Access & Improvement Evaluation for the Mansfield Commuter Rail Parking Lot

Mansfield, Massachusetts

BETA

APRIL - 2014

EXECUTIVE SUMMARY

Background

Mansfield, Massachusetts, is approximately halfway between Boston and Providence. The opening of Interstate Highway 95 in 1966 provided a link between Providence and Boston's Route 128, which transformed Mansfield into an attractive destination for both commuters and for truck-oriented industry. In 1982, the completion of Interstate 495 made the Town even more of an attraction for auto and truck travel. Situated near the junction of Interstate 95 the Town has since grown considerably. Transportation is centered at a train station along the Providence-Boston Commuter Rail Line, making the Town an ideal location for transit-oriented development **(TOD)**.

The station abuts Chauncy Street (Route 106) which is one of two major east/west connections through Mansfield. Parking is located in large surface lots on the west side of the tracks, as well as in smaller lots to the south and east of the station. Currently, access to parking west of the tracks is limited; approaches to parking lots are through an adjacent neighborhood, on unmaintained streets that are poorly marked with crumbling surfaces. The large surface lots (approximately 16 acres) adjacent to the passenger rail line make this area ideal for a **Transportation Orientated Development** otherwise referred to as a **TOD**. The principles of **TOD** are based upon creating attractive, accessible and safe routes for pedestrians and bicyclists. This can be achieved by providing pedestrian scaled amenities such as increased green space and way-finding signage between the station, residential areas and the Downtown.

The goal of this project is to address these planning and design principles through: 1) Developing options to enhance vehicular access and optimize parking; 2) Improving pedestrian and bicycle links; and 3) Promoting strategies that maximize the potential for creating transit oriented development **(TOD)**.

Several intersections, within and outside of the study area, were selected for study based on expected impact to access options. The Town identified six options, and an additional nine were developed as part of the study process. While most options would provide access from Chauncy Street, two would utilize points north of the site and include an at-grade crossing of the CSX tracks that are adjacent to the Mansfield Commuter Rail Station.

Access Assessment

Major considerations for assessment of options included: impact to residential neighborhoods; traffic impacts; bicycle and pedestrian access; physical/environmental constraints; parking supply; urban design/landscape; and, **TOD**/ sustainability principles. An assessment matrix included each measure of effectiveness (MOE), a weighting factor, and a performance rating. The top three rating options were carried forward for a more comprehensive assessment. These included:

- Option 6B – A northerly route to North Main Street, crossing CSX tracks to an intersection with County Street.
- Option 9A – Traffic signal installation at the Draper Avenue intersection with Chauncy Street and modification of the existing Highland Avenue intersection to right in/right out only operation.
- Option 4 – A northerly route to King Street, crossing CSX tracks to an intersection with County Street

Based on further analysis, it was determined that while each option had merit individually, neither on its own could sustain acceptable levels of traffic operations at full build-out of the available land in the study area. Traffic demand on Chauncy Street necessitated relief from a northerly options. The final access recommendation was a combination of options 6B and 9A.

Local Improvements

In addition to improvements directly related to access, several short-term, mid-term and long-term improvements were investigated on local roadways.

An additional planning level analysis was conducted to determine if the section of Chauncy Street that is currently two lanes (Highland Avenue to Route 140) should be widened to four lanes (two in each direction). Traffic volumes were projected to five, ten, twenty, thirty and forty year periods. Analysis indicated that the widening to four lanes would be warranted within the five year period.

Development Alternatives

In order to anticipate future traffic volumes this study reviewed the potential of a mid to high density TOD that would act as a maximum build-out model for the parcels of land located west of the railroad tracks. This model generated numbers for future residential units, square footage of mixed use commercial space and the necessary parking areas to support them. It also organized surface parking as well as structured parking so that the greatest efficiency could be achieved in laying out all site features. The objective was to maximize the available acreage so that future traffic volumes could be accounted for especially if the land were to be developed as a **TOD**. As a result, the traffic capacity of the Route 106 corridor greatly influenced the level of development so that any future vehicular count, especially for the commuter parking lot, would not exceed twice the current capacity of approximately 1200 vehicles. Other development strategies that the Town is considering are; 1) Promoting parking with offsetting times of use; and 2) encouraging residential development that is supported more by passenger rail than the typical two vehicles per household. This type of residential development is found in many **TOD**s today and density of units range from 25 to 50 units per acre and even higher in metropolitan areas. With the prerequisite that new traffic improvements on Chauncy Street can support the future development, this study encourages the Town to explore a higher ratio of 25-30 units per acre.

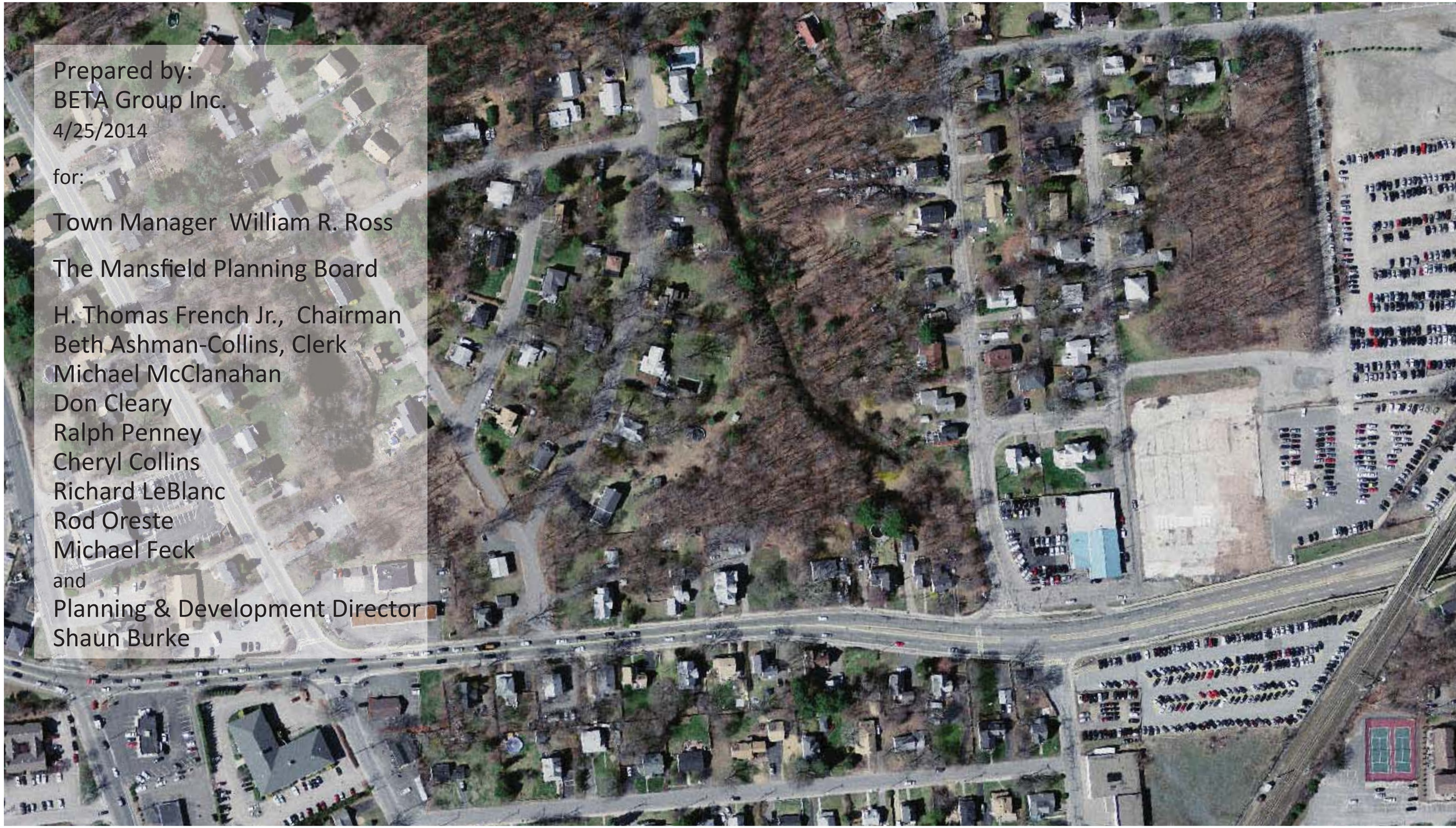
A cohesive TOD plan between the Town of Mansfield, the MBTA, and the private landowners will be vital for infusing the downtown area with new opportunities. By converting acres of asphalt into mixed-use development (that still accommodates commuter parking), Mansfield's downtown will 'jump the tracks' and reconnect with neighborhoods to the west.

Summary of Recommendations

- **Short Term**
  - Copeland Drive & Central Street Left-Turn Lane (markings only)
  - Traffic Signal at Chauncy Street/Draper Avenue (Option 9)
  - Allen Street Extension
  - Bicycle Racks/Storage
  - Way Finding Signage

- **Mid to Long Term (Transportation)**
  - Northern Roadway Connection (N. Main Street/King Street)
  - Pedestrian Connection Over Railroad
  - Pedestrian Bridges Across Route 106 (East and West of Railroad)
  - Route 106 Widening (Highland Avenue to Route 140)
  - Internal Roadway Circulation (Based on Development)
  - Pedestrian/Bicycle Access Improvements

- **Development**
  - Mixed Use - (Residential, Commercial, Office, Open Space)
  - Garage - Buffers Residential from Station
  - Increase Development Density to 25 to 30 units / acre
  - Emphasize Work-Live-Play Principles to Allow Higher Densities
  - Low Impact Storm Water Management (Open Space)



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4/25/2014

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1.0 INTRODUCTION

1.1 Project Background

Mansfield, MA, is a town located roughly halfway between Boston and Providence. Prior to 1960, Mansfield was primarily a farming community with a small Town Center. Interstate Highway 95 between Providence and Boston's Route 128 opened in 1966 and transformed Mansfield into an attractive destination for both commuters and truck-oriented industry. In 1982, the completion of Interstate 495 (Boston's outer beltway, about 25 miles from downtown) made it even more of an attraction for auto and truck travel. Situated near the junction of Interstate 95 the Town has since grown considerably. The Mansfield Town Center radiates out from the train station along the Providence-Boston Commuter Rail Line, making the Town ideal for **transit-oriented development (TOD)**. The principles of **TOD** are based upon creating attractive, accessible and safe routes for pedestrians and bicyclists that link directly to the train station. In the case of Mansfield this can be achieved by incorporating amenities such as increased green space, pedestrian shelters, and way-finding signage between the station and residential neighborhoods.

Existing station on east side of tracks

The station is located adjacent to Chauncy Street (Route 106) which is one of only two major east/west routes through Mansfield. The majority of commuter parking is located in large surface lots on the west side of the tracks as well as in smaller lots to the south and east of the station. There is also on street parking along River Street and Mansfield Avenue. Currently, access to parking west of the tracks is limited; approaches to parking lots are either through an adjacent neighborhood, or on unmaintained streets to parking lots that are poorly marked with crumbling surfaces. Motorists must then walk south towards Route 106 for pedestrian access along the underpass and then turn north to the in-bound station platforms. Overall, both vehicular and pedestrian access are generally inadequate and confusing for the first time user.

Commuter parking lots on the west side of tracks which can accommodate approximately 1200 spaces.

1.2 Residential Impacts

The residential neighborhood bounded by Draper Avenue, Highland Avenue, Allan Street and Howe Street is adjacent to existing commuter parking areas and is greatly impacted by the coming and going of the weekday traffic. While currently affected by traffic circulation, the impact to this neighborhood could increase dramatically with increased development and parking availability. A successful **TOD** plan would encourage greater use of rail transit along with walking and biking from either existing neighborhoods or future **TOD** housing. The shift to this mode of transportation along with an appropriate access option, (see proposed option on page 27) would minimize the vehicular impact to the neighborhood.

Current access for pedestrians from one side of the tracks to the other

Existing residential neighborhood adjacent to the study site.

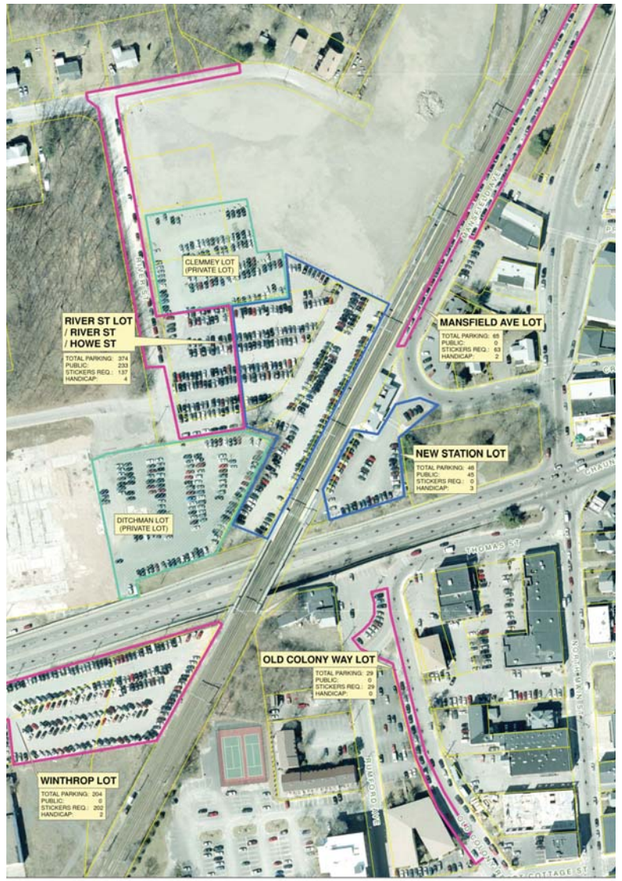
1.3 Goals of This Study

The goals of this project are to study and evaluate options that: enhance vehicular access/egress and optimize parking; increase pedestrian and bicycle links; make use of sustainability measures; and identify strategies to realize the full potential for a Transit Oriented Development in a community that is already well-situated for this application.

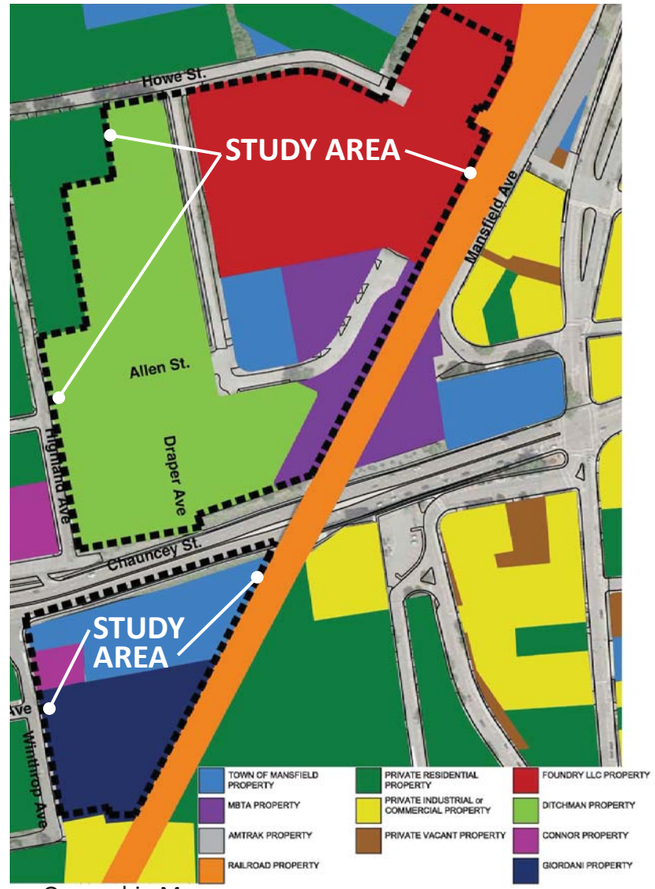
- **Enhance vehicular access to the commuter parking areas**
- **Optimize parking (both short term & long term)**
- **Improve pedestrian & bicycle connectivity**
- **Lay the groundwork for transit oriented development**

1.4 Project Objectives

In understanding what the growth potential is for the Mansfield TOD this study reviewed three important factors to help evaluate both current and future traffic conditions. ***Roadway Geometry, Traffic Control, and Development Potential*** were identified as an integrated trio of design factors that, when evaluated together, produced the most balanced view of how the **TOD** could evolve over the next 10 to 30 and perhaps 40 years. This planning/engineering approach was selected to achieve three (3) objectives. First was to determine future traffic volumes that would in turn identify the needed roadway/signal improvements for access/egress to the commuter parking lot. The second was to provide feedback to the Town regarding the 2013 draft **TOD** by-laws and in particular about the proposed level of residential density which also contributes to traffic volume. The third objective was to better understand how future development, either short range or long range, could be organized in a manner that would contribute positively to the entire downtown area and at the same time have minimal impacts on the adjacent residential neighborhood (Howe Street, Draper Avenue and Highland Avenue).



Parking lot delineation around the train station



Ownership Map

Objectives

- **Identify short and long range road and traffic improvements for easing traffic congestion.**
- **Assist in developing TOD Design Guidelines that reinforce the town character.**
- **Suggest a development pattern that respects the existing neighborhood(s) adjacent to the site but connects them through new sidewalks and multi-use trails.**

2.0 EXISTING CONDITIONS

2.1 Study Area

In determining how the future volumes of both commuting vehicles and local traffic might be quantified, this study focused mainly on the commuter parking lots located on the west side of the tracks. On the east side of the tracks, the downtown area is essentially built out with only minor portions of land available for development or perhaps the redevelopment of some nearby commercial properties. Parking on the east side is restricted to a small train station parking lot or along Mansfield Avenue. The west side of the tracks, however, has a large acreage of land (15.75 total acres) that currently accommodates about 815 commuter vehicles but has the potential for considerable more parking (1200 surface parking) as well as mixed use development.

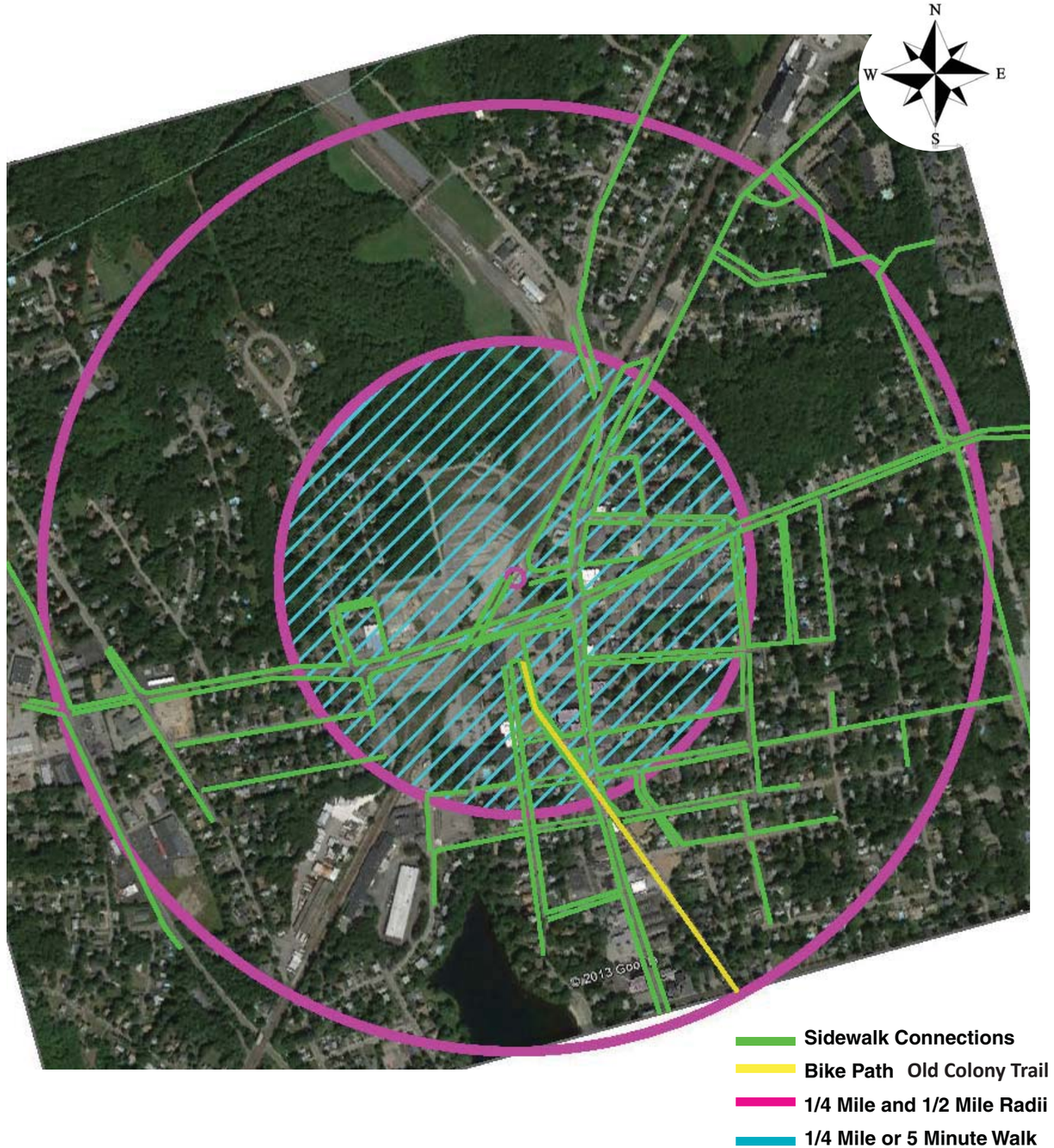
This property within the study area is well positioned for creating a **TOD** because the parcels are presently owned by only four (4) entities with, one being the Town of Mansfield and another being MBTA. The remainder of land on the north side of Chauncy Street is owned by two (2) private owners.

This study also included the south side of Chauncy Street (Route 106) where existing commuter parking occupies approximately 1.4 acres along with a commercial property that currently has a vacant building. The entire study area on the south side of Chauncy Street is 3.4 acres. Like the north side this smaller but important parcel abuts an existing neighborhood west of Winthrop Street and could possibly mirror a mixed use development along Route 106 if properly planned. This study also considered how to strengthen the walking and bicycling connections from the existing neighborhoods and stressed that any future development should extend sidewalks and multi-use trails from a future **TOD** into these adjacent neighborhoods.

2.2 The TOD Area

To further understand the connectivity of the surrounding neighborhoods this study looked at a larger 1/2 mile radius area and conducted a cursory review of sidewalk and bicycle connections. **TOD**'s typically encompass a 10 to 15 minute walking radius from the central transportation hub; in this case the Mansfield Train Station. The commuter traffic congestion at Chauncy Street is the primary concern of this study, but during several review meetings with the Mansfield Planning Board the connectivity of the existing neighborhoods was also an essential issue to address. Ease of access by foot or bicycling is indeed critical, especially where the inner most walkways/multi-use paths are accommodating both local residents and commuters walking to and from the parking lots. After reviewing the existing sidewalk network this study found that three-quarters of the **TOD**'s radial footprint had fairly good sidewalk connections leading in from the outer most distance. The exception was the northwest quadrant where no sidewalks were constructed within the residential neighborhood areas.

The second discovery is that as the sidewalk network converges at the station area the pedestrian (and bicycle) comforts greatly diminish in and around the Route 106 bridge connection. Narrow sidewalk widths adjacent to the high speed tracks combined with total exposure to foul weather conditions are challenging for both pedestrians and bicyclist. Handicap accessibility is less than ideal and the current elevated sidewalk along the Route 106 overpass is an excessive distance for reaching the inbound station platform from the west side parking area(s). (see below)



2.3 Existing Sidewalk Conditions

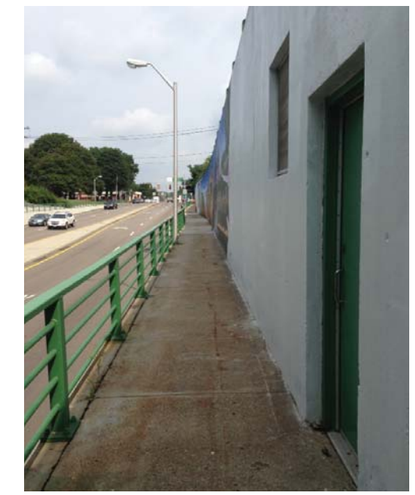
Within the 1/2 mile radius most roadways and side streets generally have one sidewalk. At this distance from the station, sidewalks should be on both sides of roadways and should include wayfinding signage and enhanced crosswalks at major street crossings.

Sidewalks on both sides of Chauncy Avenue (Route 106)

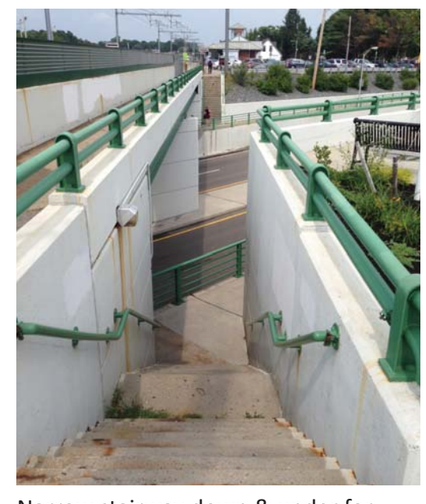
Typical side street conditions with one sidewalk

As the outer network of sidewalks converge at the station area pedestrian comfort & connectivity diminishes. The greatest challenge is the existing ramp system and pedestrian bridge along and across Route 106. The current configuration forces the pedestrian to travel an extended route along narrow sidewalks. The overall experience of walking under the bridges, and up an down narrow staircases is very uncomfortable. Bicyclists also have difficult time navigating across the narrow Route 106 bridges, especially at times of heavy use.

Walkway under train bridge



Elevated sidewalk along Route 106



Narrow stairway down & under for reaching the other side of the tracks

Train tracks overhead

3.0 EXISTING TRAFFIC CONDITIONS

Traffic data were collected and intersection capacity analysis was performed to evaluate existing and future traffic conditions with and without each of the station access options. Analysis was also performed for each access option with and without the potential Transit Oriented Development at the station. All analysis cases were then analyzed again implementing traffic and safety improvement measures.

Traffic signal warrants were considered as justification for the installation of traffic signals at the project intersections on Chauncy Street, North Main Street and County Street.

Vehicle crash data for all project intersections were collected for the three most recently available years (2009-2011). These data were analyzed to identify existing safety issues that could be corrected and to identify any issues that could be compounded by future development.

This section will present existing conditions related to the station and to traffic volumes and traffic operations at the study area intersections.

3.1 Existing Intersection Geometry/Traffic Control

Existing geometry and traffic control measures are described in Figure B-1 through Figure B-9 located in Appendix B of this report.

3.2 Existing Traffic Volumes

Turning Movement Counts (TMC's) were collected on Tuesday, September 17, 2013 between 7 and 9 AM and 4 and 6 PM at the following seven project intersections:

1. Chauncy Street at Highland Avenue and Winthrop Avenue
2. Chauncy Place at Highland Avenue
3. Allen Street at Highland Avenue
4. Allen Street at Draper Avenue
5. King Street at County Street
6. North Main Street at County Street and Angel Street
7. Chauncy Place at Chauncy Street

Turning movement data were reviewed, and it was determine that the morning peak hour for all intersections occurred between 7 and 8 AM and the afternoon peak hour occurred between 5 and 6 PM. Turning movement data for each peak hour were summarized and traffic volumes entering and exiting adjacent project intersections were balanced where appropriate.

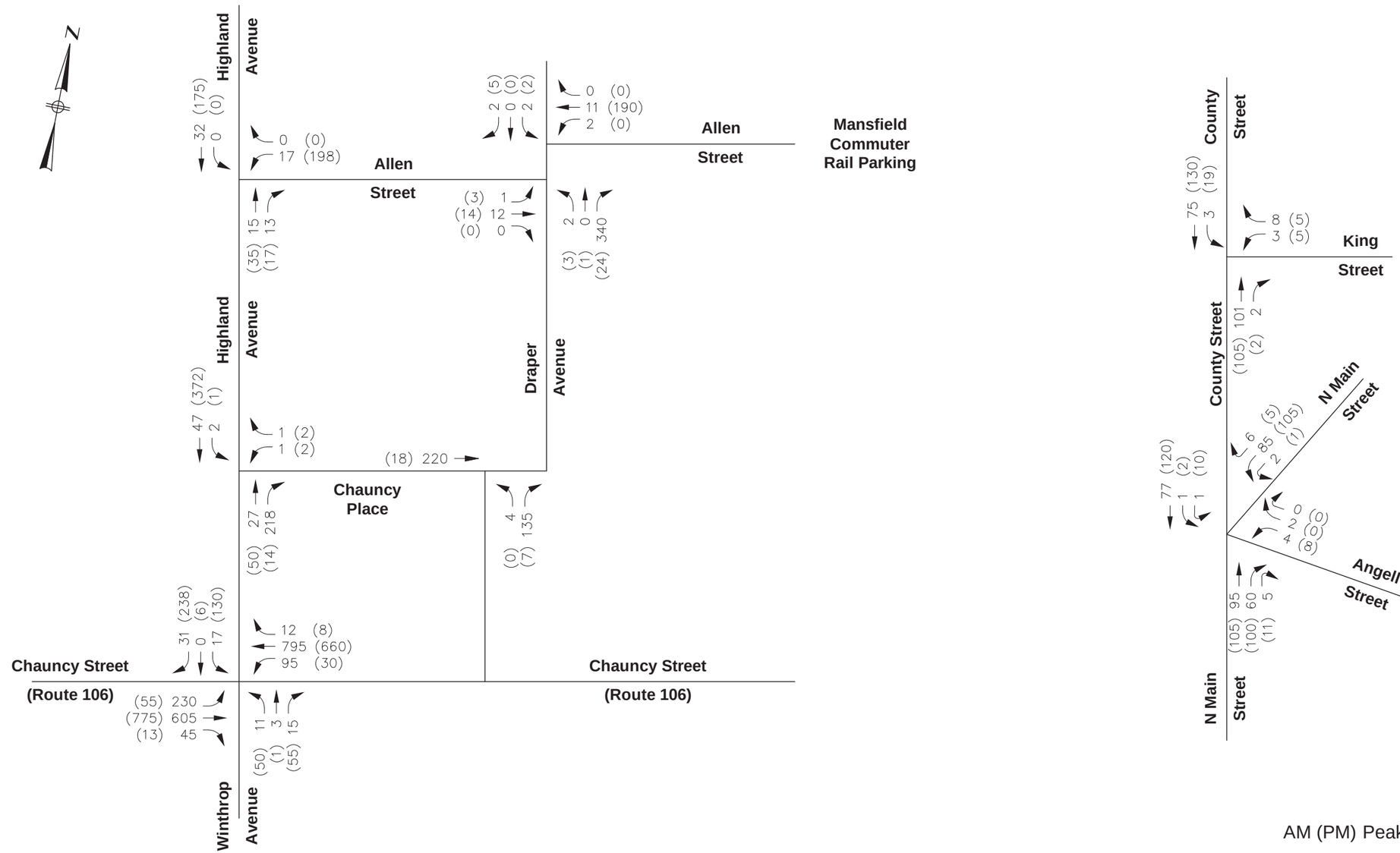
Study area turning movement volumes for the weekday morning and afternoon peak hours are presented in Figure 3-1 (on page 10).

Figure 3-1 - Existing (2013) Turning Movement Volumes

Automatic Traffic Recorders (ATR) were placed on the following roadways to collect daily traffic volume data on Tuesday, September 17, 2013 and Wednesday, September 18, 2013:

- Chauncy Street (Route 106) west of Highland Avenue
- Highland Avenue south of Allen Street
- Allen Street between Highland and Draper Avenues
- Allen Street east of Draper Avenue
- River Street south of Howe Street
- Chauncy Place east of Highland Avenue
- Chauncy Street (Route 106) east of Highland Avenue
- The driveway of the Winthrop Avenue Parking Lot
- Winthrop Avenue north of Bella Vista Avenue
- County Street north of King Street
- King Street east of County Street
- County Street south of King Street
- North Main Street north of County Street
- North Main Street south of Angell Street

The data indicate that the average daily traffic volume on Chauncy Street (Route 106) is 16,800 vehicles per day west of Highland Avenue and 21,900 vehicles per day east of Highland Avenue.



AM (PM) Peak Hour Traffic Volumes

Count Date: Tuesday, September 17, 2013
7AM - 8AM & 5PM - 6PM

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Figure 3-1
Existing (2013) Peak Hour
Turning Movement Volumes

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3.3 Level of Service Analysis Methodology

Operations at the project intersections were evaluated using the SYNCHRO software package (Version 6, Build 614). This software package is based on methodologies contained in the 2000 Highway Capacity Manual. Traffic operations are defined by Level of Service (LOS), which is a qualitative measure that associates LOS with vehicle delays. The criteria for unsignalized intersections are different than for signalized intersections because drivers expect different performance levels from each type of intersection. The relationship between LOS and delay is summarized in Table 3-1 for unsignalized and signalized intersections. (see below)

Table 3-1 - Level of Service Criteria

LOS	Unsignalized Intersection Criteria Average Total Delay (Seconds per Vehicle)	Signalized Intersection Criteria Average Total Delay (Seconds per Vehicle)
A	< 10.0	< 10.0
B	10.1 to 15.0	10.1 to 20.0
C	15.1 to 25.0	20.1 to 35.0
D	25.1 to 35.0	35.1 to 55.0
E	35.1 to 50.0	55.1 to 80.0
F	> 50.0	> 80.0

Source: Highway Capacity Manual, Transportation Research Board; Washington, DC; 2000

3.4 Existing Conditions Analysis Results

The following section presents the results of the Level of Service analysis for existing conditions during the weekday morning and afternoon peak hours. Analysis results are presented in Tables C-1 and C-2 located in the Appendix, and in Figure 3-2. (right)

Morning Peak Hour

Most approaches to unsignalized intersections operate at LOS B or better during the morning peak hour. The following two approaches operate at LOS F:

- Winthrop Avenue northbound approach to Chauncy Street (Route 106)
- Highland Avenue southbound approach to Chauncy Street (Route 106)

Afternoon Peak Hour

Most approaches to unsignalized intersections operate at LOS B or better during the afternoon peak hour. The following two approaches operate at LOS F:

- Winthrop Avenue northbound approach to Chauncy Street (Route 106)
- Highland Avenue southbound approach to Chauncy Street (Route 106)

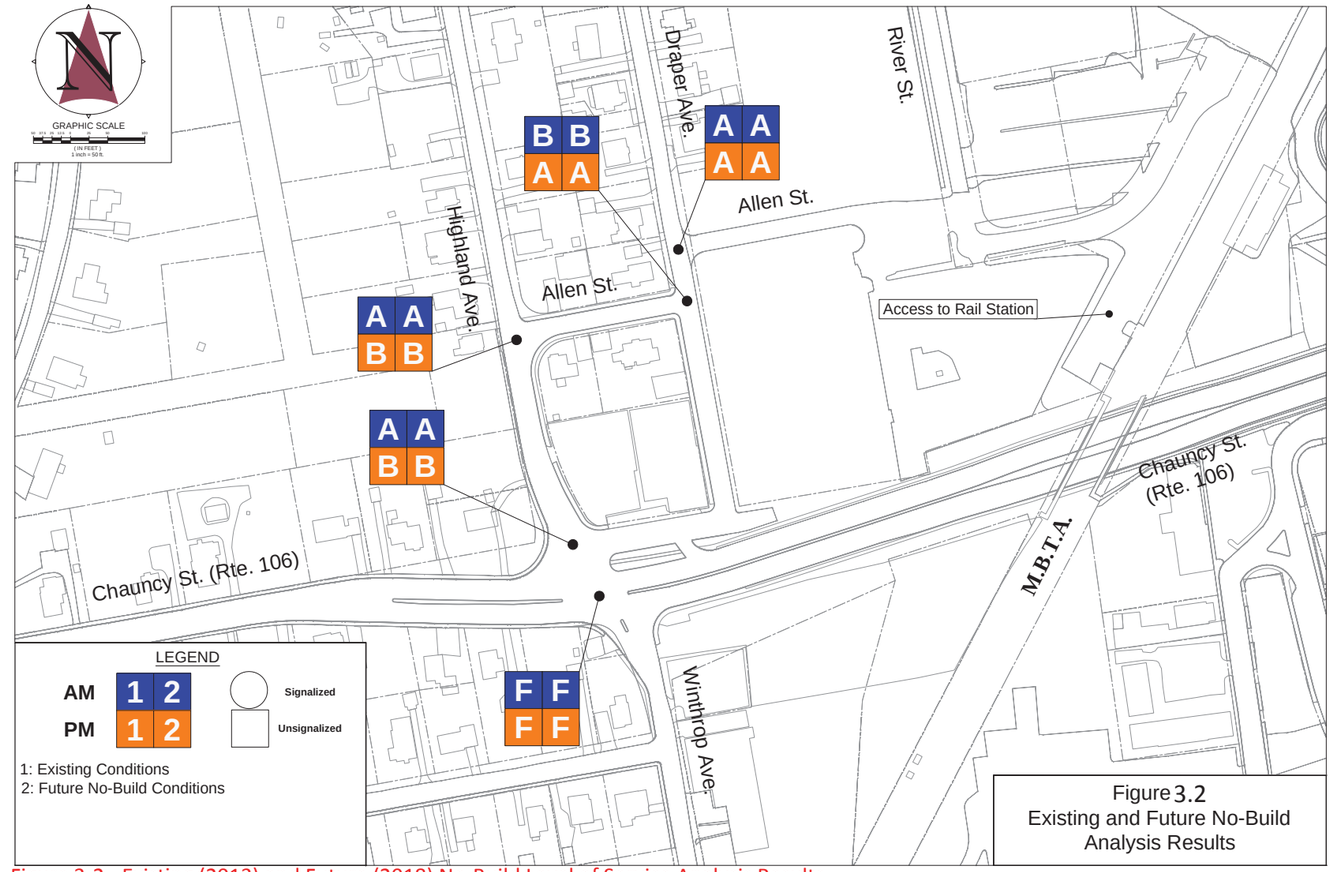


Figure 3-2 - Existing (2013) and Future (2018) No-Build Level of Service Analysis Results

4.0 FUTURE CONDITIONS

The following section will present the analysis of future conditions at the project intersections. The study intersections will be analyzed under the following conditions:

- Existing roadway network with Future (2018) traffic volumes (No-Build)
- Proposed roadway improvement options with Existing (2013) traffic volumes
- Proposed roadway improvement options with Future (2018) traffic volumes
- Proposed roadway improvement options with Future (2018) traffic volumes plus trips generated by the Transit Oriented Development scenario.

4.1 Traffic Projections

The following sections will present the methodology used to project the existing traffic volumes to the future analysis years.

4.1.1 Peak Hour Turning Movement Counts

A review of available historic traffic volume data distributed by the Southeast Region Planning and Economic Development District (SRPEDD) indicate that traffic volumes have remained stable or even declined over the past five years. It is expected that traffic volumes will return to levels experienced prior to the current decline and then continue to increase. A background growth rate of 1.0% per year has been utilized to project existing traffic volumes five years into the future. This growth rate is expected to account for both background growth and any other specific planned developments which may occur within the project area (not including the **TOD** trips). Future (2018) No-Build traffic volumes are presented in Figure 4-1 (page 13).

4.1.2 Chauncy Street Daily Traffic Volumes

BETA was also requested to examine future traffic volumes along Chauncy Street (Route 106). Traffic projections were estimated 5-, 10-, 20-, 30-, and 40-years into the future. A background growth rate of 1.0% per year was used to project traffic volumes for the first five years, and a rate of 0.5% per year was used to project the volumes for the years thereafter. Future traffic volume projections for Chauncy Street (Route 106) are presented in Table 4-1.

Table 4-1 Chauncy Street (Route 106) Traffic Volume Projections

	Chauncy Street West of Highland Avenue	Chauncy Street East of Highland Avenue
2013 (Existing)	16,800	21,850
2018 (5 year projection)	17,650	22,950
2023 (10 year projection)	18,100	23,550
2033 (20 year projection)	19,050	24,750
2043 (30 year projection)	19,950	26,000
2053 (40 year projection)	21,050	27,350

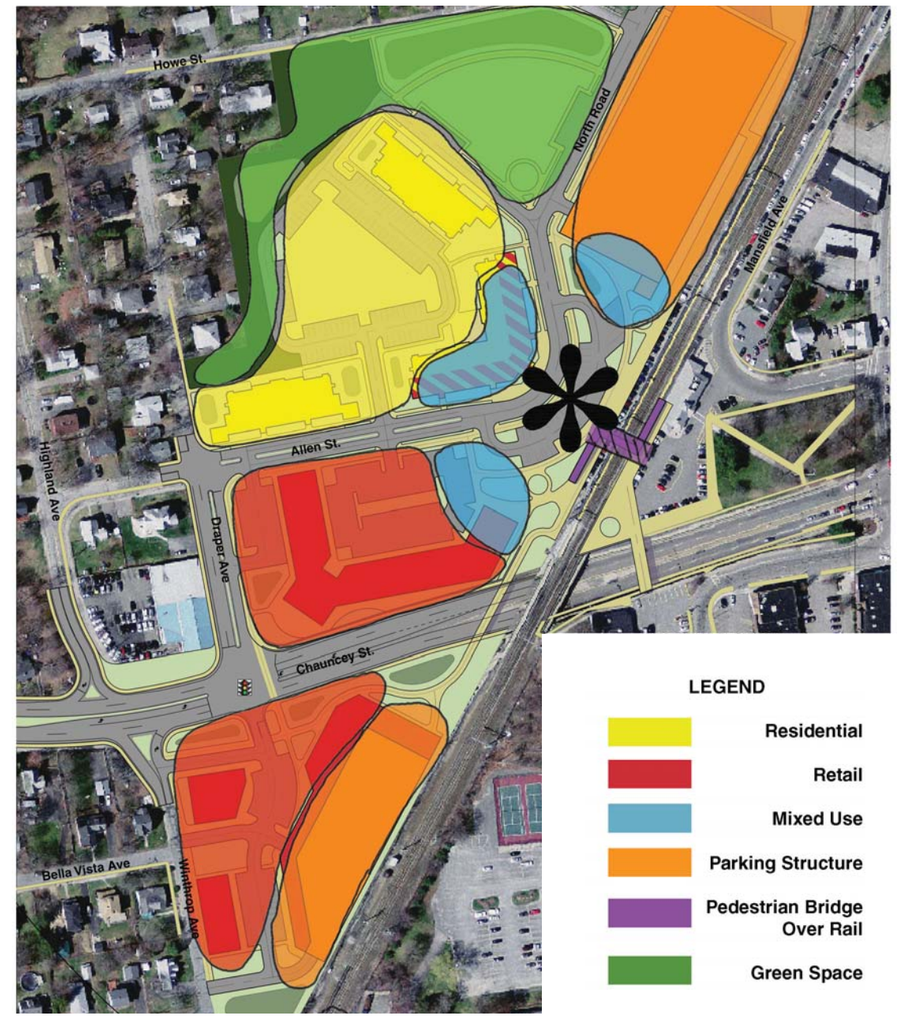
4.2 Development Scenario Traffic Evaluation

The conceptual development plan (right) was generated for purposes of projecting future trip generations that would then factor into evaluating the long term level of service (LOS) for proposed traffic improvements. This study maximized the entire acreage available and assumed a planning approach to create mixed-use TOD. For the 15.75 acres north of Chauncy Street and the 3.4 acres on the south side the total build-out generated approximately:

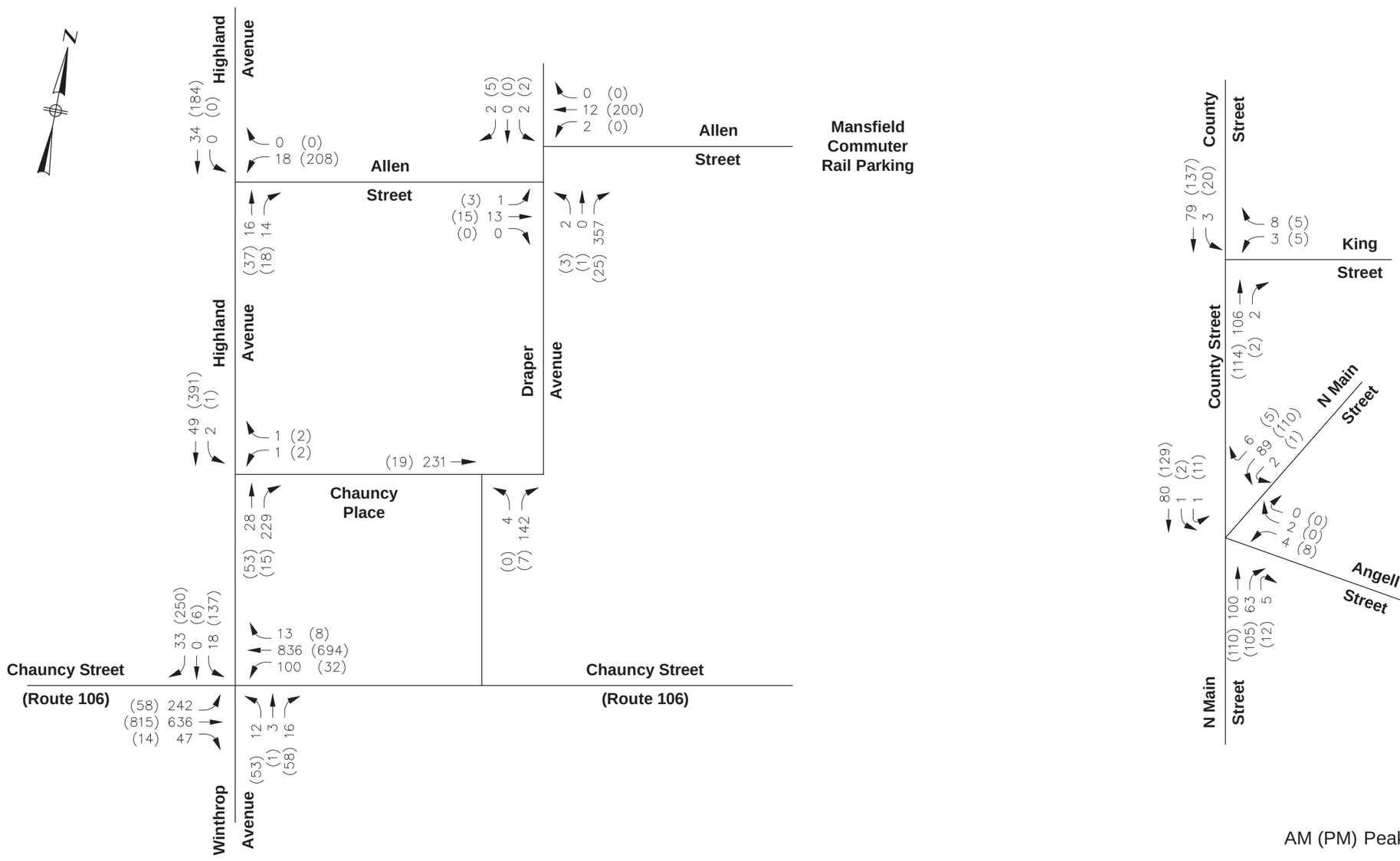
- 90 residential units with 1.5 cars per unit
- 64,000 sf of retail/commercial with 260 parking spaces (4 spaces/1000sf)
- 1865 commuter parking spaces within a three story parking garage

In addition to understanding the physical features that generate traffic volumes, the conceptual plan also incorporated ample green space for buffering the existing neighborhoods and providing needed surface area for handling stormwater run-off.

Because the further study will be required to fully understand the soil conditions, the plan did not rely on below grade structures for parking or circulation. (Further information about the plan can be found on page 30 in this report.)



The traditional four step planning process (Trip Generation, Trip Distribution, Mode Split and Trip Assignment) was used to integrate the new development trips into the future transportation network. The following section will provide descriptions of each step of the four step process.



AM (PM) Peak Hour Traffic Volumes

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Figure 4-1
No-build (2018) Peak Hour
Turning Movement Volumes

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4.2.1 Trip Generation

Trip generation estimates were developed using the procedures outlined in the Institute of Transportation Engineers (ITE) publication: Trip Generation, 9th Edition. For the purposes of this planning level evaluation, the following land-use assumptions were applied:

- Land-use code 220, Apartment, has been used to represent the residential component of the development scenario
- Land-use code 710, General Office Building, has been used to represent the office space component of the development scenario
- Land-use code 820, Shopping Center, has been used to represent the retail component of the development scenario

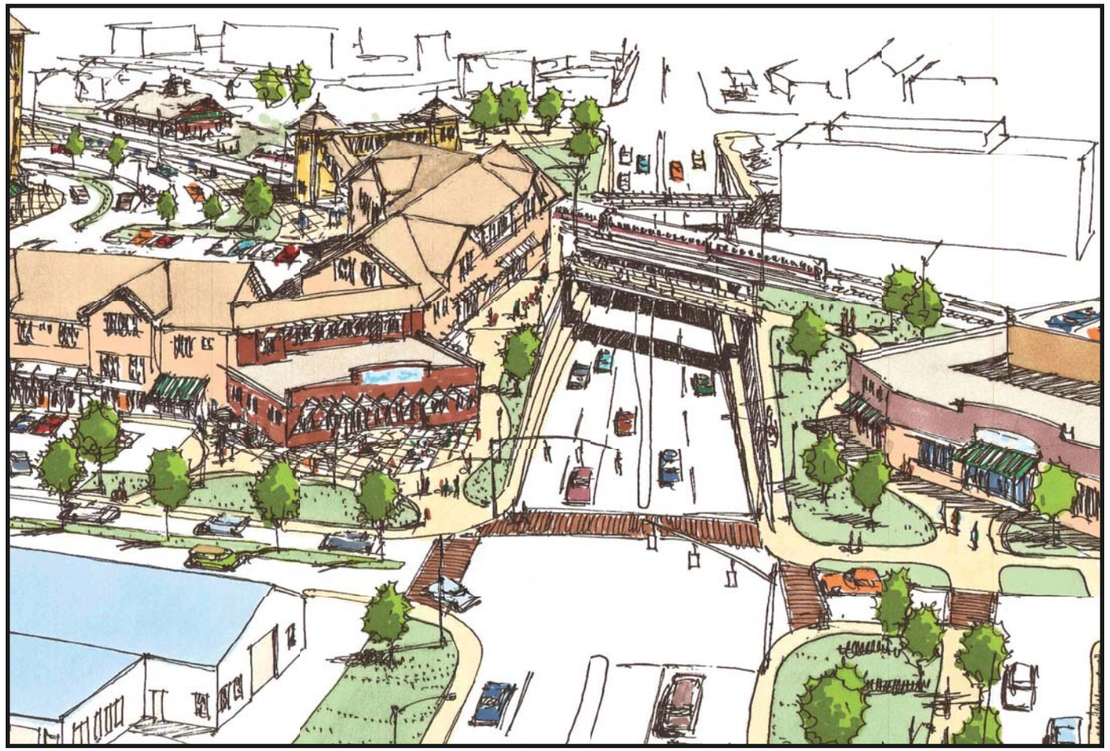
Existing traffic counts, collected as part of this project, were reviewed to determine the peak hour trip generation for the existing station parking spaces located on the west side of the rail line. The data indicate that each existing space generates 0.53 vehicle trips (99% entering, 1% exiting) during the morning peak hour and 0.49 vehicle trips (3% entering, 97% exiting) during the afternoon peak hour. These existing trip generation rates serve as the basis for all estimates of future trips due to increases in parking supply.

4.2.2 Trip Distribution

Trip Distribution data presented by the MBTA in their 2009 Mansfield Station Survey report were utilized to assess the origins and destination of trips entering and exiting the existing parking lots. The distribution percentages for each of the surrounding towns are presented in Table 4-2. (see below)

Table 4-2 – Existing Trip Distribution

Town	Origin/Destination Percentage
Easton	4%
Taunton	4%
Norton	15%
Attleboro	5%
North Attleboro	6%
Plainville	4%
Foxborough	7%
Mansfield	55%



Perspective view of option 9

4.2.3 Mode Split

A number of transportation options are present within the study area. Trips to/from the station can generally be made by three modes of transportation: walking, public transportation, and automobile. For the purposes of this study, the mode split assignments presented in Table 4-3 (see below) were used for each land use. The mode split assumptions are conservative with respect to vehicle trips so that the vehicle trips would not be under estimated. The actual development may justify a higher percentage of walking and transit trips and fewer vehicle trips.

Table 4-3 Assumed Mode Split for Land Use

Town	Walk	Transit	Automobile
Residential	5%	25%	70%
Retail	5%	5%	90%
Office	5%	25%	70%
Parking	0%	0%	100%

4.2.4 Trip Assignment

The final step of the four step planning process is to assign the generated trips to the transportation network. Assumptions were made on which roadways vehicles would use to enter or exit the study area based on existing roadway patterns.

4.3 Proposed Roadway Improvement Options

Access Options

Nine primary access options and six sub-options have been considered to improve vehicular access to the existing Mansfield Train Station. Options 1 - 6 were presented by the Town in the Request for Proposal and Options 7 - 9 were developed by the BETA Group project team. The nine primary access options considered are:

1. Chauncy Place Extension
2. Allen Street Extension
3. Allen Street Extension at Draper Avenue
4. King Street Extension
5. Chauncy Street Crossing
6. North Main Street Extension
7. Allen Street Extension/Modification at Draper Avenue
8. Parallel Draper Avenue Roadway
9. Draper Avenue/Chauncy Street Intersection

Option 6 was broken into five sub-options and Option 9 was broken into three sub-options, for a total of 15 options.

All options provide a direct means of access/egress to/from the station while:

1. Minimizing or eliminating traffic impacts within the existing residential neighborhood,
2. Preserving the development potential of the vacant properties surrounding the existing station.

In addition to the vehicular access improvements, the access options also include improvements to pedestrian and bicycle access through handicapped accessible sidewalks and curb ramps, landscaping opportunities and street lighting, and bicycle paths/accommodation.

Conceptual sketches and preliminary cost estimates have been developed for all nine access options and preliminary concept plans have been developed for the top three preferred options.

Option 1: *Chauncy Place Extension (Appendix B)*

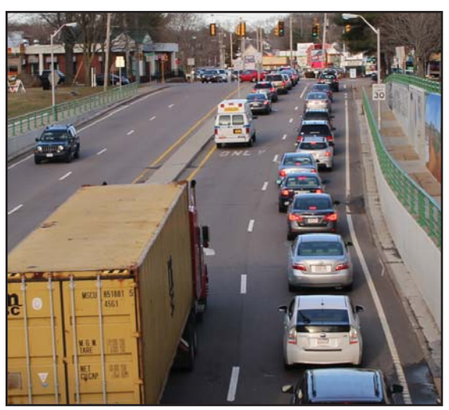
This option would provide direct access to the commuter rail parking lot via an extension of Chauncy Place which would minimize impacts to the residential area. The new layout would consist of upgrading the existing Chauncy Street (Route 106) intersection with Highland and Winthrop Avenues to incorporate a new traffic signal. A new left turn lane would be proposed for east bound traffic turning into Highland Avenue. Modifications to improve channelization at Winthrop Avenue would also be proposed.

Although proposed improvements would remain within the right-of-way, access and parking for the existing automobile dealership on Chauncy Place would be disrupted. An issue that is common to any option beginning at the Route 106/ Highland Avenue intersection is the very tight turn that currently exists to Chauncy Place from Route 106 westbound, which would be exacerbated by increased traffic volumes. The estimated budget cost of construction only is $1.6 million.

Option 2: *Allen Street Extension (Appendix B)*

This option would provide access to the commuter rail parking lot via an extension of Allen Street. As with Option 1, the new layout would consist of upgrading the existing Chauncy Street (Route 106) intersection with Highland and Winthrop Avenues to incorporate a new traffic signal. Traffic would be directed north along Highland Avenue before turning right onto Allen Street and then crossing Draper Avenue before accessing the parking lot. River Street would also likely be extended to connect with the new Allen Street extension. On Route 106, a new left turn lane would be proposed for eastbound traffic turning into Highland Avenue and modifications to improve channelization at Winthrop Avenue would also be proposed.

This option increases the use of existing roadways rather than a new road as required with Option 1. This option is also likely to be most disruptive to residents, impacting the lower portion of Highland Avenue, Allen Street and Draper Avenue. The estimated budget cost of construction only is $1.6 million.



Options included in the original RFP

Option 3: *Allen Street Extension at Draper Avenue (Appendix B)*

Option 3 is the third alternative proposing improvements at the Chauncy Street, Highland Avenue, Winthrop Avenue junction, and would run from Chauncy Place to Draper Avenue, and then turn east along a realigned Allen Street. This alignment would reduce residential impacts to a portion of the existing residential neighborhood, but would still impact Draper Avenue and a portion of Allen Street. Similar to Option 1, disruption to the automobile dealership parking and the tight turn by westbound Route 106 traffic would remain. The estimated budget cost of construction only is $1.6 million.

Option 4: *King Street Extension (Appendix B)*

This option provides access to the commuter rail lot from the north via a new service road commencing at the intersection of County and King Streets and terminating at the end of Howe Street. This option would require an at-grade crossing of the CSX rail line before turning south and running parallel to the existing rail tracks. The provision of a new service road would reduce traffic congestion along North Main Street and Route 106. This option would be more costly than previous options due to the added expense of a new service road and property acquisition from CSX. Potential safety concerns regarding the rail crossing and general opposition from CSX could be experienced. The upgrading of King Street between County Street and North Main Street might also be required. The estimated budget cost of construction only is $2.6 million.

Option 5: *Chauncy Street Crossing (Appendix B)*

Option 5 proposes a new bridge that would run parallel to the existing railroad bridge across Route 106 and connect the parking lots on Winthrop Avenue to the station. The bridge could allow for both vehicular and pedestrian connection between parking lots on a visible, Americans with Disabilities Act (ADA) compliant alignment. This option would facilitate movement between the parking lots while avoiding the need to travel back through the Highland Avenue/Winthrop Avenue intersections. This option would likely result in the excessive loss of parking spaces in each lot. Therefore the estimated budget cost of construction was not determined because of the physical constrains of bridging over Route 106.

Option 6: *North Main Street Extension (Appendix B)*

This option consists of a new connection from the intersection of North Main Street and County Street, southwest, across CSX property (parcel 18-219) and then following the Option 4 alignment to Howe Street and the station. This connection would form an additional leg to the intersection of North Main Street/County Street/Angell Street and may require the intersection to be

signalized. Both County Street and North Main Street would require widening to accommodate new left turn lanes on the approach to the intersection. Additionally a portion of the existing reinforced concrete wall on North Main Street would likely require rebuilding to overcome grading issues.

This option would require establishing an at-grade rail crossing of CSX rail lines and provide a direct connection to the station from the areas north and east of the station, reducing station bound traffic on Route 106. This option presents particular challenges in crossing of the CSX tracks and requires CSX property acquisition. The estimated budget cost of construction only is $2.2 million.

Option 7: *Allen Street Extension/Modification at Draper Avenue (Appendix B)*

This option is a hybrid of Option 3, which would utilize the same alignment, but modify the intersection of Allen Street and Draper Avenue to prevent motorists from exiting the station via Highland Avenue. This would shield the residential area from traffic originating in the parking lots. The estimated budget cost of construction only is $1.6 million.

Option 8: *Parallel Draper Avenue Roadway (Appendix B)*

Option 8 is a further modification of Option 3 to help minimize commuter traffic from impacting Highland and Draper Avenues. This option would maintain Draper Avenue for local circulation and would create a parallel road slightly to the east within the "Ditchman" parcel (parking lot A). This parallel access road on a new alignment would be physically separated from Draper Avenue by a raised median which would provide landscaping and screening opportunities. The new access road would also be separated from River Street to ensure the separation of neighborhood and commuter traffic. Careful attention to the location and layout of the roadway would be critical to ensure that the alignment is compatible with and does not negatively affect potential TOD uses. The estimated budget cost of construction only is $1.7million.

Option 9: *Proposed Intersection at Draper Avenue/Chauncy Street (Appendix B)*

Option 9 provides access from Route 106 to the commuter rail parking lot via a new intersection with Draper Avenue. Traffic would access the lower half of Draper Avenue before turning onto a new extension of Allen Street. Similar to Option 2, this option increases the use of existing roadways but, could reduce traffic on Highland Avenue.

The intersections of Highland Avenue and Winthrop Avenue would be restricted to operate as right-in/right-out to facilitate the new left turn lane for east bound traffic destined for the parking lot. The area once occupied by Chauncy Place would be preserved for public space.

As an additional modification, direct access between the existing parking lot on the south side and Route 106 could be established by the introduction of an additional leg to the intersection and a new left turn lane for west bound traffic. This would require widening of Route 106 and partial reconstruction of the north retaining wall. The estimated budget cost of construction only is $2.5 million.

4.4 No-Build Traffic Analysis Results with Future Traffic Volumes

The following section presents the Level of Service analysis results for future conditions during the weekday morning and afternoon peak hours assuming no changes were made to the existing roadway network. Analysis results are presented in Tables C-3 and C-4 located in the Appendix.

Morning Peak Hour

Most approaches to unsignalized intersections would operate at LOS B or better during the morning peak hour. The following two approaches would continue to operate at LOS F:

- Winthrop Avenue northbound approach to Chauncy Street (Route 106)
- Highland Avenue southbound approach to Chauncy Street (Route 106)

Afternoon Peak Hour

Most approaches to unsignalized intersections would operate at LOS C or better during the afternoon peak hour. The following two approaches would continue to operate at LOS F:

- Winthrop Avenue northbound approach to Chauncy Street (Route 106)
- Highland Avenue southbound approach to Chauncy Street (Route 106)

4.5 Traffic Analysis Results for Roadway Improvement Options with Existing Traffic Volumes, Without TOD Trips

The following section will present the traffic analysis results for each study area intersection under existing traffic volume conditions for all roadway improvement options. Analysis results are presented in Tables C-1 and C-2 located in the Appendix.

In this section all locations would be analyzed as unsignalized intersections. Signalization will be considered as a traffic and safety improvement measure later in this report. Intersection level of service analysis was not performed for Option 5 because this option proposes bridges over Chauncy Street (Route 106) which would not significantly alter traffic patterns.

Morning Peak Hour

The analysis results indicate that most intersection approaches would continue to operate at LOS B or better under all roadway improvement options. The Winthrop Avenue northbound and Highland Avenue southbound approaches would continue to operate at LOS F under Options 1 - 4 and 6 - 8. These approaches would be restricted to right-in/right-out operation under Options 9A, 9B and 9C which would improve operations to LOS B on each approach.

A new unsignalized intersection would be introduced at Chauncy Street and Draper Avenue under Options 9A, 9B, and 9C, and the southbound approach to this intersection would operate at LOS F.

Afternoon Peak Hour

The analysis results indicate that most intersection approaches would continue to operate at LOS C or better under all roadway improvement options. The Winthrop Avenue northbound and Highland Avenue southbound approaches to Chauncy Street would continue to operate at LOS F, with excessive delays, under Options 1 - 4 and 6 - 8. These approaches would be restricted to right-in/right-out operation under Options 9A, 9B and 9C which would improve operations to LOS B on each approach.

A new intersection would be introduced at the intersection of Chauncy Street and Draper Avenue under Options 9A, 9B, and 9C, and the southbound approach to this intersection would operate at LOS F.

4.6 Traffic Analysis Results for Roadway Improvement Options with Future Traffic Volumes, Without TOD Trips

The following section will present the traffic analysis results for each study area intersection under future traffic volume conditions for all roadway improvement options. Analysis results are presented in Tables C-3 and C-4 located in the Appendix.

In this section all locations would be analyzed as unsignalized intersections. Signalization will be considered as a traffic and safety improvement measure later in this report. Intersection level of service analysis was not performed for Option 5 because this option proposes bridges over Chauncy Street (Route 106) which would not significantly alter traffic patterns.

Morning Peak Hour

The analysis results indicate that most intersection approaches would continue to operate at LOS B or better under all roadway improvement options. The Winthrop Avenue northbound and Highland Avenue southbound approaches to Chauncy Street would continue to operate at LOS F under Options 1 - 4 and 6 - 8. These approaches would be restricted to right-in/right-out operation under Options 9A, 9B, and 9C which would improve operations to LOS B on each approach.

A new intersection would be introduced at the intersection of Chauncy Street and Draper Avenue under Options 9A, 9B, and 9C, and the southbound approach to this intersection would operate at LOS F.

Afternoon Peak Hour

The analysis results indicate that most intersection approaches would continue to operate at LOS C or better under all roadway improvement options. The Winthrop Avenue northbound and Highland Avenue southbound approaches to Chauncy Street would continue to operate at LOS F, with excessive delays, under Options 1 - 4 and 6 - 8. These approaches would be restricted to right-in/right-out operation under Options 9A, 9B and 9C which would improve operations to LOS B on each approach. A new intersection would be introduced at the intersection of Chauncy Street and Draper Avenue under Options 9A, 9B, and 9C, and the southbound approach to this intersection would operate at LOS F.

4.7 Traffic Analysis Results for Roadway Improvement Options with Future Traffic Volumes, With TOD Trips

The following section will present the traffic analysis results for each study area intersection under Future traffic volume conditions with all roadway improvement options and estimated development trips. Analysis results are presented in Tables C-5 and C-6 located in the Appendix.

In this section all locations would be analyzed as unsignalized intersections. Signalization will be considered as a traffic and safety improvement measure later in this report. Intersection level of service analysis was not performed for Option 5 because this option proposes bridges over Chauncy Street (Route 106) which would not significantly alter traffic patterns.

Morning Peak Hour

The analysis results indicate that most intersection approaches would continue to operate at LOS C or better under all roadway improvement options. The Winthrop Avenue northbound and Highland Avenue southbound approaches to Chauncy Street would continue to operate at LOS F, with excessive delays, under Options 1 - 4 and 6 - 8. These approaches would be restricted to right-in/right-out operation under Options 9A, 9B, and 9C, which would improve operations to LOS B on each approach.

A new intersection would be introduced at the intersection of Chauncy Street and Draper Avenue under Options 9A, 9B, and 9C. The Draper Avenue southbound left-turn movement at this intersection would operate at LOS F, and the eastbound left-turn movement from Chauncy Street would operate at LOS D.

Afternoon Peak Hour

The analysis results indicate that most intersection approaches would continue to operate at LOS C or better under all roadway improvement options. The Winthrop Avenue northbound and Highland Avenue southbound approaches to Chauncy Street would continue to operate at LOS F, with excessive delays, under Options 1 - 4 and 6 - 8. These approaches would be restricted to right-in/right-out operation under Options 9A, 9B and 9C which would improve operations to LOS B on each approach.

The Allen Street westbound approach to Highland Avenue would degrade to LOS D under Option 6C and LOS E under Option 2.

The Allen Street westbound approach Draper Avenue would degrade to LOS D under Option 7.

A new intersection would be introduced at the intersection of Chauncy Street and Draper Avenue under Options 9A, 9B, and 9C, and the southbound approach to this intersection would operate at LOS F.

5.0 TRAFFIC AND SAFETY IMPROVEMENTS

The following section presents short- and long-term traffic improvement options along Chauncy Street and level of service analysis results for the roadway improvement options with traffic and safety improvements.

5.1 Short Term Improvements along Chauncy Street (Route 106)

Short term improvements were investigated along Chauncy Street that could improve traffic operations and safety in the near term without a great deal of expense. The project team evaluated lane-use at the Chauncy Street intersections with Copeland Drive and Central Street. Chauncy Street currently provides a single travel lane in each direction at each of these intersections. The existing roadway width is approximately 34 feet. This width is sufficient to stripe one travel lane in each direction plus a single exclusive westbound left-turn lane in the center of the roadway. This additional lane would provide queuing space for left turning vehicles which would allow through and right-turning vehicles to pass. The proposed improvement is presented in Figure 5-1. This modification would be comprised of removing the existing pavement markings and replacing them with proposed markings. No changes would be required to the existing traffic signal at the Copeland Drive intersection under the proposed configuration.

5.2 Long Term Improvements along Chauncy Street (Route 106)

Chauncy Street currently experiences a great deal of congestion throughout the day. Field observations and analysis results indicate that vehicle queues frequently stretch from intersection to intersection along Chauncy Street during the morning and afternoon peak periods. Figure 5-2 shows the queue lengths observed during the afternoon peak hour and the queues calculated by the traffic analysis for the same period. When traffic volumes are projected out even five years, the analysis shows that the queuing would continue to grow and a four lane roadway is warranted. Analysis indicates that a four lane roadway could accommodate traffic volumes through the 40-year horizon examined.

5.3 Existing and No-Build Analysis Results with Traffic and Safety Improvements

The following section will present the traffic analysis results under existing and future traffic volume conditions if no roadway improvements were implemented (No-Build) and without TOD trips. Only intersections that would receive improvement treatments are discussed in this section.

All analysis results are located in the appendix of this report. Morning and afternoon peak hour analysis results for traffic signal and roundabout controlled intersections are presented in Tables C-8 and C-10 for existing traffic volumes and in Tables C-12 and C-14 for future traffic volumes.

Intersection 1) Chauncy Street at Highland Avenue/Winthrop Avenue

This intersection could be improved by signalizing the intersection under both the Existing and Future No-Build conditions. Signalization could include:

- Eastbound and westbound left-turn lanes along Chauncy Street
- Protected/permitted left-turn traffic signal phasing along Chauncy Street
- An exclusive pedestrian phase to provide protected pedestrian crossings

Morning and Afternoon peak Hours

Overall intersection operations would improve as follows under traffic signal control:

- LOS A during the morning peak hour under both existing and future No-Build traffic volumes.
- LOS B during the afternoon peak hour under both existing and future No-Build traffic volumes.

5.4 Traffic Analysis Results for Roadway Improvement Options with Traffic and Safety Improvement Measures under Existing Traffic Volumes, Without TOD Trips

The following section will present the traffic analysis results under existing traffic volume conditions for all roadway improvement options, without TOD trips. Only intersections that would receive improvement treatments are discussed in this section.

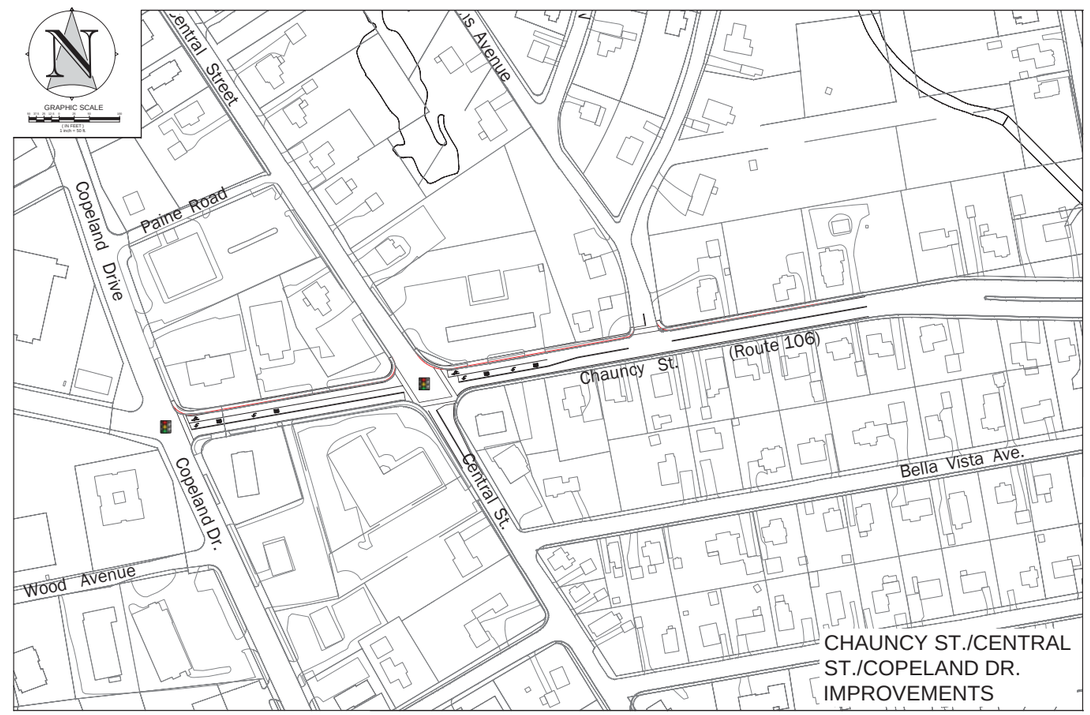


Figure 5-1 - Short Term Improvements at the Chauncy Street/Copeland Drive and Chauncy Street Central Avenue intersections

All analysis results are located in the appendix of this report. Unsignalized intersection analysis results are presented in Tables C-7 and C-9 for the morning and afternoon peak hours, respectively, and signalized and roundabout intersection analysis results are presented in Table C-8 for the morning peak hour and Table C-10 for the afternoon peak hour.

Intersection 1) Chauncy Street at Highland Avenue/Winthrop Avenue

This intersection could be improved by signalizing the intersection under all roadway improvement options except options 9A, 9B and 9C. Signalization could include:

- Eastbound and westbound left-turn lanes along Chauncy Street
- Protected/permitted left-turn traffic signal phasing along Chauncy Street
- An exclusive pedestrian phase to provide protected pedestrian crossings

Morning Peak Hour

The Winthrop Avenue northbound and Highland Avenue southbound approaches to this intersection would only serve right-turn-in/right-turn-out movements Under Options 9A, 9B and 9C. The Winthrop Avenue southbound approach would operate at LOS B and the Highland Avenue southbound approach would operate at LOS A under these three options.

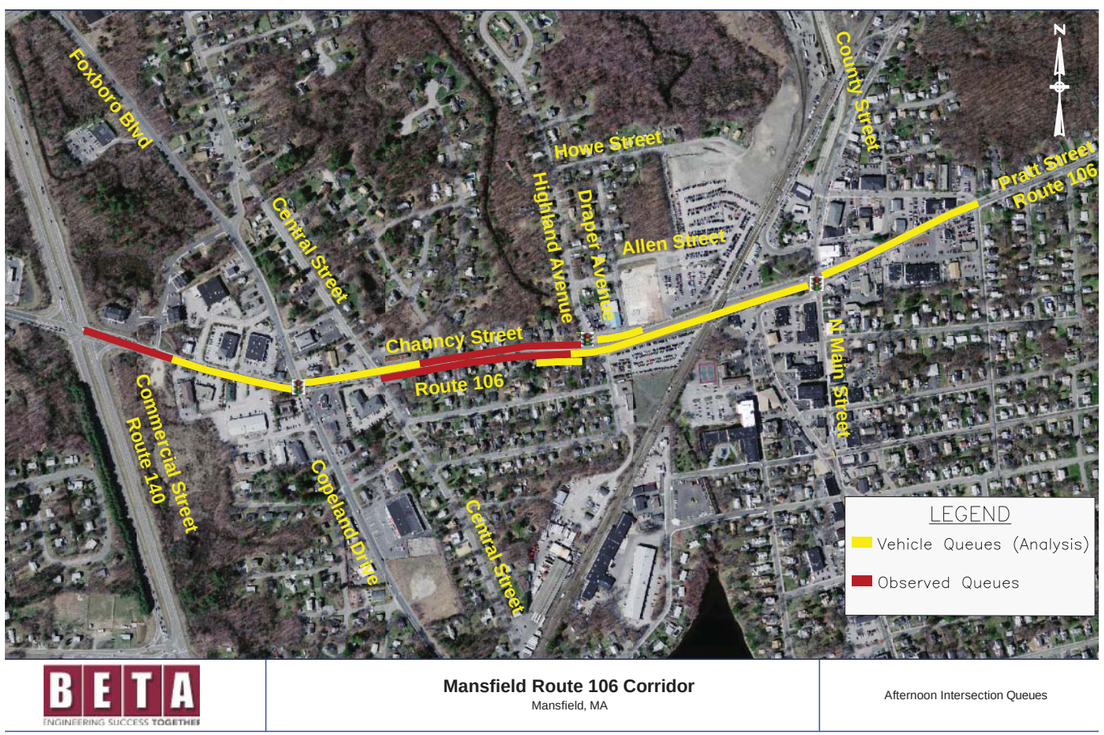


Figure 5-2 – Queuing along Chauncy Street

Overall intersection operations would improve as follows under traffic signal control:

- LOS A with existing roadway conditions and under Options 4, and 6A through 6E
- LOS B under Options 2, 3, 7 and 8
- LOS C under Option 1

Afternoon Peak Hour

The Winthrop Avenue northbound and Highland Avenue southbound approaches to this intersection would serve right-turn-in/right-turn-out movements only. These approaches would each operate at LOS B under roadway improvement options 9A, 9B and 9C.

Overall intersection operations would improve as follows under traffic signal control:

- LOS B under existing roadway conditions and under Options 4, and 6A through 6E
- LOS C under Options 1, 2, and 3
- LOS D under Options 7 and 8

Intersection 1A) Chauncy Street (Route 106) at Draper Avenue

This intersection would operate as a signalized intersection under Option 9A and as a roundabout under Options 9B and 9C.

Morning and afternoon Peak Hours

This intersection would operate as follows during each of the peak hours:

- LOS B as a signalized intersection under Option 9A
- LOS F as a single lane roundabout under Option 9B
- LOS B as a multi-lane roundabout under Option 9C

Intersection 2) Chauncy Place at Highland Avenue

Operations at this intersection would be combined with the traffic signal operations at the intersection of Chauncy Street at Highland Avenue/Winthrop Avenue under Options 1, 3, 7 and 8. This intersection would be eliminated under Options 2, 4, and 6A through 6E.

Intersection 6A) North Main Street at County Street

This intersection could be improved under Options 6B and 6C with the installation of traffic signals and under Options 6D and 6E with the installation of a roundabout.

Morning Peak Hour

This intersection would operate at an overall LOS B under Options 6B and 6C and at LOS A with Options 6D and 6E.

Afternoon Peak Hour

This intersection would operate at an overall LOS C under Option 6B, LOS B with Option 6C and LOS A with Options 6D and 6E.

5.5 Traffic Analysis Results for Roadway Improvement Options with Traffic and Safety Improvement Measures under Future Traffic Volumes, Without TOD Trips

The following section will present the traffic analysis results under future traffic volume conditions under all roadway improvement options, without TOD trips. Only intersections that would receive improvement treatments are discussed in this section.

All analysis results are located in the appendix of this report. Unsignalized intersection analysis results are presented in Tables C-11 and C-13 for the morning and afternoon peak hours, respectively, and signalized and roundabout intersection analysis results are presented in Table C-12 for the morning peak hour and Table C-14 for the afternoon peak hour.

Intersection 1) Chauncy Street at Highland Avenue/Winthrop Avenue

This intersection would be signalized under all roadway improvement options except Options 9A, 9B and 9C. Signalization could include:

- Eastbound and westbound left-turn lanes along Chauncy Street
- Protected/permitted left-turn traffic signal phasing along Chauncy Street
- An exclusive pedestrian phase to provide protected pedestrian crossings

Morning Peak Hour

The Winthrop Avenue northbound and Highland Avenue southbound approaches to this intersection would serve right-turn-in/right-turn-out movements only under Options 9A, 9B, and 9C. The Winthrop Avenue southbound approach would operate at LOS B and the Highland Avenue southbound approach would operate at LOS A under these options.

As a signalized intersection, overall intersection operations would improve to:

- LOS A under Options 4, and 6A through 6E
- LOS B under Options 2, 3, 7 and 8
- LOS C under Option 1

Afternoon Peak Hour

The Winthrop Avenue northbound and Highland Avenue southbound approaches to this intersection would serve right-turn-in/right-turn-out movements only under Options 9A, 9B and 9C. These approaches would each operate at LOS B under each option.

As a signalized intersection, overall intersection operations would improve to:

- LOS B under Options 4 and 6A through 6E
- LOS C under Options 1, 2, and 3
- LOS D under Options 7 and 8

Intersection 1A) Chauncy Street (Route 106) at Draper Avenue

This intersection would operate as a signalized intersection under Option 9A and as a roundabout under Options 9B and 9C.

Morning and afternoon Peak Hours

This intersection would operate as follows during each of the peak hours:

- LOS B as a signalized intersection under Option 9A
- LOS F as a single lane roundabout under Option 9B
- LOS B as a multi-lane roundabout under Option 9C

Intersection 2) Chauncy Place at Highland Avenue

Operations at this intersection would be combined with the traffic signal operations at the intersection of Chauncy Street at Highland Avenue/Winthrop Avenue under Options 1, 3, 7 and 8. This intersection would be eliminated under Options 2, 4, and 6A through 6E.

Intersection 6A) North Main Street at County Street

This intersection could be improved under Options 6B and 6C with the installation of traffic signals and under Options 6D and 6E with the installation of a roundabout.

Morning Peak Hour

This intersection would operate at an overall LOS B under Options 6B and 6C and at LOS A with Options 6D and 6E.

Afternoon Peak Hour

This intersection would operate at an overall LOS C under Option 6B, LOS B with Option 6C and LOS A with Options 6D and 6E.

5.6 Traffic Analysis Results for Roadway Improvement Options with Traffic and Safety Improvement Measures under Future Traffic Volumes With TOD Trips

The following section presents the traffic analysis results under future traffic volume conditions under all roadway improvement options, with TOD trips. Only intersections that would receive improvement treatments are discussed in this section.

All analysis results are located in the appendix of this report. Unsignalized intersection analysis results are presented in Tables C-15 and C-17 for the morning and afternoon peak hours, respectively, and signalized and roundabout intersection analysis results are presented in Table C-16 for the morning peak hour and Table C-18 for the afternoon peak hour.

Intersection 1) Chauncy Street at Highland Avenue/Winthrop Avenue

This intersection would be signalized under all roadway improvement options except options 9A, 9B and 9C. Signalization could include:

- Eastbound and westbound left-turn lanes along Chauncy Street
- Protected/permitted left-turn traffic signal phasing along Chauncy Street
- An exclusive pedestrian phase to provide protected pedestrian crossings

Morning Peak Hour

The Winthrop Avenue northbound and Highland Avenue southbound approaches to this intersection would serve right-turn-in/right-turn-out movements only under Options 9A, 9B and 9C. The Winthrop Avenue southbound approach would operate at LOS B and the Highland Avenue southbound approach would operate at LOS A under these Options.

Overall intersection operations would improve as follows under traffic signal control:

- LOS A under Options 4 and 6A through 6E
- LOS B under Options 2 and 3
- LOS C under Options 1, 7 and 8.

Afternoon Peak Hour

The Winthrop Avenue northbound and Highland Avenue southbound approaches to this intersection would serve right-turn-in/right-turn-out movements only under Options 9A, 9B and 9C. These approaches would each operate at LOS B.

Overall intersection operations would improve as follows under traffic signal control:

- LOS B under Options 4 and 6A through 6E
- LOS C under Options 2, and 3
- LOS D under Options 1, 7 and 8

Intersection 1A) Chauncy Street (Route 106) at Draper Avenue

This intersection would operate as a signalized intersection under Option 9A and as a roundabout under Options 9B and 9C.

Morning Peak Hour

This intersection would operate as follows during the morning peak hour:

- LOS C as a signalized intersection under Option 9A
- LOS F as a single lane roundabout under Option 9B
- LOS C as a multi-lane roundabout under Option 9C

Afternoon Peak Hour

This intersection would operate as follows during the afternoon peak hour:

- LOS E as a signalized intersection under Option 9A
- LOS F as a single lane roundabout under Option 9B
- LOS E as a multi-lane roundabout under Option 9C

Intersection 2) Chauncy Place at Highland Avenue

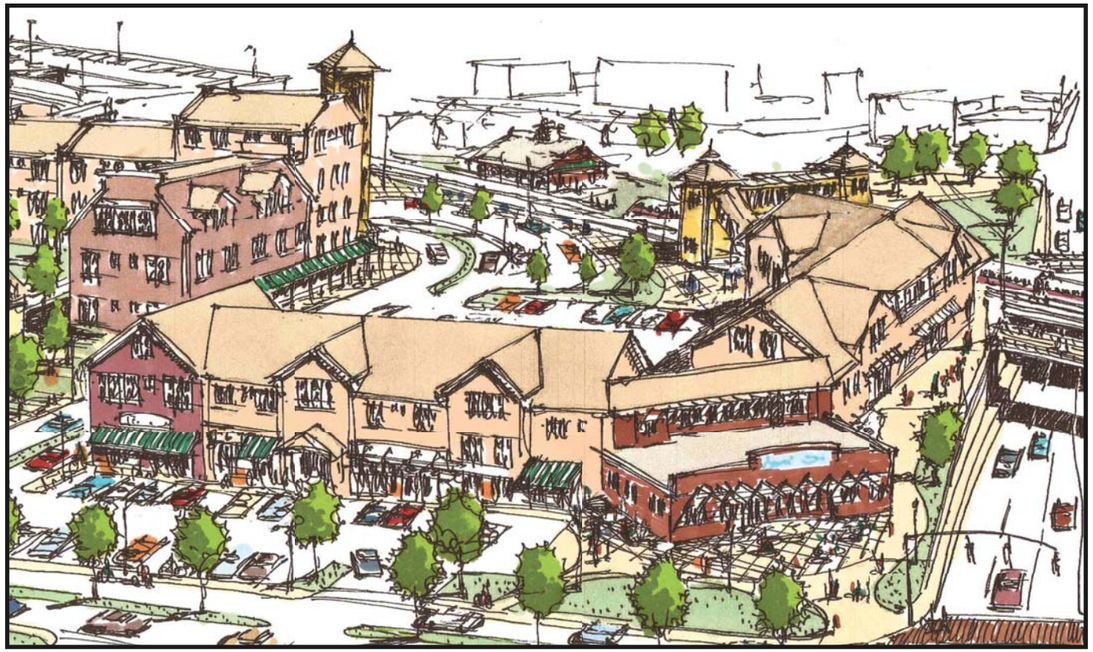
Operations at this intersection would be combined with the traffic signal operations at the intersection of Chauncy Street at Highland Avenue/Winthrop Avenue under roadway improvement options 1, 3, 7 and 8. This intersection would be eliminated under roadway improvement options 2, 4, 6A through 6E and 9A through 9C.

Intersection 6A) North Main Street at County Street

This intersection could be improved under Options 6B and 6C with the installation of traffic signals and under Options 6D and 6E with the installation of a roundabout.

Morning and Afternoon Peak Hours

This intersection would operate at an overall LOS B under Options 6B and 6C and to LOS A with Options 6D and 6E during the morning and afternoon peak hours.



Conceptual TOD center built around existing railroad station

6.0 INTRODUCTION TO TRAFFIC MATRIX

The proposed roadway improvement options considered by this study each have their own strengths and weaknesses. A decision matrix has been developed which provides a rating profile for each roadway option with respect to the following project goals, as described in the scope of work provided by the Town:

- Improve Station Access
- Improve Pedestrian / Bicycle Access
- Minimize/Reduce Residential Impacts
- Promote Smart Growth / Sustainability

A series of factors, or Measures of Effectiveness (MOE), were considered for each roadway option. A rating was assigned for each MOE based on how the roadway option promotes the project goals. A higher rating was assigned to an option which would strongly promote the project goals, while a lower rating was assigned to an option that would not promote the project goal.

The MOEs considered are:

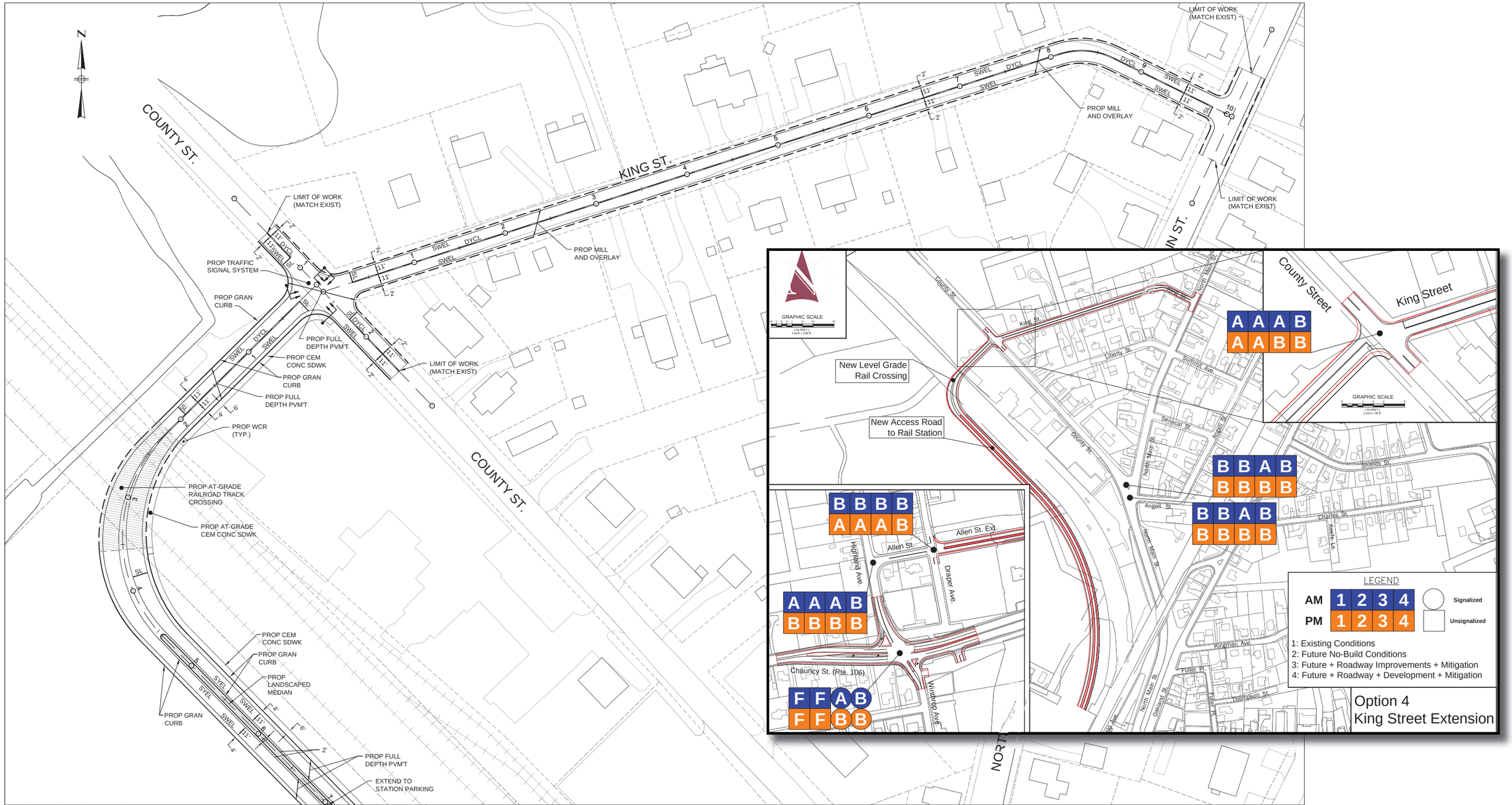
- Traffic Operations
- Station Access
- Pedestrian and Bicycle Access
- Parking Supply
- Urban Design/Landscape
- Development Strategies
- Impacts to Residential Neighborhoods
- Smart Growth/Sustainability
- Route 106 Impacts
- Cost

The rating for some MOEs, such as Traffic Operations, was based on quantified results such as intersection level of service; while other MOEs, such as Smart Growth/Sustainability, were more subjectively rated.

Each MOE was assigned a weighting factor. A greater weighting factor indicates a higher level of importance to the stakeholders involved. The assigned priorities are the result of discussions held with the Town Selectmen and Planning Board at various early coordination meetings.

An overall score was developed for each option by summing the product of the assigned MOE rating and the MOE weighting factor. A ranking was assigned to each option based on the overall score. Only the highest performing sub-option was included in the ranking for Options 6 and 9.

Measure of Effectiveness	Traffic Operations	Station Access	Pedestrian/ Bicycle Access	Parking Supply	Urban Design /Landscape	Development Strategies	Residential Impacts	Smart Growth/ Sustainability	Route 106 Impacts	Cost	Overall Score	Rank
Weight (1X to 3X)	2	3	3	1	1	1	3	3	2	1		
	Rating (1 = Least Favorable to 10 - Most Favorable)											
Option 1 - Chancy Place Extension	4	3	7	4	3	6	7	3	4	3	92	5
Option 2 - Allen Street Extension	7	6	6	5	5	6	3	5	6	3	105	4
Option 3 - Allen St. Ext. @ Draper Ave.	3	5	6	5	3	4	5	3	4	3	86	8
Option 4 - King Street Extension	9	7	2	5	4	6	7	2	7	6	107	3
Option 5 - Bridges Over Route 106	5	5	5	3	5	3	5	4	5	3	91	6
Option 6A - North Main St Option 1	8	8	3	5	4	4	8	5	7	5	120	
Option 6B - North Main St Option 2	9	8	9	5	3	5	9	5	8	5	145	1
Option 6C - North Main St Option 3	8	6	4	5	2	4	6	5	6	5	107	
Option 6D - North Main St Roundabout Option 1	8	8	5	5	8	5	8	5	7	5	131	
Option 6E - North Main St Roundabout Option 2	8	8	4	5	7	5	8	5	7	5	127	
Option 7 - Allen St. Ext. @ Draper Ave.	3	4	6	5	4	4	7	3	3	3	88	7
Option 8 - Parallel Draper Ave. Roadway	3	2	6	3	4	5	7	3	3	4	82	9
Option 9A - Draper Ave. Traffic Signal	8	8	7	5	6	7	6	6	6	6	133	2
Option 9B - Draper Ave. Roundabout Option 1	1	7	5	3	8	6	7	7	1	7	106	
Option 9C - Draper Ave. Roundabout Option 2	7	7	3	2	9	3	5	7	3	8	108	



NUMBER	DATE	MADE BY	CHECKED BY	DESCRIPTION

REVISIONS

DRAWN BY:
DESIGNED BY:
CHECKED BY:

Not for Construction

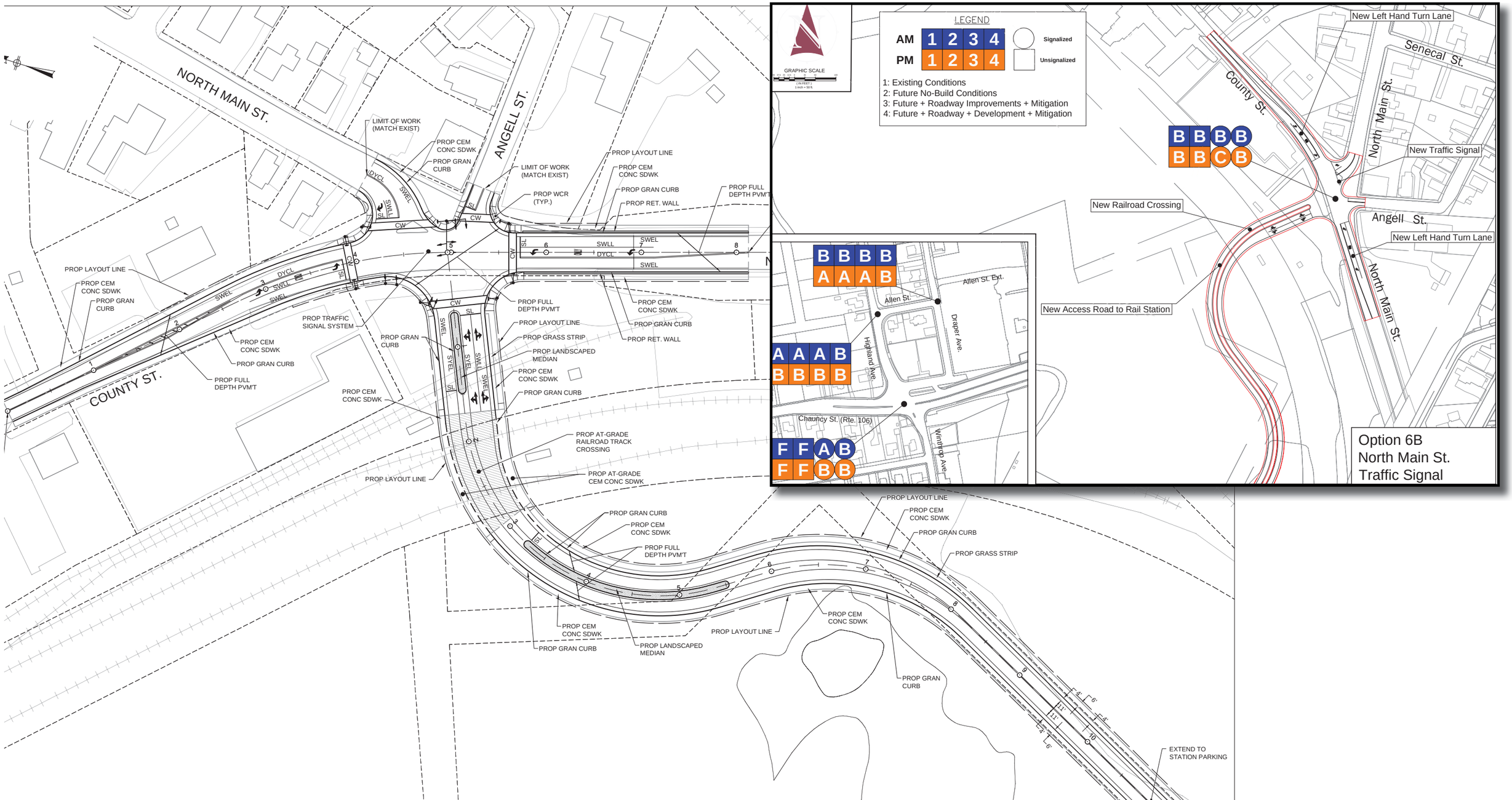
BETA Group, Inc.
Engineers • Planners • Landscape Architects
Lincoln, RI - Norwood, MA - Hartford, CT

SCALE:
40 30 20 10 0 20 40 80
SCALE IN FEET: 1" = 40'
UNLESS OTHERWISE NOTED OR CHANGED BY REPRODUCTION

Commuter Rail
King Street Extension
Mansfield, MA

JOB 4566
PLOT DATE: Mar. 28, 2014 2:09pm
ISSUE DATE 03/12/2014
SHEET
email: BETA@BETA-inc.com

Plot Date: 3/28/2014 2:09 PM



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REVISIONS			

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SCALE:
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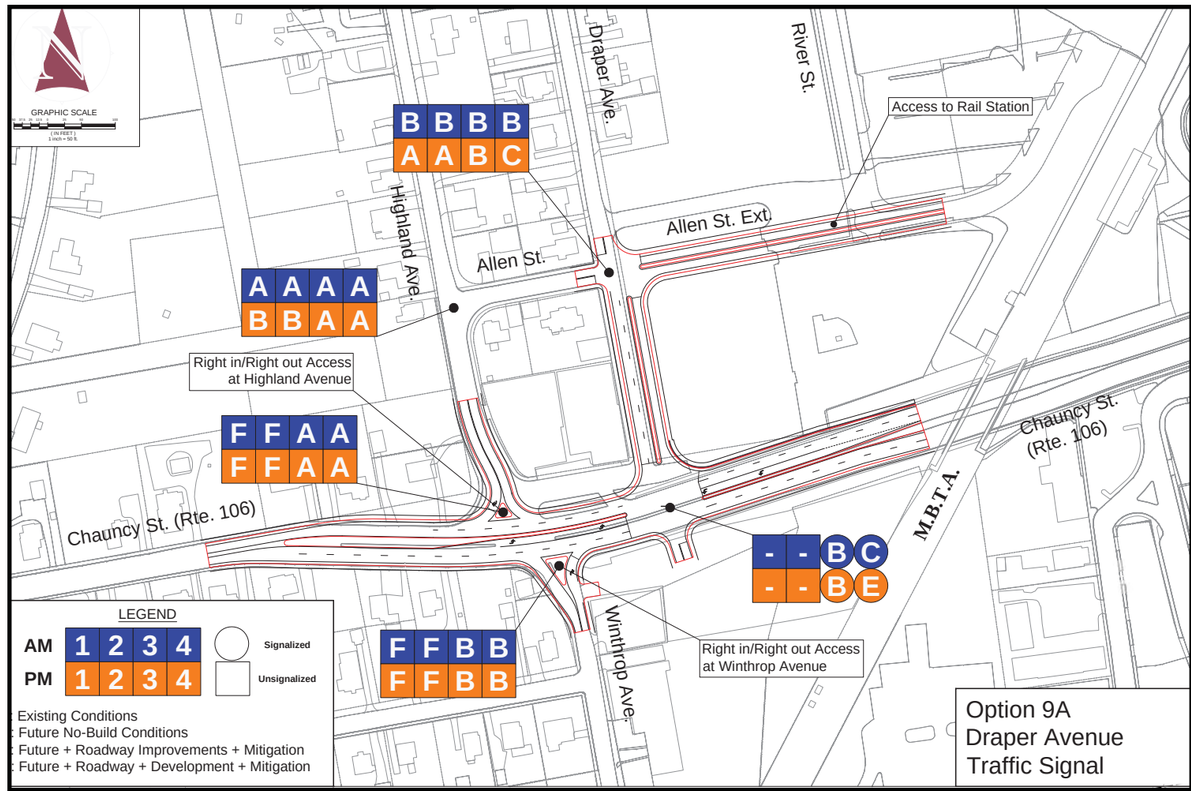
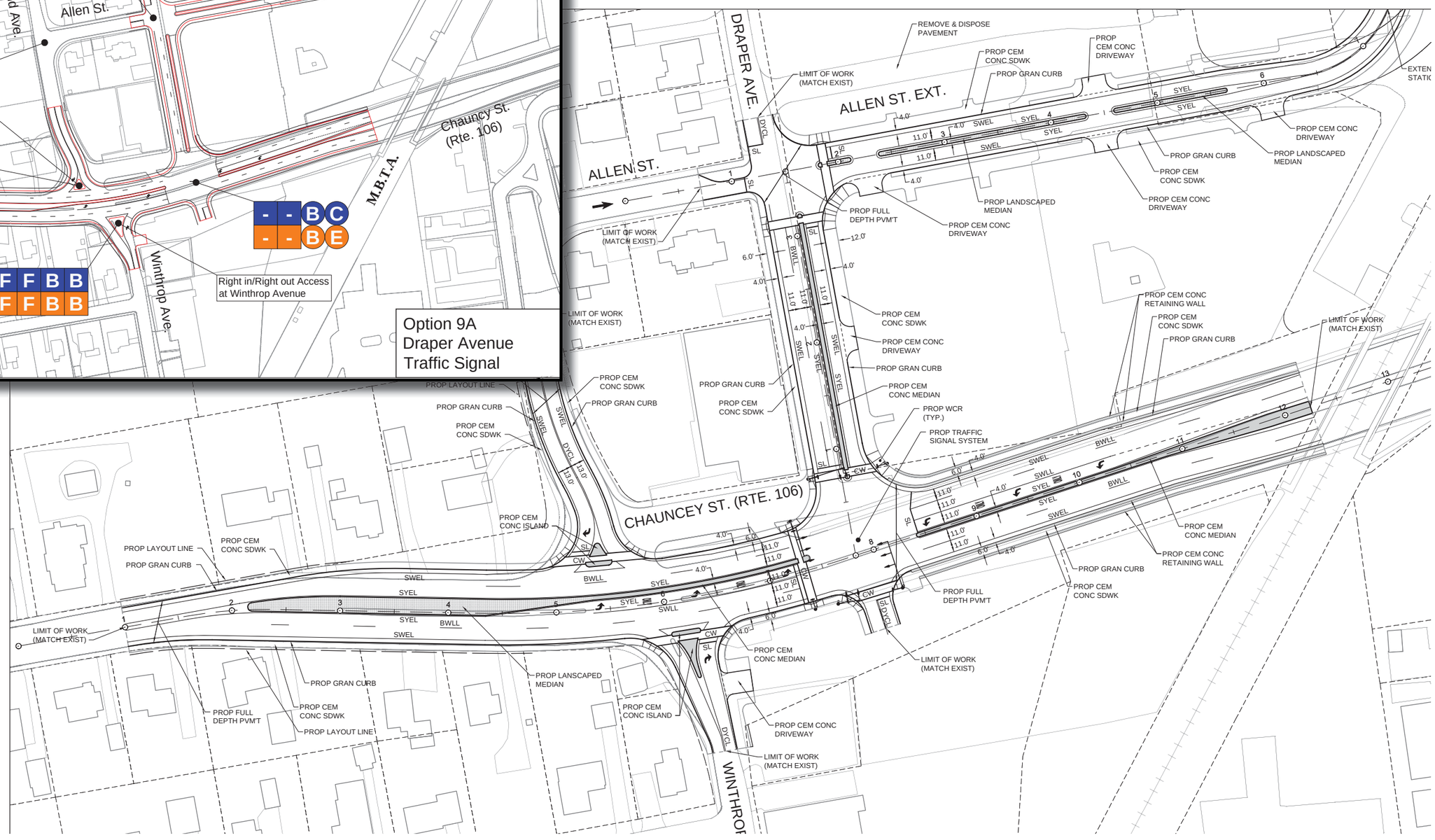
SCALE IN FEET: 1" = 40'
UNLESS OTHERWISE NOTED OR CHANGED BY REPRODUCTION

Commuter Rail
North Main Street Traffic Signal
Mansfield, MA

JOB 4566
PLOT DATE: Mar. 28, 2014 2:10pm
ISSUE DATE 02/19/2014
SHEET
email: BETA@BETA-inc.com

Plot Date: 3/28/2014 2:10 PM


GRAPHIC SCALE
Draper Ave.
River St.
Access to Rail Station
B B B B
A A B C
Allen St. Ext.
Allen St.
Highland Ave.
A A A A
B B A A
Right in/Right out Access at Highland Avenue
F F A A
F F A A
Chauncy St. (Rte. 106)
Chauncy St. (Rte. 106)
M.B.T.A.
- - B C
- - B E
F F B B
F F B B
Winthrop Ave.
Right in/Right out Access at Winthrop Avenue
LEGEND
AM 1 2 3 4
PM 1 2 3 4
Signalized
Unsignalized
Existing Conditions
Future No-Build Conditions
Future + Roadway Improvements + Mitigation
Future + Roadway + Development + Mitigation
Option 9A
Draper Avenue
Traffic Signal


DRAPER AVE.
ALLEN ST.
ALLEN ST. EXT.
CHAUNCEY ST. (RTE. 106)
WINTHROP
REMOVE & DISPOSE PAVEMENT
LIMIT OF WORK (MATCH EXIST)
PROP CEM CONC SDWK
PROP GRAN CURB
PROP CEM CONC DRIVEWAY
PROP LANDSCAPED MEDIAN
PROP FULL DEPTH PVM'T
PROP CEM CONC MEDIAN
PROP WCR (TYP.)
PROP TRAFFIC SIGNAL SYSTEM
PROP CEM CONC RETAINING WALL
PROP LAYOUT LINE
PROP CEM CONC ISLAND
PROP LANSCAPED MEDIAN
SWEL
SYEL
SWLL
BWLL
DYCL
SL
CW

7.0 ROADWAY / TRAFFIC RECOMMENDATIONS

SHORT TERM

- Copeland Drive & Central Street Left-Turn Lane (Markings Only)
- Traffic Signal at Chauncy Street / Draper Avenue (Option 9)
- Allen Street Extension
- Bicycle Racks / Storage
- Way Finding Signage

MID TO LONG TERM

- Northern Roadway Connection (N. Main Street / King Street)
- Pedestrian Connections Over Railroad
- Pedestrian Bridges Across Route 106 (East and West of Railroad)
- Route 106 Widening (Highland Avenue to Route 140)
- Internal Roadway Circulation (Based on Development)
- Pedestrian / Bicycle Access Improvements

8.0 DRAFT ZONING BY-LAWS

The proposed 2013 DRAFT By-Laws were reviewed which, as written, supports development that looks and appears more like the current downtown density just east of the tracks. Building heights are set at 45' and the residential FAR promotes a density of approximately 20 residential units per acre which generally reflects the recent development of 214 Rumford Avenue just south of Route 106 next to the railroad tracks.

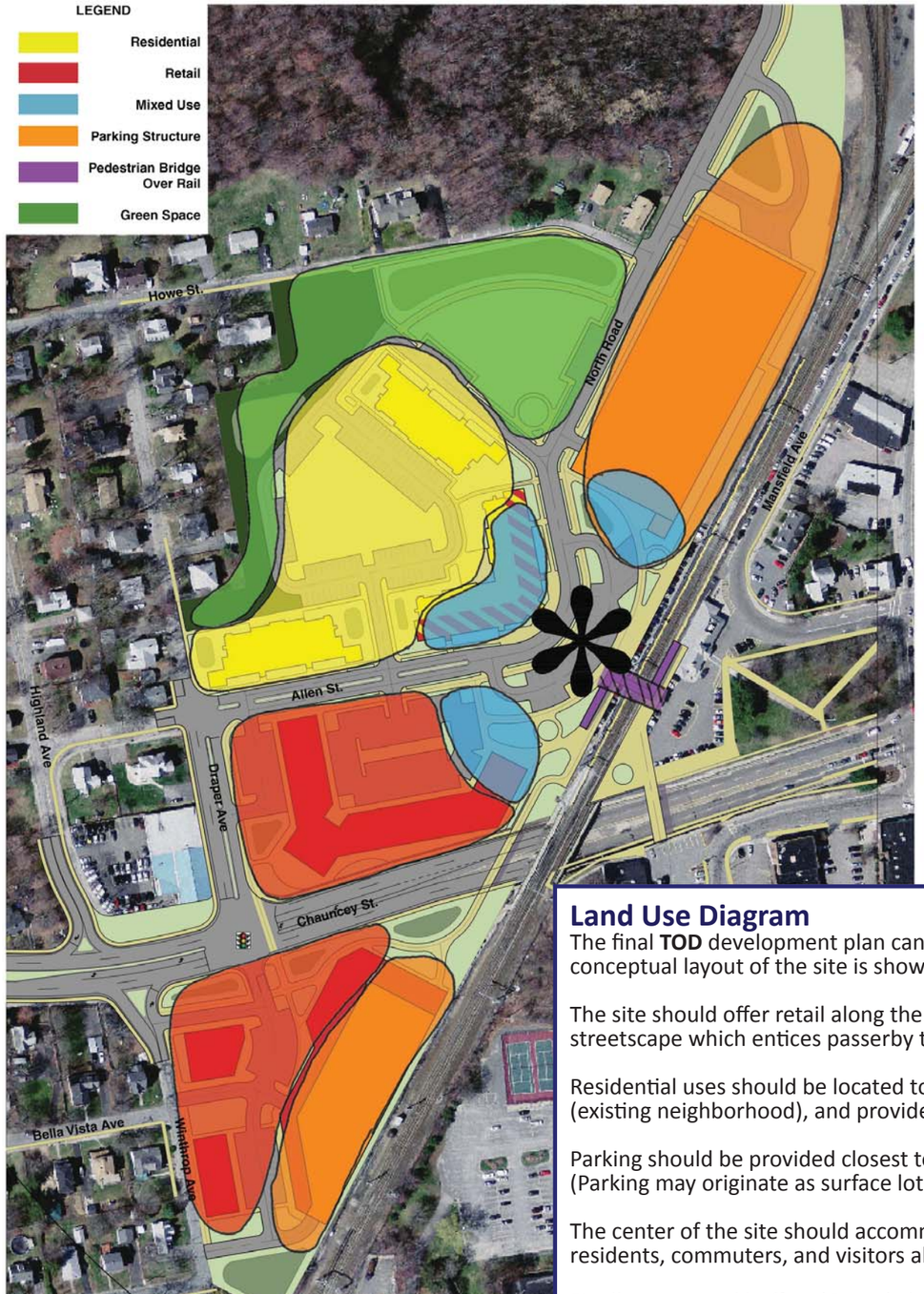
The draft By-Laws further emphasize a bonus development which increases the residential unit count if public amenities are provided by the developer. Parking areas covered by some portion of the proposed building footprint are also encouraged along with uses that would promote shared parking between the users with off-setting hours of operation.

One key element of a successful **TOD** is the critical mass of residential units which can transform a 'sense-of-place'. Dense residential use with units designed for the younger mobile generation is ideal. Often referred to as the 'Y generation' this market segment is interested in being connected more by trains and multi-use paths than the automobile. They also, however, desire a sense-of-place where they can walk or bike to a 'center-of-town' location for all their needs.

9.0 DEVELOPMENT OPPORTUNITY

The mixed use component of **TOD** considers the need to integrate a variety of small to medium size commercial footprints into proposed development scenarios which provide the essential services. This study also considered creating 'liner buildings' for any proposed parking structures so that pedestrian scale spaces could surround even the largest structures. These linear footprints support typical **TOD** development from small restaurants to newsstands and coffee shops and would be designed to appeal to local residents as well as the commuters. They would also ideally be an extension of the downtown businesses and help reinforce a more vibrant town center should be considered.

With respect to the adjacent neighborhoods the development scenarios offered in this study also recognized that site orientation in order to protect the scale and character of those neighborgoods. The traffic analysis models examined numerous scenarios that separated the commuting traffic from the local neighborhood traffic. The conceptual development schemes did as well by protecting an existing vegetated buffer along the west side of Draper Avenue. Design concepts also recognized the issues of existing soil contamination at certain locations, along with a high water table, so development schemes did not rely on below ground excavation for parking or other uses. The study instead did look at dispensing stormwater run-off throughout various points on the site; therefore additional greenspace was located to handle both road and roof run-off. Properly arranged, these stormwater collection areas (or perhaps rain gardens and bioswales) were often located as additional buffer areas between the existing neighborhoods and the proposed development.



9.1 An Overview of the Development Potential

An initial development strategy was to react to the efficiency of how the existing parking is currently arranged amongst the various parcels. The realignment of Allen Street to connect directly from Draper Avenue through to the Allen Street terminus was a top priority for better organizing circulation and parcel efficiency. The street alignment puts into motion the possibility of developing a west side drop off/pick up area to the station and helps organize surrounding properties into future, yet efficient, development parcels. The Allen Street realignment is also the first step in connecting a continuous through road that would eventually cross the railroad tracks and exit to the north of the site to County Street. The ideal **TOD** presumes that this new through road is created so that the neighborhood to the north is engaged as part of the **TOD** and contributes to the critical mass that would support mixed use development.

A north/south connecting road would also introduce a completely new character to the road corridor by having it pass through the **TOD** center. The road would have a destination other than just a parking facility for the train. Retail/commercial uses would flourish more along a through road and become an extension of the Downtown. The other advantage of a through road corridor is that a multi-use trail with associated sidewalk spurs could fall within the R.O.W. and further connect existing residential neighborhoods to the train station. This would enhance the east/west connectivity by foot or bike.

Development Goals

- Introduce Mixed Use (Residential, Commercial, Office, Open Space)
- Design Garage as Buffers for Residential Area
- Increase Development Density to Compliment Downtown Area
- Emphasize Work-Live-Play Principles to Allow Higher Densities
- Incorporate Low Impact Storm Water Management (Open Space)

Land Use Diagram

The final **TOD** development plan can have a variety of outcomes, but a general approach to a conceptual layout of the site is shown on this plan.

The site should offer retail along the central corridor of Route 106 providing a welcoming streetscape which entices passerby to enter the site. (Red)

Residential uses should be located to transition from more intense uses to less intense uses, (existing neighborhood), and provide an additional sound attenuation buffer. (Yellow)

Parking should be provided closest to the commuters' destination and along the transit corridor. (Parking may originate as surface lots but eventually become structured parking.) (Orange)

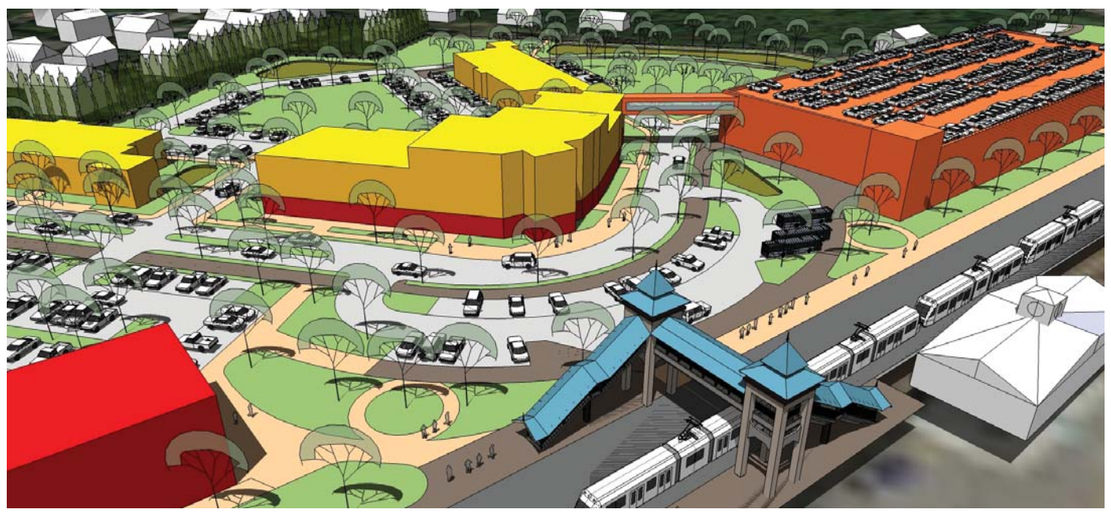
The center of the site should accommodate mixed uses to provide the greatest opportunities for residents, commuters, and visitors alike. (Blue)

Finally, vegetated buffers (Green) should be provided to screen and separate different use zones, such as the existing residential neighborhood adjacent to this site.

9.2 Organizing the Physical Elements of a TOD

This study looked at both short term and long term development scenarios and the possible physical patterns that the built environment could impose on the available land. As stated earlier the design approach considered the entire acreage as one development parcel so the most efficient layout of structures and roads could be studied and analyzed. Another presumption in reviewing the property ownership is that the Town, with its centrally located 0.6 acre lot, would most likely advocate for open space and public amenities that would be incorporated throughout the **TOD**. The MBTA, with its 1.35 acre lot, would likely advocate commuter convenience and increased ridership. The remaining private lots would be developed to serve the market demands and generate a profit as well as an increased tax revenue for the Town.

With this simplified arrangement of ownership this study presumes that a co-ordinated development scenario could be realized resulting in a high efficiency use that would benefit all parties. This study purposely assumed that approach so that the maximum number of vehicles would be accounted for in the traffic analysis. This study also suggests that a development strategy that 'blurred the property lines' would be best in generating a well co-ordinated and unified design approach, typical to a **TOD**. Like most **TOD's** there is also an emphasis on mixed use development that promotes a live/work/play environment with increased densities of residential users combined with commercial and retail users that support the live/work/play concept. It is important to note that a successful live/work/play **TOD** will often deemphasize the need for the automobile.



This model view of a suggested TOD shows the existing train station at left (white building) with an 'up and over' pedestrian connection (blue roof). A three story parking structure (orange) is in the upper right with the central drop-off/pick-up area surrounded by commercial/retail (red) and new housing units (yellow). A greenway buffer separates the TOD from the existing neighborhood at the top left.

With these overview concepts in mind the approach to the site is summarized as follows;

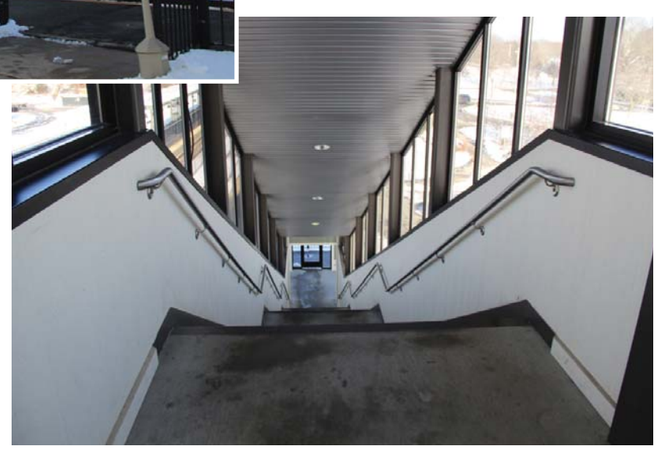
- Larger structures would be located next to the track, especially parking structures which would also provide a closer proximity to the station.
- Larger structures oriented lengthwise and parallel to the track would assist in sound attenuation of the trains and improve the acoustical conditions in the existing neighborhood(s).
- Housing units would cluster close to the parking structures and ideally be connected by walkways or pedestrian bridges so that residential surface parking could be minimized.
- Housing units would be scaled to fit the surrounding neighborhood and perhaps graduate in height from 2 to 3 floors near existing neighborhoods to higher story units (4 to 5 stories) next to parking structures.
- Commercial space would be located on the first floor levels - especially retail use that can engage with the streetscape. Wherever possible these retailers would be incorporated as linear buildings within the parking structure(s) and/or larger residential buildings.
- **TOD** Center would be clearly identified as a multi-use space that first focuses on the drop-off/pick up area and convenience of the commuting customer such as a shared parking facility. Off peak times (including weekends) will supply parking for special events such as farmers' markets or craft fairs.
- Multi-use path would engage and connect to as many neighborhoods and existing land uses as possible and be a major link to the **TOD** Center.
- Open space would be incorporated throughout the site for both informal recreation and neighborhood buffers as well as specific areas that can assist in handling storm water run-off.

This model view looks east along Chauncy Street. New commercial/retail (red) is shown on both sides of the road. A proposed signalized intersection (note: signal arms not shown) would control access/egress to both the north and south of Route 106.

10.0 Recommendations for Mansfield TOD

- **Increase the density of residential units allowed in the TOD.** Current draft zoning by-laws promote a 20 unit per acre density. Because the developable acreage is relatively small and constricted by existing neighborhoods an increased density of 25 to 35 units per acreage should be considered to develop a critical mass of live/work/play units. Ultimately the estimated traffic volumes which impact the Level of Service (LOS) at the proposed Chauncy Street signal will dictate the final density count and will be a critical part of any development proposal. Concurrent to understanding the LOS, promoting walkability throughout the entire TOD is important so the dependency of the automobile can be minimized.

- In increasing ease of pedestrian access to the station the **up-and-over** structure is thought to offer a better experience for the user because of the viewing opportunities and, most importantly, greater sense of security. It also provides a design opportunity to identify the **TOD** with meaningful architecture that can contribute to the surrounding development and promote Mansfield's character and sense-of-place.

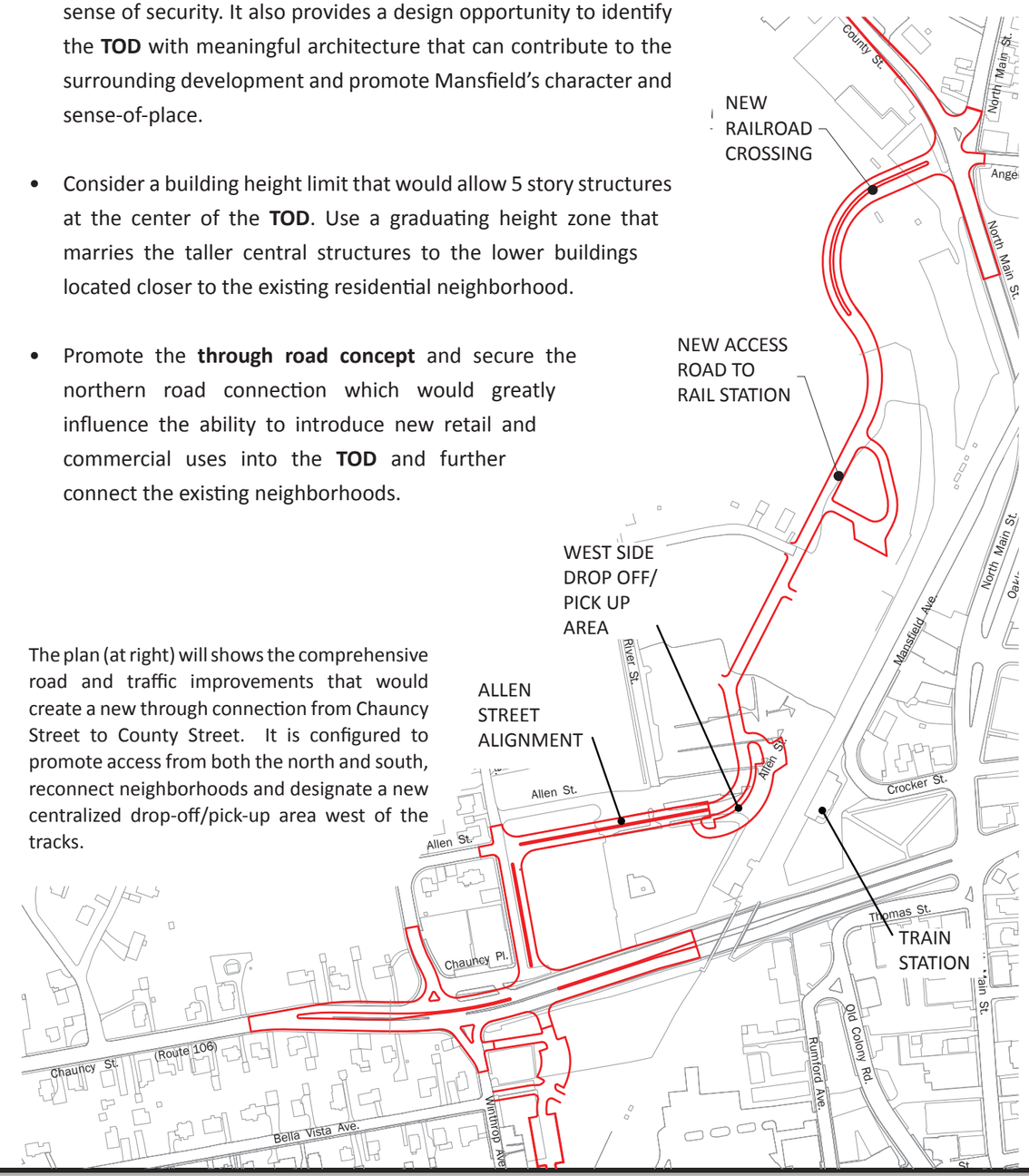


Up and Over pedestrian connection at the South Kingstown Station, RI

- Consider a building height limit that would allow 5 story structures at the center of the **TOD**. Use a graduating height zone that marries the taller central structures to the lower buildings located closer to the existing residential neighborhood.

- Promote the **through road concept** and secure the northern road connection which would greatly influence the ability to introduce new retail and commercial uses into the **TOD** and further connect the existing neighborhoods.

The plan (at right) will shows the comprehensive road and traffic improvements that would create a new through connection from Chauncy Street to County Street. It is configured to promote access from both the north and south, reconnect neighborhoods and designate a new centralized drop-off/pick-up area west of the tracks.



Existing conditions just west of the tracks looking east to the train station.

Proposed TOD with realigned Allen Street and multi-use path on right (brown) and new residential/commercial development on left (yellow/red).

10.1 TOD and Sustainability

Beyond the simple presence of rail lines, incubating successful Transit Oriented Development requires that the municipality have an awareness of the underlying infrastructure assets and liabilities, and has a solid understanding of the market conditions that will ultimately translate into project need and overall viability of the project.

It is important to consider the concentric 'draw' radiating out from the station, and focus the most dense development at the core. As such, it is critical to promote interconnectivity that engages the outlying community on all sides with regard to access for all modes of transportation – particularly walking, biking and automobiles. This suggests that new or re-aligned streets should be designed as 'Complete Streets' (all transportation modes are considered), and that the primary transportation routes should be linked to meaningful destinations that embrace the downtown character.

It is also critical to establish a clear organization of the streets providing access with interconnectivity, and establishing an urban design "language" for the area that emphasizes human scale features, and promotes a sense of place that reflects the character of Mansfield. Streetscape elements such as ornamental lighting, interpretive graphic panels, street trees, wide sidewalks, signage and site furniture will be designed integrally with the "right-sizing" of streets, the organization of pedestrian crossings, traffic movement controls and traffic calming measures. Design of the streetscape, along with the creation of public green spaces such as pocket parks and town greens further contributes to the overall walkability of an area, and when done correctly, will serve to organize and focus new development, and invigorate the existing surrounding neighborhoods.

10.2 Pedestrian/Bicycle Issues

BETA identified integrated measures to accommodate all types of pedestrian and bicycle connections. Sidewalks should be wide, and under ideal conditions separated from high volume, high speed roadways. On local streets, they should follow the curb and should extend to the facades of any new development. Sidewalks with trees, modular pavers, and different surface textures make walking more interesting and adds greatly to creating a sense of place. In an urban setting cyclists are often accommodated in vehicular travel lanes by the use of sharrows indicating to drivers the presence of bikes. Lanes may, however, require certain geometries or widths to service all users. When cyclists arrive at their destination, they should not only find ample racks, but also bike lockers that provide for weather proof storage of both bikes and gear.

View east along Chauncy Street of proposed TOD