# Downtown Study
# Existing Conditions Report

## Town of Framingham

Urban Design & Land Use

Market Analysis

**Transportation**

**Vol. 1 of 3**


Prepared by:

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Engineers • Scientists • Planners

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FRAMINGHAM DOWNTOWN STUDY
TECHNICAL MEMORANDUM ON EXISTING CONDITIONS

# TRANSPORTATION

Prepared by: BETA Group, Inc.
Prepared for: Town of Framingham

March, 2008

# TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES

## PROJECT OVERVIEW

Downtown Framingham is a hub of multi-modal transportation, with vehicles, trucking, MBTA commuter rail, regional buses, pedestrians/bicycles, and CSX freight operations converging at the Route 135/Route 126 intersection. The vitality of Downtown Framingham is in-part dependent upon the ability of the transportation network to service residents, businesses and visitors.

The market potential for retail, office, and residential development will also be a determinant in the future success of the Downtown, because the estimated range of supportable square footage of retail and office development, and number of residential units over the next five to ten years will directly impact the future transportation network.

Finally, urban design and land use conditions will influence planning and design decisions associated with this planning process.

Each of these factors is interdependent upon the others and is integral to achieving the goal of this project, which is to develop a strategy to address the long term revitalization of Downtown Framingham.

Three volumes have been created in Phase I of this project. Volume 1 consists of this assessment of existing transportation conditions. Volume 2 describes existing market and economic conditions, and Volume 3 provides and assessment of existing urban design and land use conditions.

Phase II of this project will build upon the above information to develop a recommended strategy for the revitalization of Downtown Framingham.".

## INTRODUCTION

Within the Downtown area there are numerous at-grade rail crossings of the most heavily utilized vehicular corridors. This area is typified by a high level of congestion and delay, much of which is a result of a local street system that includes just two North-South routes (Concord St and Bishop Street). The rail crossings are heavily utilized by both freight (CSX) and passenger (MBTA & Amtrak) trains. While not solely responsible for the traffic congestion in the Downtown, these rail crossings contribute significantly to additional delay upon the traffic network.

While transportation in Downtown Framingham, and associated delays, are multi-modal, each also maintains some degree of independence. Accordingly, a detailed evaluation of Downtown Framingham needs to look beyond the grade crossings in order to comprehensively improve traffic operations in the area. BETA considered three distinct conditions to evaluate the core Downtown study area: a condition with no trains present; a condition in which an individual train crossing occurs; and a condition in which the delay due to train crossings is averaged over the study period. The core Downtown study area is shown in Figure 1.

BETA has conducted numerous field visits during the months of May through August 2007 to reaffirm the study area. During these visits observations were made of roadway geometrics, traffic controls and existing vehicle queues, delay and conflicts. This information was used to create and calibrate an existing traffic model of the intersections studied within the study area.

Historical data utilized to establish the existing transportation conditions include multiple sources from the Town and various other consultants. Of particular use is the Route 126 Corridor Study dated January 9, 1997 and two letters that update this study dated July 12, 2006 and January 23, 2007 from Rizzo Associates.

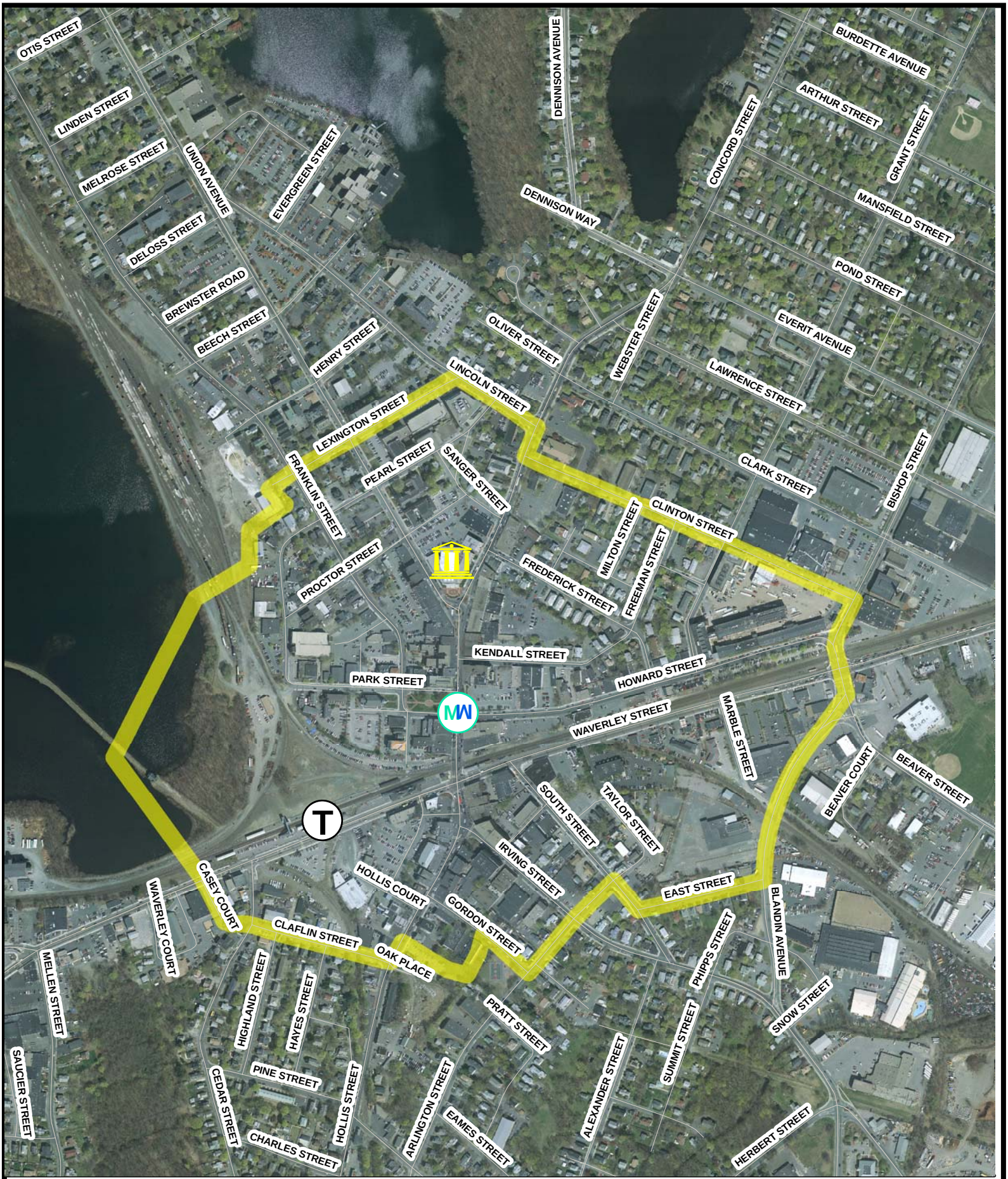


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**Figure 1**
**CORE DOWNTOWN STUDY AREA**

## EXISTING CONDITIONS

### Study Area Intersections

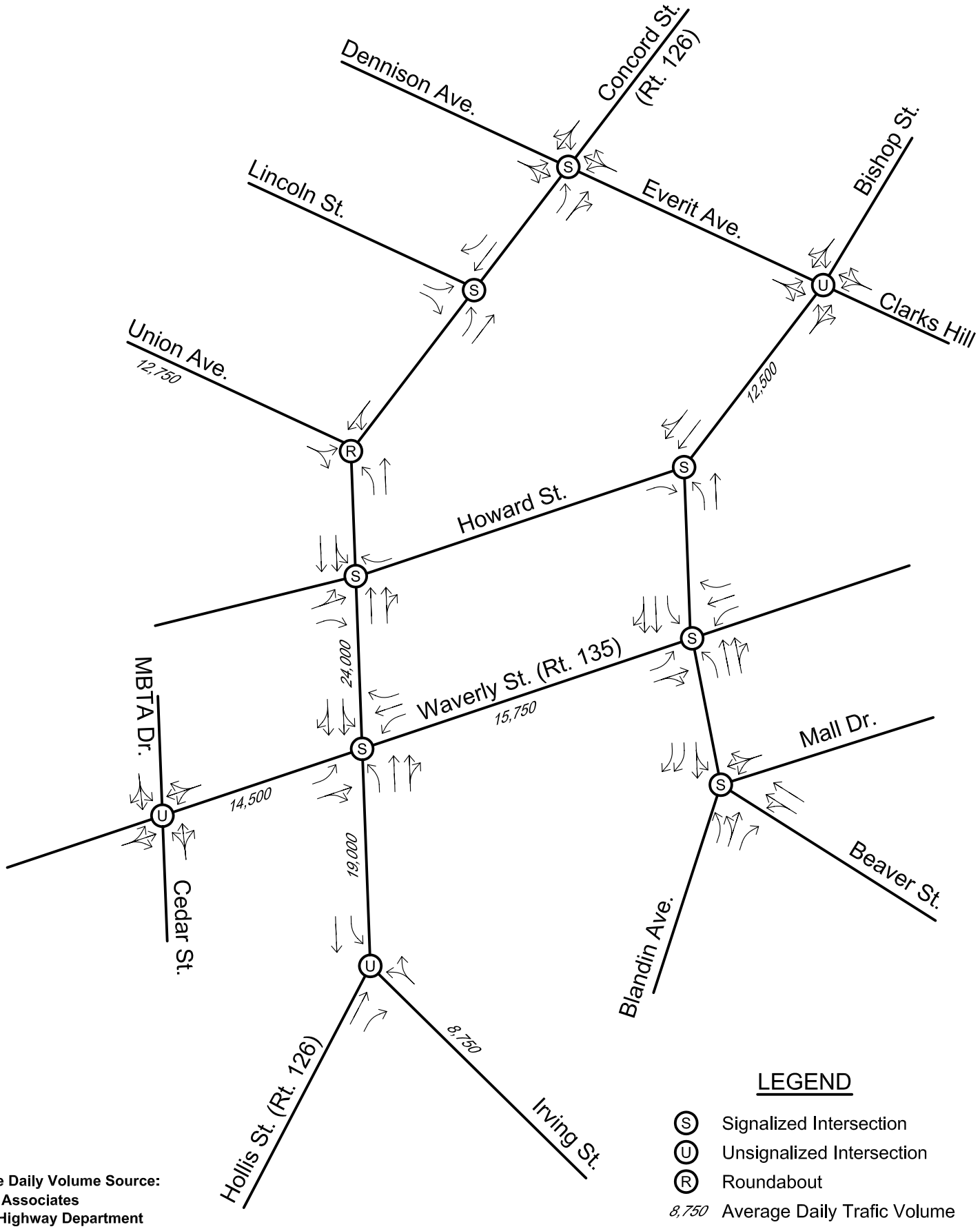
The following study area intersections were selected based upon the existing and anticipated travel patterns associated with the proposed transportation alternatives within the Downtown Core of Framingham. Existing lane use, intersection signalization, and average daily traffic volumes are presented in Figure 2 for all study area intersections.

Route 135 (Waverley Street) / Route 126 (Concord Street / Hollis Street)

This four-way signalized intersection consists of Waverley Street running generally in an east/west direction and Concord Street / Hollis Street running generally in a north/south direction. The intersection is located 230 feet to the north of the Hollis Street / Irving Street intersection, 90 feet to the south of the MBTA/CSX rail line and 350 feet to the south of the Concord Street / Howard Street intersection. The traffic signal maintains two stop line locations to control traffic on the Concord Street southbound approach, one before and after the rail line. The traffic signal is coordinated with the traffic signal at the Concord Street / Howard Street intersection. Railroad warning beacons and automatic gates alert motorists to approaching trains. The Route 135 eastbound approach consists of one through/right lane, one left turn lane with 350 feet of storage and one departure lane. The Route 135 westbound approach consists of a right turn lane, a through lane and a left turn lane along with one departure lane. Both turn lanes have 100 feet of storage. The Hollis Street northbound approach currently consists of one through/right lane and one through/left lane and two departure lanes. The Concord Street southbound approach consists of two through lanes prior to the rail line and one through/right lane and one through/left lane after the rail line along with one wide departure lane which accommodates both through lanes and gradually transitions to one lane. Parking lanes are included along the Route 126 approaches. Directional flow on all approaches is divided by a double yellow center line. The intersection includes concrete sidewalks along all approaches and crosswalks are striped across all four legs. Both roads are maintained by the Town of Framingham. The land use in the area is commercial with the MBTA commuter rail station directly adjacent to the intersection.

This intersection and the Concord Street / Howard Street intersection was reconstructed by the MBTA in 2002 as part of mitigation for the Worcester Commuter Rail Project. Subsequent traffic signal operations were not satisfactory to the Town. The Town then initiated a project to correct these deficiencies. This revised project (also performed by BETA) recommended changes to the lane use and signal phasing at this intersection. The proposed intersection modifications are presented in Figure 3.

Some of these modifications have already been implemented. The remaining recommendations have been approved by the Town and MassHighway and will be implemented in the short term. For purposes of this study it is assumed that these changes will be in place as part of the existing




**Average Daily Volume Source:**
Rizzo Associates
MassHighway Department

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**Figure 2**
**EXISTING INTERSECTION LANE-USE, SIGNALIZATION, AND AVERAGE DAILY VOLUMES**

1. GENERAL - UPDATE EXISTING PAVEMENT MARKINGS.
2. ADD TURN AND THROUGH LANE-USE PAVEMENT MARKINGS ON THE SOUTHBOUND APPROACH.
3. REMOVE TWO "LEFT LANE MUST TURN LEFT" SIGNS (NORTHBOUND AND SOUTHBOUND).
4. ADD DOTTED LINE MARKINGS TO EXTEND LANE LINES THROUGH THE INTERSECTION.
5. ADD BROKEN WHITE LANE LINES ON IRVING STREET SOUTHBOUND.
6. REMOVE EXISTING PARKING SPACES TO ADD A SHARED THROUGH / RIGHT TURN LANE. CHANGE THE EXISTING SHARED THROUGH / RIGHT TURN LANE TO A THROUGH LANE. ADD TURN AND THROUGH LANE-USE PAVEMENT MARKINGS TO BOTH LANES.
7. SOUTHBOUND GREEN AT HOWARD STREET SET TO BEGIN 2 SECONDS AFTER SOUTHBOUND GREEN AT WAVERLY STREET.
8. SOUTHBOUND GREEN AT HOWARD STREET SET TO END 6 SECONDS BEFORE SOUTHBOUND GREEN AT WAVERLY STREET.

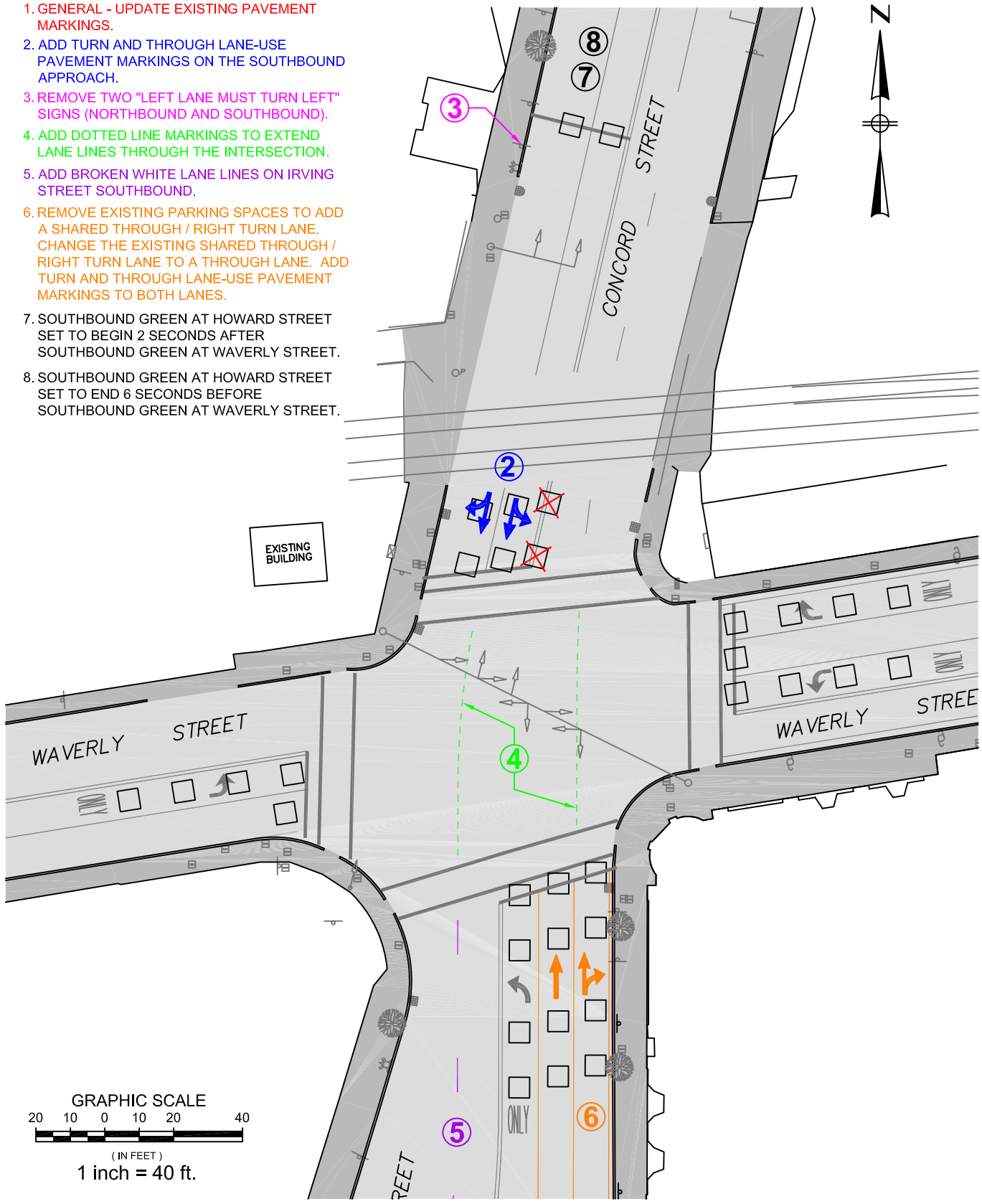


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**Figure 3**
**Intersection Modifications**
**Concord St @ Waverly St**

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conditions. The proposed changes at this intersection will modify Hollis Street northbound from one through/left lane and one through/right lane to one left turn lane, one through lane and one through/right lane, and will eliminate the parking lane. In addition, the Route 135 / Route 126 and Route 126 / Howard Street intersections will be operated by one traffic controller.

Route 126 (Concord Street) / Howard Street

This four-way signalized intersection consists of Concord Street running generally in a north/south direction with Howard Street running generally in an east/west direction. The intersection is located 350 feet to the north of the Waverley Street / Concord Street / Hollis Street intersection and 260 feet to the north of the MBTA/CSX rail line. The traffic signal is coordinated with the traffic signal at the Waverley Street / Concord Street / Hollis Street intersection. The Concord Street northbound approach consists of one through lane, one through/right lane and two departure lanes. The Concord Street southbound approach consists of a through lane and a through/left lane along with two departure lanes. The Howard Street eastbound approach is one-way towards the intersection. It consists of a through/left lane and a right turn lane along with one departure lane. The Howard Street westbound approach consists of one right turn lane. Parking is allowed along all approaches with the exception of the Howard Street eastbound approach. Directional flow on all approaches is divided by a double yellow center line. Concrete sidewalks are provided along all approaches and crosswalks are striped across all four legs. Pavement markings are faded on the Howard Street westbound approach. Both roads are maintained by the Town of Framingham. The land use in the area is commercial with a town green on the northwest corner.

Route 126 (Hollis Street) / Irving Street

This unsignalized Y-intersection consists of Hollis Street approaching from the north and southwest and Irving Street approaching from the southeast. The intersection is located 230 feet south of the Waverley Street / Concord Street / Hollis Street intersection. No traffic controls are provided. The intersection operates similar to a roundabout. A "Keep Right" (R4-7) sign is mounted inside of a tire on a ten foot wide circular traffic island which mimics the center island of a roundabout. The intersection is wide open (over 100 feet wide) with no pavement markings to guide vehicles through the intersection. All approaches to the intersection consist of one all purpose lane

along with one departure lane. Parking is allowed along all approaches and departures with the exception of the Irving Street approach. Parking along the Hollis Street northbound approach to Waverley Street is proposed to be removed. Directional flow on all approaches is divided by a double yellow center line. Concrete sidewalks are provided along all approaches and crosswalks are striped across Irving Street and the southern leg of Hollis Street. Both roads are maintained by the Town of Framingham. The land use in the area is commercial.

Route 126 (Concord Street) / Union Avenue

This modern roundabout consists of Concord Street approaching from the south and northeast and Union Avenue approaching from the northwest. The intersection is located 530 feet north of the Concord Street / Howard Street intersection. All approaches are chanalized into the roundabout by use of landscaped traffic islands and pavement markings. Yield lines are included along all approaches to delineate the circulating roadway. The landscaped center island is thirty feet in diameter surrounded by a five foot truck apron. Union Avenue and Concord Street from the northeast maintain one travel lane. Concord Street from the south maintains two travel lanes, the right lane is intended for through movements onto Concord Street and the left lane is for movements onto Union Avenue. All departures consist of one lane although the Concord Street southbound departure quickly transitions to two lanes. Parking lanes are included along all approaches. Directional flow on all approaches is divided by a double yellow center line. Concrete/brick sidewalks exist along all approaches and crosswalks are striped across Union Avenue and Concord Street from the northeast. Both roads are maintained by the Town of Framingham. The land use in the area is commercial with Town Hall located immediately to the north of the intersection.

Route 135 (Waverley Street) / Cedar Street

This four-way unsignalized intersection consists of Waverley Street running generally in an east/west direction, Cedar Street approaching from the south, and the MBTA commuter rail parking lot driveway approaching from the north. Waverley Street operates freely while Cedar Street operates under stop control. There are no traffic controls on the MBTA driveway. A CSX rail line bisects the intersection. Local employees indicated that this rail line is frequently utilized resulting in significant delay for all approaches. Mast arm and pole mounted railroad crossing warning beacons along with associated pavement markings are located along all approaches with the

exception of the MBTA driveway. All approaches to the intersection consist of one all purpose lane along with one departure lane. Waverley Street maintains a nine foot shoulder on all approaches. Although parking is not permitted in this shoulder, parked vehicles were observed during field observations. Directional flow on all approaches with the exception of the MBTA driveway is divided by a double yellow center line. Pavement markings are partially faded and no pavement markings are included on the MBTA driveway. Concrete/asphalt sidewalks are provided along all approaches. Crosswalks are striped across Cedar Street, with one across Waverley Street approximately 280 feet to the east of the intersection. Both roads are maintained by the Town of Framingham. The land use in the area is a mixture of commercial and residential with the MBTA commuter rail station to the north of the intersection.

Route 126 (Concord Street) / Lincoln Street

This three-way signalized intersection consists of Concord Street running generally in a northeast/southwest direction and Lincoln Street approaching from the northwest. An uncontrolled parking lot driveway for Saint Stephen's Church opens into the intersection. The Concord Street northeast approach consists of one through lane and one left turn and one departure lane. The Concord Street southwest approach consists of a right turn lane and a through lane along with one departure lane. The Lincoln Street approach consists of one right turn lane and one left turn lane along with one departure lane. Parking is not allowed at this intersection. Directional flow on all approaches is divided by a double yellow center line. A small traffic island on Lincoln Street separates opposing traffic. Concrete sidewalks are provided along all approaches and crosswalks are striped across all legs of the intersection. Both roads are maintained by the Town of Framingham. The traffic signal equipment at this location is outdated. Pedestrian phasing is indicated by the red and yellow balls of the traffic signals which may confuse some motorists. The land use in the area is a mixture of residential, commercial and institutional.

Route 126 (Concord Street) / Everit Avenue / Dennison Avenue

This four-way signalized intersection consists of Concord Street running generally in a northeast/southwest direction, Everit Avenue approaching from the southeast and Dennison Avenue approaching from the northwest. The Concord Street northeast approach consists of one through lane and one left turn along with one departure lane. A horizontal curve on the northeast approach

immediately prior to the intersection skews the approach. All other approaches consist of one all purpose lane and one departure lane. Eight foot parking lanes are included along Dennison Avenue and Concord Street from the northeast. Directional flow on all approaches is divided by a double yellow center line with the exception of Everit Avenue. Concrete sidewalks are provided along all approaches and crosswalks are striped across all legs. Both roads are maintained by the Town of Framingham. The traffic signal equipment at this location appears to meet current standards. The land use in the area is a mixture of residential and commercial. A commercial heavy vehicle exclusion exists on Everit Avenue.

Bishop Street / Everit Avenue / Clarks Hill

This four-way unsignalized intersection consists of Bishop Street running generally in a northeast/southwest direction, Everit Avenue approaching from the northwest and Clarks Hill approaching from the southeast. Bishop Street operates freely while Everit Avenue and Clarks Hill operate under stop control. All approaches to the intersection consist of one all purpose lane along with one departure lane. Directional flow on Bishop Street is divided by a faded double yellow center line. Pavement striping on Everit Avenue is limited to a stop line. Clarks Hill has no pavement markings. Concrete/asphalt sidewalks are provided along all approaches. One faded crosswalk is provided across the northern leg of Bishop Street. The land use in the area is a mixture of commercial and residential. A commercial heavy vehicle exclusion exists on Everit Avenue and Bishop Street.

Bishop Street / Howard Street

This three-way signalized intersection consists of Bishop Street approaching from the south and northeast and Howard Street approaching from the west. The intersection is directly adjacent to the MBTA/CSX rail line and is located 150 feet to the north of the Waverley Street / Howard Street / Beaver Street intersection and 350 feet to the north of the Beaver Street / Blandin Avenue intersection. The traffic signal is operated by the same traffic controller as the traffic signal at the Waverley Street / Howard Street / Beaver Street intersection and is coordinated with the Beaver Street / Blandin Avenue intersection. Railroad warning beacons and automatic gates warn vehicles about approaching trains. The Bishop Street approach from the south consists of one left

turn lane and one through lane (striped as a right turn lane due to configuration) and one departure lanes. The Bishop Street approach from the northeast consists of a through/right lane and a through lane along with three departure lanes. The Howard Street eastbound approach consists of one right turn lane and one departure lane. Left turns are prohibited from Howard Street. Parking is prohibited along all approaches with the exception of Howard Street. Pavement markings along all approaches either do not exist or are extremely faded. Concrete sidewalks are provided along all approaches and crosswalks across Howard Street and the northeast approach of Bishop Street are faded. Both roads are maintained by the Town of Framingham. The land use in the area is urban commercial. A commercial heavy vehicle exclusion exists on Bishop Street. This intersection along with the Waverley Street / Howard Street / Beaver Street and Beaver Street / Blandin Avenue intersections were recently reconstructed as part of a MassHighway improvements project along Waverley Street.

Route 135 (Waverley Street) / Bishop Street / Beaver Street

This four-way signalized intersection consists of Waverley Street running generally in an east/west direction, Bishop Street approaching from the north and Beaver Street approaching from the south. The intersection is directly adjacent to the MBTA/CSX rail line and is located 150 feet to the south of the Bishop Street / Howard Street intersection and 200 feet to the north of the Beaver Street / Blandin Avenue intersection. The traffic signal is operated by the same traffic controller as the Bishop Street / Howard Street intersection and is coordinated with the traffic signal Beaver Street / Blandin Avenue intersection. Railroad warning beacons and automatic gates alert motorists to approaching trains. The Waverley Street approach from the west consist of one left turn lane with 300 feet of storage and one through/right lane, along with one departure lane. The Waverley Street approach from the east consists of a right turn lane, a left turn lane with 150 feet of storage, and a through lane along with a departure lane. The Bishop Street approach consists of a left turn lane, a through lane and through/right lane along with two departure lanes. The Beaver Street approach is consists of a left turn lane, a through lane and a through/right lane along with two departure lanes. A variable message sign warns vehicles on the Waverley Street westbound approach that right turn on red is only allowed when no trains are approaching. Parking is prohibited along all approaches. Some pavement markings are faded. Concrete sidewalks along all approaches and crosswalks across all but the Bishop Street approach are provided. Both roads are maintained by the Town of Framingham. The land use in the area is urban commercial. A commercial heavy vehicle exclusion exists on Bishop Street. This intersection along with the Bishop Street / Howard Street and Beaver Street / Blandin Avenue intersections were recently reconstructed as part of a MassHighway improvements project along Waverley Street.

Beaver Street / Blandin Avenue

This four-way signalized intersection consists of Beaver Street running generally in a north/south direction, Blandin Avenue approaching from the west and a mall driveway approaching from the

east. The intersection is located 200 feet to the south of the Waverley Street / Howard Street / Beaver Street intersection and 350 feet to the south of the Bishop Street / Howard Street intersection. The traffic signal is coordinated with the traffic signals at the Waverley Street / Howard Street / Beaver Street and Bishop Street / Howard Street intersections. The Beaver Street approach from the south consists of a through/left lane and a through/right lane and three departure lanes. The Beaver Street approach from the north consists of a through/left lane and two right turn lanes lane and a departure lane. There exists only one wide departure lane on Blandin Avenue to accommodate the two right turn lanes. The Blandin Avenue approach consists of a left turn lane, a through/left lane and a chanalized free right turn lane, along with a departure lane. The mall driveway approach consists of one all purpose lane. Parking is prohibited along all approaches. Some pavement markings are faded. Concrete sidewalks along all approaches and crosswalks across all but the Beaver Street southbound approach are provided. Both roads are maintained by the Town of Framingham. The land use in the area is urban commercial. This intersection along with the Waverley Street / Howard Street / Beaver Street and Bishop Street / Howard Street intersections were recently reconstructed as part of a MassHighway improvements project along Waverley Street.

**Data Collection**

Traffic volumes used as a basis for analysis were gathered from historical data and primary counts conducted for this project. A summary is provided below.

Turning movement volumes were counted by Tetra Tech Rizzo between the hours of 7:00 and 9:00 AM and 4:00 and 6:00 PM at the following study area intersections during the month of June, 2007:

- Route 135 (Waverley Street) at Cedar Street
- Route 126 (Concord Street) at Everit Avenue and Dennison Avenue
- Bishop Street at Everit Avenue and Clarks Hill
- Bishop Street at Howard Street
- Beaver Street at Blandin Avenue

Turning movement volumes were counted by Tetra Tech Rizzo between the hours of 7:00 and 9:00 AM and 4:00 and 6:00 PM at the following study area intersections during the month of May, 2006:

- Route 126 (Concord Street) at Union Avenue
- Route 126 (Concord Street) at Howard Street
- Route 126 (Concord Street / Hollis Street) at Route 135 (Waverley Street)
- Route 126 (Hollis Street) at Irving Street

Turning movement volumes were counted by BETA between the hours of 7:00 and 9:00 AM and 4:00 and 6:00 PM at the following study area intersection during the month of June, 2004:

- Route 126 (Concord Street) at Lincoln Street

Turning movement volumes were counted by Tetra Tech Rizzo between the hours of 7:00 and 9:00 AM and 4:00 and 6:00 PM at the following study area intersection during the month of March, 2004:

- Route 135 (Waverley Street) at Bishop Street and Beaver Street

The MassHighway weekday seasonal adjustment factors worksheet was reviewed to determine whether the traffic count data required a seasonal adjustment. The MassHighway seasonal factors are based on statewide traffic data collection and are classified by roadway type. Group 6 (urban arterials, collectors and rural arterials), was used to determine that March, May and June traffic is typically higher than average monthly traffic conditions. Seasonal adjustments were not made in order to present a conservative analysis.

To account for changes in traffic volumes an annual 1% growth rate, as consistent with the Route 126 Corridor Study, was applied to all traffic counts conducted prior to 2007.

The 2007 existing peak hour traffic networks are presented in Figures 4 & 5.

## INTERSECTION OPERATIONS

### HCM Methodology

A capacity (level of service) analysis was performed at all study area locations to evaluate existing traffic conditions.

This analysis was performed using methods of the 2000 *Highway Capacity Manual* published by the Transportation Research Board. For intersections, six levels of service, "A"-"F", have been established with "A" representing very good operation and "F" representing very poor operation. For signalized and unsignalized intersections, level of service is defined in terms of total delay and is computed for individual intersection turning movements. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time.

Level of service criteria for signalized and unsignalized intersections have been defined as shown in Table 1.

Analysis was performed for each of the eleven study intersections using Synchro 6 and SIDRA 2 (for roundabout analysis) software packages. The analysis was performed for three scenarios: one with no train crossings, one with a typical train crossing and one with an average amount of time lost to train crossings.

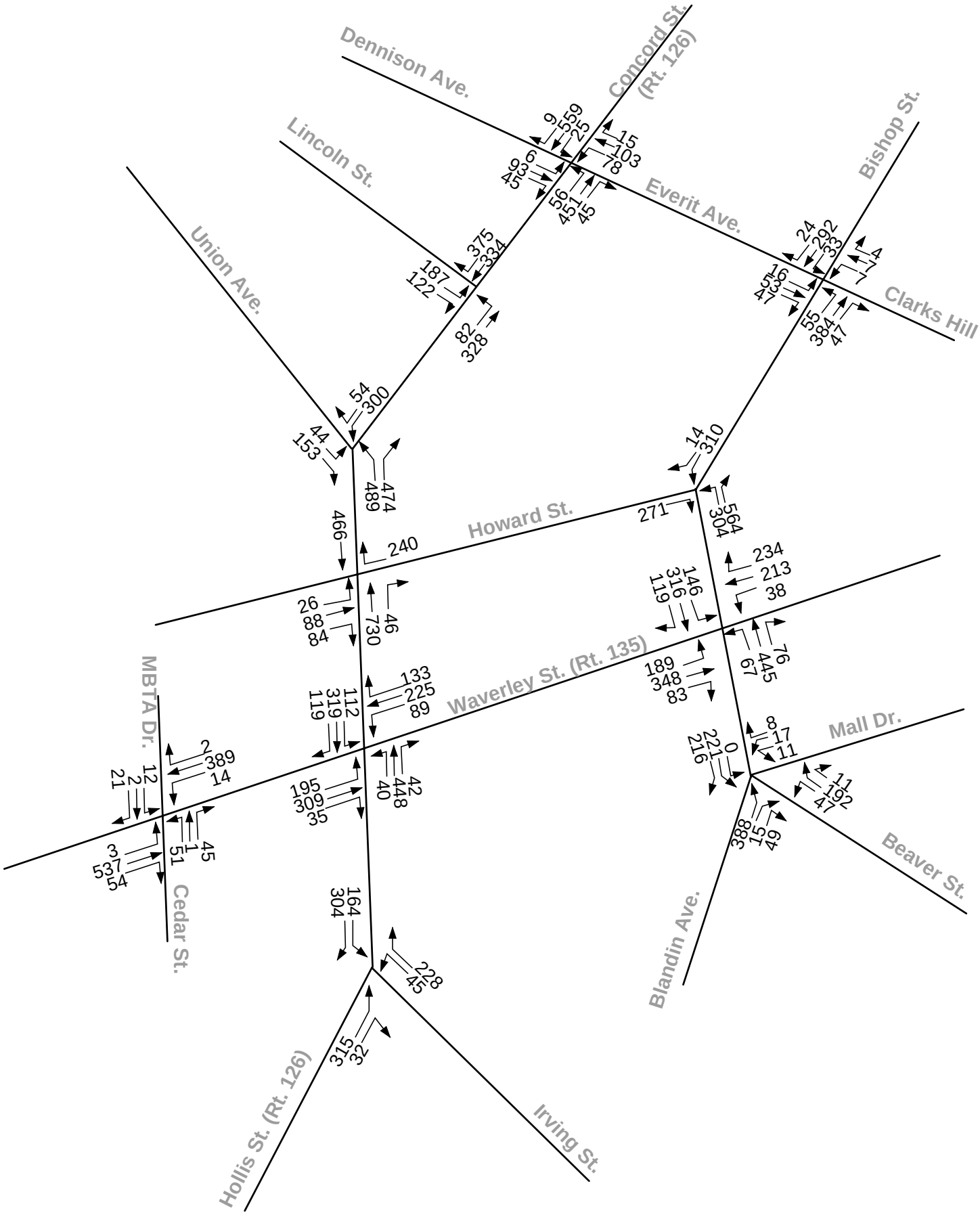


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**Figure 4**
**EXISTING AM**
**PEAK HOUR VOLUMES**

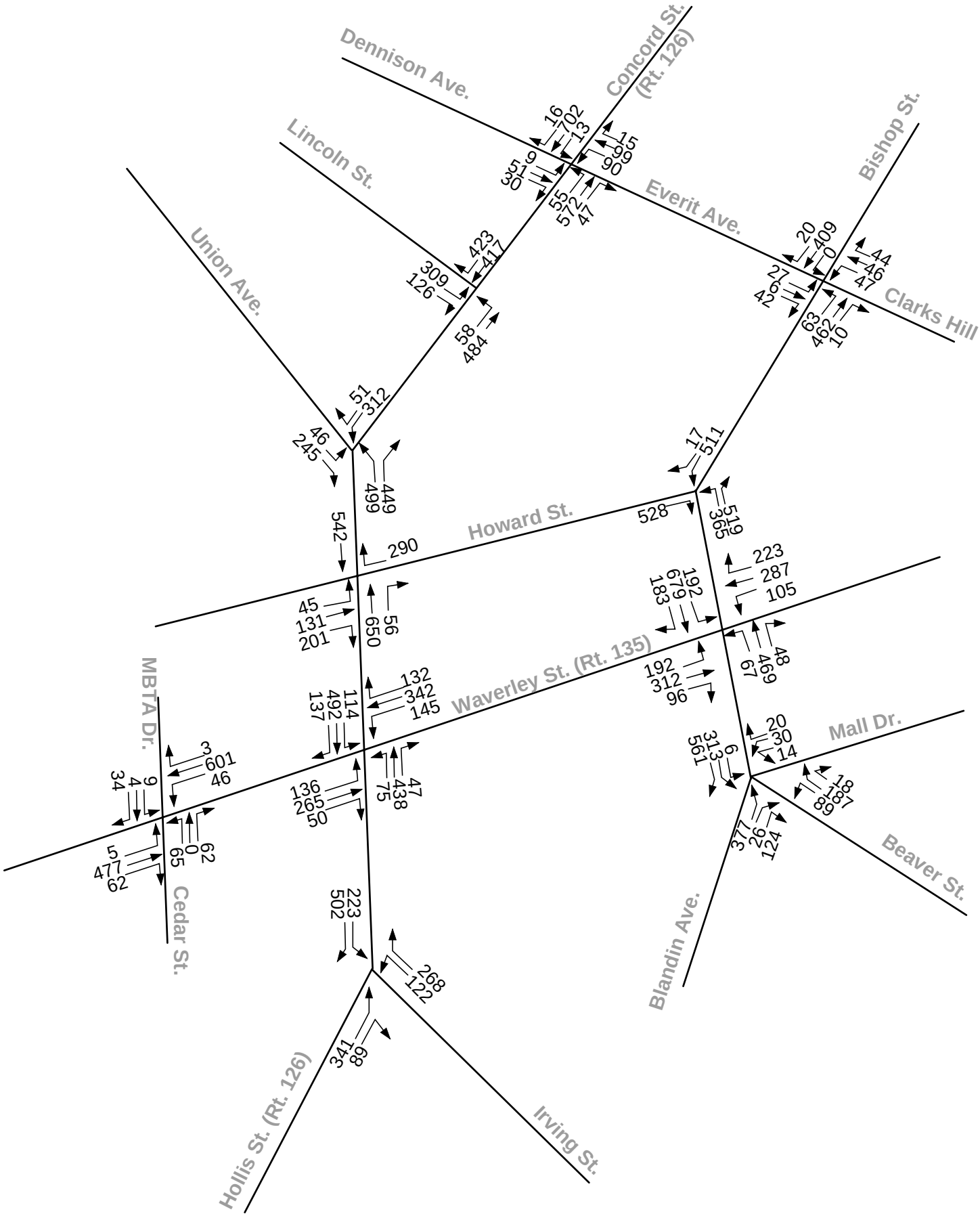


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**Figure 5**
**EXISTING PM**
**PEAK HOUR VOLUMES**

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| Table 1<br>Level of Service Criteria | | | |
|---|---|---|---|
| LOS | Control Delay (sec./veh.) | | General Description |
| | 2000 HCM Signalized | 2000 HCM Unsignalized | |
| A | 0 – 10.0 | 0 – 10.0 | Free Flow |
| B | 10.1 – 20.0 | 10.1 – 15.0 | Stable Flow (Slight Delays) |
| C | 20.1 – 35.0 | 15.1 – 25.0 | Stable Flow (Acceptable Delays) |
| D | 35.1 – 55.0 | 25.1 – 35.0 | Approaching Unstable Flow (Tolerable Delays) |
| E | 55.1 – 80.0 | 35.1 – 50.0 | Unstable Flow (Intolerable Delays) |
| F | 80.1+ | 50.1+ | Forced Flow (Jammed) |

**No Train Crossings**

Observations were made at the study area intersection during the peak hours. At some locations the observed queues were extensive and exceeded capacity. In some cases, observed queues did not match calculated levels. These differences are noted in the tables that summarize the intersection analysis results.

Results of the capacity analysis with no train crossings for the unsignalized and signalized intersections are shown in Table 2 & 3. Complete analysis results are included in the Appendix.

The results for the unsignalized intersections show that the major streets operate at acceptable levels of service during both peak periods. Results of LOS E or F are denoted on side streets.

The summary of the intersection analysis for signalized intersections found in Table 3 indicates that of the seven intersections only the PM condition for the Beaver Street / Blandin Avenue intersection (LOS E) does not operate at an overall acceptable level (LOS D or better). Some intersection movements however, would operate at LOS E or F.

The analysis of the existing traffic network without taking into account the train crossings reveals that while all intersections operate below capacity there is a significant amount of vehicle delay and queues during both peak hours. The intersections with Waverley Street, which are located immediately in the Downtown, tend to operate at poorer levels of service than those intersections that are removed from the immediate Downtown, as would be expected. Generally speaking major movements operate at LOS D and E while minor movements operate much better at LOS B and C. Of the two peak hours, the PM condition is generally worse.

**Train Crossings**

Evaluating the intersections in Downtown Framingham without taking into account the effect of train crossings is intended to address underlying traffic conditions. In reality these intersections are heavily effected by the at-grade rail crossings at Concord and Bishop Streets. The intersections of Waverley Street / Concord Street / Hollis Street, Concord Street / Howard Street, Bishop Street / Howard Street, Waverley Street / Bishop Street / Beaver Street, and Beaver Street

**Table 2**
**Existing (2007) Unsignalized Intersection Level of Service Analysis (No Train Crossing)**

| Unsignalized Intersection | Movement | AM Peak Hour | | PM Peak Hour | |
|---|---|---|---|---|---|
| | | LOS | Delay | LOS | Delay |
| Route 126 (Hollis Street) / Irving Street | Hollis Street Northbound | C | 20.1 | D | 26.1 |
| | Hollis Street Southbound | C | 16.3 | F | 85.1 |
| | Irving Street North-Westbound | C | 16.8 | D | 30.5 |
| Route 126 (Concord Street) / Union Street | Concord Street Northbound | B | 18.0 | B | 18.1 |
| | Concord Street Southbound | A | 6.0 | A | 5.9 |
| | Union Avenue South-Eastbound | A | 8.1 | A | 7.8 |
| Route 135 (Waverley Street) / Cedar Street | Cedar Street Northbound | E | 38.4 | F | 276.0 |
| | MBTA Driveway Southbound | C | 22.6 | E | 39.2 |
| | Waverley Street Eastbound Left | A | 0.1 | A | 0.2 |
| | Waverley Street Westbound Left | A | 0.5 | A | 1.3 |
| Bishop Street / Everit Avenue / Clarks Hill | Bishop Street Northbound Left | A | 1.5 | A | 1.7 |
| | Bishop Street Southbound Left | A | 1.2 | A | 0.0 |
| | Everit Avenue Eastbound | D | 34.0 | E | 36.9 |
| | Clarks Hill Westbound | D | 29.9 | F | 79.5 |

/ Blandin Avenue are directly impacted by train crossings. A 20 hour observation of all train crossings on Concord Street was performed in November of 2006. This observation was made on a typical weekday to quantify the effects of gate closures for train crossings. During this period, the gates were closed a total of 62 times for 41 MBTA commuter rail trains, 18 CSX freight trains, 2 Amtrak passenger trains and one closure with no train. The total closure over the course of the 20 hours was 1 hour, 49 minutes and 51 seconds, approximately 9% of the 20 hour period.

**Typical Train Crossing**

The average gate closure duration was calculated to account for a typical train crossing for each peak hour (8:00 – 9:00 AM & 5:00 – 6:00 PM). During the morning peak hour, the average train closure was 2 minutes and 30 seconds in duration. The average duration of the closure during the afternoon peak hour was 1 minute and 37 seconds. This average duration was incorporated into the traffic model as the railroad preemption phase of the appropriate signal cycle. Table 4 indicates the LOS of the specified intersections under no train crossing and a typical train crossing conditions.

As expected, the Level of Service of the intersections becomes significantly worse taking into account a typical train crossing. All of the study area intersections operate at LOS F under these conditions for both peak hours. Most movements operate at LOS F with excessive delays and queues. The effects of a typical train crossing is severe, intersections that otherwise operate near or just at capacity without the effects of a train crossing will degenerate to gridlock with a train crossing. It should be noted that during the railroad preemption phases some movements that do not conflict with the train are allowed to proceed. These movements experience an improvement in LOS due to this increased green time.

## Table 3
## Existing (2007) Signalized Intersection Level of Service Analysis Results (No Train Crossing)

| Signalized Intersection | Movement | AM Peak Hour | | | PM Peak Hour | | |
|---|---|---|---|---|---|---|---|
| | | LOS | Delay | Queue | LOS | Delay | Queue |
| Route 135 (Waverley Street) / Route 126 (Concord Street / Hollis Street) | Hollis Street Northbound Left | C | 32.1 | 60+ | C | 34.1 | 103+ |
| | Hollis Street Northbound Thru/Right | D | 35.3 | 292 | C | 33.2 | 291 |
| | Concord Street Southbound | D | 48.3 | 163^ | E | 63.2 | 449^ |
| | Waverley Street Eastbound Left | C | 30.2 | 172 | D | 35.0 | 140 |
| | Waverley Street Eastbound Thru/Right | E | 56.7 | 410 | E | 57.7 | 437 |
| | Waverley Street Westbound Left | C | 27.0 | 85 | C | 34.2 | 148 |
| | Waverley Street Westbound Thru | D | 40.8 | 265 | E | 66.0 | 488 |
| | Waverley Street Westbound Right | D | 35.1 | 74 | D | 40.4 | 127 |
| | Overall | D | 42.0 | 0.88* | D | 51.0 | 0.88* |
| Route 126 (Concord Street) / Howard Street | Concord Street Northbound | B | 10.5 | 244 | A | 9.9 | 145 |
| | Concord Street Southbound | E | 78.5 | 348%$ | E | 64.5 | 419%$ |
| | Howard Street Eastbound Thru/Left | D | 45.6 | 177$ | E | 60.0 | 310$ |
| | Howard Street Eastbound Right | D | 42.3 | 49 | D | 53.3 | 79 |
| | Howard Street Westbound | D | 43.6 | 0 | D | 47.0 | 15 |
| | Overall | D | 39.2 | 0.65* | D | 39.2 | 0.62* |
| Route 126 (Concord Street) / Lincoln Street | Concord Street Northbound Left | B | 11.9 | 59 | B | 14.2 | 46 |
| | Concord Street Northbound Thru | B | 13.6 | 192$ | B | 18.7 | 294$ |
| | Concord Street Southbound Thru | B | 13.0 | 193$ | B | 17.5 | 251$ |
| | Concord Street Southbound Right | B | 11.6 | 47 | B | 15.0 | 73 |
| | Lincoln Street Eastbound Left | C | 28.2 | 148$ | D | 41.3 | 271$ |
| | Lincoln Street Eastbound Right | C | 23.0 | 37 | C | 21.7 | 32 |
| | Overall | B | 15.6 | 0.50* | C | 21.8 | 0.70* |
| Route 126 (Concord Street) / Dennison Avenue / Everit Avenue | Concord Street Northbound Left | B | 12.1 | 34 | B | 11.8 | 33 |
| | Concord Street Northbound Thru/Right | B | 13.5 | 295 | B | 12.7 | 361 |
| | Concord Street Southbound | D | 40.9 | 644$ | D | 48.0 | 842$ |
| | Dennison Avenue Eastbound | C | 33.9 | 148$ | C | 34.5 | 96 |
| | Everit Avenue Westbound | F | 108.6 | 322%$ | E | 66.3 | 300%$ |
| | Overall | D | 39.9 | 0.94* | D | 36.2 | 0.92* |
| Bishop Street / Howard Street | Bishop Street Northbound Left | C | 28.7 | 286# | C | 25.1 | 339# |
| | Bishop Street Northbound Thru | A | 0.6 | 18# | A | 0.7 | 3# |
| | Bishop Street Southbound | D | 43.0 | 172 | D | 47.7 | 288 |
| | Howard Street Eastbound Right | C | 33.7 | 0 | D | 38.5 | 6 |
| | Overall | C | 22.7 | 0.45* | C | 28.0 | 0.57* |
| Route 135 (Waverley Street) / Bishop Street / Beaver Street | Beaver Street Northbound Left | C | 20.3 | 38# | E | 64.6 | 74# |
| | Beaver Street Northbound Thru/Right | C | 22.9 | 101# | E | 61.6 | 291# |
| | Bishop Street Southbound Left | A | 7.7 | 37# | B | 10.1 | 57# |
| | Bishop Street Southbound Thru/Right | A | 4.8 | 34# | B | 11.7 | 110# |
| | Waverley Street Eastbound Left | F | 99.6 | 314% | F | 106.2 | 322% |
| | Waverley Street Eastbound Thru/Right | D | 42.8 | 455 | D | 37.6 | 420 |
| | Waverley Street Westbound Left | D | 43.6 | 66 | E | 61.0 | 181 |
| | Waverley Street Westbound Thru | D | 53.7 | 264 | E | 72.9 | 405 |
| | Waverley Street Westbound Right | D | 41.9 | 87 | D | 42.6 | 133 |
| | Overall | C | 34.1 | 0.63* | D | 41.8 | 0.74* |
| Beaver Street / Blandin Avenue | Beaver Street Northbound | E | 56.6 | 143 | E | 55.6 | 116 |
| | Beaver Street Southbound Left/Thru | C | 25.3 | 138# | C | 31.4 | 386# |
| | Beaver Street Southbound Right | A | 4.5 | 11# | E | 70.9 | 114# |
| | Blandin Avenue Eastbound Left | D | 45.1 | 288 | E | 59.2 | 351 |
| | Blandin Avenue Eastbound Left/Thru | D | 49.1 | 317 | E | 72.2 | 393 |
| | Blandin Avenue Eastbound Right | C | 31.6 | 43 | D | 38.8 | 82 |
| | Mall Drive Westbound | E | 55.1 | 55 | E | 55.9 | 75 |
| | Overall | D | 37.8 | 0.68* | E | 57.3 | 0.73* |

Queue – 95th percentile queue
* - Volume to Capacity Ratio
+ - Observed queue longer than reported
# - Queue metered by upstream signal
% - Queue exceeds capacity
$ - Observed queue shorter than reported
^ - Queue exceeds capacity and metered by upstream signal

**Table 4**
**Existing (2007) Signalized Level of Service Analysis Results (Typical Train Crossing)**

| Signalized Intersection | Movement | No Train AM Peak Hour | | | Average Train AM Peak Hour | | | No Train PM Peak Hour | | | Average Train PM Peak Hour | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LOS | Delay | Queue | LOS | Delay | Queue | LOS | Delay | Queue | LOS | Delay | Queue |
| Route 135 (Waverley Street) / Route 126 (Concord Street / Hollis Street) | Hollis Street Northbound Left | C | 32.1 | 60 | F | 130.1 | 102 | C | 34.1 | 103 | F | 113.4 | 160 |
| | Hollis Street Northbound Thru/Right | D | 35.3 | 292 | F | 384.3 | 807% | C | 33.2 | 291 | F | 109.7 | 470% |
| | Concord Street Southbound | D | 48.3 | 163^ | F | 659.7 | 303^ | E | 63.2 | 449^ | F | 434.0 | 616^ |
| | Waverley Street Eastbound Left | C | 30.2 | 172 | F | 266.0 | 654% | D | 35.0 | 140 | F | 137.7 | 307% |
| | Waverley Street Eastbound Thru/Right | E | 56.7 | 410 | C | 26.1 | 296 | E | 57.7 | 437 | D | 38.9 | 343 |
| | Waverley Street Westbound Left | C | 27.0 | 85 | F | 117.9 | 234 | C | 34.2 | 148 | F | 130.9 | 318% |
| | Waverley Street Westbound Thru | D | 40.8 | 265 | C | 23.7 | 190 | E | 66.0 | 488 | D | 39.8 | 383 |
| | Waverley Street Westbound Right | D | 35.1 | 74 | F | 157.2 | 385 | D | 40.4 | 127 | F | 111.4 | 330 |
| | Overall | D | 42.0 | 0.88* | F | 329.9 | 0.98* | D | 51.0 | 0.88* | F | 187.9 | 1.00* |
| Route 126 (Concord Street) / Howard Street | Concord Street Northbound | B | 10.5 | 244 | F | 236.6 | 645^ | A | 9.9 | 145 | E | 64.0 | 637 |
| | Concord Street Southbound | E | 78.5 | 348% | F | 666.5 | 936% | E | 64.5 | 419% | F | 291.2 | 841# |
| | Howard Street Eastbound Thru/Left | D | 45.6 | 177 | C | 26.6 | 96 | E | 60.0 | 310 | D | 37.9 | 182 |
| | Howard Street Eastbound Right | D | 42.3 | 49 | C | 25.5 | 20 | D | 53.3 | 79 | D | 36.2 | 37 |
| | Howard Street Westbound | D | 43.6 | 0 | C | 28.3 | 20 | D | 47.0 | 15 | D | 38.6 | 69 |
| | Overall | D | 39.2 | 0.65* | F | 310.6 | 0.68* | D | 39.2 | 0.62* | F | 120.0 | 0.61* |
| Bishop Street / Howard Street | Bishop Street Northbound Left | C | 28.7 | 286# | D | 44.1 | 364# | C | 25.1 | 339# | D | 38.0 | 466^3# |
| | Bishop Street Northbound Thru | A | 0.6 | 18# | A | 9.4 | 71# | A | 0.7 | 3# | A | 2.6 | 47# |
| | Bishop Street Southbound | D | 43.0 | 172 | F | 236.7 | 484 | D | 47.7 | 288 | F | 274.3 | 713 |
| | Howard Street Eastbound Right | C | 33.7 | 0 | F | 334.7 | 959 | D | 38.5 | 6 | F | 649.9 | 1602 |
| | Overall | C | 22.7 | 0.45* | F | 131.9 | 0.59* | C | 28.0 | 0.57* | F | 253.1 | 0.83* |
| Route 135 (Waverley Street) / Bishop Street / Beaver Street | Beaver Street Northbound Left | C | 20.3 | 38# | F | 124.8 | 208% | E | 64.6 | 74# | F | 722.4 | 298% |
| | Beaver Street Northbound Thru/Right | C | 22.9 | 101 | F | 300.5 | 833% | E | 61.6 | 291# | F | 133.9 | 579% |
| | Bishop Street Southbound Left | A | 7.7 | 37 | F | 107.1 | 63^ | B | 10.1 | 57# | F | 80.3 | 68^ |
| | Bishop Street Southbound Thru/Right | A | 4.8 | 34 | A | 9.8 | 16# | B | 11.7 | 110 | B | 18.4 | 38# |
| | Waverley Street Eastbound Left | F | 99.6 | 314% | F | 675.1 | 804% | F | 106.2 | 322% | F | 480.7 | 643% |
| | Waverley Street Eastbound Thru/Right | D | 42.8 | 455 | B | 16.4 | 390 | D | 37.6 | 420 | B | 19.9 | 372 |
| | Waverley Street Westbound Left | D | 43.6 | 66 | B | 18.7 | 51 | E | 61.0 | 181 | C | 25.9 | 130 |
| | Waverley Street Westbound Thru | D | 53.7 | 264 | C | 20.5 | 225 | E | 72.9 | 405 | C | 27.0 | 312 |
| | Waverley Street Westbound Right | D | 41.9 | 87 | C | 21.7 | 257 | D | 42.6 | 133 | C | 27.1 | 252 |
| | Overall | C | 34.1 | 0.63* | F | 148.1 | 0.66* | D | 41.8 | 0.74* | F | 92.3 | 0.90* |
| Beaver Street / Blandin Avenue | Beaver Street Northbound | E | 56.6 | 143 | F | 379.9 | 450 | E | 55.6 | 116 | F | 240.5 | 402 |
| | Beaver Street Southbound Left/Thru | C | 25.3 | 138# | B | 17.0 | 211 | C | 31.4 | 386% | C | 23.1 | 315 |
| | Beaver Street Southbound Right | A | 4.5 | 11# | A | 7.3 | 12 | E | 70.9 | 114 | B | 10.3 | 19 |
| | Blandin Avenue Eastbound Left | D | 45.1 | 288 | F | 747.9 | 834 | E | 59.2 | 351 | F | 388.2 | 725 |
| | Blandin Avenue Eastbound Left/Thru | D | 49.1 | 317 | F | 811.9 | 900 | E | 72.2 | 393 | F | 453.9 | 223 |
| | Blandin Avenue Eastbound Right | C | 31.6 | 43 | F | 115.8 | 126 | D | 38.8 | 82 | F | 94.7 | 171 |
| | Mall Drive Westbound | E | 55.1 | 55 | F | 138.3 | 116 | E | 55.9 | 75 | F | 122.3 | 402 |
| | Overall | D | 37.8 | 0.68* | F | 379.0 | 0.61* | E | 57.3 | 0.73* | F | 156.8 | 0.67* |

Queue – 95th percentile queue
* - Volume to Capacity Ratio
+ - Observed queue longer than reported
# - Queue metered by upstream signal
% - Queue exceeds capacity
$ - Observed queue shorter than reported
^ - Queue exceeds capacity and metered by upstream signal

### Average Time Lost To Train Crossings

The previous two analysis conditions represent conditions that actually occur in Downtown Framingham. That is, sometimes traffic flows with no interruption due to a train crossing and sometimes the gates are activated and vehicles are delayed. After a gate closure period, there is typically a great deal of residual delay at the intersections surrounding the grade crossing which can sometimes take a few signal cycles to clear. For this reason a third analysis condition which represents an average cycle during the peak hour was used. This condition accounts for the traffic signal cycles with no train activity, those with train crossings, and those where traffic congestion is dissipating from a closure. While this does not represent an actual condition during a cycle, it does provide a picture of delays experienced by the traffic using the intersection during the peak hour.

During a typical peak hour, approximately 5 to 6 train crossings occur. To estimate the average operating conditions over the course of a peak hour the effects of the 5 to 6 train crossings must be averaged over the hour. To do this BETA averaged the amount of delay that occurs as a result of the train crossings occurring within the peak hour. For example if five trains cross during a peak hour each for a duration of 1 minutes and 30 seconds (1:30) the overall delay from train crossing is 7 minutes and 30 seconds (7:30) or 450 seconds. If we assume it takes the traffic signal 100 seconds to complete a phasing cycle and there are 3600 seconds in an hour we know that there are 36 signal cycles during the course of the peak hour. Therefore we can conclude that there is approximately 12.5 seconds of delay that occurs from the train crossings for every traffic signal phasing cycle. By applying this delay to the signal cycle in a similar fashion to that utilized for the average train crossing the average operating conditions of the intersections can be estimated. Table 5 indicates the LOS of the specified intersections under no train crossing and the average time lost to train crossings conditions.

Under the conditions with average time lost to train crossings many of the intersections that operate at acceptable LOS (D or better) with no train crossings now operate at LOS E or F. The intersection of Waverley Street / Concord Street / Hollis Street operates at LOS E or F during both peak hours where it operates at LOS D under no train conditions. Other intersections experience similar degradations. The average time lost to train crossings condition represents traffic conditions that have not been reduced to gridlock (like the typical train crossing condition) but do experience poor operating conditions with a marked increase in delay and queue lengths over the no train crossings condition. Under the average time lost to train crossing condition, the level of service results for the AM peak hour are generally worse due to the longer duration of the closures. This differs from the condition where no train is present, where the PM condition is generally worse.

Figures 6 & 7 indicate the LOS for all study area intersections and approaches for the AM peak hour while Figures 8 & 9 do so for the PM peak hour.

## PEDESTRIANS

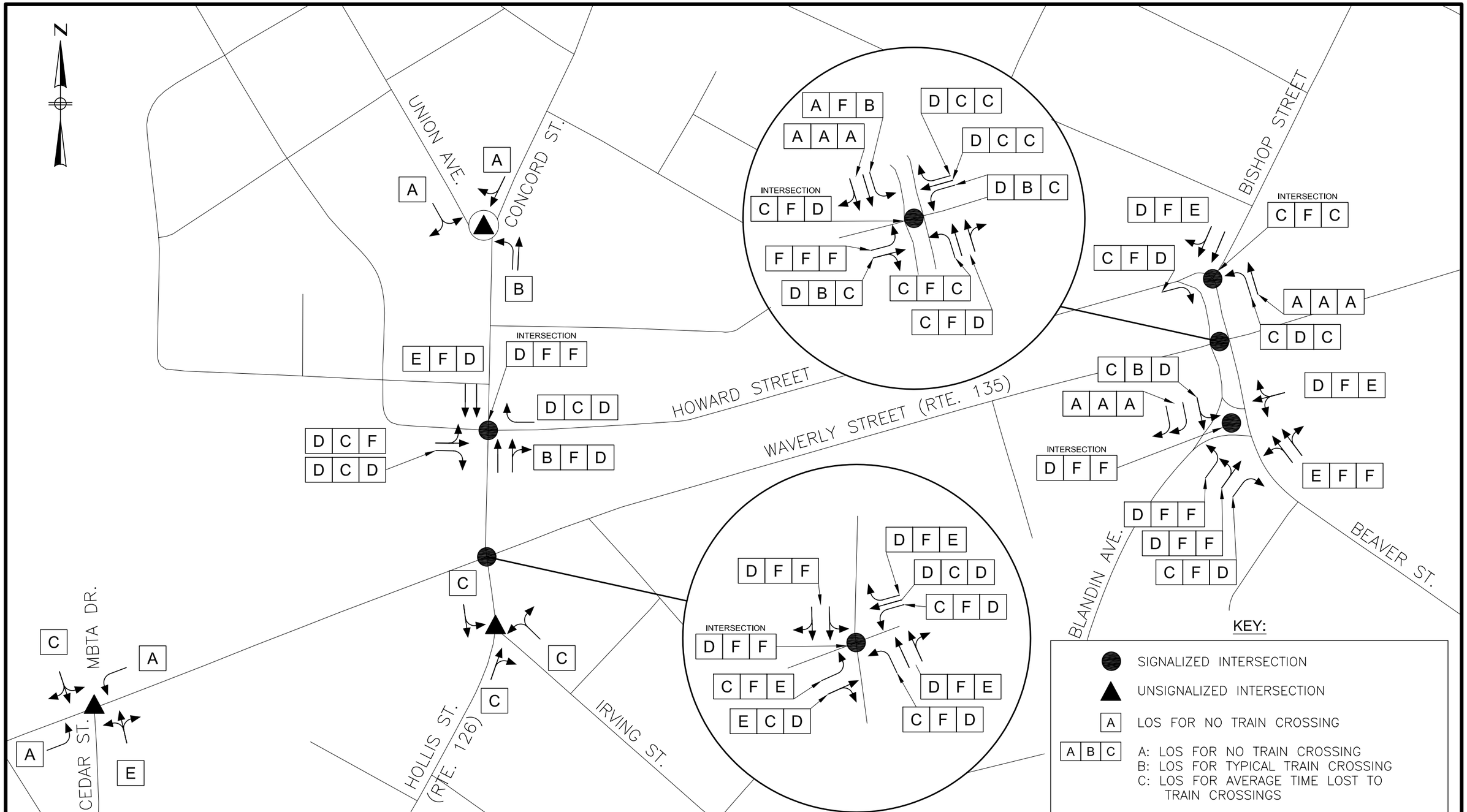
In June of 2006 Rizzo Associates conducted an extensive pedestrian count during the AM and PM peak hours within the core Downtown area. This count revealed a high level of pedestrian activity during both peak hours. The 2006 count indicates an increase in pedestrian activity compared to a count conducted in 1996.

BETA conducted pedestrian observations during a field visit in July, 2007. This observation and the previous counts reveal that a predominant pedestrian path is along Route 126 from the Irving

**Table 5**
**Existing (2007) Signalized Level of Service Analysis Results (Average Time Lost to Train Crossings)**

| Signalized Intersection | Movement | No Train AM Peak Hour | | | Average Time Lost AM Peak Hour | | | No Train PM Peak Hour | | | Average Time Lost PM Peak Hour | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LOS | Delay | Queue | LOS | Delay | Queue | LOS | Delay | Queue | LOS | Delay | Queue |
| Route 135 (Waverley Street) / Route 126 (Concord Street / Hollis Street) | Hollis Street Northbound Left | C | 32.1 | 60 | D | 43.2 | 52 | C | 34.1 | 103 | D | 42.9 | 112 |
| | Hollis Street Northbound Thru/Right | D | 35.3 | 292 | E | 72.6 | 307 | C | 33.2 | 291 | D | 53.8 | 279 |
| | Concord Street Southbound | D | 48.3 | 163^ | F | 185.5 | 156^ | E | 63.2 | 449^ | F | 112.1 | 507^ |
| | Waverley Street Eastbound Left | C | 30.2 | 172 | E | 72.4 | 177 | D | 35.0 | 140 | E | 62.4 | 187 |
| | Waverley Street Eastbound Thru/Right | E | 56.7 | 410 | D | 47.6 | 238 | E | 57.7 | 437 | E | 56.4 | 362 |
| | Waverley Street Westbound Left | C | 27.0 | 85 | D | 46.4 | 77 | C | 34.2 | 148 | E | 58.8 | 198 |
| | Waverley Street Westbound Thru | D | 40.8 | 265 | D | 41.2 | 148 | E | 66.0 | 488 | E | 60.6 | 404 |
| | Waverley Street Westbound Right | D | 35.1 | 74 | E | 62.7 | 145 | D | 40.4 | 127 | E | 58.3 | 173 |
| | Overall | D | 42.0 | 0.88* | F | 95.5 | 0.95* | D | 51.0 | 0.88* | E | 73.1 | 0.89* |
| Route 126 (Concord Street) / Howard Street | Concord Street Northbound | B | 10.5 | 244 | D | 41.6 | 483 | A | 9.9 | 145 | C | 26.3 | 267 |
| | Concord Street Southbound | E | 78.5 | 348% | D | 40.5 | 465% | E | 64.5 | 419% | F | 97.8 | 545% |
| | Howard Street Eastbound Thru/Left | D | 45.6 | 177 | F | 196.7 | 107 | E | 60.0 | 310 | D | 51.1 | 192 |
| | Howard Street Eastbound Right | D | 42.3 | 49 | D | 42.2 | 28 | D | 53.3 | 79 | D | 46.9 | 45 |
| | Howard Street Westbound | D | 43.6 | 0 | D | 39.6 | 11 | D | 47.0 | 15 | D | 48.0 | 39 |
| | Overall | D | 39.2 | 0.65* | F | 87.1 | 0.67* | D | 39.2 | 0.62* | D | 54.5 | 0.63* |
| Bishop Street / Howard Street | Bishop Street Northbound Left | C | 28.7 | 286# | C | 27.1 | 337# | C | 25.1 | 339# | C | 24.4 | 326# |
| | Bishop Street Northbound Thru | A | 0.6 | 18# | A | 0.9 | 32# | A | 0.7 | 3# | A | 0.7 | 12# |
| | Bishop Street Southbound | D | 43.0 | 172 | E | 61.0 | 224 | D | 47.7 | 288 | D | 47.7 | 288% |
| | Howard Street Eastbound Right | C | 33.7 | 0 | D | 47.9 | 0 | D | 38.5 | 6 | D | 38.7 | 6 |
| | Overall | C | 22.7 | 0.45* | C | 29.6 | 0.42* | C | 28.0 | 0.57* | C | 27.7 | 0.57* |
| Route 135 (Waverley Street) / Bishop Street / Beaver Street | Beaver Street Northbound Left | C | 20.3 | 38# | C | 35.0 | 65# | E | 64.6 | 74# | D | 53.0 | 100# |
| | Beaver Street Northbound Thru/Right | C | 22.9 | 101 | D | 37.0 | 257# | E | 61.6 | 291# | D | 42.8 | 250# |
| | Bishop Street Southbound Left | A | 7.7 | 37 | B | 13.3 | 58# | B | 10.1 | 57# | B | 10.2 | 57^ |
| | Bishop Street Southbound Thru/Right | A | 4.8 | 34 | A | 9.8 | 61 | B | 11.7 | 110 | B | 11.8 | 110 |
| | Waverley Street Eastbound Left | F | 99.6 | 314% | F | 201.3 | 419# | F | 106.2 | 322% | F | 106.2 | 322% |
| | Waverley Street Eastbound Thru/Right | D | 42.8 | 455 | C | 30.5 | 433 | D | 37.6 | 420 | D | 37.6 | 430 |
| | Waverley Street Westbound Left | D | 43.6 | 66 | C | 34.2 | 61 | E | 61.0 | 181 | E | 61.0 | 181 |
| | Waverley Street Westbound Thru | D | 53.7 | 264 | C | 37.7 | 252 | E | 72.9 | 405 | F | 302.7 | 789 |
| | Waverley Street Westbound Right | D | 41.9 | 87 | C | 34.2 | 75 | D | 42.6 | 133 | D | 46.3 | 196 |
| | Overall | C | 34.1 | 0.63* | D | 42.8 | 0.65* | D | 41.8 | 0.74* | E | 76.8 | 0.90* |
| Beaver Street / Blandin Avenue | Beaver Street Northbound | E | 56.6 | 143 | F | 81.5 | 191 | E | 55.6 | 116 | E | 75.2 | 206 |
| | Beaver Street Southbound Left/Thru | C | 25.3 | 138# | D | 48.4 | 288 | C | 31.4 | 386% | E | 62.1 | 399# |
| | Beaver Street Southbound Right | A | 4.5 | 11# | A | 2.3 | 0 | E | 70.9 | 114 | B | 14.8 | 27 |
| | Blandin Avenue Eastbound Left | D | 45.1 | 288 | F | 230.0 | 424 | E | 59.2 | 351 | D | 42.9 | 277 |
| | Blandin Avenue Eastbound Left/Thru | D | 49.1 | 317 | F | 268.0 | 460 | E | 72.2 | 393 | D | 44.9 | 317 |
| | Blandin Avenue Eastbound Right | C | 31.6 | 43 | D | 54.9 | 62 | D | 38.8 | 82 | D | 36.7 | 113 |
| | Mall Drive Westbound | E | 55.1 | 55 | E | 71.6 | 68 | E | 55.9 | 75 | E | 66.7 | 105 |
| | Overall | D | 37.8 | 0.68* | F | 121.4 | 0.66* | E | 57.3 | 0.73* | D | 44.2 | 0.72* |

Queue – 95th percentile queue
* - Volume to Capacity Ratio
+ - Observed queue longer than reported
# - Queue metered by upstream signal
% - Queue exceeds capacity
$ - Observed queue shorter than reported
^ - Queue exceeds capacity and metered by upstream signal





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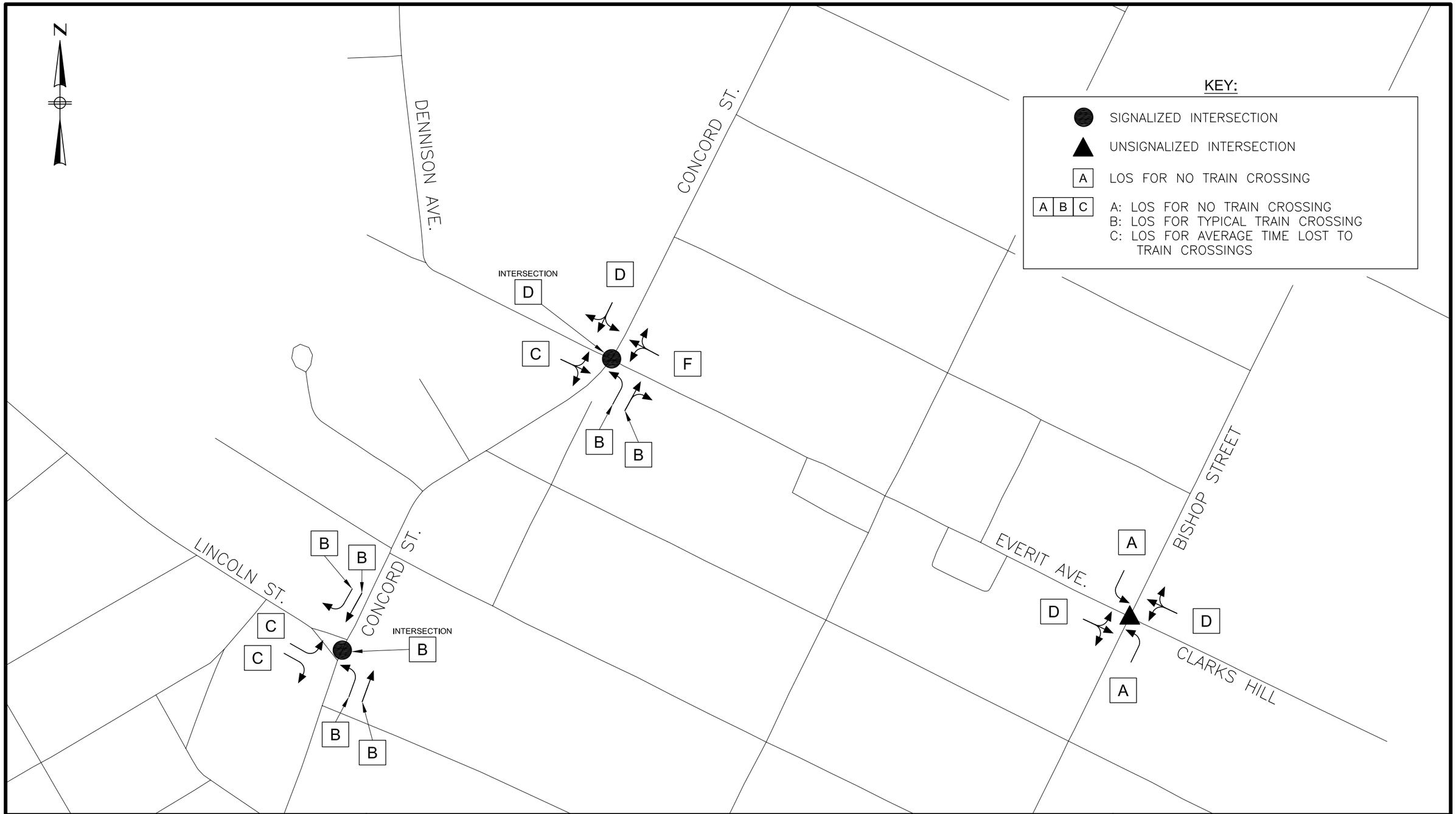
# Downtown Study

Framingham, Massachusetts

Scale: 1"=250'

Figure 6

## Level of Service Analysis Results Existing (2007) AM Peak Hour

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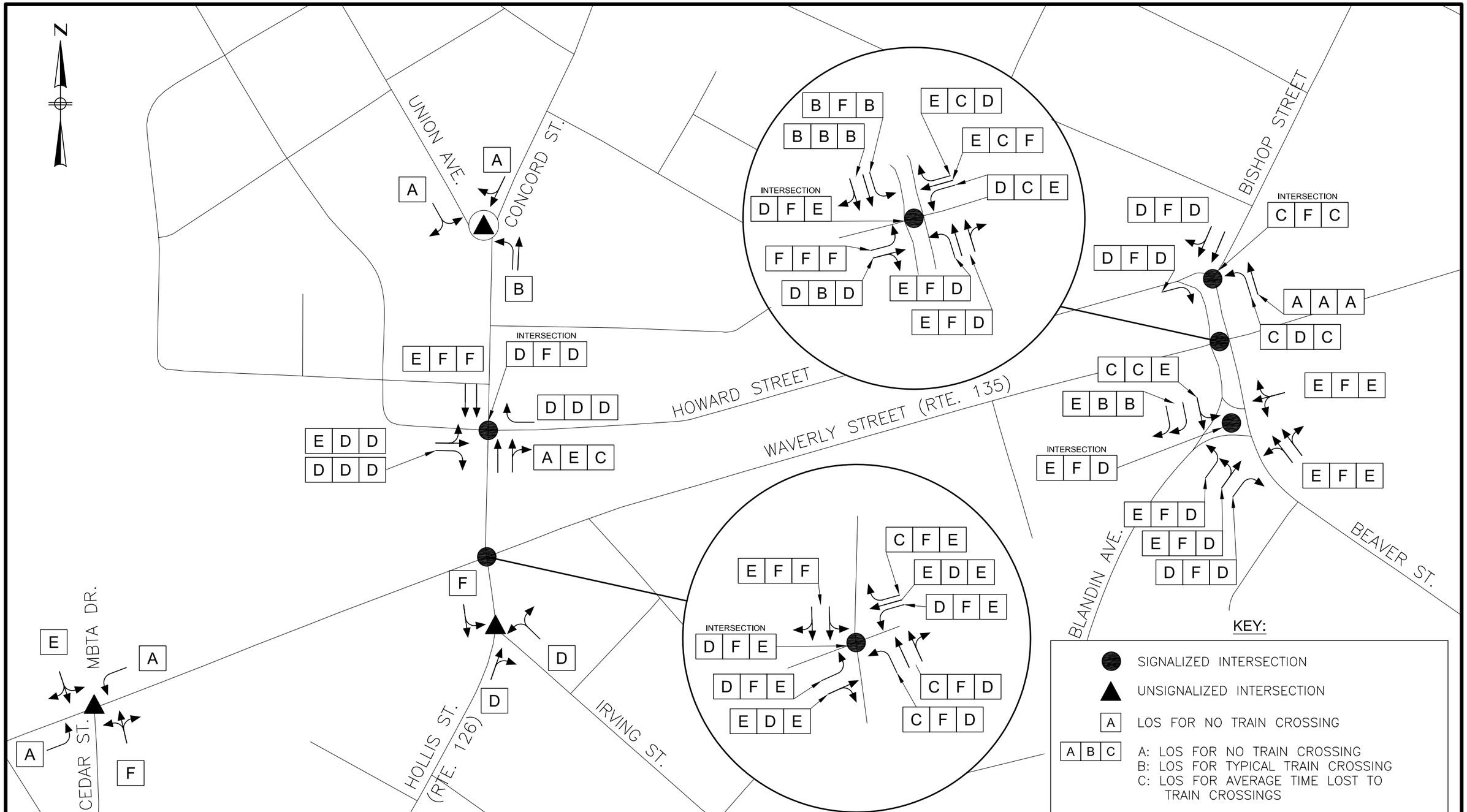
# Downtown Study

Framingham, Massachusetts

Scale: 1"=250'

Figure 7

## Level of Service Analysis Results Exisitng (2007) AM Peak Hour

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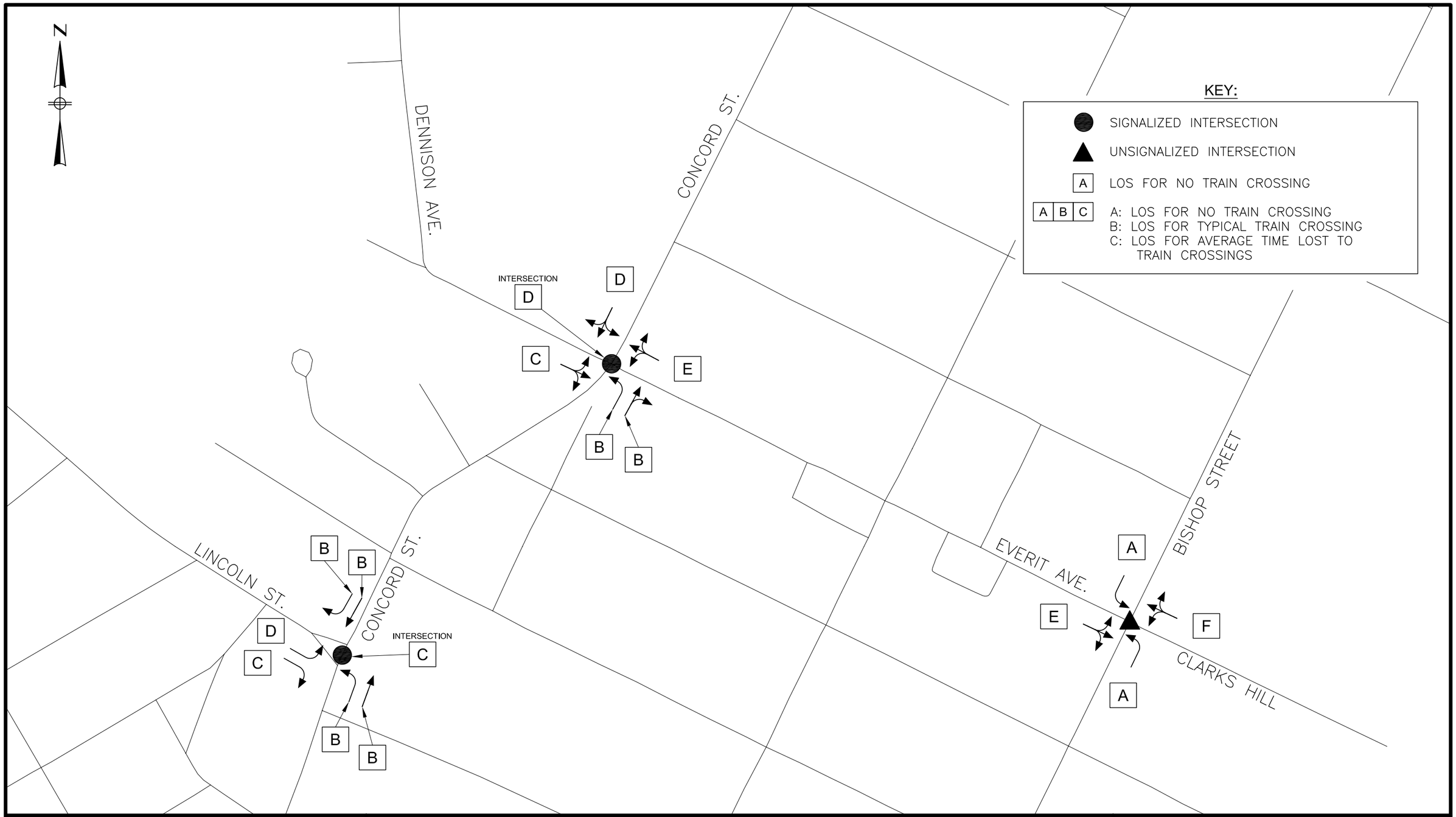
# Downtown Study

Framingham, Massachusetts

Scale: 1"=250'

Figure 8

## Level of Service Analysis Results Exisitng (2007) PM Peak Hour

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# Downtown Study

Framingham, Massachusetts

Scale: 1"=250'

Figure 9

## Level of Service Analysis Results Exisitng (2007) PM Peak Hour

Street / Hollis Street intersection to the Town Hall. The remainder of the Downtown area is typified by a high level of pedestrian activity. Significant generators of pedestrian activity include the MBTA commuter rail station, Town Hall, the Salvation Army, the Metro West Regional Transit Authority bus stop on Concord Street and the Store 24 on the corner of Waverley Street and Hollis Street.

A moderate level of bicycle traffic is evident in the Downtown study area. Previous counts identified approximately five bicycles per intersection during the AM peak hour with the exception of the Waverley Street / Concord Street intersection which experienced 29 bicycles, predominantly traveling northbound on Concord Street. During the PM peak hour 22 bicycles per intersection were identified with the exception of the Waverley Street / Concord Street intersection which experienced 61 bicycles, predominantly traveling northbound and southbound on Concord Street.

**ORIGIN / DESTINATION STUDY**

The previous studies cited in this technical memorandum include a peak hour origin destination study for vehicles on Routes 126 and 135. BETA analyzed this data to determine prevailing traffic patterns through the Downtown. Overall, Hollis Street from the south carries the highest amount of daily traffic to and from the Downtown on a daily basis, followed closely by both approaches of Waverley Street and Concord Street from the north. Figure 10 indicates the percentage of daily traffic through Downtown Framingham carried by different roadways.

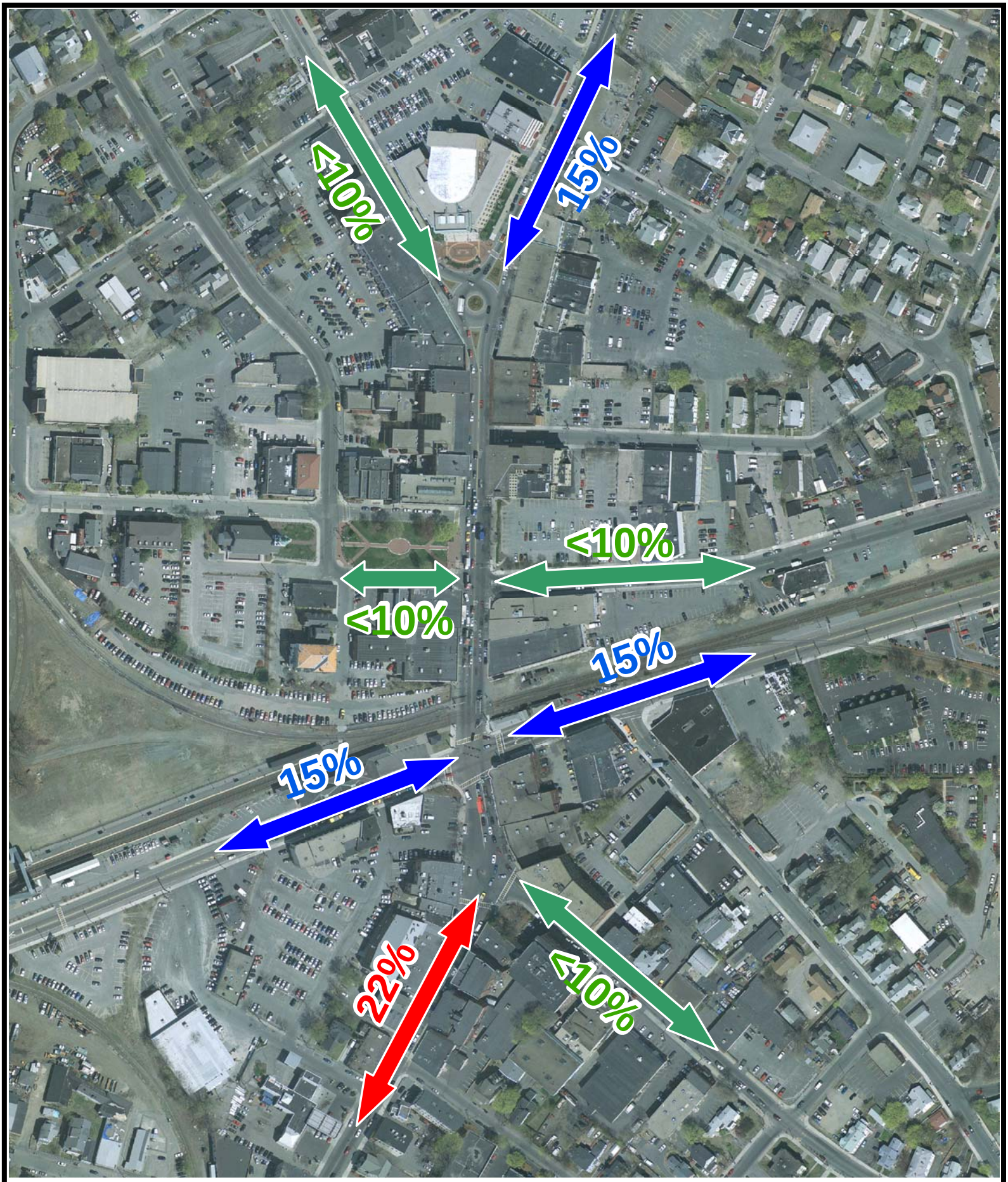
The origin / destination study reveals that 25% of traffic traveling on Route 126 is through traffic (without a destination in Downtown Framingham). This is down from 50% in 1996. This reduction is most likely a symptom of motorists seeking alternative routes to bypass the Downtown. The remaining 75% of traffic on Route 126 is a combination of traffic destined for Downtown Framingham and traffic onto Route 135.

The origin / destination study also revealed that a generally high level of all traffic coming to/from Route 135 is made via Concord Street from the north. Traffic patterns for traffic on Route 135 for the AM and PM peak hours are shown in Figures 11 through 14.

**RAIL**

The following section discusses the rail related issues surrounding Downtown Framingham Improvements. Among other things it reviews:

- Current rail operations at Framingham (CSX, MBTA and Amtrak).
- Property ownership
- Framingham Zoning Ordinance
- Grade Crossings
- The concept of a Freight Village at the CSX Yard.
- Impacts of Relocation of North Yard Functions to CP Yard
- Relocation of CSX North Yard Functions for Public Access
- CSX/EOT/Harvard Negotiations

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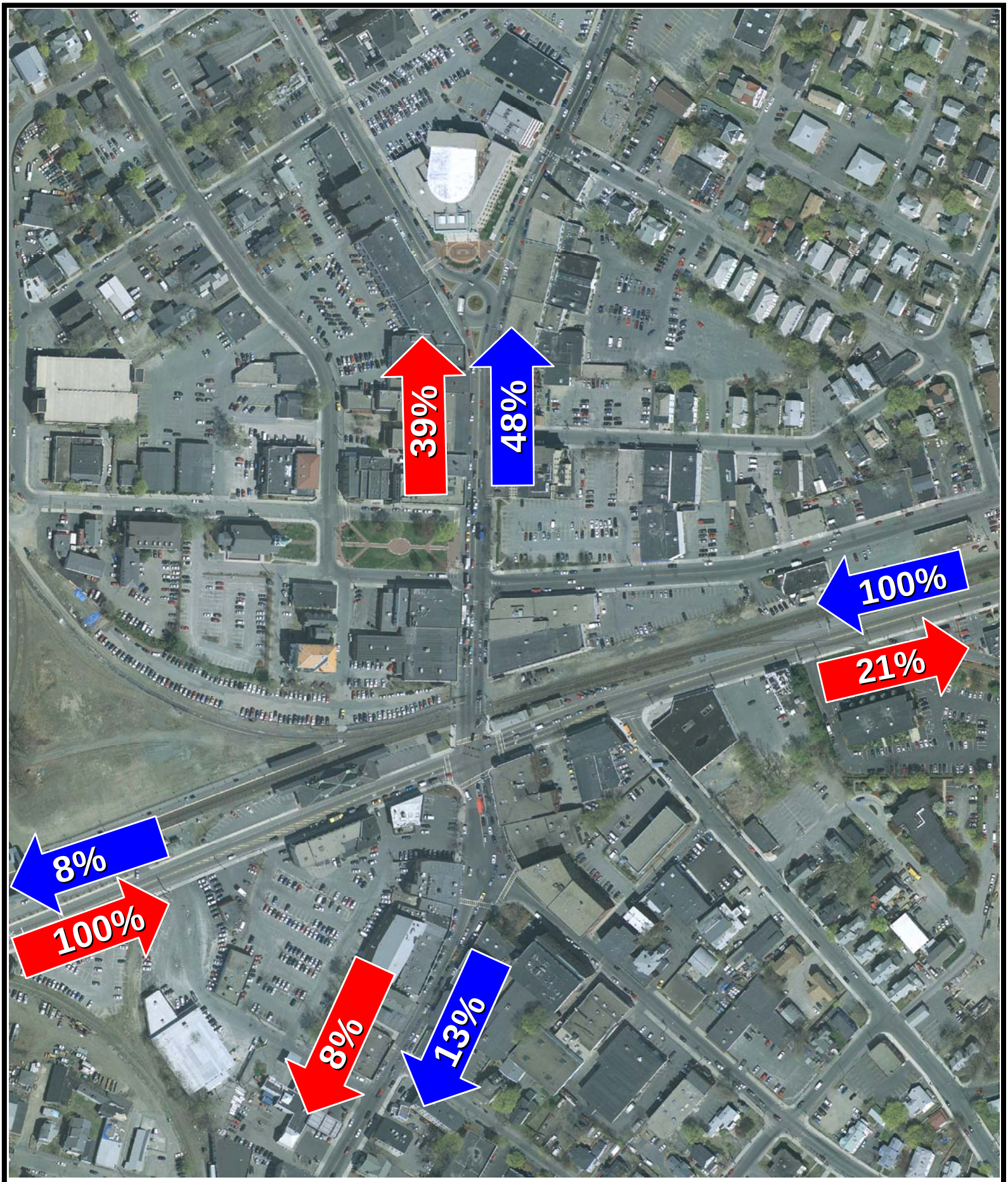
Not To Scale

**Downtown Study**
**Framingham, Ma**

**Figure 10**
**PERCENTAGE OF DOWNTOWN TRAFFIC ON MAJOR ROADWAYS**

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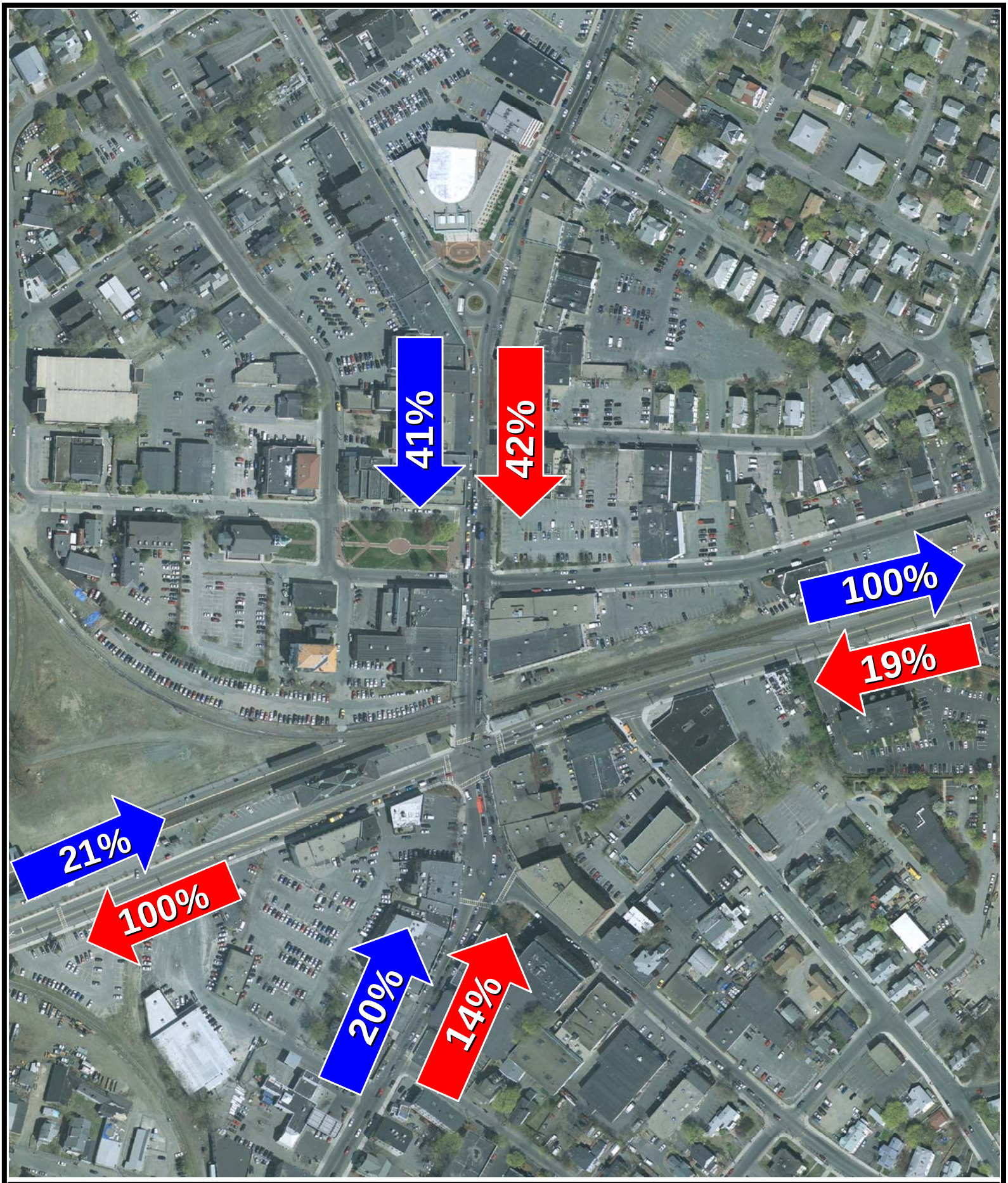
Not To Scale

**Downtown Study**
**Framingham, Ma**

**Figure 11**
**AM PEAK HOUR**
**TRAFFIC PATTERNS**

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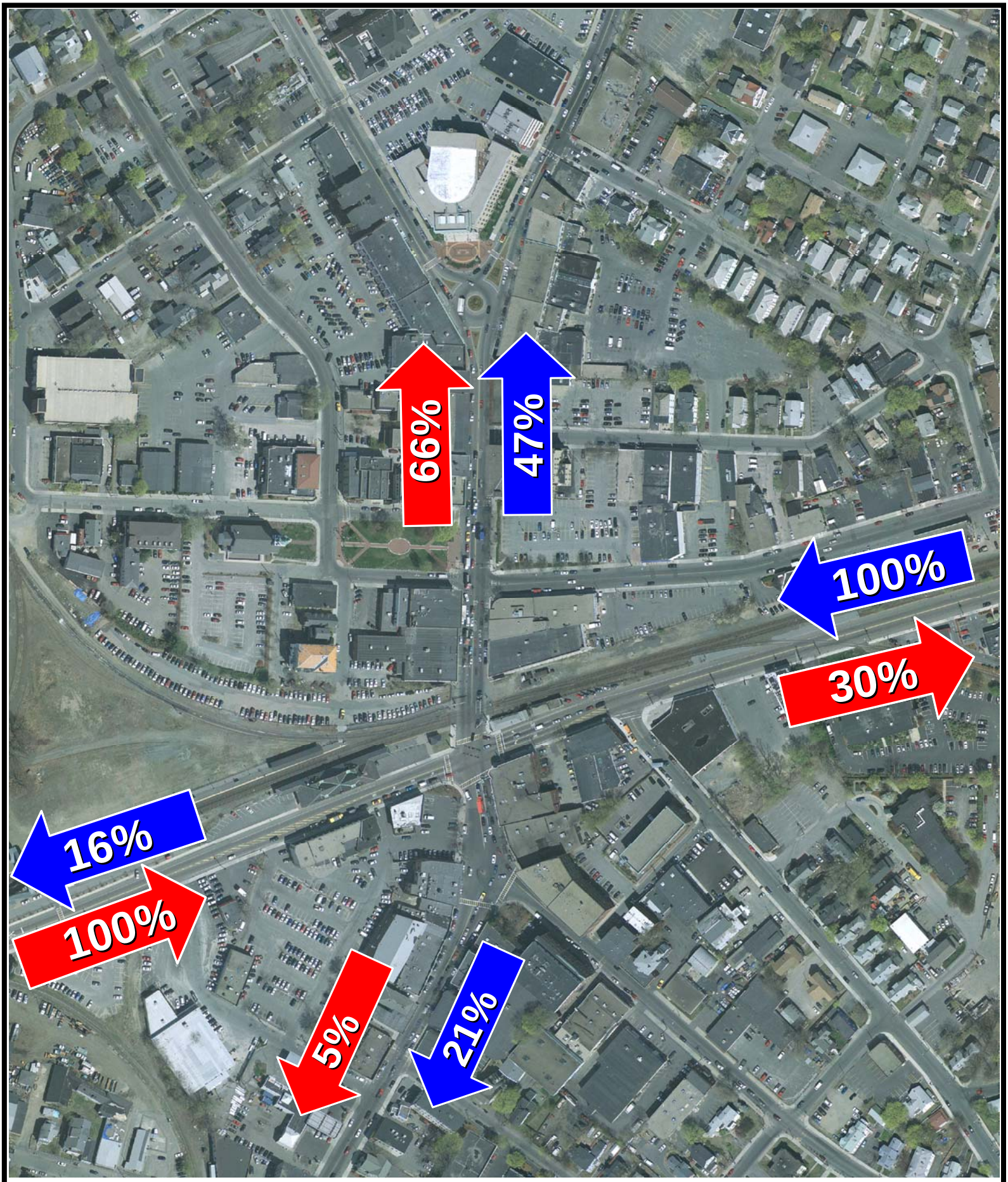
**Downtown Study**
**Framingham, Ma**

**Figure 12**
**AM PEAK HOUR**
**TRAFFIC PATTERNS**

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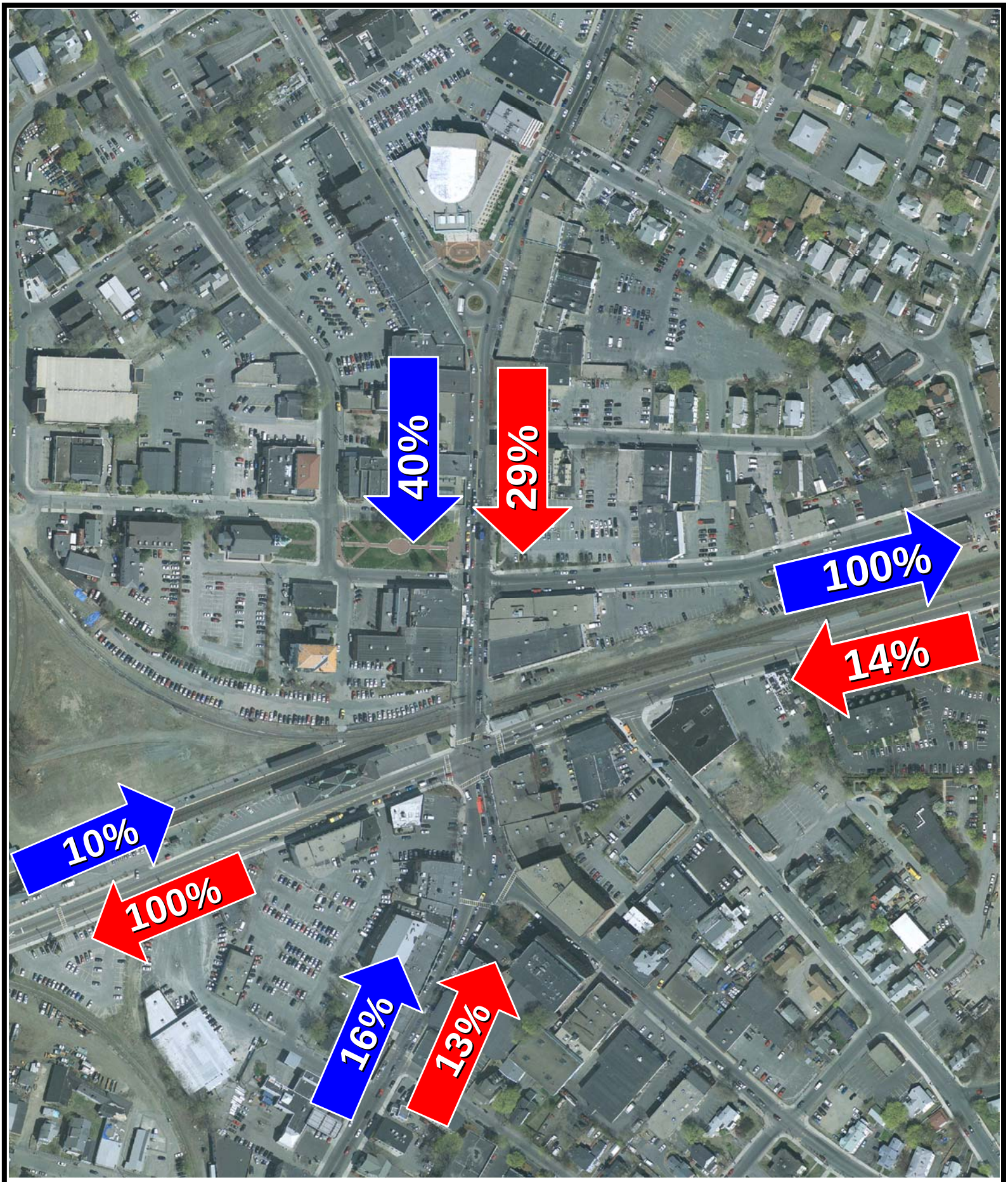
**Downtown Study**
**Framingham, Ma**

**Figure 13**
**PM PEAK HOUR**
**TRAFFIC PATTERNS**

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**Downtown Study**
**Framingham, Ma**

**Figure 14**
**PM PEAK HOUR**
**TRAFFIC PATTERNS**

The rail operations in and around Downtown Framingham are complex and varied. While certain functions can be relocated or adjusted to accommodate public interest, the town must be careful to assure that collateral impacts will not over-ride the apparent benefits of any given action.

This report provides a stepping-stone from which to review in more depth the potential opportunity to adjust rail operations and/or rail highway interfaces to improve quality of life in and around Downtown Framingham. Figures 15, 16, and 17 present the railroad network in and around Framingham.

**Current Rail Operations**

CSX

Framingham provides a nexus for several freight lines in eastern Massachusetts. The Boston Line runs east–west through town. The Framingham Secondary connects locations south and east of Framingham with the Boston Line and the rail yards at Framingham. The Fitchburg Secondary connects locations north of Framingham with the various rail yards at Framingham and to the Boston Line. (Note: the Fitchburg Secondary is in service and active only as far north as Leominster.) The Holliston Secondary connects the CSX CP yard with the Boston Line. (Note: The Holliston Secondary extends south only as far as the CP Yard, and is no longer active to Holliston.)

Framingham provides switching to break down road trains into local trains that deliver cars to customers and other area switching yards. Alternatively, Framingham consolidates cars from local trains into road trains which return to Selkirk Yard, near Albany NY, and beyond.

To perform these functions CSX maintains three (3) yards at Framingham. These yards are:

- The North Yard
- Nevins Yard
- The CP Yard

These yards each have a separate and distinct function, and support and complement each other.

Nevins Yard, which extends along the Boston Line between the Fountain Street Bridge and the Winter Street Bridge, is the major receiving and departure facility for traffic to and from Framingham. The west end of Nevins Yard itself is at the Winter Street Bridge. The track called the "Third Iron" however, extends from the Winter Street Bridge to a location just east of the Ashland town line, where this track connects to the Boston Line. Additionally, there is one track along the south side of the main line, called the "Fourth Iron" which is used to receive and depart trains. This track runs from just east of the Ashland town line to just west of the Fountain Street Bridge

The North Yard is the primary switching yard for Framingham. At the North Yard, CSX crews break up inbound trains, making up local freights to move west to Worcester, South to Walpole, Readville, South Boston, Franklin, Attleboro, Middleboro and the Cape, and north to Leominster. At this location CSX also does minor locomotive repair, freight car repair and team track unloading of rail cars.

The CP yard was originally built to support the General Motors Assembly Plant at Framingham. An automobile unloading operation was added to the yard with highway access at Hollis Street.


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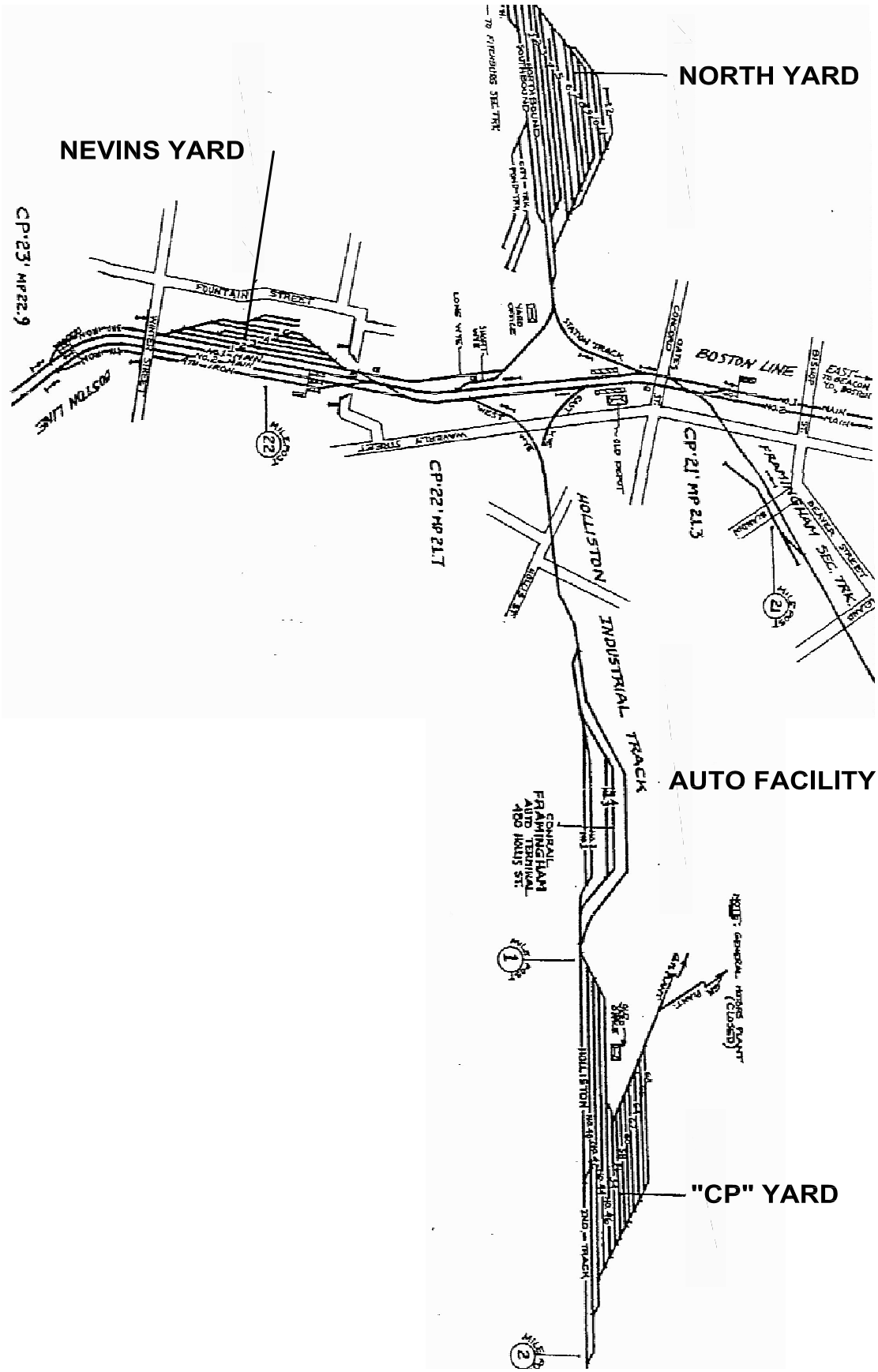
**Downtown Study**
**Framingham, Ma**

**Figure 15**
**EXISTING REGIONAL RAILROAD NETWORK**

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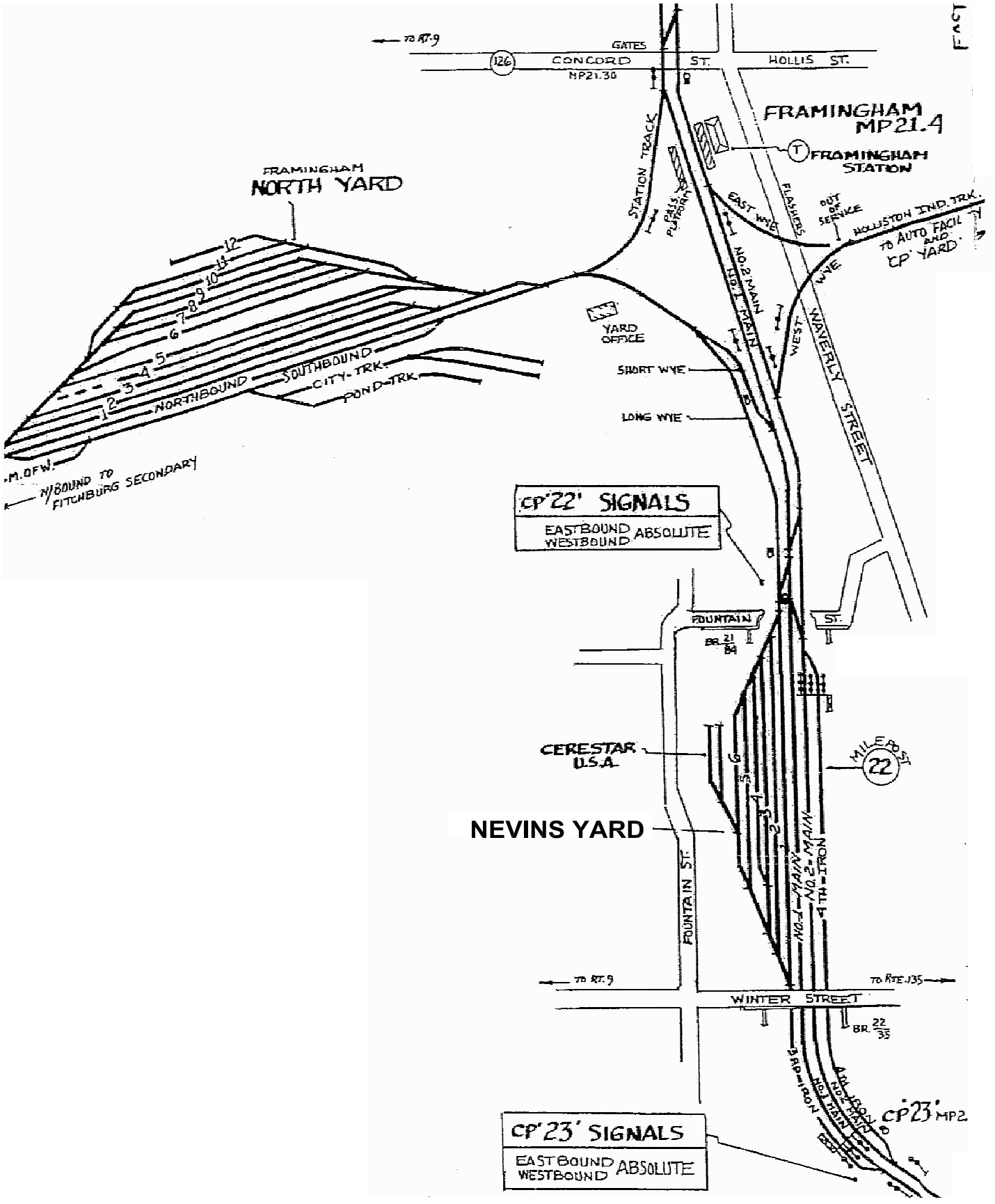
**Downtown Study**
**Framingham, Ma**

**Figure 16**
**FRAMINGHAM**
**RAIL YARDS**




**Downtown Study**
**Framingham, Ma**

**Figure 17**
**NORTH YARD AND NEVINS YARD**

Since the closure of the GM assembly operations, the automobile unloading operation has been the major use of this yard. Adessa on occasion will load outbound automobiles on railcars from the loading ramp on the former GM property.

MBTA

MBTA operates 42 trains a day through or to Framingham. These trains utilize only the Boston Line tracks, and on rare occasion trackage at Nevins Yard or the Fourth Iron.

Amtrak

Amtrak currently operates four trains daily through Framingham. Trains 448 and 449, the Lake Shore Limited, operate between Boston and Chicago. Amtrak also runs what they call "Inland Route" trains between Boston and New Haven (via Framingham, Worcester, Springfield and Hartford). Currently trains 94 and 95 are the only Inland Route trains operating through Framingham.

**Property Ownership**

Boston Line

The railway right of way for the Boston Line has several owners. From South Station to Cove Interlocking (in the South End of Boston) is owned by the MBTA, and maintained by Amtrak and MBCR. From Cove to CP 11 (in Newton MA) the line is owned by the Massachusetts Turnpike Authority, and maintained by CSX. From CP 11 to Milepost 21.3 (Framingham) it is owned by the MBTA, and maintained by CSX. From Framingham west to Selkirk Yard, near Albany NY, and beyond, the line is owned and maintained by CSX.

Yards and Secondary Tracks

The acreage that makes up the North Yard, Nevins Yard and the CP Yard, as well at the tracks connecting these yards, is privately owned and maintained by CSX. The various secondary tracks, leading north and south out of Framingham are also owned and maintained by CSX. These tracks include the Framingham Secondary, the Fitchburg Secondary and the Holliston Secondary.

As with any for-profit company, it should be assumed that CSX would expect fair market value for any railroad property sought by the town. Railroads are not subject to any state or local eminent domain takings and therefore a negotiated agreement is the only effective way to relocate a railroad yard.

As has been noted regularly in the press, CSX and the Commonwealth are at least in preliminary discussions regarding public acquisition of CSX's Beacon Park Yard located in Alston. Other lines potentially involved in such a transaction would include the Boston Line west to Worcester, and the Fall River and New Bedford lines. If Framingham were to develop a strategic vision for rail properties in the Downtown area, such a vision should be conveyed to EOT, to determine if there is a way to leverage the current state negotiations to assist Framingham's goals.

**Framingham Zoning Ordinance**

On February 18, 1992, the Town of Framingham Zoning Board of Appeals issued a decision that stated several conditions, restrictions and mitigation to be met in order for Conrail (predecessor to CSX) to expand the CP Yard and construct an automobile off loading facility. Among the criteria is a restriction of switching rail cars within the facility no earlier than 7:00 a.m. Monday through Friday, no earlier than 8:00 a.m. on Saturday and no earlier than 9:00 a.m. on Sunday. Conrail

was also required to use all reasonable efforts to complete railroad switching operations by 10:00 p.m. The ordinance also dictates two-minute headways between trucks leaving the CP Yard to prevent traffic congestion and the queuing of trucks at roadway intersections.

**Grade Crossings**

The crossings in the general Downtown Framingham area are Bishop Street, Concord Street, Waverly Street (2 locations), Claflin Street, Hollis Street, Waushakum Street, Leland Street and Blandin Avenue. These crossing have either flashing lights or flashing lights with gates. Several of these crossings are out side the scope of this study. The FRA data on those crossings were provided as additional information. A train operating on a particular line will impact a series of crossings on that line consecutively, and, depending on the length of the train, can occupy multiple crossings at the same time.

Each of the crossings is equipped with warning devices (commonly referred to as protective devices, or crossing protection, although they do not actually provide "protection") that are consistent with federal requirements. The level of crossing "protection" is determined by the United States Department of Transportation's Federal Highway Administration (Manual on Uniform Traffic Control Devices for Streets and Highways). The level of "protection" and use of active warning devices is based on a series of factors including the number of tracks within the crossing profile, amount of vehicular and railroad traffic and the speed of railroad and vehicular traffic.

The process for deciding what type of highway traffic control device is to be installed, or to even allow that a highway-rail grade crossing should exist is generally a two-step process that addresses what information the vehicle driver needs to be able to cross safely and the assurance that the driver response to the traffic control device is compatible with the intended system operating characteristics of the highway and railroad facility. A highway-rail grade crossing differs from a highway/highway intersection in that the train always has the right of way. The maintenance of the crossing and crossing protection is the responsibility of the reporting railroad.

Operating flashing lights have the same function as a STOP sign: a vehicle is required to stop completely at least 4.5 m (15 ft) short of the near rail. Flashing lights with lowered gates are equivalent to a red vehicular traffic signal indication: a vehicle is required to stop short of the gate and remain stopped until the gates go up.

The speed at which a train travels on the track is determined by the "class" of track. This Federal designation by the Federal Railroad Administration establishes the maximum authorized speed for freight and passenger trains, and places requirements on the track maintenance criteria, vehicle standards, and train control signal systems.

The highway-rail crossings in the core Downtown area are located on the Boston Line, the Framingham Secondary or the Holliston Secondary.

- The Boston Line, which crosses Bishop Street and Concord Street, is designated as FRA Class 3 track, allowing a maximum freight train speed of 40 mph and a maximum passenger train speed of 60 mph. This line connects Boston, Framingham, Worcester and ultimately Albany NY.


**Boston Line at Concord Street**

**Boston Line at Bishop Street**

- The Framingham Secondary which crosses Concord Street, Waverly Street (east of Concord Street), Blandin Avenue and Leland Street is FRA Class 2 track. FRA Class 2 allows for a maximum freight speed of 25 mph (no passenger service is provided on this line). This Line runs from Framingham through Walpole to Mansfield MA

**Framingham Secondary at Waverly Street (Boston Line to right)**

- The Holliston Secondary is designated as FRA Class 1 track with a 10 mph speed limit on all rail traffic. This line crosses Waverly Street (west of Concord Street), Clafflin Street, Hollis Street and Waushakum Street. This line, which is no longer active to Holliston, provides access to CSX's CP yard.

**Holliston Secondary at Waverly Street. (Boston Line to right)**

All of these crossings have either flashing lights or flashing lights with gates. Operating flashing lights have the same function as a STOP sign: a vehicle is required to stop completely at least 4.5 m (15 ft) short of the near rail and remain stopped until the lights stop flashing. Flashing lights with lowered gates are equivalent to a red vehicular traffic signal indication: a vehicle is required to stop short of the gate and remain stopped until the gates go up.

**Crossings on the Boston Mainline**
(Train counts are one way trips)

| Crossing | Crossing ID | Active Warning Devices | Average daily Vehicles* | CSX | MBTA | Amtrak |
|---|---|---|---|---|---|---|
| Concord Street | 501736Y | Flashing Lights & Gates | 35,000 | 20 | 42 | 4 |
| Bishop Street | 501735S | Flashing Lights & Gates | 12,500 | 12 | 42 | 4 |

**Crossings on the Framingham Secondary**
(Train counts are one way trips)

| Crossing | Crossing ID | Active Warning Devices | Average daily Vehicles * | CSX | MBTA | Amtrak |
|---|---|---|---|---|---|---|
| Waverly Street | 546796J | Flashing Lights | 20,800 | 8 | 0 | 0 |
| Leland Street | 546793N | Flashing Lights | 9,900 | 8 | 0 | 0 |
| Blandin Avenue | 546795C | Flashing Lights | 15,400 | 8 | 0 | 0 |

**Crossings on the Holliston Secondary**
(Train counts are one way trips)

| Crossing | Crossing ID | Active Warning Devices | Average daily Vehicles * | CSX | MBTA | Amtrak |
|---|---|---|---|---|---|---|
| Waverly Street | 547161J | Flashing Lights | 16,500 | 6 | 0 | 0 |
| Clafflin Street | 547162R | Flashing Lights | 3,700 | 6 | 0 | 0 |
| Hollis Street (Rte 126) | 547163X | Flashing Lights | 23,800 | 6 | 0 | 0 |
| Waushakum Street | 546795C | Flashing Lights | 10,400 | 6 | 0 | 0 |

Source: Federal Railroad Administration

### The Concept of a Freight Village at the CSX Yard

It has been proposed that Framingham consider working with CSX to create a Freight Village at the CP Yard. A Freight Village is an update of the old industrial park concept. In a Freight Village manufacturers and distributors locate in an area with rail and highway access. The density of distribution and or manufacturing creates a critical mass of freight to be moved. This critical mass, in turn, creates favorable transportation and logistics parameters, which result in improved freight service and (ideally) favorable economics.

In this case, the concept advanced was to relocate CSX traffic and functions from the North Yard to the CP Yard, create transfer facilities and eventually support development in the area.

Development of a Freight Village at the CP yard would have significant impacts on the town of Framingham, all of which should be considered before approaching CSX or others with the concept. Some of the public impact considerations of this action are outlined in Section 6 below.

### Impacts of Relocation of North Yard Functions to CP Yard

Relocation of functions currently performed at the North Yard, specifically if such functions were moved to the CP Yard, would have certain collateral effects. Such a move would change rail operations patterns and result in a changed matrix of rail/highway interfaces and community impacts.

- While, in theory, a majority of the rail functions currently performed at the North Yard could be moved to the CP Yard, certain functions would remain at the North Yard. In addition to the northbound local freight, which delivers freight to locations between Framingham and Leominster, some residual switching would likely remain at the North Yard.
- Rail traffic that presently enters and departs the North Yard from the west currently does not cross any streets in the town of Framingham. Relocating this traffic to the CP yard would require this traffic to cross Waverly Street, Clafflin Street, Hollis Street and Waushakum Street to simply arrive at the proposed "new" switching yard.
- As noted above, the current use of the North Yard is to switch cars for outbound trains which head west, south, and north from Framingham. Traffic destined for locations south of Framingham (including industries and facilities in such cities/towns as Readville, South Boston, Walpole, Franklin, Mansfield, Attleboro, Taunton, Brockton, Quincy and Cape Cod) would still have to move out of the "new" switching yard to the Framingham Secondary, by moving again over Waushakum, Hollis, Clafflin and Waverly Streets.
- Alternatively, rail traffic between the new switching facility and the Framingham Secondary could move via a suggested "new connection", directly linking the CP Yard with the Framingham Secondary. Such a connection would require at least four new grade crossings. It is anticipated that significant political capital would need to be expended to gain approval (local, state and federal) for new grade crossings. The Federal Railroad Administration is actively trying to close grade crossings and would require a high bar to met for creation of new crossings.
- According to wetlands delineation maps provided by the town, a significant part of the area east and north of the CP Yard is designated wetlands. Additionally, the logical (and possibly only) route for the proposed rail connection between the CP Yard and the Framingham Secondary would cross Beaver Dam Brook. Both of these factors would expose any such connection project to significant environmental scrutiny.
- If the Freight Village is successful, it will, by definition, generate new truck trips either on Hollis Street or, if access were secured through the old GM Facility, on Western Avenue. In either case such truck trips would impact the Downtown area as these trucks make their way to and from the Massachusetts Turnpike. It would be unlikely that such truck traffic would migrate south to I-495, rather than to the much closer I-90.
- The relocation of switching operations to the CP Yard would also increase the conflicts between the increased CSX traffic heading to/from the CP Yard with MBTA commuter rail traffic and Amtrak intercity rail service. Given the intense usage of the main line system during the morning and evening rush hours (even before the contemplated increase in commuter rail service to Worcester), freight traffic will be pushed to late evening or very early morning hours, or to mid-day (school time) hours.
- Even if the public impacts were to be deemed acceptable or able to be mitigated, the concept that a Freight Village would be commercially viable at this location would have to be fully vetted before the town, EOT or CSX would consider investing in such venture.

**Relocation of CSX North Yard Functions For Public Access**

If the rail traffic from North yard were successfully relocated to the CP Yard, allowing for public acquisition of the North Yard for recreational purposes, it would still be necessary to determine pedestrian and vehicular access to the area.

For example, should pedestrian access be desired across the heavily utilized Boston Line, it should be anticipated that the railroads collectively would require either an overpass or underpass. Gaining approval for an "at grade" pedestrian access is extremely unlikely.

Vehicular access would be more reasonable from entry points that do not require a new "at grade" crossing.

Additionally it is likely that, since the town would be inviting the public to a location that did not formerly have public access, the railroad would require the town provide protective fencing to prevent pedestrians from trespassing onto the active right of way.

The town should expect that CSX, or others, will continue to operate trains over the Fitchburg Secondary. This is both a matter of economics (the business is profitable) and requirement (the railroad enjoys a federally managed Common Carrier Obligation to provide freight service to customers along the line. Any utilization of a portion of the current North Yard or adjacent railroad owned property for purposes other than rail transportation would need to address issue of safety of users around or near an active railroad.

### CSX/EOT/Harvard Negotiations

There are ongoing negotiations between CSX, the Commonwealth Executive Office of Transportation (EOT) and Harvard University regarding the potential to re-locate certain functions from Beacon Park Yard in Allston. Beacon Park is located adjacent to the Mass Pike at the Allston/Cambridge Interchange. The yard serves multiple functions. It is an Intermodal Terminal (Intermodal being the movement of truck trailers or containers on railcars), bulk distribution terminal, local serving yard, solid waste terminal and maintenance facility.

Harvard purchased the property underlying the rail yard from the Mass Pike. The railroad retains an easement to use the property for freight purposes. The only way CSX can be re-located from this facility is by negotiation, as neither the Commonwealth nor Harvard have any mechanism to evict the railroad. Harvard and EOT (with input from MBTA, Mass Port and Mass Pike) are actively negotiating to relocate some of the functions currently at Beacon Park to locations west of Boston. If the negotiations are successful, and if the relocated facilities are west of Framingham, then the relocation would impact the number of CSX trips over Concord and Bishop Streets.

Even if an agreement were reached in the next several weeks, the actual impact on the grade crossings would not occur for several years, as relocation would likely entail permitting and constructing a new facility for the relocated CSX function. It is also unclear, and rather doubtful, that the negotiations would result in all current freight functions being moved to a point west of Framingham. Therefore, it is likely that some freight traffic east to Boston would remain along this line.

## NORTH YARD ENVIROMENTAL ISSUES

The following section presents an overview of the environmental issues and regulations relevant to potential future use of the CSX North Yard by the Town of Framingham. The CSX North Yard is generally located between Farm Pond to the west and Franklin Street to the east.

### Areas of Potential Environmental Concern

The North Yard has been in use for more than 90 years. BETA reviewed historical Sanborn Fire Insurance maps from the years 1915, 1922, 1930, 1948, and 1968 covering the area of the North

Yard. The maps for each of these years show the layout of the North Yard as similar to its present appearance. The Sanborn maps did not show any repair sheds, roundhouses, or other maintenance related structures. However, as stated in the "Rail-Related Issues" section of this study, CSX currently performs minor locomotive and freight car repair at the North Yard.

Rail yards typically contain a wide variety of oil and hazardous and toxic material use. Potential sources of contamination can include:

- Spilled hazardous or toxic cargoes
- Fuel and lubricant drips, spills, and leaks
- Treated railroad ties (the ties themselves and leaching of the wood preservatives into surrounding soil)
- Herbicides used for right-of-way maintenance (historically including Dieldrin and lead arsenate)
- Rail bed fill (including slag and ash)
- Products of combustion (polynuclear aromatic hydrocarbons (PAHs))
- Compressor oil
- Transformer and capacitor oil (including those containing polychlorinated biphenyls (PCBs)
- Unauthorized disposal through septic systems
- Lead acid batteries (leaks and unauthorized disposal)
- Locomotive and railcar repair and maintenance operations
- Painting and paint stripping (lead, solvents)
- Hydraulic systems (oil and PCBs)
- Brake repair (solvents and asbestos)

Typically, communities wishing to re-use rail facilities must deal with known, potential, and perceived contamination. Future users may be concerned about potential exposure to toxic and hazardous substances. Reuse opponents may raise concerns about contamination as a means to impede or thwart reuse or property acquisition. Elected officials may fear contaminant cleanup could escalate project costs and raise liability issues. Abutters may worry about dust exposure during construction. These concerns can be managed by knowing the risks associated with the contaminants and the most effective assessment and remediation strategies.

**Applicable Environmental Regulations**

BETA has reviewed the following regulations as they apply to any assessment, remediation, reuse, or redevelopment, of the CSX North Yard:

- Massachusetts Contingency Plan (MCP), 310 CMR 40.0000
- Massachusetts Wetlands Protection Act Regulations, 310 CMR 10.00
- Pesticides Use and Rights of Way Management, 333 CMR 11.00

Also, any future development or remediation activities at the site would likely be required to comply with the Massachusetts Department of Environmental Protection (DEP) draft asbestos-in-soil amendments to the MCP, expected to be promulgated in late 2007. These regulations will require site assessments and any subsequent remediation to assess for the presence of, and evaluate the risk posed by, any asbestos present in site soils.

The implications of these regulations are discussed in the sections below.

**Regulatory Exemptions**

Rail yards and some of the contaminants typically encountered there have certain regulatory exemptions. For example, the MCP exempts the following releases from the requirement to notify DEP:

- Releases resulting from a point of original application of lead-based paint (e.g., in soil surrounding a rail yard building) [310 CMR 40.0317 (8)(a)];
- Releases resulting from emissions from the exhaust of an engine. [310 CMR 40.0317 (8)(b)];
- Releases resulting from the application of pesticides in a manner consistent with their labeling [310 CMR 40.0317 (8)(c)]; and
- Releases related to coal, coal ash, or wood ash [310 CMR 40.0317 (9)].

Also, the MCP considers coal ash or wood ash associated with fill material to be "background" contamination [310 CMR 40.0006]. If such soil is encountered at the site it may not require cleanup. As a result, these exemptions can reduce the regulatory burden associated with redevelopment of a site; however, the health risk posed by any contaminants present will still exist and depending on the proposed reuse may require special handling and/or exposure reduction measures.

Finally, any groundwater located beneath a rail yard is not considered to be a potential source of drinking water [310 CMR 40.0006].

**Known Violations / Non-compliance**

BETA identified two records of noncompliance at the site: a 2005 Order of Notice to CSX at 60 Pearl Street from the Framingham Fire Department for the improper storage of a 20 pound propane cylinder. This issue is not anticipated to have had a negative impact on the environment at the site. The second was a DEP inspection of the former owner Conrail's 60 Pearl Street facility in August 1996. The inspection found minor violations of signage, manifests and security of a 550-gallon waste motor oil tank. In December 1996 a letter from DEP to Conrail stated all issues had been satisfactorily resolved.

**Environmental Database Search**

BETA reviewed the DEP's on-line list of oil and hazardous materials (OHM) release sites and identified ten historical releases of OHM at and in the vicinity of the site that have been reported to DEP between 1995 and 2005. Of these, nine have been cleaned up under the direction of a Licensed Site Professional (LSP) to a level that poses "no significant risk" as defined by the MCP. These releases are therefore considered closed by DEP. The remaining release is in Phase IV of the MCP cleanup process and based on readily available information on the status of the release, it is approaching final cleanup and closure.

BETA personnel additionally contracted the services of EDR Environmental Data Resources, Inc. (EDR) to provide an environmental database search relative to the North Yard and vicinity. The Site Assessment Report provided by EDR reviewed numerous environmental databases including: the United States Environmental Protection Agency (USEPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), Resource Conservation Recovery Act (RCRA) generator, Underground Storage Tank (UST), Leaking Underground Storage Tank (LUST) and the DEP State Spill and Disposal Site Lists.

BETA did not identify any listings indicating environmental liability beyond those identified and reviewed on the DEP's on-line listing as discussed above.

**Town Hall File Review**

BETA visited the Town of Framingham Fire Department, Board of Health, and Conservation Commission regarding records of any environmental issues at the CSX North Yard. BETA reviewed the following files at these offices:

- Conservation Commission - records on file included an aerial photograph of the site and vicinity overlain by wetlands and buffer zone boundaries. Refer to the Wetland and Habitats section below for a description of this map. The file also contained correspondence from the period 2000 to present between the Commission and CSX regarding approvals to spray herbicides and cut vegetation in and around wetlands under the Pesticides Use and Rights of Way Management regulations at 333 CMR 11.00.
- Board of Health - records on file included correspondence between DEP and CSX's consultants regarding various reported releases at the site. The status of these releases reported to DEP is discussed in the Environmental Database Review section above.
- Fire Department – records on file include a 1942 license for the N.Y. N.H. & H. Railroad to store 300 gallons of gasoline at 40 Pearl Street; approval in 1960 for the N.Y. N.H. & H. Railroad to install a 10,000-gallon diesel UST at the rear of 30 Pearl street; Correspondence from the U.S. EPA regarding the Penn Central Railroad spill on July, 21, 1975 (no further details); and permits for the removal in 1999 of two 150-gallon motor oil tanks and a 500-gallon diesel tank. The tanks are each described as "in bunker."

**DEP File Review**

A DEP file review has been scheduled but has not been performed at the time of submission of this Draft report. Any significant findings will be incorporated into the Final report

**Wetlands and Habitats**

BETA reviewed on-line maps available through the office of the Massachusetts Geographic Information System (MassGIS) and a wetland map provided by the Framingham Conservation Commission. The maps contained the following information regarding the site and vicinity:

- The 2006 Priority Habitat and Estimated Habitat Map prepared by the Natural Heritage and Endangered Species Program (NHESP) shows that a Priority Habitat of a Rare Species has been mapped around the perimeter of Farm Pond. The extent of the habitat encompasses most of the North Yard.
- The NHESP BioMap identifies Farm Pond as Supporting Natural Landscapes.
- The DEP Wetlands Map identifies swamp and marsh wetlands at the southern end of Farm Pond.
- The Conservation Commission map also showed wetland at the southern end of Farm Pond, as well as a 30-foot wide "No Touch" zone, a 100-foot buffer zone, and a 125 foot buffer zone – all parallel to the Farm Pond bank.
- The Conservation Commission map showed the majority of the site to be within the 100-year flood zone surrounding Farm Pond.

Based on the presence of these wetlands and habitats on and adjacent to the site, compliance with Massachusetts wetlands regulations, Town of Framingham wetland bylaws, and reporting to and compliance with NHESP requirements would be required for any activities resulting in disturbance of this site.

**Urban Soil**

As described above, the site has been the location of over 90 years of rail activity. As a result, soil at the site, even in areas where a release or spill has not occurred, will contain residual contaminants from such use. Coal, coal dust, ash, minor amounts of petroleum and metals, and even particulate deposition of lead from historic use of leaded gasoline on nearby roadways are likely to be widely present at the Site. While these contaminants may not be present at levels that require reporting to DEP, soil containing these low levels can not be handled as "clean." Any management of soil, especially to an off-site location, would require pre-planning, assessment, and special handling.

**Further Assessment / Field Sampling Program**

As a follow up to this initial assessment and environmental overview and prior to the Town taking any actions toward acquisition of the site, BETA recommends the performance of a Phase I Environmental Site Assessment (ESA) of the CSX North Yard in accordance with the guidelines put forth by the American Society for Testing and Materials (ASTM). An ASTM Phase I is an effective and relatively inexpensive means to obtain an evaluation of potential environmental liability at a site through the identification of *recognized environmental conditions*. The ESA scope of work includes a detailed site reconnaissance, interviews with knowledgeable personnel, combined with a compilation and review of readily-available environmental records.

The findings of a Phase I ESA would provide the basis for identifying locations at the site that may require further assessment by the sampling of soil, groundwater, sediment or surface water. Such locations may include the present or former locations of: oil storage tanks, chemical storage areas, historical releases, maintenance areas, leaching fields, etc. Additional assessment for the presence of current or former USTs would also be performed, which may include ground penetrating radar surveys, magnetometer surveys, and/or test pits.

Based on the recognized environmental conditions identified in the Phase I ESA, a targeted soil and groundwater sampling plan would be developed that would determine if any of these potential sources of releases have negatively impacted the site. In the absence of, or in addition to, such targeted sampling locations identified in the Phase I, a soil and groundwater sampling plan to assess the general impact of the rail yard operations would be developed. A typical assessment for a rail yard may include the advancement of soil borings on a grid pattern across the entire site to evaluate general levels of contamination. Soil samples are submitted for laboratory analysis of petroleum hydrocarbons, metals, herbicides, and semi-volatile organics; the completion of a minimum of three of the borings as groundwater monitoring wells, with submittal of appropriate groundwater samples; and possible sampling and analysis of surface water and sediment. Based on site history and to comply with the draft asbestos in soil regulations, visual observation and laboratory analysis for asbestos in surface soils and fill would also be recommended.

**Summary of North Yard Environmental Issues**

The CSX North Yard is an active rail yard having occupied its present location in downtown Framingham for over 90 years. The site has a documented history of OHM releases, with available information indicating that all but one of the releases reported to DEP have been closed by cleanup to a level of No Significant Risk. The remaining release is reportedly nearing the end of the cleanup process. However, despite the record of cleanup of reported releases, the use of a site as a rail yard typically results in generalized soil (and possibly groundwater) contamination from the widespread and historic uses of multiple OHM.

The Massachusetts NHESP has mapped the site as the location of a Priority Habitat of a Rare Species, and the abutting Farm pond as Supporting Natural Landscapes. DEP has identified wetlands at portions of the site and other wetlands are likely present along the banks of Farm Pond. As a result of these habitats and wetlands, compliance with wetland regulations and Town wetland bylaws would be required prior to any potential site development.

As a follow up to this initial assessment and environmental overview and prior to the Town taking any actions toward acquisition of the site, BETA recommends the performance of an ASTM Phase I ESA in order to obtain detailed information on the presence of *recognized environmental conditions* including further research into remaining USTs at the site and the subsequent implementation of a site specific soil and groundwater sampling plan to obtain information on the environmental condition of the site.

**References**


1. Massachusetts Contingency Plan 310 CMR 40.0000.
2. *Best Management Practices for Controlling Exposure to Soil during the Development of Rail Trails,* Massachusetts Department of Environmental Protection, 2005.
3. *Environmental Contamination of Rail Yards,* in Environmental Update #20, EPA funded Hazardous Substance Research Centers/South & Southwest Outreach Program, November 2005.
4. *Considering Contamination in Rail-Trail Conversion* in Connections- a National Transportation Enhancements Clearinghouse Newsletter, Federal Highway Administration, winter 2004.

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