	1	0	1	0	0	237
17:00	1	1	192	0	1	1	0	2	0	0	76	2	0	0	0	0	276
Hour Total	1	2	630	0	1	7	0	16	0	2	314	6	0	1	0	0	980
17:15	0	1	170	0	0	0	0	4	0	1	105	4	0	0	0	0	285
17:30	0	0	219	0	0	0	0	4	0	0	96	1	0	2	0	0	322
17:45	0	0	120	0	0	0	0	4	0	3	87	1	0	1	0	0	216
18:00	0	0	145	0	0	0	7	1	1	0	68	1	0	1	2	0	226
Hour Total	0	1	654	0	0	0	7	13	1	4	356	7	0	4	2	0	1049
DAY TOTAL	1	3	1284	0	1	7	7	29	1	6	670	13	0	5	2	0	2029
PERCENTS	0.1%	0.2%	63.3%	0.0%	0.1%	0.4%	0.4%	1.5%	0.0%	0.2%	33.0%	0.6%	0.0%	0.2%	0.0%	0.0%	100%

AM Times																	
AM Peaks																	
Factors																	
PM Times	16:15	16:15	16:45		16:15	16:15	17:15	16:15	17:15	17:00	17:00	16:30		17:15	17:15		
PM Peaks	1	2	743		1	7	7	16	1	4	364	8		4	2		
Factors																	

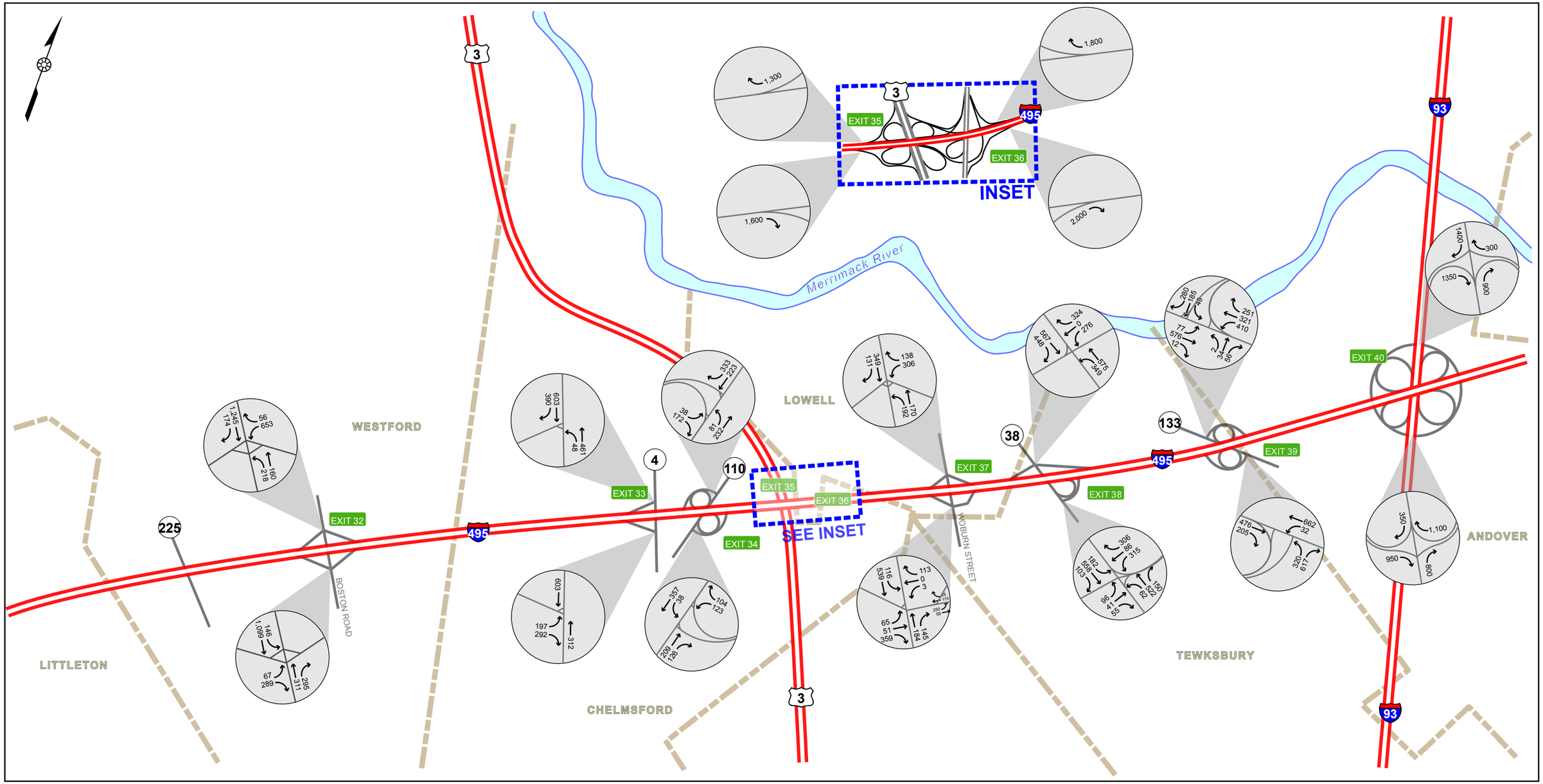


Figure 2-5*
2006 AM Peak Hour Volumes
Western Segment

*Map Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs

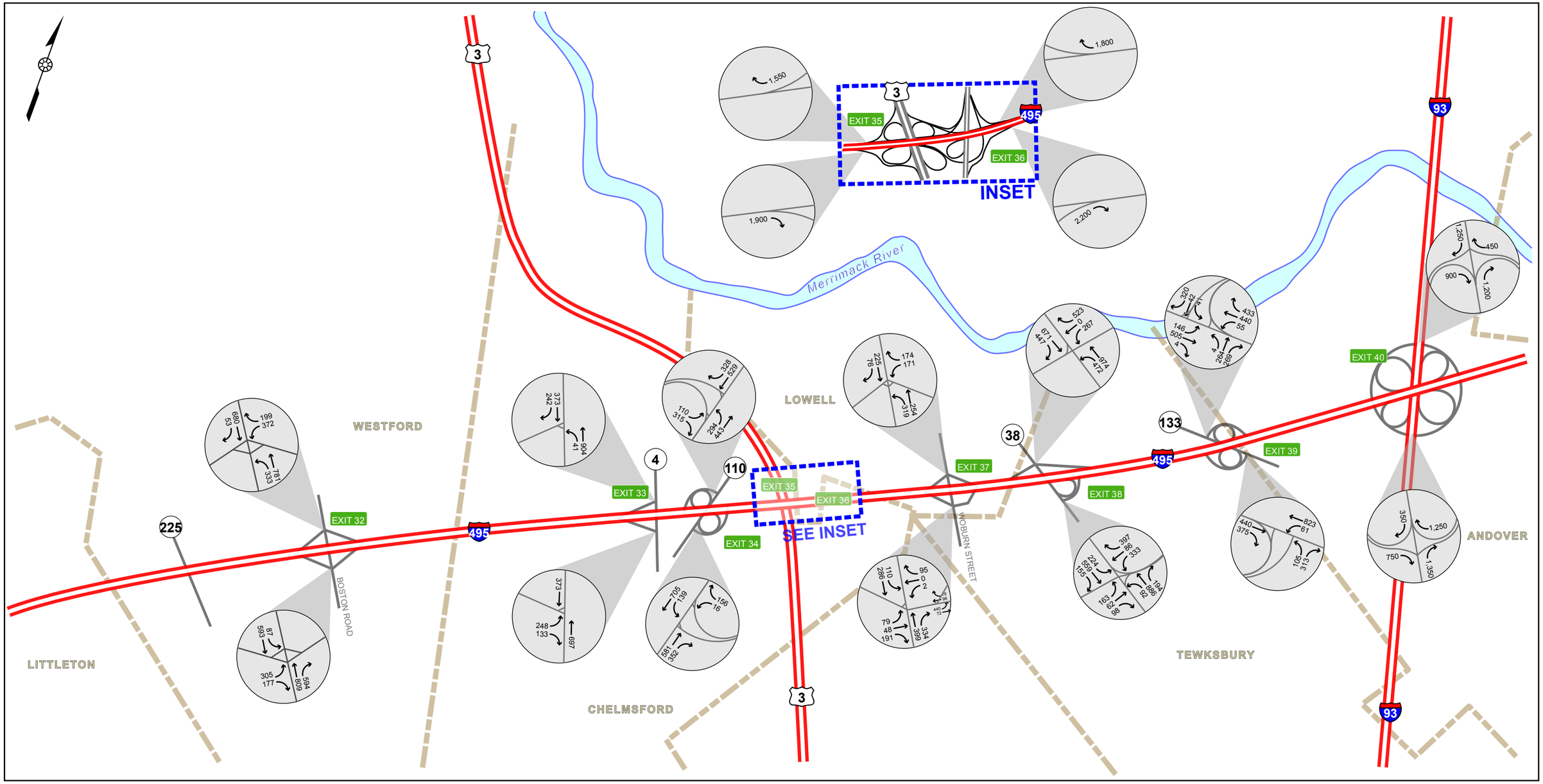


Figure 2-7*
2006 PM Peak Hour Volumes
Western Segment

*Map Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs

Woburn Street
Corridor Study

APPENDIX F

Crash Rate Worksheets

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : Billerica COUNT DATE : 2009

DISTRICT : 4 UNSIGNALIZED : X SIGNALIZED :

MHD USE ONLY

Source #

~ INTERSECTION DATA ~

MAJOR STREET : Billerica Ave

MINOR STREET(S) : BILLERICA BUSINESS CENTER ENTRANCE

RIN #

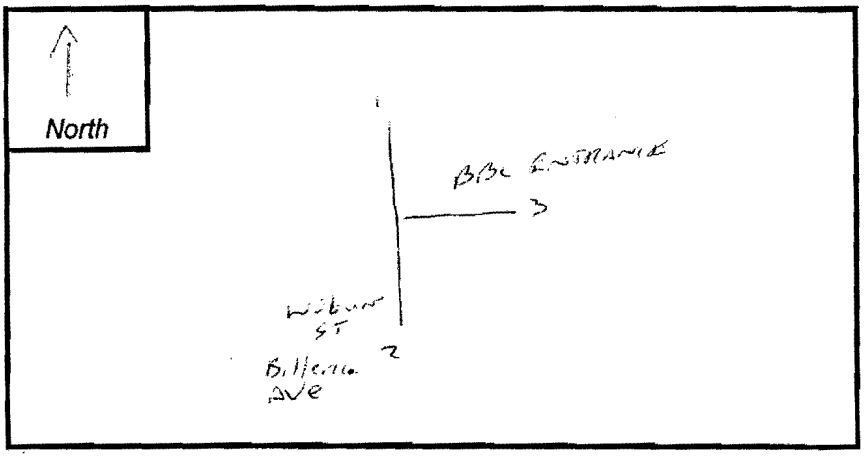
RIN #

RIN #

RIN #

RIN #

INTERSECTION DIAGRAM (Label Approaches)



INTERSECTION REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	6
DIRECTION :	SB	NB	WB			
VOLUMES (AM/PM) :	168	50	124			

"K" FACTOR : 0.10 APPROACH ADT : 3,420 ADT = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS :	# OF YEARS :	AVERAGE # OF ACCIDENTS (A) :
0	3	0

CRASH RATE CALCULATION : 0.00 RATE = $\frac{(A * 1{,}000{,}000)}{(ADT * 365)}$

Comments : Lower than MassDOT Avg Rate of 0.58

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : TEWKSBURY COUNT DATE : 2009

DISTRICT : 4 UNSIGNALIZED : X SIGNALIZED :

MHD USE ONLY

Source #

~ INTERSECTION DATA ~

MAJOR STREET : WOBURN STREET

MINOR STREET(S) : RIVERVIEW COMMERCE CENTER DRIVEWAY

ESTRANGE

RIN #

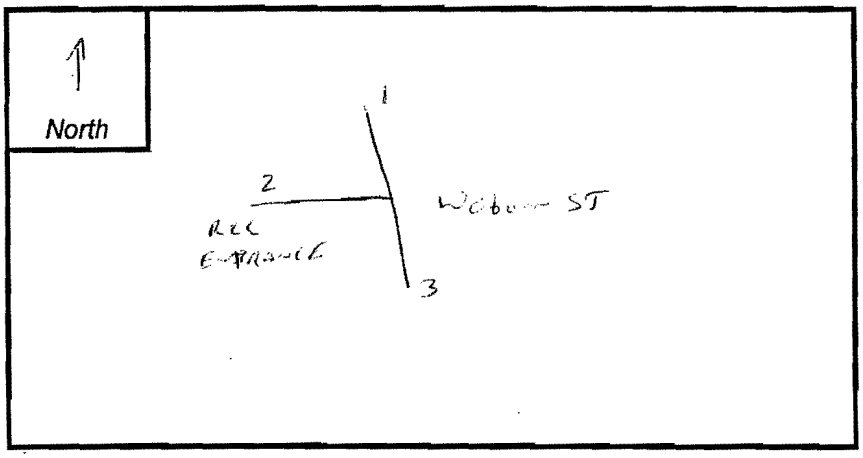
RIN #

RIN #

RIN #

RIN #

INTERSECTION DIAGRAM (Label Approaches)



INTERSECTION REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	6
DIRECTION :	SB	EB	NB			
VOLUMES (AM/PM) :	344	18	745			

"K" FACTOR : 0.10 APPROACH ADT : 11,070 ADT = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS :	# OF YEARS :	AVERAGE # OF ACCIDENTS (A) :
1	3	0.33

CRASH RATE CALCULATION : 0.08 RATE = $\frac{(A * 1{,}000{,}000)}{(ADT * 365)}$

Comments : LOWER THAN MASSDOT Avg RATE of 0.58

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : LOWELL COUNT DATE : 2009

DISTRICT : 4 UNSIGNALIZED : X SIGNALIZED :

MHD USE ONLY

Source #

~ INTERSECTION DATA ~

MAJOR STREET : WOBURN STREET RIN #

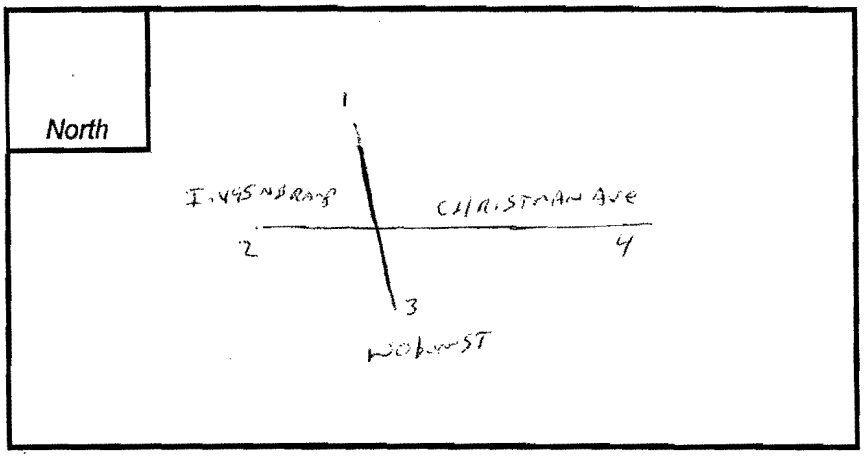
MINOR STREET(S) : I-495 NB RAMP / CHRISTIAN AVE RIN #

RIN #

RIN #

RIN #

INTERSECTION DIAGRAM (Label Approaches)



INTERSECTION REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	6
DIRECTION :	SB	EB	NB	WB		
VOLUMES (AM/PM) :	396	318	733	97		

"K" FACTOR : 0.10 APPROACH ADT : 1844 ADT = TOTAL VOL*"K" FACT.

TOTAL # OF ACCIDENTS : 12 # OF YEARS : 3 AVERAGE # OF ACCIDENTS (A) : 4.00

CRASH RATE CALCULATION : 0.71 RATE = $\frac{(A * 1{,}000{,}000)}{(ADT * 365)}$

Comments : Higher than MassDOT Avg Rate of 0.58

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : LOWELL COUNT DATE : 2009

DISTRICT : 4 UNSIGNALIZED : X SIGNALIZED :

MHD USE ONLY

Source #

~ INTERSECTION DATA ~

MAJOR STREET : WOBURN STREET

MINOR STREET(S) : I-495 SB RAMP

RIN #

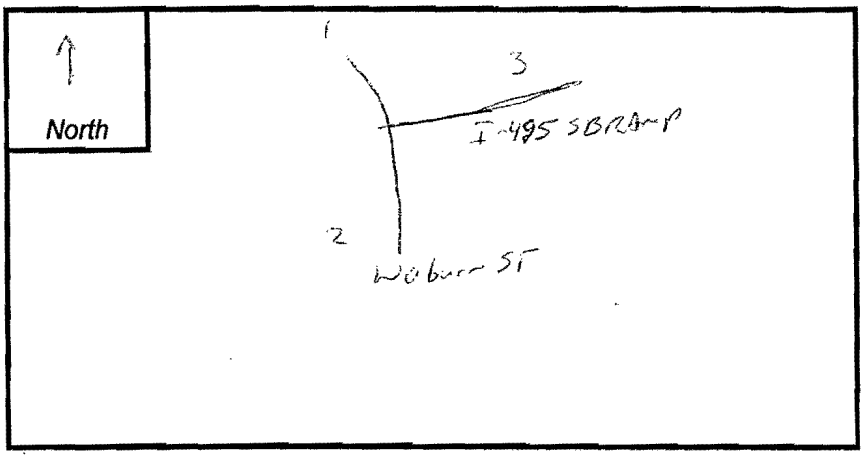
RIN #

RIN #

RIN #

RIN #

INTERSECTION DIAGRAM (Label Approaches)



INTERSECTION REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	6
DIRECTION :	SB	NB	WB			
VOLUMES (AM/PM) :	301	573	345			

"K" FACTOR : 0.10 APPROACH ADT : 12,190 ADT = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS :	# OF YEARS :	AVERAGE # OF ACCIDENTS (A) :
6	3	2.00

CRASH RATE CALCULATION : 0.45 RATE = $\frac{(A * 1{,}000{,}000)}{(ADT * 365)}$

Comments : Lower than MassDOT Avg Rate of 0.58

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : Billerica COUNT DATE : 2009

DISTRICT : 4 UNSIGNALIZED : X SIGNALIZED :

MHD USE ONLY

Source #

~ INTERSECTION DATA ~

MAJOR STREET : Billerica Ave / MT PLEASANT ST

MINOR STREET(S) :

RIN #

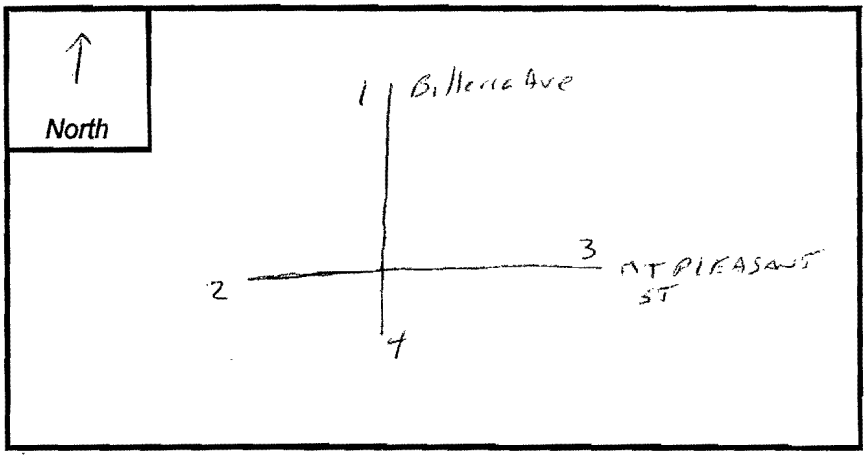
RIN #

RIN #

RIN #

RIN #

INTERSECTION DIAGRAM (Label Approaches)



INTERSECTION REF #

Peak Hour Volumes

APPROACH :	1	2	3	4	5	6
DIRECTION :	SB	EB	WB	NB		
VOLUMES (AM/PM) :	267	962	172	14		

"K" FACTOR : 0.10 APPROACH ADT : 14,150 ADT = TOTAL VOL/"K" FACT.

TOTAL # OF ACCIDENTS :	# OF YEARS :	AVERAGE # OF ACCIDENTS (A) :
7	3	2.33

CRASH RATE CALCULATION : 0.45 RATE = $\frac{(A * 1{,}000{,}000)}{(ADT * 365)}$

Comments : LOWER THAN MASSDOT Avg Rate of 0.58

Woburn Street
Corridor Study

APPENDIX G

Level of Service Worksheets: Existing Conditions

I-495 STUDY

Table B-2
Existing 2006 AM and PM Peak Hour Levels of Service for Unsignalized Intersections
Western Segment

Exit[1]		Approach	Dir.[2]	Mvmt.[3]	AM Delay (s)[4]	AM LOS	AM Queue (ft)[5]	PM Delay (s)[4]	PM LOS	PM Queue (ft)[5]
33	NB	Exit ramp	NB	L	50	F	140	54	F	111
		Exit ramp	NB	R	24	C	109	14	B	51
33	SB	Route 4	WB	L	1	A	5	1	A	3
34	NB	Exit ramp	NB	L	20	C	40	88	F	28
		Exit ramp	NB	R	11	B	13	27	D	77
		Route 110	WB	L	2	A	2	4	A	14
34	SB	Exit ramp	SB	L	16	C	9	526	F	269
		Exit ramp	SB	R	11	B	23	27	C	129
		Route 110	EB	L	1	A	6	7	A	37
37	NB	Exit ramp	NB	L/T	68	F	111	234	F	242
		Exit ramp	NB	R	28	D	145	12	B	34
		Woburn St.	EB	L	15	C	34	18	C	31
		Christman Ave.	SB	L	2	A	7	3	A	10
37	SB	Exit ramp	SB	L	622	F	707	576	F	403
		Exit ramp	SB	R	10	B	17	12	B	26
		Woburn St.	WB	L	6	A	19	6	A	32

[1] Please see Figures 2-1 and 2-2.

[2] Approach direction.

[3] Turning movement.

[4] Average Delay in seconds per vehicle.

[5] Total length of queue in feet.

*Incalculable.

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JH*
Agency/Co.	*NMCOG*
Date Performed	*10/8/2009*
Analysis Time Period	*PM Peak Period*

Site Information

Intersection	*Billerica Ave at Mt. Pleasant*
Jurisdiction	*Billerica*
Analysis Year	*2009*

Project Description *Woburn Street Traffic Study*

East/West Street: *Mount Pleasant Street* | North/South Street: *Billerica Ave*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*569*	*375*	*18*	*1*	*151*	*20*
Peak-Hour Factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*598*	*394*	*18*	*1*	*158*	*21*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LTR*			*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*9*	*4*	*1*	*40*	*5*	*222*
Peak-Hour Factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*9*	*4*	*1*	*42*	*5*	*233*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LTR*	*LTR*		*LTR*			*LTR*	
v (vph)	*598*	*1*		*14*			*280*	
C (m) (vph)	*1409*	*1158*		*25*			*167*	
v/c	*0.42*	*0.00*		*0.56*			*1.68*	
95% queue length	*2.17*	*0.00*		*1.70*			*19.51*	
Control Delay	*9.4*	*8.1*		*264.7*			*377.4*	
LOS	*A*	*A*		*F*			*F*	
Approach Delay	--	--	*264.7*			*377.4*		
Approach LOS	--	--	*F*			*F*		

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JH*
Agency/Co.	*NMCOG*
Date Performed	*10/8/2009*
Analysis Time Period	*AM Peak Period*

Site Information

Intersection	*Billerica Ave at Mt. Pleasant*
Jurisdiction	*Billerica*
Analysis Year	*2009*

Project Description *Woburn Street Traffic Study*

East/West Street: *Mount Pleasant Street* | North/South Street: *Billerica Ave*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*186*	*89*	*5*	*0*	*336*	*35*
Peak-Hour Factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*195*	*93*	*5*	*0*	*353*	*36*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LTR*			*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*12*	*2*	*0*	*13*	*0*	*612*
Peak-Hour Factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*12*	*2*	*0*	*13*	*0*	*644*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LTR*	*LTR*		*LTR*			*LTR*	
v (vph)	*195*	*0*		*14*			*657*	
C (m) (vph)	*1181*	*1508*		*9*			*655*	
v/c	*0.17*	*0.00*		*1.56*			*1.00*	
95% queue length	*0.59*	*0.00*		*2.63*			*15.82*	
Control Delay	*8.7*	*7.4*					*61.0*	
LOS	*A*	*A*		*F*			*F*	
Approach Delay	--	--					*61.0*	
Approach LOS	--	--		*F*			*F*	

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JH*	Intersection	*Billerica Ave at BBC Entrance*
Agency/Co.	*NMCOG*	Jurisdiction	*Billerica*
Date Performed	*11/18/09*	Analysis Year	*2009*
Analysis Time Period	*PM Peak Period*		

Project Description	*Woburn St Corridor Study*
East/West Street: *BBC Entrance*	North/South Street: *Billerica Ave*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*498*	*3*	*7*	*161*	*0*
Peak-Hour Factor, PHF	*0.95*	*0.94*	*0.38*	*0.44*	*0.91*	*0.95*
Hourly Flow Rate, HFR	*0*	*528*	*8*	*16*	*175*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*1*	*1*	*0*
Configuration			*TR*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*31*	*0*	*93*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.86*	*0.95*	*0.65*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*36*	*0*	*144*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*	*L*		*R*			
v (vph)		*16*	*36*		*144*			
C (m) (vph)		*1042*	*382*		*551*			
v/c		*0.02*	*0.09*		*0.26*			
95% queue length		*0.05*	*0.31*		*1.04*			
Control Delay		*8.5*	*15.4*		*13.8*			
LOS		*A*	*C*		*B*			
Approach Delay	--	--	*14.1*					
Approach LOS	--	--	*B*					

>

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JH*	Intersection	*Billerica Ave at BBC Entrance*
Agency/Co.	*NMCOG*	Jurisdiction	*Billerica*
Date Performed	*11/18/09*	Analysis Year	*2009*
Analysis Time Period	*AM Peak Period*		

Project Description	*Woburn St Corridor Study*
East/West Street: *BBC Entrance*	North/South Street: *Billerica Ave*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*170*	*28*	*53*	*565*	*0*
Peak-Hour Factor, PHF	*0.95*	*0.89*	*0.64*	*0.83*	*0.92*	*0.95*
Hourly Flow Rate, HFR	*0*	*191*	*44*	*64*	*611*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*1*	*1*	*0*
Configuration			*TR*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*2*	*0*	*4*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.50*	*0.95*	*0.50*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*4*	*0*	*8*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*	*L*		*R*			
v (vph)		*64*	*4*		*8*			
C (m) (vph)		*1344*	*276*		*832*			
v/c		*0.05*	*0.01*		*0.01*			
95% queue length		*0.15*	*0.04*		*0.03*			
Control Delay		*7.8*	*18.2*		*9.4*			
LOS		*A*	*C*		*A*			
Approach Delay	--	--	*12.3*					
Approach LOS	--	--	*B*					

>

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JH*	Intersection	*Woburn at RCC Entrance*
Agency/Co.	*NMCOG*	Jurisdiction	*Tewksbury*
Date Performed	*10/21/09*	Analysis Year	*2009*
Analysis Time Period	*AM Peak Period*		
Project Description	*Woburn Street Corridor Study*		
East/West Street:	*RCC Entrance*	North/South Street:	*Woburn St*
Intersection Orientation:	*North-South*	Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*6*	*270*	*0*	*0*	*869*	*20*
Peak-Hour Factor, PHF	*0.95*	*0.34*	*0.25*	*0.25*	*1.00*	*1.00*
Hourly Flow Rate, HFR	*6*	*783*	*0*	*0*	*869*	*20*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*4*	*0*	*5*
Peak-Hour Factor, PHF	*0.95*	*0.95*	*0.75*	*0.25*	*0.95*	*1.00*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*16*	*0*	*5*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*					*L*		*R*
v (vph)	*6*					*16*		*5*
C (m) (vph)	*771*					*105*		*350*
v/c	*0.01*					*0.15*		*0.01*
95% queue length	*0.02*					*0.52*		*0.04*
Control Delay	*9.7*					*45.4*		*15.4*
LOS	*A*					*E*		*C*
Approach Delay	--	--				*38.2*		
Approach LOS	--	--				*E*		

>

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JH*	Intersection	*Woburn at RCC Entrance*
Agency/Co.	*NMCOG*	Jurisdiction	*Tewksbury*
Date Performed	*10/21/09*	Analysis Year	*2009*
Analysis Time Period	*PM Peak Period*		
Project Description	*Woburn Street Corridor Study*		
East/West Street:	*RCC Entrance*	North/South Street:	*Woburn St*
Intersection Orientation:	*North-South*	Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*743*	*0*	*8*	*342*	*2*
Peak-Hour Factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*0*	*782*	*0*	*0*	*360*	*2*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*15*	*0*	*3*
Peak-Hour Factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*15*	*0*	*3*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*					*L*		*R*
v (vph)	*0*					*15*		*3*
C (m) (vph)	*1208*					*223*		*688*
v/c	*0.00*					*0.07*		*0.00*
95% queue length	*0.00*					*0.21*		*0.01*
Control Delay	*8.0*					*22.3*		*10.3*
LOS	*A*					*C*		*B*
Approach Delay	--	--				*20.3*		
Approach LOS	--	--				*C*		

>

Woburn Street
Corridor Study

APPENDIX H

Traffic Signal Warrant Information, MUTCD 2009

CHAPTER 4C. TRAFFIC CONTROL SIGNAL NEEDS STUDIES

Section 4C.01 Studies and Factors for Justifying Traffic Control Signals

Standard:

01 **An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is justified at a particular location.**

02 **The investigation of the need for a traffic control signal shall include an analysis of factors related to the existing operation and safety at the study location and the potential to improve these conditions, and the applicable factors contained in the following traffic signal warrants:**

Warrant 1, Eight-Hour Vehicular Volume
Warrant 2, Four-Hour Vehicular Volume
Warrant 3, Peak Hour
Warrant 4, Pedestrian Volume
Warrant 5, School Crossing
Warrant 6, Coordinated Signal System
Warrant 7, Crash Experience
Warrant 8, Roadway Network
Warrant 9, Intersection Near a Grade Crossing

03 **The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.**

Support:

04 Sections 8C.09 and 8C.10 contain information regarding the use of traffic control signals instead of gates and/or flashing-light signals at highway-rail grade crossings and highway-light rail transit grade crossings, respectively.

Guidance:

05 *A traffic control signal should not be installed unless one or more of the factors described in this Chapter are met.*

06 *A traffic control signal should not be installed unless an engineering study indicates that installing a traffic control signal will improve the overall safety and/or operation of the intersection.*

07 *A traffic control signal should not be installed if it will seriously disrupt progressive traffic flow.*

08 *The study should consider the effects of the right-turn vehicles from the minor-street approaches. Engineering judgment should be used to determine what, if any, portion of the right-turn traffic is subtracted from the minor-street traffic count when evaluating the count against the signal warrants listed in Paragraph 2.*

09 *Engineering judgment should also be used in applying various traffic signal warrants to cases where approaches consist of one lane plus one left-turn or right-turn lane. The site-specific traffic characteristics should dictate whether an approach is considered as one lane or two lanes. For example, for an approach with one lane for through and right-turning traffic plus a left-turn lane, if engineering judgment indicates that it should be considered a one-lane approach because the traffic using the left-turn lane is minor, the total traffic volume approaching the intersection should be applied against the signal warrants as a one-lane approach. The approach should be considered two lanes if approximately half of the traffic on the approach turns left and the left-turn lane is of sufficient length to accommodate all left-turn vehicles.*

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

11 *At a location that is under development or construction and where it is not possible to obtain a traffic count that would represent future traffic conditions, hourly volumes should be estimated as part of an engineering study for comparison with traffic signal warrants. Except for locations where the engineering study uses the satisfaction of Warrant 8 to justify a signal, a traffic control signal installed under projected conditions should have an engineering study done within 1 year of putting the signal into stop-and-go operation to determine if the signal is justified. If not justified, the signal should be taken out of stop-and-go operation or removed.*

12 *For signal warrant analysis, a location with a wide median, even if the median width is greater than 30 feet, should be considered as one intersection.*

Option:

13 At an intersection with a high volume of left-turn traffic from the major street, the signal warrant analysis may be performed in a manner that considers the higher of the major-street left-turn volumes as the "minor-street" volume and the corresponding single direction of opposing traffic on the major street as the "major-street" volume.

14 For signal warrants requiring conditions to be present for a certain number of hours in order to be satisfied, any four sequential 15-minute periods may be considered as 1 hour if the separate 1-hour periods used in the warrant analysis do not overlap each other and both the major-street volume and the minor-street volume are for the same specific one-hour periods.

15 For signal warrant analysis, bicyclists may be counted as either vehicles or pedestrians.

Support:

16 When performing a signal warrant analysis, bicyclists riding in the street with other vehicular traffic are usually counted as vehicles and bicyclists who are clearly using pedestrian facilities are usually counted as pedestrians.

Option:

17 Engineering study data may include the following:

A. The number of vehicles entering the intersection in each hour from each approach during 12 hours of an average day. It is desirable that the hours selected contain the greatest percentage of the 24-hour traffic volume.
B. Vehicular volumes for each traffic movement from each approach, classified by vehicle type (heavy trucks, passenger cars and light trucks, public-transit vehicles, and, in some locations, bicycles), during each 15-minute period of the 2 hours in the morning and 2 hours in the afternoon during which total traffic entering the intersection is greatest.
C. Pedestrian volume counts on each crosswalk during the same periods as the vehicular counts in Item B and during hours of highest pedestrian volume. Where young, elderly, and/or persons with physical or visual disabilities need special consideration, the pedestrians and their crossing times may be classified by general observation.
D. Information about nearby facilities and activity centers that serve the young, elderly, and/or persons with disabilities, including requests from persons with disabilities for accessible crossing improvements at the location under study. These persons might not be adequately reflected in the pedestrian volume count if the absence of a signal restrains their mobility.
E. The posted or statutory speed limit or the 85th-percentile speed on the uncontrolled approaches to the location.
F. A condition diagram showing details of the physical layout, including such features as intersection geometrics, channelization, grades, sight-distance restrictions, transit stops and routes, parking conditions, pavement markings, roadway lighting, driveways, nearby railroad crossings, distance to nearest traffic control signals, utility poles and fixtures, and adjacent land use.
G. A collision diagram showing crash experience by type, location, direction of movement, severity, weather, time of day, date, and day of week for at least 1 year.

18 The following data, which are desirable for a more precise understanding of the operation of the intersection, may be obtained during the periods described in Item B of Paragraph 17:

A. Vehicle-hours of stopped time delay determined separately for each approach.
B. The number and distribution of acceptable gaps in vehicular traffic on the major street for entrance from the minor street.
C. The posted or statutory speed limit or the 85th-percentile speed on controlled approaches at a point near to the intersection but unaffected by the control.
D. Pedestrian delay time for at least two 30-minute peak pedestrian delay periods of an average weekday or like periods of a Saturday or Sunday.
E. Queue length on stop-controlled approaches.

Section 4C.02 Warrant 1, Eight-Hour Vehicular Volume

Support:

01 The Minimum Vehicular Volume, Condition A, is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

02 The Interruption of Continuous Traffic, Condition B, is intended for application at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.

03 It is intended that Warrant 1 be treated as a single warrant. If Condition A is satisfied, then Warrant 1 is satisfied and analyses of Condition B and the combination of Conditions A and B are not needed. Similarly, if Condition B is satisfied, then Warrant 1 is satisfied and an analysis of the combination of Conditions A and B is not needed.

Standard:

04 **The need for a traffic control signal shall be considered if an engineering study finds that one of the following conditions exist for each of any 8 hours of an average day:**

A. The vehicles per hour given in both of the 100 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; or

B. The vehicles per hour given in both of the 100 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

In applying each condition the major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of these 8 hours.

Option:

05 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 70 percent columns in Table 4C-1 may be used in place of the 100 percent columns.

Guidance:

06 *The combination of Conditions A and B is intended for application at locations where Condition A is not satisfied and Condition B is not satisfied and should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.*

Standard:

07 **The need for a traffic control signal shall be considered if an engineering study finds that both of the following conditions exist for each of any 8 hours of an average day:**

A. The vehicles per hour given in both of the 80 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; and

B. The vehicles per hour given in both of the 80 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

These major-street and minor-street volumes shall be for the same 8 hours for each condition; however, the 8 hours satisfied in Condition A shall not be required to be the same 8 hours satisfied in Condition B. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume 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		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume 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 other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Option:

08 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 56 percent columns in Table 4C-1 may be used in place of the 80 percent columns.

Section 4C.03 Warrant 2, Four-Hour Vehicular Volume

Support:

01 The Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

Standard:

02 **The need for a traffic control signal shall be considered if an engineering study finds that, for each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) all fall above the applicable curve in Figure 4C-1 for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these 4 hours.**

Option:

03 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-2 may be used in place of Figure 4C-1.

Section 4C.04 Warrant 3, Peak Hour

Support:

01 The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street.

Standard:

02 **This signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.**

03 **The need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:**

- **A. If all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:**
  1. **The total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach; and**
  2. **The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes; and**
  3. **The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.**
- **B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes.**

Option:

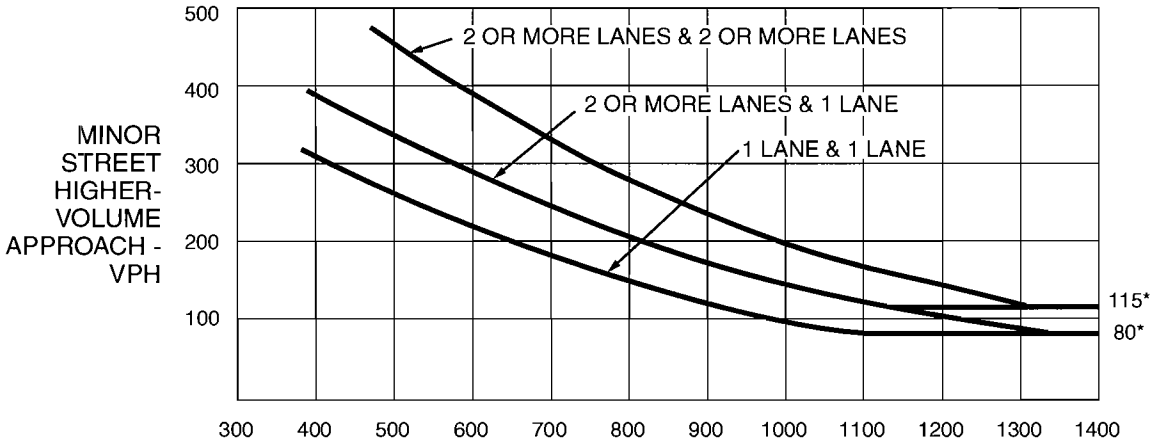
04 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-4 may be used in place of Figure 4C-3 to evaluate the criteria in the second category of the Standard.

05 If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal may be operated in the flashing mode during the hours that the volume criteria of this warrant are not met.

Guidance:

06 *If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal should be traffic-actuated.*

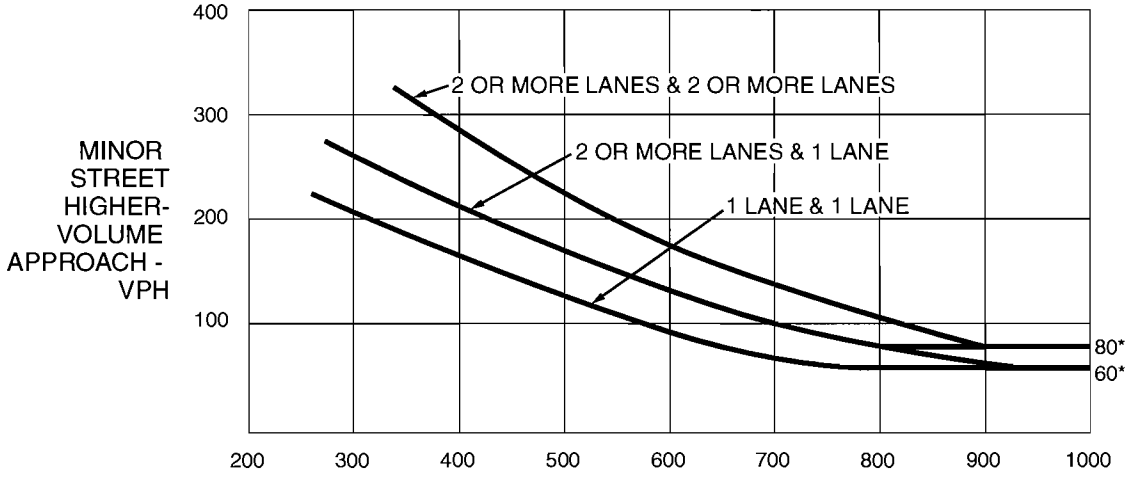
Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

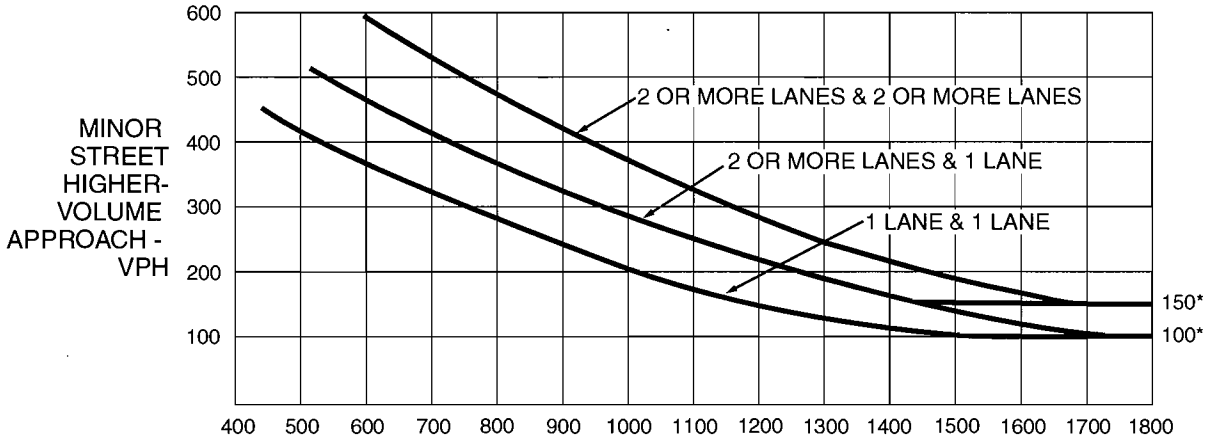
Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

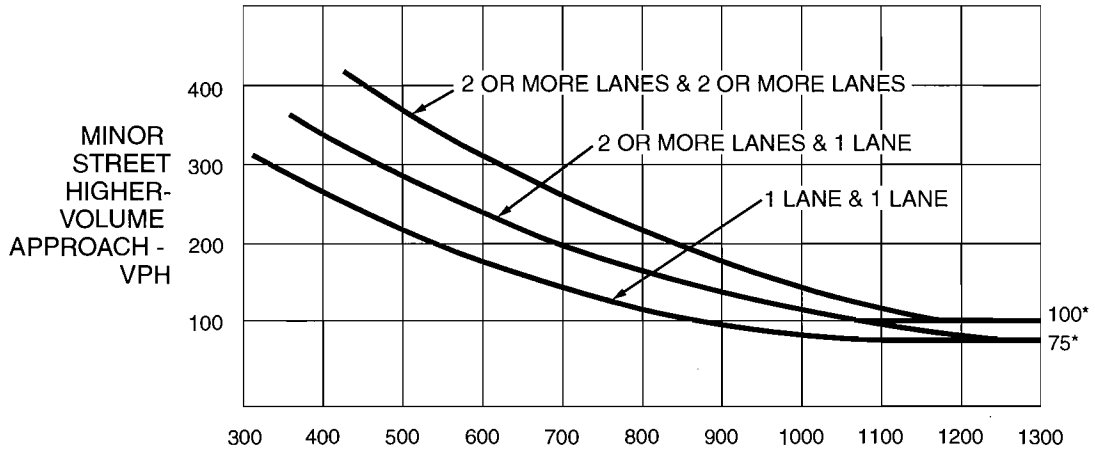
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Section 4C.05 Warrant 4, Pedestrian Volume

Support:

01 The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.

Standard:

02 **The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that one of the following criteria is met:**

- **A. For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-5; or**
- **B. For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve in Figure 4C-7.**

Option:

03 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 35 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-6 may be used in place of Figure 4C-5 to evaluate Criterion A in Paragraph 2, and Figure 4C-8 may be used in place of Figure 4C-7 to evaluate Criterion B in Paragraph 2.

Standard:

04 **The Pedestrian Volume signal warrant shall not be applied at locations where the distance to the nearest traffic control signal or STOP sign controlling the street that pedestrians desire to cross is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.**

05 **If this warrant is met and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E.**

Guidance:

06 *If this warrant is met and a traffic control signal is justified by an engineering study, then:*

- *A. If it is installed at an intersection or major driveway location, the traffic control signal should also control the minor-street or driveway traffic, should be traffic-actuated, and should include pedestrian detection.*
- *B. If it is installed at a non-intersection crossing, the traffic control signal should be installed at least 100 feet from side streets or driveways that are controlled by STOP or YIELD signs, and should be pedestrian-actuated. If the traffic control signal is installed at a non-intersection crossing, at least one of the signal faces should be over the traveled way for each approach, parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the crosswalk or site accommodations should be made through curb extensions or other techniques to provide adequate sight distance, and the installation should include suitable standard signs and pavement markings.*
- *C. Furthermore, if it is installed within a signal system, the traffic control signal should be coordinated.*

Option:

07 The criterion for the pedestrian volume crossing the major street may be reduced as much as 50 percent if the 15th-percentile crossing speed of pedestrians is less than 3.5 feet per second.

08 A traffic control signal may not be needed at the study location if adjacent coordinated traffic control signals consistently provide gaps of adequate length for pedestrians to cross the street.

Section 4C.06 Warrant 5, School Crossing

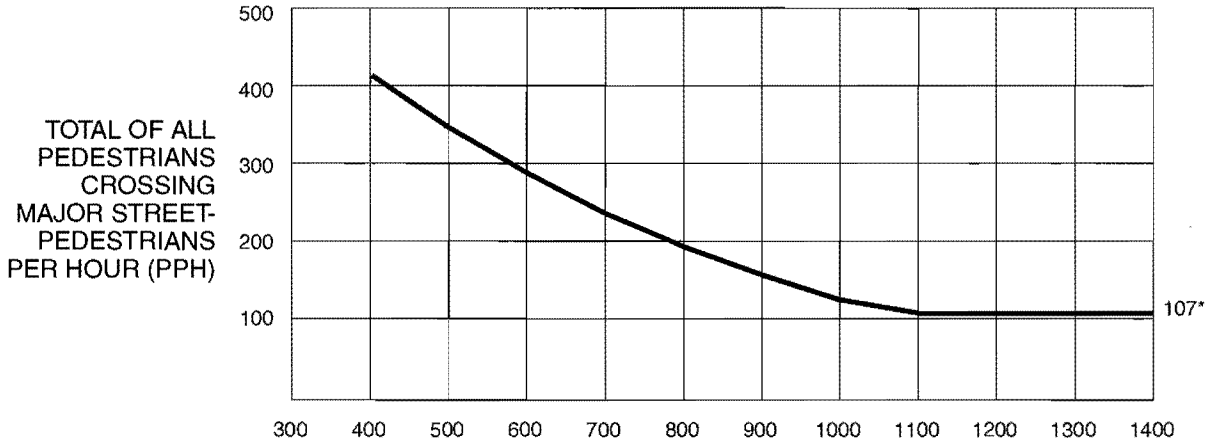
Support:

01 The School Crossing signal warrant is intended for application where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word "schoolchildren" includes elementary through high school students.

Standard:

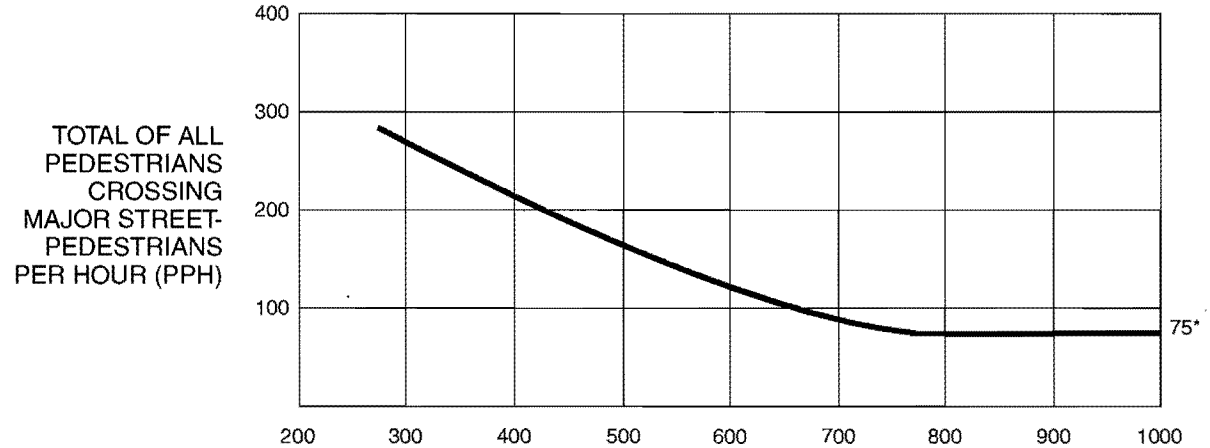
02 **The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of schoolchildren at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the schoolchildren are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 schoolchildren during the highest crossing hour.**

Figure 4C-5. Warrant 4, Pedestrian Four-Hour Volume



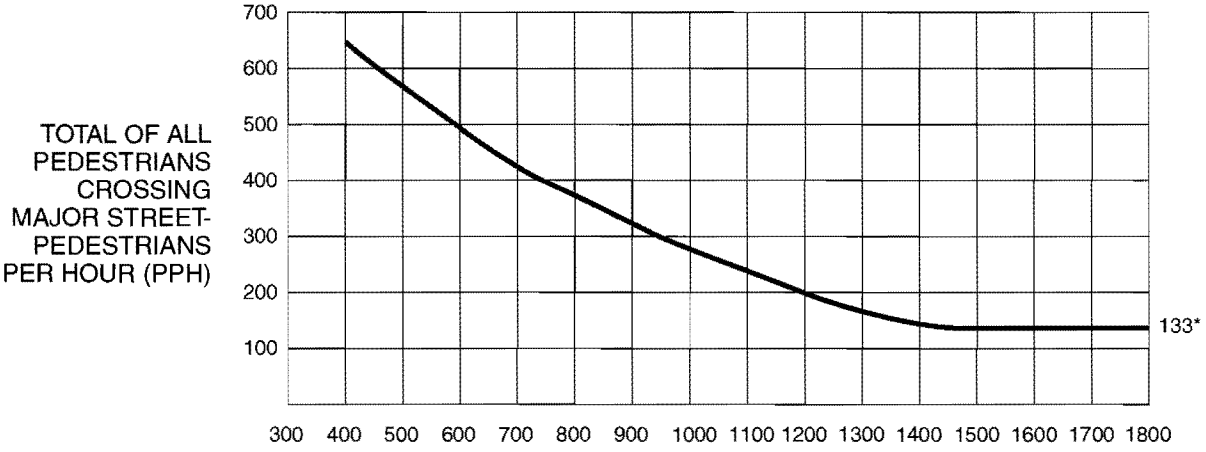
*Note: 107 pph applies as the lower threshold volume.

Figure 4C-6. Warrant 4, Pedestrian Four-Hour Volume (70% Factor)



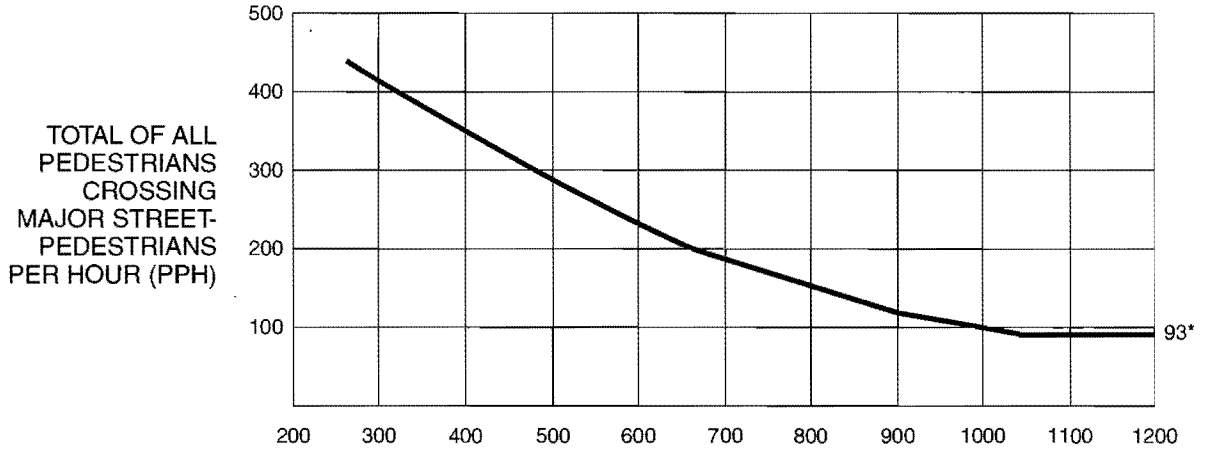
*Note: 75 pph applies as the lower threshold volume.

Figure 4C-7. Warrant 4, Pedestrian Peak Hour



*Note: 133 pph applies as the lower threshold volume.

Figure 4C-8. Warrant 4, Pedestrian Peak Hour (70% Factor)



*Note: 93 pph applies as the lower threshold volume.

03 **Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.**

04 **The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.**

Guidance:

05 *If this warrant is met and a traffic control signal is justified by an engineering study, then:*

A. *If it is installed at an intersection or major driveway location, the traffic control signal should also control the minor-street or driveway traffic, should be traffic-actuated, and should include pedestrian detection.*
B. *If it is installed at a non-intersection crossing, the traffic control signal should be installed at least 100 feet from side streets or driveways that are controlled by STOP or YIELD signs, and should be pedestrian-actuated. If the traffic control signal is installed at a non-intersection crossing, at least one of the signal faces should be over the traveled way for each approach, parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the crosswalk or site accommodations should be made through curb extensions or other techniques to provide adequate sight distance, and the installation should include suitable standard signs and pavement markings.*
C. *Furthermore, if it is installed within a signal system, the traffic control signal should be coordinated.*

Section 4C.07 Warrant 6, Coordinated Signal System

Support:

01 Progressive movement in a coordinated signal system sometimes necessitates installing traffic control signals at intersections where they would not otherwise be needed in order to maintain proper platooning of vehicles.

Standard:

02 **The need for a traffic control signal shall be considered if an engineering study finds that one of the following criteria is met:**

A. On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.
B. On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.

Guidance:

03 *The Coordinated Signal System signal warrant should not be applied where the resultant spacing of traffic control signals would be less than 1,000 feet.*

Section 4C.08 Warrant 7, Crash Experience

Support:

01 The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.

Standard:

02 **The need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:**

A. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and
B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and
C. For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Condition A in Table 4C-1 (see Section 4C.02), or the vph in both of the 80 percent columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 80 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

Option:

03 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 56 percent columns in Table 4C-1 may be used in place of the 80 percent columns.

Section 4C.09 Warrant 8, Roadway Network

Support:

01 Installing a traffic control signal at some intersections might be justified to encourage concentration and organization of traffic flow on a roadway network.

Standard:

02 **The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:**

- **A. The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3 during an average weekday; or**
- **B. The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday).**

03 **A major route as used in this signal warrant shall have at least one of the following characteristics:**

- **A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow.**
- **B. It includes rural or suburban highways outside, entering, or traversing a city.**
- **C. It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.**

Section 4C.10 Warrant 9, Intersection Near a Grade Crossing

Support:

01 The Intersection Near a Grade Crossing signal warrant is intended for use at a location where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of a grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic control signal.

Guidance:

02 *This signal warrant should be applied only after adequate consideration has been given to other alternatives or after a trial of an alternative has failed to alleviate the safety concerns associated with the grade crossing. Among the alternatives that should be considered or tried are:*

- *A. Providing additional pavement that would enable vehicles to clear the track or that would provide space for an evasive maneuver, or*
- *B. Reassigning the stop controls at the intersection to make the approach across the track a non-stopping approach.*

Standard:

03 **The need for a traffic control signal shall be considered if an engineering study finds that both of the following criteria are met:**

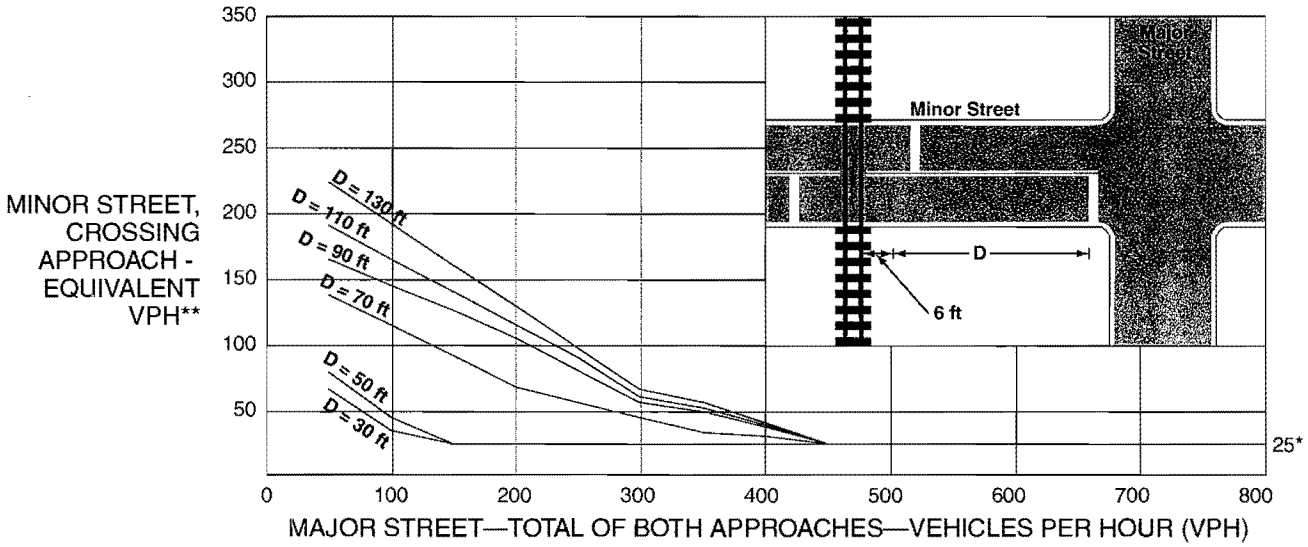
- **A. A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach; and**
- **B. During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the minor-street approach that crosses the track (one direction only, approaching the intersection) falls above the applicable curve in Figure 4C-9 or 4C-10 for the existing combination of approach lanes over the track and the distance D, which is the clear storage distance as defined in Section 1A.13.**

Guidance:

04 *The following considerations apply when plotting the traffic volume data on Figure 4C-9 or 4C-10:*

- *A. Figure 4C-9 should be used if there is only one lane approaching the intersection at the track crossing location and Figure 4C-10 should be used if there are two or more lanes approaching the intersection at the track crossing location.*

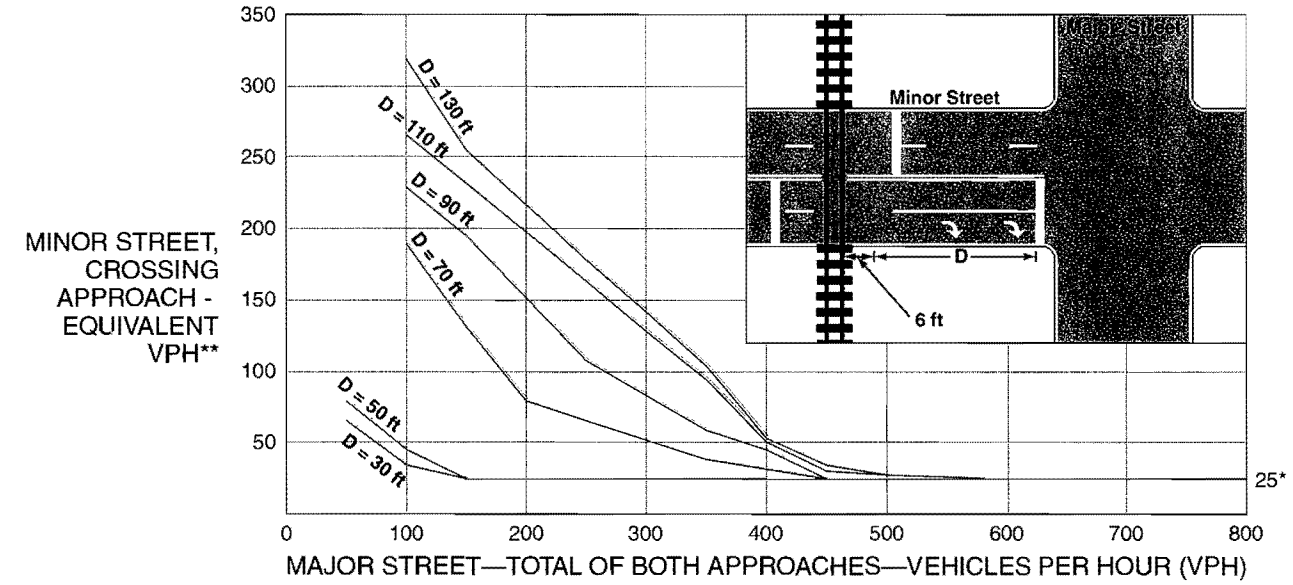
Figure 4C-9. Warrant 9, Intersection Near a Grade Crossing (One Approach Lane at the Track Crossing)



* 25 vph applies as the lower threshold volume

** VPH after applying the adjustment factors in Tables 4C-2, 4C-3, and/or 4C-4, if appropriate

Figure 4C-10. Warrant 9, Intersection Near a Grade Crossing (Two or More Approach Lanes at the Track Crossing)



* 25 vph applies as the lower threshold volume

** VPH after applying the adjustment factors in Tables 4C-2, 4C-3, and/or 4C-4, if appropriate

B. After determining the actual distance D, the curve for the distance D that is nearest to the actual distance D should be used. For example, if the actual distance D is 95 feet, the plotted point should be compared to the curve for D = 90 feet.

C. If the rail traffic arrival times are unknown, the highest traffic volume hour of the day should be used.

Option:

05 The minor-street approach volume may be multiplied by up to three adjustment factors as provided in Paragraphs 6 through 8.

06 Because the curves are based on an average of four occurrences of rail traffic per day, the vehicles per hour on the minor-street approach may be multiplied by the adjustment factor shown in Table 4C-2 for the appropriate number of occurrences of rail traffic per day.

07 Because the curves are based on typical vehicle occupancy, if at least 2% of the vehicles crossing the track are buses carrying at least 20 people, the vehicles per hour on the minor-street approach may be multiplied by the adjustment factor shown in Table 4C-3 for the appropriate percentage of high-occupancy buses.

08 Because the curves are based on tractor-trailer trucks comprising 10% of the vehicles crossing the track, the vehicles per hour on the minor-street approach may be multiplied by the adjustment factor shown in Table 4C-4 for the appropriate distance and percentage of tractor-trailer trucks.

Standard:

09 **If this warrant is met and a traffic control signal at the intersection is justified by an engineering study, then:**

A. The traffic control signal shall have actuation on the minor street;

B. Preemption control shall be provided in accordance with Sections 4D.27, 8C.09, and 8C.10; and

C. The grade crossing shall have flashing-light signals (see Chapter 8C).

Guidance:

10 *If this warrant is met and a traffic control signal at the intersection is justified by an engineering study, the grade crossing should have automatic gates (see Chapter 8C).*

Table 4C-2. Warrant 9, Adjustment Factor for Daily Frequency of Rail Traffic

Rail Traffic per Day	Adjustment Factor
1	0.67
2	0.91
3 to 5	1.00
6 to 8	1.18
9 to 11	1.25
12 or more	1.33

Table 4C-3. Warrant 9, Adjustment Factor for Percentage of High-Occupancy Buses

% of High-Occupancy Buses* on Minor-Street Approach	Adjustment Factor
0%	1.00
2%	1.09
4%	1.19
6% or more	1.32

* A high-occupancy bus is defined as a bus occupied by at least 20 people.

Table 4C-4. Warrant 9, Adjustment Factor for Percentage of Tractor-Trailer Trucks

% of Tractor-Trailer Trucks on Minor-Street Approach	Adjustment Factor	
	D less than 70 feet	D of 70 feet or more
0% to 2.5%	0.50	0.50
2.6% to 7.5%	0.75	0.75
7.6% to 12.5%	1.00	1.00
12.6% to 17.5%	2.30	1.15
17.6% to 22.5%	2.70	1.35
22.6% to 27.5%	3.28	1.64
More than 27.5%	4.18	2.09

Woburn Street
Corridor Study

APPENDIX I

Level of Service Worksheets: Future Conditions with Traffic Signal Installation

SHORT REPORT

General Information		Site Information	
Analyst	JH	Intersection	Mt Pleasant and Billerica Ave
Agency or Co.	NMCOG	Area Type	All other areas
Date Performed	10/8/2009	Jurisdiction	Billerica
Time Period	PM Peak Period	Analysis Year	2010

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	1	1	0	0	1	0	0	1	0	0	1	1
Lane group	L	TR			LTR			LTR			LT	R
Volume (vph)	569	375	18	1	151	20	9	4	1	40	5	222
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0			2.0			2.0			2.0	2.0
Ext. eff. green	2.0	2.0			2.0			2.0			2.0	2.0
Arrival type	3	3			3			3			3	3
Unit Extension	3.0	3.0			3.0			3.0			3.0	3.0
Ped/Bike/RTOR Volume	0		0	0		0	0		0	0		0
Lane Width	12.0	12.0			12.0			12.0			12.0	12.0
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr	0	0			0			0			0	0
Unit Extension	3.0	3.0			3.0			3.0			3.0	3.0

Phasing	EB Only	EW Perm	03	04	NS Perm	06	07	08
Timing	G = 10.0	G = 15.0	G =	G =	G = 16.0	G =	G =	G =
	Y =	Y = 4	Y =	Y =	Y = 4	Y =	Y =	Y =

Duration of Analysis (hrs) = 0.25 | Cycle Length C = 52.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate	632	437			191			15			50	247
Lane group cap.	666	1016			539			516			474	1615
v/c ratio	0.95	0.43			0.35			0.03			0.11	0.15
Green ratio	0.54	0.54			0.29			0.31			0.31	1.00
Unif. delay d1	11.7	7.2			14.7			12.6			12.9	0.0
Delay factor k	0.46	0.11			0.11			0.11			0.11	0.11
Increm. delay d2	23.1	0.3			0.4			0.0			0.1	0.0
PF factor	1.000	1.000			1.000			1.000			1.000	0.950
Control delay	34.8	7.5			15.1			12.6			13.0	0.0+
Lane group LOS	C	A			B			B			B	A
Apprch. delay	23.6			15.1			12.6			2.2		
Approach LOS	C			B			B			A		
Intersec. delay	18.4			Intersection LOS						B		

SHORT REPORT

General Information		Site Information	
Analyst	JH	Intersection	Mt Pleasant and Billerica Ave
Agency or Co.	NMCOG	Area Type	All other areas
Date Performed	10/8/2009	Jurisdiction	Billerica
Time Period	AM Peak Period	Analysis Year	2010

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	1	1	0	0	1	0	0	1	0	0	1	1
Lane group	L	TR			LTR			LTR			LT	R
Volume (vph)	186	89	5	0	336	35	12	2	0	13	0	612
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0			2.0			2.0			2.0	2.0
Ext. eff. green	2.0	2.0			2.0			2.0			2.0	2.0
Arrival type	3	3			3			3			3	3
Unit Extension	3.0	3.0			3.0			3.0			3.0	3.0
Ped/Bike/RTOR Volume	0		0	0		0	0		0	0		0
Lane Width	12.0	12.0			12.0			12.0			12.0	12.0
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr	0	0			0			0			0	0
Unit Extension	3.0	3.0			3.0			3.0			3.0	3.0

Phasing	EB Only	EW Perm	03	04	NS Perm	06	07	08
Timing	G = 10.0	G = 15.0	G =	G =	G = 24.0	G =	G =	G =
	Y =	Y = 4	Y =	Y =	Y = 4	Y =	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 60.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate	207	105			412			15			14	680
Lane group cap.	428	879			469			673			661	1615
v/c ratio	0.48	0.12			0.88			0.02			0.02	0.42
Green ratio	0.47	0.47			0.25			0.40			0.40	1.00
Unif. delay d1	11.5	9.0			21.6			10.9			10.9	0.0
Delay factor k	0.11	0.11			0.41			0.11			0.11	0.11
Increm. delay d2	0.9	0.1			17.1			0.0			0.0	0.2
PF factor	1.000	1.000			1.000			1.000			1.000	0.950
Control delay	12.3	9.1			38.7			10.9			10.9	0.2
Lane group LOS	B	A			D			B			B	A
Apprch. delay	11.2			38.7			10.9			0.4		
Approach LOS	B			D			B			A		
Intersec. delay	13.9			Intersection LOS						B		

SHORT REPORT

General Information		Site Information	
Analyst	JH	Intersection	RCC at Woburn
Agency or Co.	NMCOG	Area Type	All other areas
Date Performed	4/8/2010	Jurisdiction	Tewksbury
Time Period	AM Peak Period	Analysis Year	2020

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	1	0	1	0	0	0	0	1	0	0	1	0
Lane group	L		R					LT			TR	
Volume (vph)	29		38				62	327			1163	192
% Heavy veh	0		0				0	0			0	0
PHF	0.90		0.90				0.90	0.90			0.90	0.90
Actuated (P/A)	A		A				A	A			A	A
Startup lost time	2.0		2.0					2.0			2.0	
Ext. eff. green	2.0		2.0					2.0			2.0	
Arrival type	3		3					3			3	
Unit Extension	3.0		3.0					3.0			3.0	
Ped/Bike/RTOR Volume	0		0	0						0		0
Lane Width	12.0		12.0					12.0			12.0	
Parking/Grade/Parking	N	0	N	N		N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr	0		0					0			0	
Unit Extension	3.0		3.0					3.0			3.0	

Phasing	EB Only	02	03	04	NS Perm	06	07	08
Timing	G = 8.0	G =	G =	G =	G = 50.0	G =	G =	G =
	Y = 4	Y =	Y =	Y =	Y = 4	Y =	Y =	Y =

Duration of Analysis (hrs) = 0.25 | Cycle Length C = 66.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate	32		42					432			1505	
Lane group cap.	219		196					984			1412	
v/c ratio	0.15		0.21					0.44			1.07	
Green ratio	0.12		0.12					0.76			0.76	
Unif. delay d1	25.9		26.2					2.9			8.0	
Delay factor k	0.11		0.11					0.11			0.50	
Increm. delay d2	0.3		0.6					0.3			43.6	
PF factor	1.000		1.000					1.000			1.000	
Control delay	26.3		26.7					3.2			51.6	
Lane group LOS	C		C					A			D	
Apprch. delay	26.5						3.2			51.6		
Approach LOS	C						A			D		
Intersec. delay	40.3			Intersection LOS						D		

SHORT REPORT

General Information		Site Information	
Analyst	JH	Intersection	RCC at Woburn
Agency or Co.	NMCOG	Area Type	All other areas
Date Performed	4/8/2010	Jurisdiction	Tewksbury
Time Period	PM Peak Period	Analysis Year	2020

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	1	0	1	0	0	0	0	1	0	0	1	0
Lane group	L		R					LT			TR	
Volume (vph)	267		51				39	1032			419	40
% Heavy veh	0		0				0	0			0	0
PHF	0.90		0.90				0.90	0.90			0.90	0.90
Actuated (P/A)	A		A				A	A			A	A
Startup lost time	2.0		2.0					2.0			2.0	
Ext. eff. green	2.0		2.0					2.0			2.0	
Arrival type	3		3					3			3	
Unit Extension	3.0		3.0					3.0			3.0	
Ped/Bike/RTOR Volume	0		0	0						0		0
Lane Width	12.0		12.0					12.0			12.0	
Parking/Grade/Parking	N	0	N	N		N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr	0		0					0			0	
Unit Extension	3.0		3.0					3.0			3.0	

Phasing	EB Only	02	03	04	NS Perm	06	07	08
Timing	G = 10.0	G =	G =	G =	G = 30.0	G =	G =	G =
	Y = 4	Y =	Y =	Y =	Y = 4	Y =	Y =	Y =

Duration of Analysis (hrs) = 0.25 | Cycle Length C = 48.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate	297		57				1190			510		
Lane group cap.	376		336				1156			1174		
v/c ratio	0.79		0.17				1.03			0.43		
Green ratio	0.21		0.21				0.63			0.63		
Unif. delay d1	18.0		15.6				9.0			4.6		
Delay factor k	0.34		0.11				0.50			0.11		
Increm. delay d2	10.9		0.2				34.3			0.3		
PF factor	1.000		1.000				1.000			1.000		
Control delay	28.9		15.8				43.3			4.9		
Lane group LOS	C		B				D			A		
Apprch. delay	26.8						43.3			4.9		
Approach LOS	C						D			A		
Intersec. delay	30.9			Intersection LOS						C		

SHORT REPORT

General Information		Site Information	
Analyst	*JH*	Intersection	*Billerica Ave at BBC*
Agency or Co.	*NMCOG*	Area Type	*All other areas*
Date Performed	*4/8/2010*	Jurisdiction	*Billerica*
Time Period	*AM Peak Period*	Analysis Year	*2020*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	*0*	*0*	*0*	*1*	*0*	*1*	*0*	*1*	*0*	*1*	*1*	*0*
Lane group				*L*		*R*		*TR*		*L*	*T*	
Volume (vph)				*16*		*32*		*242*	*135*	*263*	*655*	
% Heavy veh				*0*		*0*		*0*	*0*	*0*	*0*	
PHF				*0.90*		*0.90*		*0.90*	*0.90*	*0.90*	*0.90*	
Actuated (P/A)				*A*		*A*		*A*	*A*	*A*	*A*	
Startup lost time				*2.0*		*2.0*		*2.0*		*2.0*	*2.0*	
Ext. eff. green				*2.0*		*2.0*		*2.0*		*2.0*	*2.0*	
Arrival type				*3*		*3*		*3*		*3*	*3*	
Unit Extension				*3.0*		*3.0*		*3.0*		*3.0*	*3.0*	
Ped/Bike/RTOR Volume	*0*			*0*		*0*	*0*		*0*			
Lane Width				*12.0*		*12.0*		*12.0*		*12.0*	*12.0*	
Parking/Grade/Parking	*N*		*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*
Parking/hr												
Bus stops/hr				*0*		*0*		*0*		*0*	*0*	
Unit Extension				*3.0*		*3.0*		*3.0*		*3.0*	*3.0*	

Phasing	WB Only	02	03	04	NS Perm	06	07	08
Timing	G = *20.0*	G =	G =	G =	G = *30.0*	G =	G =	G =
	Y = *4*	Y =	Y =	Y =	Y = *4*	Y =	Y =	Y =

Duration of Analysis (hrs) = *0.25* | Cycle Length C = *58.0*

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate				*18*		*36*		*419*		*292*	*728*	
Lane group cap.				*622*		*557*		*935*		*411*	*983*	
v/c ratio				*0.03*		*0.06*		*0.45*		*0.71*	*0.74*	
Green ratio				*0.34*		*0.34*		*0.52*		*0.52*	*0.52*	
Unif. delay d1				*12.6*		*12.7*		*8.8*		*10.7*	*11.0*	
Delay factor k				*0.11*		*0.11*		*0.11*		*0.27*	*0.30*	
Increm. delay d2				*0.0*		*0.0*		*0.3*		*5.6*	*3.0*	
PF factor				*1.000*		*1.000*		*1.000*		*1.000*	*1.000*	
Control delay				*12.6*		*12.8*		*9.1*		*16.3*	*14.0*	
Lane group LOS				*B*		*B*		*A*		*B*	*B*	
Apprch. delay				*12.7*			*9.1*			*14.7*		
Approach LOS				*B*			*A*			*B*		
Intersec. delay	*13.0*			Intersection LOS						*B*		

SHORT REPORT

General Information		Site Information	
Analyst	JH	Intersection	Billerica Ave at BBC
Agency or Co.	NMCOG	Area Type	All other areas
Date Performed	4/8/2010	Jurisdiction	Billerica
Time Period	PM Peak Period	Analysis Year	2020

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	0	0	1	0	1	0	1	0	1	1	0
Lane group				L		R		TR		L	T	
Volume (vph)				103		316		584	20	49	225	
% Heavy veh				0		0		0	0	0	0	
PHF				0.90		0.90		0.90	0.90	0.90	0.90	
Actuated (P/A)				A		A		A	A	A	A	
Startup lost time				2.0		2.0		2.0		2.0	2.0	
Ext. eff. green				2.0		2.0		2.0		2.0	2.0	
Arrival type				3		3		3		3	3	
Unit Extension				3.0		3.0		3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0			0		0	0		0			
Lane Width				12.0		12.0		12.0		12.0	12.0	
Parking/Grade/Parking	N		N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr				0		0		0		0	0	
Unit Extension				3.0		3.0		3.0		3.0	3.0	

Phasing	WB Only	02	03	04	NS Perm	06	07	08
Timing	G = 20.0	G =	G =	G =	G = 20.0	G =	G =	G =
	Y = 4	Y =	Y =	Y =	Y = 4	Y =	Y =	Y =

Duration of Analysis (hrs) = 0.25 | Cycle Length C = 48.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate				114		351		671		54	250	
Lane group cap.				752		673		788		158	792	
v/c ratio				0.15		0.52		0.85		0.34	0.32	
Green ratio				0.42		0.42		0.42		0.42	0.42	
Unif. delay d1				8.7		10.4		12.7		9.5	9.4	
Delay factor k				0.11		0.13		0.38		0.11	0.11	
Increm. delay d2				0.1		0.7		8.9		1.3	0.2	
PF factor				1.000		1.000		1.000		1.000	1.000	
Control delay				8.8		11.2		21.5		10.8	9.6	
Lane group LOS				A		B		C		B	A	
Apprch. delay				10.6			21.5			9.8		
Approach LOS				B			C			A		
Intersec. delay	15.5			Intersection LOS						B		

SHORT REPORT

General Information		Site Information	
Analyst	JH	Intersection	Mt Pleasant and Billerica Ave
Agency or Co.	NMCOG	Area Type	All other areas
Date Performed	10/8/2009	Jurisdiction	Billerica
Time Period	AM Peak Period	Analysis Year	2020

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	1	1	0	0	1	0	0	1	0	0	1	1
Lane group	L	TR			LTR			LTR			LT	R
Volume (vph)	336	99	5	0	373	64	13	4	0	16	0	719
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0			2.0			2.0			2.0	2.0
Ext. eff. green	2.0	2.0			2.0			2.0			2.0	2.0
Arrival type	3	3			3			3			3	3
Unit Extension	3.0	3.0			3.0			3.0			3.0	3.0
Ped/Bike/RTOR Volume	0		0	0		0	0		0	0		0
Lane Width	12.0	12.0			12.0			12.0			12.0	12.0
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr	0	0			0			0			0	0
Unit Extension	3.0	3.0			3.0			3.0			3.0	3.0

Phasing	EB Only	EW Perm	03	04	NS Perm	06	07	08
Timing	G = 14.0	G = 15.0	G =	G =	G = 16.0	G =	G =	G =
	Y =	Y = 4	Y =	Y =	Y = 4	Y =	Y =	Y =

Duration of Analysis (hrs) = 0.25 | Cycle Length C = 56.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate	373	116			485			18			18	799
Lane group cap.	587	1077			499			474			454	1615
v/c ratio	0.64	0.11			0.97			0.04			0.04	0.49
Green ratio	0.57	0.57			0.27			0.29			0.29	1.00
Unif. delay d1	8.7	5.5			20.3			14.4			14.4	0.0
Delay factor k	0.22	0.11			0.48			0.11			0.11	0.11
Increm. delay d2	2.3	0.0			33.0			0.0			0.0	0.2
PF factor	1.000	1.000			1.000			1.000			1.000	0.950
Control delay	10.9	5.5			53.3			14.5			14.5	0.2
Lane group LOS	B	A			D			B			B	A
Apprch. delay	9.7			53.3			14.5			0.6		
Approach LOS	A			D			B			A		
Intersec. delay	17.3			Intersection LOS						B		

SHORT REPORT

General Information		Site Information	
Analyst	JH	Intersection	Mt Pleasant and Billerica Ave
Agency or Co.	NMCOG	Area Type	All other areas
Date Performed	10/8/2009	Jurisdiction	Billerica
Time Period	PM Peak Period	Analysis Year	2020

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	1	1	0	0	1	0	0	1	0	0	1	1
Lane group	L	TR			LTR			LTR			LT	R
Volume (vph)	677	416	20	1	168	24	10	4	1	61	8	341
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0			2.0			2.0			2.0	2.0
Ext. eff. green	2.0	2.0			2.0			2.0			2.0	2.0
Arrival type	3	3			3			3			3	3
Unit Extension	3.0	3.0			3.0			3.0			3.0	3.0
Ped/Bike/RTOR Volume	0		0	0		0	0		0	0		0
Lane Width	12.0	12.0			12.0			12.0			12.0	12.0
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr	0	0			0			0			0	0
Unit Extension	3.0	3.0			3.0			3.0			3.0	3.0

Phasing	EB Only	EW Perm	03	04	NS Perm	06	07	08
Timing	G = 14.0	G = 15.0	G =	G =	G = 16.0	G =	G =	G =
	Y =	Y = 4	Y =	Y =	Y = 4	Y =	Y =	Y =

Duration of Analysis (hrs) = 0.25 | Cycle Length C = 56.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB	
Adj. flow rate	752	484		215			16			77	379
Lane group cap.	712	1078		499			471			424	1615
v/c ratio	1.06	0.45		0.43			0.03			0.18	0.23
Green ratio	0.57	0.57		0.27			0.29			0.29	1.00
Unif. delay d1	11.5	6.9		17.0			14.4			15.1	0.0
Delay factor k	0.50	0.11		0.11			0.11			0.11	0.11
Increm. delay d2	49.5	0.3		0.6			0.0			0.2	0.1
PF factor	1.000	1.000		1.000			1.000			1.000	0.950
Control delay	61.1	7.2		17.6			14.5			15.3	0.1
Lane group LOS	E	A		B			B			B	A
Apprch. delay	40.0			17.6			14.5			2.6	
Approach LOS	D			B			B			A	
Intersec. delay	28.4			Intersection LOS						C	