

Route 28 Priority Corridor Study



Randolph, MA

Route 28 Priority Corridor Study

Corridor Safety Analysis

June 2021

TECHNICAL REPORT



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TECHNICAL REPORT

Prepared by: **BETA GROUP, INC.**

Prepared for: Town of Randolph as Part a Fiscal Year 2012 Earmark Funding from MMP/MOTT
(Executive Office of the Massachusetts Marketing Partnership/Massachusetts Office of Travel & Tourism)

June 2021

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EXECUTIVE SUMMARY

E.1 Roadway Character and Land Uses

The Route 28 study area corridor runs for approximately 4.8 miles between Avon on the south and the I-93/Route 1 interchange on the north in Randolph. The I-93/Route 1 interchange with Route 28 is not included in the study area. Route 28 (North/South Main Street) is classified as a Principal Arterial. For approximately one-third of a mile between Route 139 (Union Street) and Depot Street, Route 28 is under Town of Randolph jurisdiction. The remainder of the Route 28 corridor (approximately 4.8 miles) is under MassDOT jurisdiction. There are several traffic signals located along this section of Route 28. Route 28 serves as a regional north-south connector between the communities located north and south of Randolph including Interstate 93. Route 28 also serves the Randolph Center, civic buildings, businesses along the corridor and schools located within the study area corridor, such as, the Randolph Community Middle School and the Donovan Elementary School located north of the project area. The Randolph High School at #70 Memorial Parkway and the Randolph/Holbrook Community Station on Mill Street. The East Randolph Industrial Park is located along North Street (east of Route 28). Figure 1 shows the Route 28 study area and study intersections.

E.2 Existing Conditions Analyses

Crash Rates

Crash rates, measured against traffic exposure, or vehicle miles traveled, are an effective analysis tool to understand roadway safety and design. For intersection locations where turning movement count data was collected as part of this project, the crash rate was calculated. The following Route 28 intersections have crash rates that exceed the MassDOT District 2 average:

- South Main Street and Center Street
- South Main Street and Stoughton Street
- South Main Street and North Main Street at North Street and Union Street
- North Main Street and Warren Street (Route 139)
- North Main Street and Pleasant Street
- North Main Street and Allen Street at Nelson Drive
- North Main Street and Scanlon Drive at Russ Street

Intersection Capacity Analyses

Capacity analyses were conducted to assess the quality of traffic flow at each of the study intersections along Route 28. This was performed for the existing weekday AM and PM peak hours using Trafficware's Synchro software package (Version 11).

Table E-1 – Study Area Intersection Level of Service

Intersection	AM Peak	PM Peak
Route 28 at Center Street (Stop Controlled)	F	F
Route 28 at Stoughton Street/Woodland Parkway (Stop Controlled)	C	D
Route 28 at North Street (Signalized)	C	C
Route 28 at Memorial Parkway (Signalized)	B	B
Route 28 at Route 139 / Warren Street (Signalized)	D	E
Route 28 at Pleasant Street (Stop Controlled)	F	F
Route 28 at West Street (Stop Controlled)	F	F
Route 28 at Nelson Drive/Allen Street (Stop-Controlled)	F	F
Route 28 at Grove Street (Stop Controlled)	F	F
Route 28 at Liberty Street (Stop Controlled)	F	F
Route 28 at Chestnut / Oak Street (Signalized)	E	D
Route 28 at Pond Street/Reed Street (Signalized)	E	E
Route 28 at Russ Street/Scanlon Drive (Signalized)	F	D

A summary of the weekday AM and PM peak hour capacity analysis results are displayed in **Table 9**. Existing conditions capacity analysis (Synchro) reports are provided in **Appendix E**.

Traffic patterns in the corridor are highly directional, with higher traffic volumes and congestion in the northbound direction during the AM peak period and higher traffic volumes and congestion in the southbound direction during the PM peak period. Due to the high volumes traveling along Route 28, Levels of Service is poor, and delays are high at stop-controlled approaches to unsignalized intersections. The presence of long queues on side streets during peak hours have been confirmed through observations. To enter the Route 28 traffic flow, some drivers have been observed making aggressive maneuvers. Also, motorists on Route 28 were observed to provide a courtesy gap a vehicle from the side street during congested conditions. Also noteworthy is the high crash rates at some of these intersections, in particular Route 28 at Allen Street and Nelson Drive, where the high delays are likely a factor in some drivers making unsafe maneuvers thus resulting in crashes.

Conditions during peak hours at signalized intersections vary throughout the corridor. Intersections in the vicinity of the Crawford Square/downtown area were found to be operating at overall Level of Service E or better for both AM and PM peak hours. The three signalized intersections in the northern portion of the study area are operating closer to capacity (Levels of Service of E or F).

Traffic Signal Warrant Analysis

The following unsignalized intersections meet one or more signal warrants:

- South Main Street and Center Street (8-hour, 4-hour, peak hour)
- North Main Street and Pleasant Street (8-hour, 4-hour, peak hour)
- North Main Street and West Street (8-hour, 4-hour, peak hour)
- North Main Street at Allen Street and Nelson Drive (4-hour and peak hour)
- North Main Street and Liberty Street (4-hour)

Full reports of the analysis for each intersection are included in **Appendix F**.

Pedestrians

There are four types of crosswalk markings used in the study corridor. There is a lack of consistency in crosswalk type and color. Outside of the downtown area, only the intersection of North Main Street and Pond and Reed Streets has a stamped colored crosswalk.

- Two parallel lines (8 locations)
- Continental, ladder style (10 locations)
- Stamped pavement painted red with two parallel lines (3 locations)
- Stamped pavement painted blue with two parallel lines (2 locations)

Curb Ramps

All of the crosswalks along Route 28 in the study area have curb ramps. Many of the crosswalks have no detectable warning panels, including all six in the South Main Street segment. The curb ramps that **do not currently include** detectable warning panels along the Route 28 include:

- South of Acorn Drive
- South of Woodland Parkway
- North of Lou Courtney Drive
- South of Van Beal Road at Hurley Funeral Home
- Chestnut Street at Oak Street

Bicycle Level of Traffic Stress

Bicycle Level of Traffic Stress (BLTS) is a rating given to a road segment or crossing indicating the traffic stress it imposes on bicyclists using that road. Route 28 within the study corridor received a LTS rating of 4 along the majority of the roadway, the highest stress rating.

Transit

Route 28 in Randolph is serviced by two Massachusetts Bay Transit Authority (MBTA) bus routes: Route 240 and Route 238; and one Brockton Area Transit (BAT) bus route: Route 12.

MBTA Route 240 provides service between Ashmont Station in Dorchester and Avon Square in Avon and received approximately 1,300 weekday daily inbound boarding's and 1,345 weekday daily outbound boarding's during a count conducted in 2016. There are 50 daily weekday scheduled departures.

The three bus stops with the highest number of daily boarding's for Route 240 in the Randolph Route 28 study area:

- North Main Street opposite Memorial Parkway - 248
- North Main Street opposite Warren Street - 148
- North Main Street at Oak Street - 125

MBTA Route 238 provides service from Quincy Center to Holbrook and received approximately 855 weekday daily inbound boarding's and 839 weekday daily outbound boarding's during a count conducted in 2016. There are 27 daily weekday scheduled departures.

Brockton Area Transit operates a bus service between the Brockton Center Transit Station and Ashmont Station. The bus route services the entire Route 28 study corridor in Randolph: from Acorn Drive near the Avon town line north to Scanlon Drive and beyond. There are 49 stops between Acorn Drive and Scanlon Street. There are 47 scheduled daily weekday departures.

E.3 Findings/Deficiencies

The following transportation, safety, and mobility issues and deficiencies were observed along the Route 28 study corridor.

Pedestrian and Bicycle Issues

- No bicycle facilities are provided along the entire study corridor. High traffic volumes and speed makes bicycle travel on Route 28 stressful and uncomfortable.
- A total of 10 crashes involving a pedestrian or bicyclist have occurred between 2016 and 2018 with one fatality at the intersection of North Main Street at Oak Street and Chestnut Street.
- Sidewalks are provided along most of the Route 28 corridor. There is a one-quarter mile gap with no sidewalk on the west side of North Main Street south of the Boston Higashi School north driveway, and asphalt sidewalk in poor condition for one-quarter mile on the east side of North Main Street south of the Boston Higashi School north driveway.
- There are many areas along the corridor where there is no separation of sidewalk from the roadway or commercial parking areas and driveways.
- Outside of the downtown area there are few street trees.
- There are two unsignalized crosswalks on Route 28 that cross more than two travel lanes: north of West Street and south of Pleasant Street.
- There is a lack of consistency in crosswalk type and color.
- Most of the Route 28 corridor operates with the highest Bicycle Level of Stress (Level 4).

Traffic Safety and Operations

- Two intersections on South Main Street and six intersections on North Main Street have been identified as high crash locations and are also listed as a Highway Safety Improvement Program crash cluster.
- High traffic volumes and closely-spaced intersections create congestion and long vehicle queues during weekday peak periods. This includes along North Main Street southbound in the PM peak period between Boston Higashi School and the Crawford Square downtown area.
- One intersection on South Main Street and nine intersections on North Main Street operate at Level of Service F conditions in the AM and/or PM peak hours.
- High traffic volumes along Route 28 and on unsignalized side streets results in few gaps for motorists to enter the main traffic flow. Motorists turning left must therefore drive aggressively to fill a short gap in Route 28 traffic and/or rely on the courtesy of a Main Street motorist to allow them to turn.
- The following unsignalized intersections meet one or more signal warrants:
 - South Main Street and Center Street (8-hour, 4-hour, peak hour)
 - North Main Street and Pleasant Street (8-hour, 4-hour, peak hour)

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- North Main Street and West Street (8-hour, 4-hour, peak hour)
- North Main Street at Allen Street and Nelson Drive (4-hour and peak hour)
- North Main Street and Liberty Street (4-hour)
- There are several four-way unsignalized intersections that have off-set geometric alignments between the side streets that result in conflicts between motorists making turning movements into and out of the side streets
- High traffic volumes along Route 28 and many closely-spaced commercial driveways create conflicts between vehicles.
- Vehicle speeds were recorded 6 and 11 mph above the 85th percentile speeds on Route 28 south of Chestnut Street and north of Pond Street
- There are various posted speed limits along the Route 28 study corridor that include 25, 30, 35, and 40 mph. Drivers frequently travel above posted speed limits.

Transit

- Of the 92 bus stops along the Route 28 study corridor, only five have shelters and only three have benches. There are several high ridership stops along the study corridor with no shelter or bench.
- Several of the 92 bus stops along the Route 28 study corridor are closely spaced, some with very low ridership. Having too many stops can increase bus travel time and conflicts between vehicles.

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E.4 Proposed Improvements

Table E-2 summarizes the proposed transportation improvements, time frame, and cost range for the four identified segments of the Route 28 study corridor. A high-level order of magnitude cost is included in the proposed project table below using the following symbols and dollar amounts:

- \$ = < \$10,000
- \$\$ = \$ 10,000 – \$100,000
- \$\$\$ = > \$100,000

The four segments are:

1. South Main Street: Acorn Street to North Street
2. North Main Street: North Street to West Street
3. North Main Street: West Street to Boston Higashi School north driveway
4. North Main Street: Boston Higashi School north driveway to Scanlon Drive at Russ Street

Table E-2 – Segment 1 Proposed Improvements

Issue	Proposed Improvement	Time Frame	Cost
Pedestrian Safety	1.1 – Repaint faded crosswalks across South Main Street with continental striping	Short-Term	\$
Traffic Congestion and Safety	1.2 – Optimize signal timing at South Main Street / North Main Street including adequate time for the pedestrian phase and the northbound left-turn phase	Short-Term	\$
Bicycle Accommodation	1.3 – Stripe buffered bicycle lanes on both sides of South Main Street	Medium-Term	\$\$
Bicycle Accommodation	1.4 – Provide enhanced pavement markings (green lanes with dotted white lane lines) for bicycle lanes at conflict points such as major intersections and bus stops	Medium-Term	\$\$
Pedestrian Safety	1.5 – Install a Rectangular Rapid Flashing Beacon (RRFB) at the intersection of South Main Street at Lou Courtney Drive for the Martin E. Young School	Medium-Term	\$\$
ADA Compliance	1.6 – Install detectable warning panels at pedestrian curb ramps	Medium-Term	\$
Congestion and Safety	1.7 – Signalize the intersection of South Main Street and Center Street	Long-Term	\$\$\$
Pedestrian Safety and Aesthetics	1.8 – Consider the installation of sidewalk street trees and a landscaped grass buffer throughout the corridor	Long-Term	\$\$\$

Table E-3 – Segment 2 Proposed Improvements

Issue	Proposed Improvement	Time Frame	Cost
Pedestrian Safety	2.1 – Repaint faded crosswalks across North Main Street at West Street with continental striping	Short-Term	\$
Pedestrian Safety	2.2 – Raise the height of the crosswalk signs at Diauto Drive to seven feet (from bottom of sign)	Short-Term	\$
Traffic Operations	2.3 – Install No Left Turn sign on the east bound Turner Lane approach to North Main Street	Short-Term	\$
Pedestrian Safety	2.4 – Install missing pedestrian push button on the southwest corner of the North Main Street and Memorial Parkway intersection	Short-Term	\$
Bicycle Accommodation	2.5 – Install bicycle shared lane markings (sharrows) on North Main Street between North Street and Depot Street in both directions	Short-Term	\$
Traffic Operations	2.6 – Install missing Stop sign on the Nelson Drive eastbound approach to North Main Street	Short-Term	\$
Traffic Congestion and Safety	2.7 – Optimize signal timing to include adequate time for pedestrian phases at a) North Main Street and Memorial Parkway intersection, b) Warren Street (Rte. 139) including increasing All Red clearance phase, and c) Pedestrian signal between Short Street and Diauto Drive	Short-Term	\$
Bicycle Accommodation	2.8 – Stripe a pair of 5' wide bicycle lanes in both directions on North Main Street between Depot Street and West Street	Short-Term	\$
Pedestrian Safety	2.9 – Develop consistent crosswalk color and continental-style striping for the downtown area	Medium-Term	\$
ADA Compliance	2.10 – Install detectable warning panels at pedestrian curb ramps	Medium-Term	\$\$
Pedestrian Safety	2.11 – Rebuild eight deteriorated stamped pavement crosswalks throughout segment 2	Medium-term	\$\$
Pedestrian Safety	2.12 – Install a Rectangular Rapid Flashing Beacon (RRFB) at the intersection of North Main Street and Diauto Drive	Medium-Term	\$\$
Traffic Congestion and Safety	2.13 – Install adaptive signal control at the signalized intersections of North Main Street and Memorial Drive and Warren Street (Rt. 139)	Medium-Term	\$\$\$
Bicycle Accommodation	2.14 – Install Inverted-U bicycle parking racks	Medium-Term	\$
Safety and Visibility	2.15 – At the intersection of North Main Street and Warren Street (Rt. 139) upgrade signal equipment and install signal mast arms	Long-Term	\$\$\$
Safety and Congestion	2.16 – Signalize the intersection of North Main Street and West Street	Long-Term	\$\$\$

Table E-4 – Segment 3 Proposed Improvements

Issue	Proposed Improvement	Time Frame	Cost
Pedestrian Safety	3.1 – Repaint crosswalks across North Main Street with continental striping	Short-Term	\$
Pedestrian Safety	3.2 – Install crosswalk signs on both sides of crosswalk north of West Street	Short-Term	\$
Traffic Safety	3.3 – Install an overhead flashing beacon at the intersection of North Main Street at Allen Street and Nelson Drive	Medium-Term	\$\$
Bicycle Accommodation	3.4 – Stripe buffered bicycle lanes on both sides of North Main Street between West Street and Boston Higashi School north driveway	Medium-Term	\$\$
Pedestrian Accommodation	3.5 – Construct six-foot-wide concrete sidewalk with granite curb and grass buffer strip with street trees along west side of North Main Street between #682 North Main and Boston Higashi School north driveway	Medium-Term	\$\$\$
Pedestrian Comfort and Corridor Aesthetics	3.6 – Install trees and tree pits on the west side of North Main Street in the existing grass buffer strip area	Medium-Term	\$\$
ADA Compliance	3.7 – Install detectable warning panels at pedestrian curb ramps	Medium-Term	\$\$
Pedestrian Safety	3.8 – Tighten radius on southbound right-turn slip lane on North Main Street at Grove Street to slow turning vehicles and improve safety for pedestrians in crosswalk	Medium-Term	\$\$
Pedestrian Safety	3.9 – Realign crosswalk on Orchard Street closer to North Main Street to improve visibility of pedestrians in crosswalk	Medium-Term	\$\$
Pedestrian Safety	3.10 – Replace asphalt sidewalk on the east side of North Main Street between #659 North Main Street and Boston Higashi School north driveway	Medium-Term	\$\$\$

Table E-5 – Segment 4 Proposed Improvements

Issue	Proposed Improvement	Time Frame	Cost
Pedestrian Safety	4.1 – Repaint crosswalks across North Main Street with continental striping, including crosswalks at the Chestnut Street and Oak Street intersection	Short-Term	\$
Pedestrian Safety	4.2 – Optimize signal timing at North Main and Chestnut Street at Oak Street, North Main Street and Reed Street at Pond Street, and North Main Street at Russ Street and Scanlon Drive	Short-Term	\$\$
Roadway Striping	4.3 – Improve striping on the eastbound Scanlon Drive approach to North Main Street to clarify lane arrangements as one exclusive left-turn lane and one shared left-through-right lane (as existing signage indicates)	Short-Term	\$
ADA Compliance	4.4 – Install detectable warning panels at pedestrian curb ramps	Medium-Term	\$\$
Pedestrian Accommodation	4.5 – Replace the deteriorated sidewalk on the west side of North Main Street between Stacy Street and Jane Street and on the east side of the corridor between Oliver Street and Wordsworth Street	Medium-Term	\$\$\$
Pedestrian Comfort and Accommodation	4.6 – Work with business owners to consolidate and/or narrow driveway curb cuts and to ensure physical and visual separation between parking areas and directly adjacent sidewalks to discourage vehicular encroachment	Medium-Term	\$\$
Pedestrian Safety	4.7 – Consider installing a signalized pedestrian crosswalk at the North Randolph Fire Station at the location of the current emergency signal	Medium-Term	\$\$
Roadway Geometry and Safety	4.8 – Construct a raised splitter island on the Oak Street westbound approach to North Main Street to calm traffic and prevent collisions	Medium-Term	\$\$
Traffic Congestion and Safety	4.9 – Install adaptive signal control at the intersections of North Main Street and Chestnut Street at Oak Street, North Main Street and Reed Street at Pond Street, and North Main Street at Russ Street and Scanlon Drive	Medium-Term	\$\$\$
Pedestrian Safety	4.10 – Replace the stamped red asphalt pavement crosswalks at North Main Street at Reed Street and Pond Street with continental striping	Medium-Term	\$\$

1.0 INTRODUCTION

ORIGIN AND BACKGROUND OF STUDY

Over the years, the Town of Randolph had attempted to address and evaluate the on-going traffic congestion issues along the Route 28 corridor. Since 2015, the Town has engaged BETA Group, Inc. multiple times to assist the Town in methodically evaluating the traffic operational issues at some of the intersections along the Route 28 corridor. Of particular concern were issues of speeding, cut-through traffic surrounding the neighborhood roadway network adjacent and parallel to Route 28, and more importantly the congestion at traffic signals. While issues were spread throughout the Town, the approach was to phase services in order to meet budget constraints. For example, Phase One focused on the High Street/Lafayette Street intersection and the Route 28 corridor between Scanlon Drive and West Street, and the Route 28 corridor between Russ Street and West Street.

The primary focus of those traffic evaluations was on vehicular operational issues, particularly speeding and cut-through traffic on High Street due to congestion on Route 28 with traffic destined to Interstate 93. The goal was to identify deficiencies and improve transportation efficiency. Measures were developed to minimize conflict, enhance connectivity, and reduce vehicular speeds and discourage cut-through traffic through neighborhood streets and improve traffic operations along the Route 28 corridor.

FISCAL YEAR 2021 EARMARKS FUNDING

The Town of Randolph has recently received a Fiscal Year 2021 Earmarks funding from the Executive Office of the Massachusetts Marketing Partnership/Massachusetts Office of Travel & Tourism (MMP/MOTT) who will be administering the fund per the Fiscal Year 2021 Massachusetts State Budget.

This ASSIGNMENT consists of performing a corridor study along Route 28. It will focus on the traffic operational and safety issues along the Route 28 (South and North Main Street) corridor in Randolph. The project limits start from the Interstate 93 to Acorn Drive (just north of the Avon town line).

The primary focus of the traffic study is on traffic congestions, overall vehicular operational issues, pedestrian, bicycle, and transit safety. The study evaluates existing traffic volumes, crash history, and transportation condition and amenities, as well as to recommend improvements in an effort to improve safety, improve mobility. And alleviate deficiencies and congestion. Traffic data is compiled and collected to understand current multi-modal travel, speeds, and patterns along the Route 28 corridor. With the goal of improving transportation efficiency for all modes of transportation, measures are developed to minimize conflict, improve safety, and enhance connectivity along the corridor.

The study details the analyses of the existing conditions and assessment of safety and operational problems in the corridor, discusses options for roadway/intersection, pedestrian and bicycle, and transit improvements and makes recommendations for implementing improvements.

2.0 PROJECT LOCATION

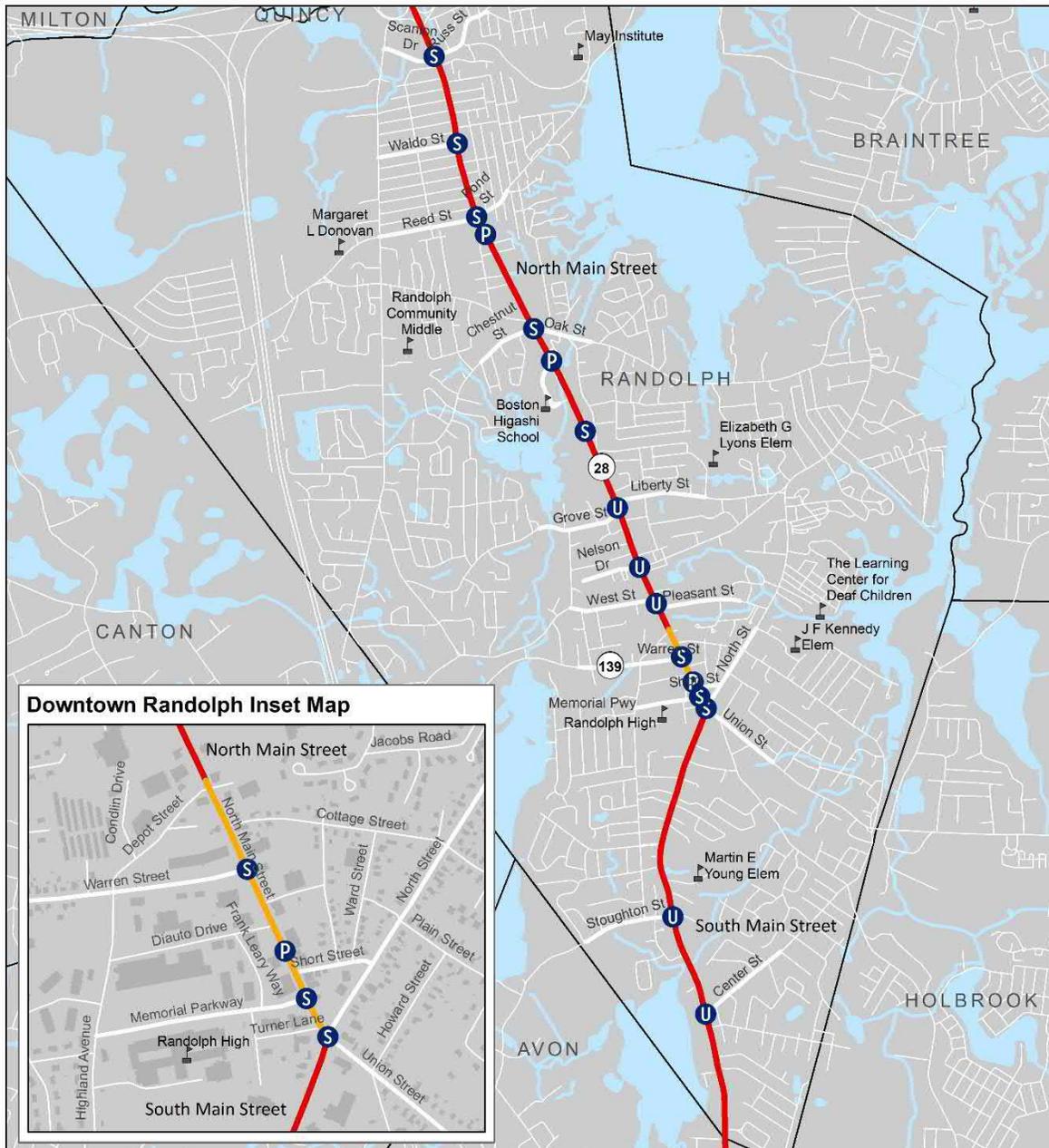
The Route 28 study area corridor runs for approximately 4.8 miles between Avon on the south and the I-93/Route 1 interchange on the north in Randolph. The I-93/Route 1 interchange with Route 28 is not included in the study area. Route 28 (North/South Main Street) is classified as a Principal Arterial. For approximately one-third of a mile between Route 139 (Union Street) and Depot Street, Route 28 is under

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Town of Randolph jurisdiction. The remainder of the Route 28 corridor (approximately 4.8 miles) is under MassDOT jurisdiction. There are several traffic signals located along this section of Route 28. Route 28 serves as a regional north-south connector between the communities located north and south of Randolph including Interstate 93. Route 28 also serves the Randolph Center, civic buildings, businesses along the corridor and schools located within the study area corridor, such as, the Randolph Community Middle School and the Donovan Elementary School located north of the project area. The Randolph High School at #70 Memorial Parkway and the Randolph/Holbrook Community Station on Mill Street. The East Randolph Industrial Park is located along North Street (east of Route 28).

Figure 1 on the following page shows the Route 28 study area and study intersections.

Figure 1 – Route 28 Corridor Study Intersections and Roadway Jurisdiction



- | | |
|------------------------------------|------------------------------|
| Study Area Intersections | Route 28 Jurisdiction |
| S Signalized Intersection | — MassDOT |
| U Unsignalized Intersection | — Town Accepted |
| P Pedestrian Signal | |

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Route 28 Corridor Study

Data Source: MassGIS
 Issue Date: June 2021
 This Map is Intended for Planning Purposes Only



3.0 EXISTING CONDITIONS

ROADWAY AND INTERSECTION CHARACTERISTICS

3.1.1 ROUTE 28

Route 28 (North/South Main Street) is classified as a Principal Arterial. For approximately one-third of a mile between Route 139 (Union Street) and Depot Street, Route 28 is under Town of Randolph jurisdiction. The remainder of the Route 28 corridor (approximately 4.8 miles) is under MassDOT jurisdiction. Between Acorn Street and Rt. 139 (Union Street) Route 28 is referred to as South Main Street, and between Route 139 (Union Street) and the I-93 interchange Route 28 is referred to as North Main Street. There are several signalized and two unsignalized study intersections, four signalized crosswalks, one fire station emergency signal, one school zone, and numerous commercial driveway curb cuts along the study corridor.

3.1.2 SOUTH MAIN STREET

The South Main Street section of Route 28 between Acorn Street and Route 139 (Union Street) is approximately 1.8 miles long and has one travel lane and wide shoulders in each direction. There are concrete sidewalks with granite curb on both sides of the roadway. The posted speed is 35 and 40 MPH. On-street parking is prohibited in this section that is under MassDOT jurisdiction. Streetlights are provided on the east side of Route 28. There is one signalized study intersection in this section of the corridor at South Main Street at Route 139 and Union Street and North Street. There are two unsignalized study intersections in this section:

- South Main Street and Center Street
- South Main Street and Stoughton Street

Figure 1 (previous page) shows the South Main Street and North Main Street sections of the study corridor.

3.1.3 NORTH MAIN STREET

The North Main Street section of Route 28 between Route 139 (Union Street) and I-93 has various travel lane arrangements as follows:

- Between Route 139 (Union Street) and Route 139 (Warren Street)
 - Two travel lanes in each direction
 - Concrete sidewalks and granite curb both sides
 - One-hour parking on one or both sides
 - Pedestrian scale lighting
 - 25 MPH
 - 0.2 miles long
- Between Route 139 (Warren Street) and Depot Street
 - One lane northbound and two lanes southbound
 - Concrete sidewalks and granite curb both sides
 - One-hour parking on the east side
 - Pedestrian scale lighting

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- 25 MPH
 - 0.1 miles long
- Between Depot Street and Pleasant Street
 - One travel lane in each direction
 - Two-way center left-turn lane
 - Concrete sidewalks and granite curb both sides
 - Pedestrian scale lighting
 - 0.1 miles long
- Between Pleasant Street and Boston Higashi Driveway (north)
 - One travel lane in each direction
 - Concrete and bituminous sidewalks and granite curb both sides
 - Sidewalk gap between 672 North Main Street and Boston Higashi Highschool Driveway (north)
 - Wide shoulders
 - Cobra-style streetlights on west side
 - 35 MPH
 - 1.1 miles long
- Between Boston Higashi Highschool Driveway (north) and I-93
 - Two travel lanes in each direction
 - Concrete and bituminous sidewalks and granite curb both sides
 - Sidewalk on west side ends north of Scanlon Drive
 - Cobra-style lights on east or west side
 - Median with three-beam guardrail north of Russ Street
 - 30, 35 and 40 MPH
 - 1.5 miles long

There are six signalized intersections, four signalized crosswalks, and one emergency fire station signal within the North Main Street section of the corridor:

- North Main Street at Memorial Parkway
- North Main Street mid-block signalized crosswalk between Short Street and Diauto Drive
- North Main Street at Route 139 (Warren Street)
- North Main Street at Simon Fireman Retirement Community Driveway
- North Main Street signalized crosswalk at Boston Higashi School (north drive)
- North Main Street at Chestnut Street and Oak Street (*Note that Canton Street is unsignalized and very close to this intersection*)
- North Main Street emergency signal at North Randolph Fire House
- North Main Street signalized crosswalk at Saint Bernadette Catholic Church
- North Main Street at Pond Street and Reed Street
- North Main Street signalized crosswalk at Waldo Street
- North Main Street at Russ Street and Scanlon Drive

There are also *School Speed Limit 20 When Flashing* signs on both sides of South Main Street at Lou Courtney Drive for the Martin E. Young School.

STUDY INTERSECTIONS

3.1.4 SOUTH MAIN STREET UNSIGNALIZED INTERSECTIONS

South Main Street and Center Street is an unsignalized T-intersection with Center Street forming the stem of Tee on the east side. Center Street is Stop controlled with a one lane approach that flares out at South Main Street to allow right-turning vehicles to maneuver around vehicles waiting to make a left turn onto South Main Street southbound. South Main Street is uncontrolled has one approach and departure lane in each direction. There are crosswalks across the South Main Street north leg and Center Street east leg.

South Main Street and Stoughton Street is an unsignalized T-intersection with Stoughton Street forming the stem of Tee on the west side of South Main Street. Woodland Parkway is located approximately 60 feet south of Stoughton Street and forms the stem of the T-intersection on the west side, forming an off-set four-way intersection with Stoughton Street. Stoughton Street and Woodland Street are Stop controlled. South Main Street is uncontrolled has one approach and departure lane in each direction. There are crosswalks across the Stoughton Street west leg and South Main Street approximately 60 feet south of Woodland Parkway.

3.1.5 SOUTH MAIN STREET SIGNALIZED INTERSECTION

South Main Street at North Main Street, Union Street (Rt.139), and North Street is a four-way signalized intersection under Town of Randolph jurisdiction. This intersection is also known as Crawford Square. The South Main Street approach has an exclusive left-turn lane and shared through-right lane and two departure lanes. The North Street approach has a shared through-left lane, and exclusive through lane and an uncontrolled right-turn slip lane separated by a raised delta island. It has one wide departure lane. The North Main Street approach has one exclusive left-turn lane, one exclusive through lane, and one exclusive right-turn lane, and two departure lanes. The Union Street approach has one shared through-left lane and one shared through-right lane. This signal is coordinated with the adjacent signal at the intersection of North Main Street at Memorial Parkway. This signal has protected-permitted phasing for the northbound Route 28 left-turn movement with an eastbound right-turn overlap. All other left turn movements are permitted only. There is also an exclusive pedestrian phase. There are pedestrian signals and crosswalks across all intersection legs, except the right -turn slip from North Street to North Main Street. MBTA bus stops are located on the North Main Street southbound approach (Route 12), South Main Street southbound departure side (Route 12), and North Street approach and departure sides (Route 238).

3.1.6 NORTH MAIN STREET SIGNALIZED INTERSECTIONS

North Main Street at Memorial Parkway is a signalized T-intersection with Memorial Parkway forming the stem of the Tee on the west side. There are two undesignated approach lanes on both South Main Street approaches and two departure lanes in each direction. The Memorial Parkway approach has one exclusive left-turn lane and one exclusive right-turn lane and one wide departure lane. There is a raised planted median on Memorial Parkway. This traffic signal is coordinated with the adjacent signal at the intersection of South Main Street at Route 139 (Union Street) and North Street. There is protected-permitted phasing for the northbound Route 28 left-turn movement at this intersection. There is also an exclusive pedestrian phase. There are crosswalks on each intersection leg. On-street parking is provided on both sides of the North Main Street north leg of the intersection and both sides of Memorial Parkway. MBTA bus stops are located on the North Main Street northbound direction in the center of the intersection (Routes 238 and 240) and southbound approach (Route 12).

North Main Street mid-block crosswalk between Short Street and Diauto Drive is a signalized pedestrian activated crossing. The signal is activated by pedestrian push buttons. Two approach and departure lanes are provided in both directions of North Main Street. The crosswalk is a stamped brick material and painted blue. On-street parking is provided on the North Main Street approach and departure sides.

North Main Street and Route 139 (Warren Street) is a signalized T-intersection with Warren Street forming the stem of the Tee. The North Main Street northbound approach has an exclusive left-turn lane and through lane and two departure lanes. The North Main Street southbound approach has an exclusive right-turn lane and two through lanes and two departure lanes. The Warren Street approach has one exclusive left-turn lane and one exclusive right-turn lane and one wide departure lane. There is a raised planted median on Warren Street. The traffic signal at this intersection is uncoordinated, has protected-permitted northbound left-turn phasing, and an exclusive pedestrian phase. There are crosswalks on each intersection leg. On-street parking is provided on the east side of North Main Street north of the intersection. MBTA bus stops are located on the North Main Street northbound approach (Route 240) and southbound approach (Routes 12 and 240).

North Main Street at Simon Fireman Retirement Community Driveway is a signalized T-intersection with the Simon Fireman Retirement Community driveway serving as the stem of the Tee on the west side. The North Main Street legs have one approach and one departure lane in each direction. The Simon Fireman leg has one approach lane and one departure lane. The traffic signal at this intersection has permitted phasing for the northbound left turns and an exclusive pedestrian phase to cross Route 28. Crosswalks are provided on the North Main Street south leg and Simon Fireman Driveway west leg. MBTA bus stops are located on the North Main Street northbound approach and southbound south of the intersection (Route 240).

North Main Street crosswalk at Boston Higashi School North Driveway) is a signalized T-intersection with Boston Higashi School North Driveway serving as the stem of the Tee on the west side. The signal is activated by pedestrian push buttons. One approach and one departure lane are provided in both directions of North Main Street. Boston Higashi School North Driveway is not marked but is wide enough to provide one approach and one departure lane. The crosswalk is located on the North Main Street north leg of the intersection. MBTA bus stops for Route 240 are located on both sides of the north leg of North Main Street.

North Main Street at Chestnut Street and Oak Street is a signalized four-way intersection. Both the North Main Street north and south legs of the intersection have one left-turn lane, one through lane, and one shared right-through lane, and two departure lanes. The northbound and southbound approaches are signed for No Turn on Red. The Oak Street eastbound approach has one right-turn lane, a shared left-through lane, and one departure lane. The Chestnut Street westbound approach has one left-turn lane, a shared through-right lane, and one departure lane. The traffic signal at this intersection is uncoordinated, the northbound and southbound Route 28 left-turn movements have protected-only phasing with a westbound right-turn overlap, the side street approaches run concurrently with permitted left turns, and there is an exclusive pedestrian phase. Crosswalks are provided on all four intersection legs. MBTA bus stops are provided on the North Main Street northbound approach (Route 240) and southbound approach (Routes 12 and 240). It is noted that Canton Street is unsignalized and located approximately 120 feet north of the intersection and can be impacted from vehicle queuing.

North Main Street at North Randolph Fire House is an emergency traffic signal activated by emergency vehicles. There are two lanes in each direction on North Main Street.

North Main Street crosswalk at Saint Bernadette Catholic Church is a signalized pedestrian activated crossing. The signal is activated by pedestrian push buttons. Two approach and departure lanes are provided in both directions of North Main Street.

North Main Street at Pond Street and Reed Street is a signalized four-way intersection. There are two approach and departure lanes in both directions of North Main Street. In both North Main Street directions, both approach lanes have pavement markings indicating bicycle detection. Both Pond Street and Reed Street have one approach lane and one departure lane. The traffic signal at this location is uncoordinated, there is a southbound protected advance phase, the side street approaches run concurrently with permitted left turns, and there is an exclusive pedestrian phase. There are stamped brick crosswalks painted red on each intersection leg. There is an MBTA bus stop on the North Main Street southbound approach (Routes 12 and 240). Old Street is a one-way westbound street (away from North Main Street) on the west side located approximately 50 feet south of Reed Street. Curb extension and landscaping improvements have recently been constructed on the southwest corner.

North Main Street Crosswalk at Waldo Street is a signalized T-intersection with Waldo Street serving as the stem of Tee. There are signal heads for each approach, but the Waldo Street eastbound approach also has a Stop sign. Two approach and departure lanes are provided in both directions of North Main Street. One approach and departure lane are provided on Waldo Street. There is an exclusive pedestrian phase and crosswalks on the North Main Street and Waldo Street legs. One MBTA bus stop is provided on the southbound North Main Street approach (Route 12).

North Main Street at Russ Street and Scanlon Drive is a four-way signalized intersection. The North Main Street northbound approach has one left-turn lane, one through lane, and one shared through-right lane, and two departure lanes. A raised median separates the approach and departure lanes. The North Main Street southbound approach has one left-turn lane, two through lanes, one right-turn lane, and two departure lanes. A flush median with three-beam guardrail separates the approach and departure lanes on North Main Street north of the intersection and a raised median with planters separates the approach and departure lanes south of the intersection. The Russ Street east leg has one exclusive left-turn lane, a shared through-right lane, and one departure lane. The Scanlon Drive west leg has two unmarked approach lanes and one departure lanes. The traffic signal at this intersection is uncoordinated, the northbound and southbound left-turn movements have protected-only phasing, the eastbound and westbound approaches have split phasing with a southbound right-turn overlap on the eastbound phase, and pedestrian phasing is concurrent. Crosswalks are located on all legs of the intersection, except the North Main Street north leg. Commercial and residential driveways are located within 100 feet of the intersection on both Russ Street and Scanlon Drive. There is an MBTA bus stop on the North Main Street southbound approach (Routes 12 and 240).

PEDESTRIAN AND BICYCLE FACILITIES

3.1.7 PEDESTRIAN FACILITIES

The location and condition of sidewalks, crosswalks, and curb ramps are discussed in this section. There is a total of 28 crosswalks (unsignalized and signalized) that cross Route 28 in the study corridor. On average there is one crosswalk every 1,100 feet (1/5th of a mile).

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3.1.7.1 SOUTH MAIN STREET

Sidewalks

There are concrete sidewalks with granite curbing on both sides of South Main Street throughout the study corridor. They are largely in good condition and typically do not feature a landscaped buffer between the sidewalk and the curb. Occasional obstructions are present and include utility poles and mailboxes. Figure 2 includes a variety of typical sidewalk typologies found along the Route 28 study area corridor.

Crosswalks and Curb Ramps

There is a total of seven crosswalks across Route 28 along the South Main Street section of the corridor:

- South of Acorn Drive (unsignalized intersection)
- North of Center Street (unsignalized intersection)
- South of Woodland Parkway (unsignalized intersection)
- North of Lou Courtney Drive at Martin E. Young School (unsignalized intersection)
- South of Van Beal Road at Hurley Funeral Home (unsignalized intersection)
- Town Hall at Randolph Square shopping plaza (unsignalized intersection)
- Union Street (signalized intersection)

There is a School Zone designated by *School Speed Limit 20 When Flashing* signs and SCHOOL pavement markings on both sides of South Main Street north and south of Lou Courtney Drive for the Martin E. Young Elementary School. (See Figure 3 for crosswalk locations.)

3.1.7.2 NORTH MAIN STREET

Sidewalks

There are both concrete sidewalks with granite curbing and asphalt sidewalks on both sides of North Main Street throughout the study corridor. They are largely in good condition and although they do not feature a landscaped buffer between the sidewalk and the curb, there are significant portions that feature decorative brick banded edging. There is no sidewalk on the west side of North Main Street between #682 North Main Street on the south and the Boston Higashi School north driveway (approximately 1,400 feet). Occasional obstructions are present and include utility poles, however the sidewalk is generally wider on North Main Street than on South Main Street.

Crosswalks and Curb Ramps

There are a total of 21 crosswalks that cross Route 28 along the North Main Street section of the corridor. Five intersections -- Pond Street/Reed Street, Chestnut Street/Oak Street, Memorial Parkway, North Street/Union Street, and Route 139 (Warren Street) -- feature two crosswalks that provide an east-west corridor crossing. Of the 21 crosswalks:

- Four are pedestrian signal crossings
- 11 are signalized crossings, and
- Six are unsignalized crossings

The 21 crosswalks along the North Main Street portion of the study corridor are located at the following locations:

- North Street and Union Street, which features two crosswalks (signalized intersection)
- Memorial Parkway, which features two crosswalks (signalized intersection)

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- Mid-block between Short Street and Diauto Drive (pedestrian signal)
- South of Diauto Drive (unsignalized intersection)
- Warren Street, which features two crosswalks (signalized intersection)
- South of Pleasant Street (unsignalized intersection)
- North of West Street (unsignalized intersection)
- South of Mt. Pleasant Square (unsignalized intersection)
- South of School Lane (unsignalized intersection)
- South of Orchard Street (unsignalized intersection)
- Simon Fireman Retirement Community Drive (signalized intersection)
- Boston Higashi School north Driveway (pedestrian signal)
- Chestnut Street and Oak Street, which features two crosswalks (signalized intersection)
- St. Bernadette Catholic Church (pedestrian signal)
- Pond Street and Reed Street, which features two crosswalks (signalized intersection)
- Waldo Street (Pedestrian signal)
- South leg of Russ Street and Scanlon Drive (signalized intersection)

Figure 2- Existing Sidewalk Typologies

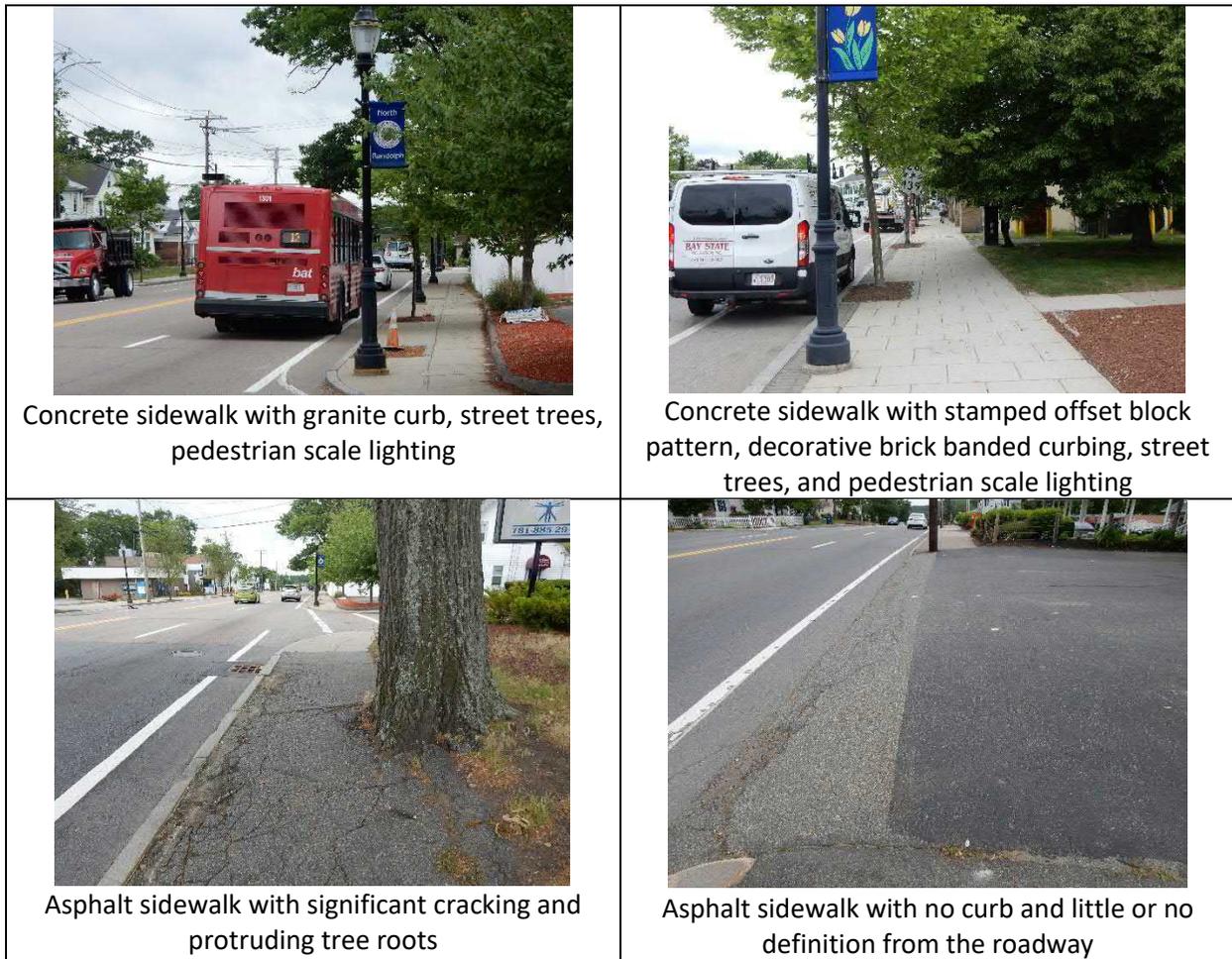


Table 1 summarizes amenities and condition for crosswalks across Route 28 in the study area.

Table 1 – Crosswalk Data Inventory

	Signalized*	Crosswalk Type	Curb Ramps	Detectable Warning Panel	Crosswalk Signs	# of Lanes Crossed
South of Acorn Drive	No	2 Parallel lines	Yes	No	Yes	2
North of Center Street	No	Continental	Yes	No	Yes	2
South of Woodland Parkway	No	Continental	Yes	No	Yes	2
North of Lou Courtney Drive at Martin E. Young School	No	Continental	Yes	No	Yes	2
South of Van Beal Road at Hurley Funeral Home	No	Continental	Yes	No	Yes	2
Town Hall at Randolph Sq Plaza	No	Continental	Yes	No	Yes	2

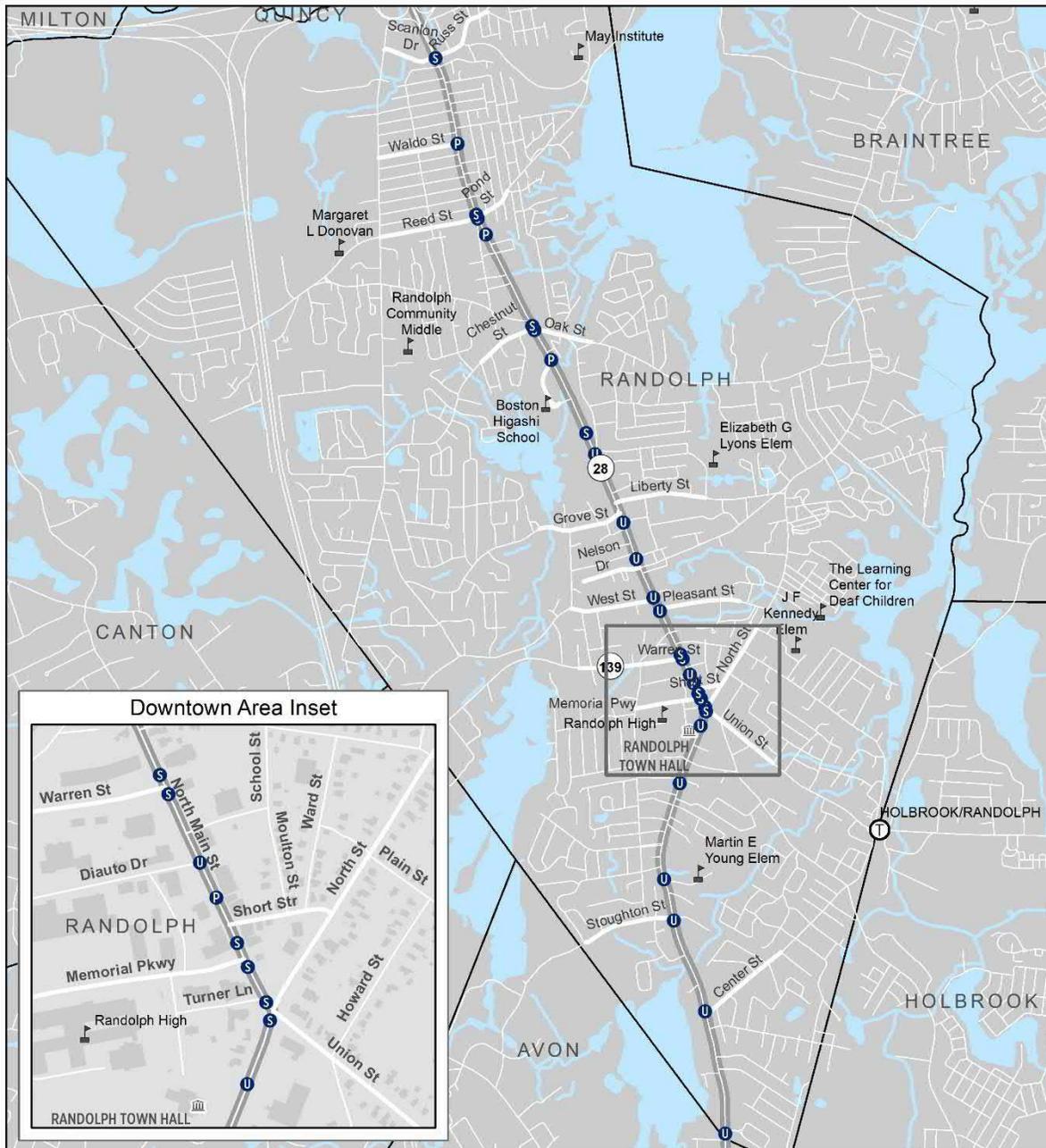
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North Street at Union Street	Yes	Continental	Yes	Yes	n/a	5
Memorial Drive	Yes	Stamped Red	Yes	Yes	n/a	5
Short Street at Diauto Drive	Yes (P)	Stamped Blue	Yes	Yes	n/a	4
South of Diauto Drive	No	Stamped Blue	Yes	Yes	Yes	4
Warren Street	Yes	Stamped Red	Yes	Yes	n/a	5
South of Pleasant Street (this crosswalk crosses a flush median)	No	Continental	Yes	Yes	Yes	2+
North of West Street	No	2 Parallel lines	Yes	Yes	No	4
South of Mt Pleasant Sq	No	Continental	Yes	Yes	Yes	2
South of School Ln	No	Continental	Yes	Yes	Yes	2
South of Orchard Street	No	2 Parallel lines	Yes	Yes	Yes	2
Simon Fireman Retirement Community	Yes	2 Parallel lines	Yes	Yes	n/a	2
Boston Higashi School Drive (north)	Yes (P)	2 Parallel lines	Yes	Yes	n/a	2
Chestnut Street at Oak Street	Yes	2 Parallel lines	Yes	No	n/a	5
St. Bernadette Catholic Church	Yes (P)	2 Parallel lines	Yes	Yes	n/a	4
Pond Street and Reed Street	Yes	Stamped Red	Yes	Yes	n/a	4
Waldo Street	Yes (P)	2 Parallel lines	Yes	No	n/a	4
Russ Street and Scanlon Drive	Yes	Continental	Yes	No	n/a	5

3.1.8 BICYCLE FACILITIES

There is a painted bicycle detection symbol a few feet shy of the stop bar on both the Reed Street and Pond Street approach to North Main Street. There are no formal bicycle lanes or paths located along the Route 28 study corridor. In those locations along the corridor where the roadway lane configuration consists of a two-lane or three-lane cross section, bicycling may occur in the shoulder area. In the northern portion of the study corridor where the roadway configuration is a 4-lane cross section, bicyclists were observed riding on the sidewalks where there is no shoulder and higher motor vehicle speeds and volumes. There are two bicycle parking racks located in the downtown commercial and retail shopping area, one south of School Lane and another outside of the AutoZone building.

Figure 3 – Route 28 Pedestrian Crosswalk Locations



Route 28 Corridor Study - Crosswalk Locations

-  Signalized Pedestrian Crossing
-  Unsignalized Pedestrian Crossing
-  Pedestrian Signal Crossing

Town of Randolph, MA

Route 28 Corridor Study

Data Source: MassGIS
 Issue Date: May 2021
 This Map is Intended for Planning Purposes Only



Randolph, MA

TRANSIT

Route 28 in Randolph is serviced by two Massachusetts Bay Transit Authority (MBTA) bus routes: Route 240 and Route 238; and one Brockton Area Transit (BAT) bus route: Route 12.

MBTA Bus Route 240

Route 240 provides service between Ashmont Station in Dorchester and Avon Square in Avon, with stops in Dorchester, Milton, Randolph, and Avon. According to the most recently available data released by MBTA, Route 240 experienced 1,300 weekday daily inbound boarding's and 1,345 weekday daily outbound boarding's during a count conducted in 2016. The first trip northbound from Avon Square leaves at 5:20 AM and the last trip northbound leaves at 12:19 AM. The first trip southbound from Ashmont Station leaves at 5:41 AM and the last trip leaves at 12:50 AM.

There are 50 daily weekday scheduled departures.

The following stops had the highest number of daily boarding's for Route 240 within the Randolph Route 28 study area:

- North Main Street opposite Memorial Parkway - 248
- North Main Street opposite Warren Street - 148
- North Main Street at Oak Street - 125
- North Main Street at Russ Street - 57
- Opposite 1048 North Main Street south of Pond Street- 52
- North Main Street at Reed Street - 36
- North Main Street at Chestnut Street - 35
- North Main Street at Boston Higashi School North Driveway - 15

MBTA Bus Route 238

Route 28 in Randolph is also serviced by MBTA Route 238. Route 238 provides service from Quincy Center to Holbrook with stops in Braintree and Randolph. According to the most recently available data released by MBTA, Route 238 experienced 855 weekday daily inbound boarding's and 839 weekday daily outbound boarding's during a count conducted in 2016. The first trip northbound from Holbrook leaves at 5:24 AM and the last trip northbound leaves at 10:20 PM. The first trip southbound from Quincy Center leaves at 5:19 AM and the last trip leaves at 11:09 PM.

There are 27 daily weekday scheduled departures. There are three departures every hour during peak commuter times and one to two every hour mid-day.

BAT Bus Route 12

Brockton Area Transit operates a bus that provides service between the Brockton Center Transit Station to the south and Ashmont Station to the north. The bus route services the Route 28 corridor in Randolph from Acorn Drive near the Avon town line up to Scanlon Drive at the northern border of the study area and continues north. There are 49 stops between Acorn Drive and Scanlon Street. According to the Brockton Area Transit website, the bus runs approximately three times per hour on the weekday schedule with mostly 20-minute headways between departure times. The headways are reduced to 10 minutes during the morning peak and afternoon peak periods. The first bus departs Ashmont Station at 5:45 AM and the last bus arrives in Brockton Area Transit center at 11:40 PM. The first bus departs Brockton Area Transit center at 5:00 AM and the last bus arrives at Ashmont station at 11:30 PM. There are 47 scheduled daily weekday departures.

Bus Stops

Figure 4 shows the MBTA bus stops along the Route 28 study area. There are approximately 92 bus stops along the study corridor. The bus stops can be broken into three categories:

- Bus stops that include a shelter – 5 locations
- Bus stops that include a bench and a sign – 3 locations
- Bus stops that only include a sign – 84 locations

The study corridor includes the above listed amenities at the following locations:

South Main

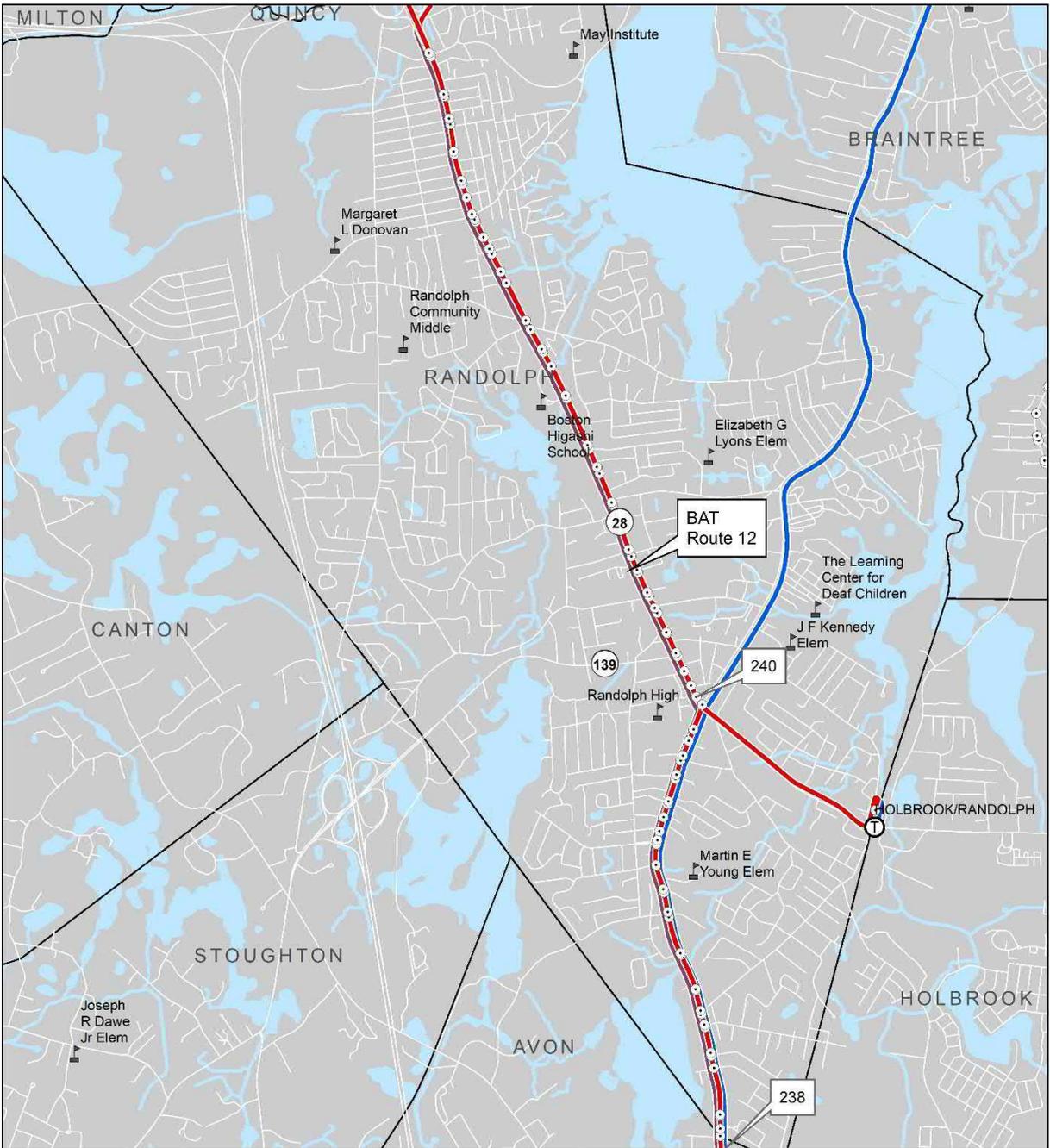
- A shelter and trash can are provided on the west side at the Town Hall. A crosswalk is provided.

North Main

- Shelter and trash can on northbound approach to Oak Street. Crosswalk provided at signal.
- On the southbound approach to Chestnut Street there is a short retaining wall that serves as an informal bench. A trash can is provided, and a crosswalk is provided at the signal.
- Shelter on southbound side south of Simon Fireman Driveway. No trash can is provided. A crosswalk is provided at the signal (5'x10')
- A bench and trash can are provided on the southbound approach to West Street. A crosswalk is provided
- A bench is provided on the southbound approach to Grove Street. No trash can or crosswalk are provided
- A bench and trash can are provided on the northbound side north of Liberty Street. No crosswalk is provided
- Shelter opposite Warren Street (Rt. 139) on the east side with trash can
- Shelter opposite Memorial Parkway on the east side with trash can

All bus shelters are 10 feet long and 5 feet wide. There are no formal bus pull outs along the corridor, but rather curbside or shoulder-area pick up that may temporarily block motor vehicle traffic. Depending on lane width and configuration, motorists may have the ability to pull around a bus picking up or discharging passengers at a bus stop.

Figure 4 – MBTA and BAT Bus Routes



Route 28 Corridor Study - Public Transit - Bus Routes

-  Bus Stops
-  MBTA Route 240
-  MBTA Route 238
-  BAT Route 12

Town of Randolph, MA



Route 28 Corridor Study

Data Source: MassGIS
 Issue Date: June 2021
 This Map is Intended for Planning Purposes Only



LAND USE AND DEVELOPMENT

The Route 28 corridor study area was analyzed using 2016 land cover data obtained from the Massachusetts GIS Clearinghouse. A buffer was applied surrounding the Route 28 corridor, encompassing each of the parcels on both sides of the roadway from I-93/Route 1 to the Avon town line. Approximately 500 acres of land exist within this roughly 800-foot-wide zone along Route 28 in Randolph. Among those 500 acres of land, the dominant land use types are present as detailed in **Table 2**.

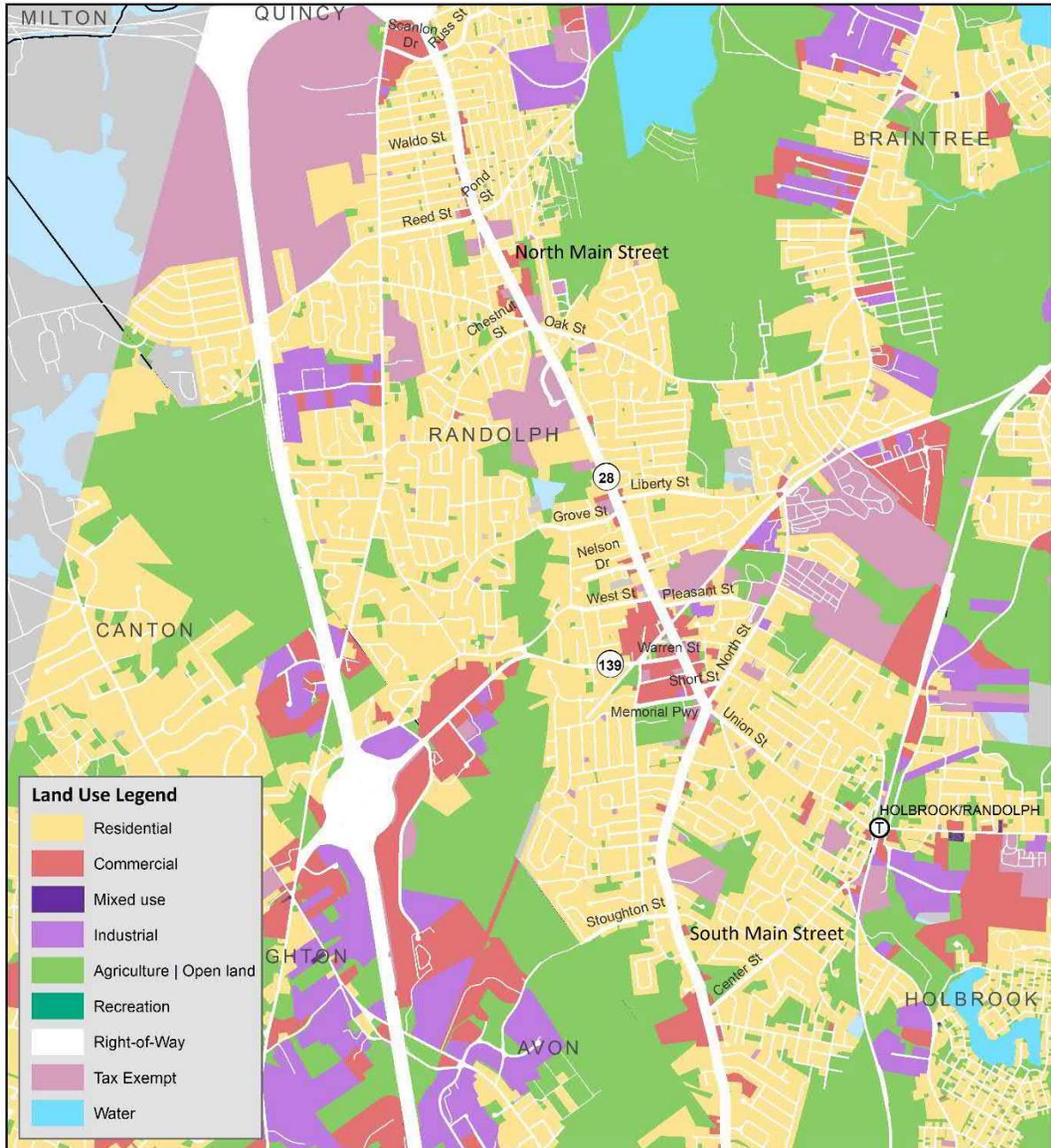
Table 2 – Route 28 Corridor Land Use Summary

Land Use Category	Acres
Residential – single family	165
Right-of-way	106
Commercial	88
Residential – multi-family	65
Tax exempt	45
Open land	28
Unknown	2
<i>Total Acres</i>	<i>499</i>

The dominant land use along the Route 28 study corridor is residential with pockets of commercial. In the downtown Crawford Square area there are several Town buildings and properties including the Town Hall, Police Department, Randolph High School, and School Administration between West Street and North Street in the downtown area the primary land use type is commercial. This commercial land use supports the businesses that operate in the downtown area. Tax exempt parcels include town buildings, schools, churches, and other public non-tax-revenue generating parcels. Right-of-way classification includes publicly owned roadways, alleys, and easements.

Figure 5 shows a simplified land use map along the Route 28 in Randolph, as well as land use in Randolph and adjoining towns adjacent to the Route 28 study corridor.

Figure 5 – Land Use Map



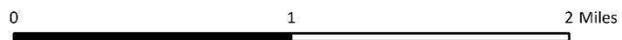
Route 28 Corridor Study - Land Use

Town of Randolph, MA



Route 28 Corridor Study

Data Source: MassGIS
 Issue Date: May 2021
 This Map is Intended for Planning Purposes Only



TRAFFIC VOLUMES, SPEEDS, AND TRAVEL TIME

3.1.9 ROUTE 28 ROADWAY TRAFFIC VOLUMES

Traffic count data along the Route 28 corridor was obtained in May 2021 for this study. Data was also available for some locations in the corridor from two recently completed studies: the *Crawford Square Traffic Signal Timing Evaluation*, with intersection turning movement count (TMC) data collected in June 2015 and the *Phase 1 Town Wide Traffic Evaluation for Randolph*, with automatic traffic recorder (ATR) and TMC data collected in April 2017.

For this study, ATR counts were collected during a 48-hour period between Tuesday, May 25, 2021 and Wednesday, May 26, 2021 at three locations along Route 28. ATR counts were also available from the 48-hour period between Wednesday, April 5, 2017, and Thursday, April 6, 2017 at three locations along Route 28. ATR traffic counts were collected or available at the following locations.

- Route 28 south of Acorn Drive (May 25-26, 2021)
- Route 28 south of Pleasant Street (May 25-26, 2021)
- Route 28 south of Chestnut Street (April 5-6, 2017)
- Route 28 north of Pond Street (April 5-6, 2017)
- Route 28 north of Russ Street (May 25-26, 2021)
- Route 28 between the I-93 ramps (April 5-6, 2017)

The data collected included volume and speed for all locations, and vehicle classification for the 2017 counts. Complete ATR volume count data are included in **Appendix A**. The traffic-volume data are summarized in **Table 3**.

Table 3 – Existing Traffic-Volume Summary

Location/Direction	Vehicles Per Day ^a	Weekday AM Peak Hour ^b	Weekday PM Peak Hour ^b	Percent Heavy Vehicles ^c
Route 28 South of Acorn Drive (May 2021)				
Northbound	9,796	739	630	--
Southbound	10,274	474	852	--
Route 28 South of Pleasant Street (May 2021)				
Northbound	13,544	975	781	--
Southbound	8,416	380	642	--
Route 28 South of Chestnut Street (April 2017)				
Northbound	12,870	1,066	730	11%
Southbound	12,531	669	1,006	8%
Route 28 North of Pond Street (April 2017)				
Northbound	13,610	1,200	774	15%
Southbound	12,706	620	932	12%
Route 28 North of Russ Street (May 2021)				
Northbound	17,832	1,399	944	--
Southbound	17,189	918	1,231	--
Route 28 Between I-93 Ramps (April 2017)				
Northbound	14,466	1,557	895	9%
Southbound	13,985	673	1,282	18%
^a Average vehicles per day from 48-hour count.				

^b Average vehicles per peak hour from 48-hour count

^c Percent of daily vehicles that include ≥ 2 axles and ≥ 6 tires (no buses or cars with trailers).

Along Route 28, according to the 2021 ATR count data, the weekday peak hours were generally found to be between 7:30 and 8:30 AM and 5:00 and 6:00 PM.

3.1.10 ROUTE 28 VEHICLE SPEEDS AND TRAVEL TIME

Vehicle Speeds

Vehicle speed is a basic measure of transportation performance that is defined as the rate of movement of a vehicle in distance per unit of time. Speed limits on roadways are typically established based on sound traffic engineering principles that consider actual motorist travel speeds in ideal driving conditions (i.e., free-flowing). Vehicle speeds are important as motorists relate travel speeds to safety, convenience, time, comfort, and economics. The intent for limiting vehicle speeds is to reduce traffic collisions, improve safety for non-motorized traffic, and alleviate environmental impacts (e.g., vehicle noise, vibration, emissions).

Travel speeds were recorded using automatic traffic recorders (ATRs) over 48-hour periods, thereby also recording travel speeds during non-peak hours when vehicle speeds are not affected by platooning and congestion. Speed measurements were obtained at the same locations and for the same time periods as the ATR counts listed above. The speed measurement data are summarized in **Table 4** and detailed speed data reports are provided in **Appendix B**.

Traffic speed data are summarized with average (median) speed and 85th percentile speeds. The 85th percentile speed represents the speed at which 85% of vehicles are traveling at or below. Since this speed more accurately represents the overall travel speed, 85th percentile speeds are typically used to verify speeding concerns. In addition, the pace was noted of the vehicles traveling in each of the specific sections. The pace is the 10-mph range containing the largest number of sample vehicles.

The posted speed limit along Route 28 varies along the corridor from 30 to 45 miles per hour and is indicated for each speed data collection location in **Table 4**.

Table 4 – Speed Data Summary

Location/Direction	Regulated Speed Limit	Average Speed	85 th Percentile Speed ^a	Pace ^b
Route 28 South of Acorn Drive (May 2021)				
Northbound	40	35	40	30-39
Southbound	40	31	35	25-34
Route 28 South of Pleasant Street (May 2021)				
Northbound	35	30	32	23-32
Southbound	35	25	29	20-29
Route 28 South of Chestnut Street (April 2017)				
Northbound	35	33	41	31-40
Southbound	35	40	46	36-45
Route 28 North of Pond Street (April 2017)				
Northbound	30	31	40	31-40
Southbound	30	30	38	26-35
Route 28 North of Russ Street (May 2021)				
Northbound	40	31	37	25-34

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Southbound	40	33	41	30-39
Route 28 Between I-93 Ramps (April 2017)				
Northbound	45	41	51	41-50
Southbound	45	50	60	46-55
^a Speed at, or below which, 85% of observed vehicles travel.				
^b The 10 mph speed range containing the greatest number of vehicles.				

Average vehicular speeds along most of the study corridor were found to be generally below or consistent with the posted speed limits. The 10 mph pace ranges were also found to be generally in the range of the posted speed limits. The 85th percentile speeds were observed to be higher than the regulated speed limit in three areas:

- South of Chestnut Street where the 85th percentile speeds are 6 mph above the posted speed limit of 35 mph in the northbound direction and 11 mph above the speed limit in the southbound direction
- North of Pond Street, where the speeds are fairly consistent with adjacent sections of the corridor to the north and south, but the 85th percentile speeds are 10 mph above the posted speed limit of 30 mph in the northbound direction and 8 mph above the speed limit in the southbound direction
- In the vicinity of the I-93 ramps where the roadway character is that of a highway interchange

For free flow conditions, speeds observed along a roadway are primarily a reflection of the functional classification (the amount of mobility vs. access the roadway is intended to provide) and the design elements (lane and shoulder widths, horizontal and vertical alignment, roadside elements). Another factor impacting observed speeds is traffic congestion, of which this corridor has significant amounts during peak periods.

Travel Time

BETA staff recorded vehicle speeds along the Route 28 study corridor in the morning (7:00-9:00 AM) and afternoon (4:00-6:00 PM) weekday peak periods on Tuesday, June 22 and Wednesday, June 23, 2021. Travel times were measured using a “floating vehicle” technique where a vehicle is driven at the speed of prevailing traffic.

Table 5 shows the recorded travel time and calculated speeds for segments and for the entire corridor. The travel times were recorded for the following four segments*:

5. Acorn Street to North Street
6. North Street to West Street
7. West Street to Boston Higashi School north driveway
8. Boston Higashi School north driveway to Scanlon Drive at Russ Street

Table 5 - Travel Time Summary

Segment*	AM Peak				PM Peak			
	Northbound		Southbound		Northbound		Southbound	
	Minutes	MPH	Minutes	MPH	Minutes	MPH	Minutes	MPH
1	3:24	31	3:51	28	4:22	24	3:15	33
2	2:01	15	1:54	16	1:32	19	2:40	11
3	1:54	33	2:00	31	2:13	28	4:07	15
4	4:52	16	3:35	22	3:56	21	3:59	30
<i>Total</i>	<i>12:11</i>	<i>24</i>	<i>11:20</i>	<i>24</i>	<i>12:01</i>	<i>23</i>	<i>14:02</i>	<i>20</i>

The results show that the primary time of congestion, delay, and/or slower vehicle travel times are in the southbound direction during the PM peak. In particular, the stretch of North Main Street from West Street to North Street during the PM peak had the slowest travel speeds and longest travel times.

Intersection Turning Movement Counts

Turning movement counts were collected and/or available from recently completed studies for a number of intersections along the Route 28 corridor including:

- Route 28 at Center Street (May 2021)
- Route 28 at Stoughton Street/Woodland Parkway (May 2021)
- Route 28 at Route 139 (Union Street)/North Street (May 2021 and June 2015)
- Route 28 at Memorial Parkway (May 2021 and June 2015)
- Route 28 at Route 139 (Warren Street) (May 2021 and June 2015)
- Route 28 at Pleasant Street (May 2021)
- Route 28 at West Street (May 2021)
- Route 28 at Nelson Drive/Allen Street (May 2021)
- Route 28 at Grove Street (May 2021)
- Route 28 at Liberty Street (May 2021)
- Route 28 at Chestnut Street/Oak Street (April 2017)
- Route 28 at Reed Street/Pond Street (April 2017)
- Route 28 at Scanlon Drive/Russ Street (April 2017)

Based on the ATR data, the weekday peak hours for the corridor were determined to generally be 7:30-8:30 AM and 5:00-6:00 PM. Peak hour turning movement volumes for these time periods were calculated for each intersection, based on the most recently available count data, and then the traffic volumes were examined to evaluate the need for adjustment. A review of the seasonal axle correction factors maintained by the Massachusetts Department of Transportation (MassDOT) Highway Division indicates that traffic volumes in April, May, and June are below average, with seasonal correction factor values of less than one for an Urban Other Principal Arterial. To provide a more conservative analysis, none of the intersection turning movement counts were reduced with a seasonal correction factor. Adjustments were then made for to account for yearly growth and COVID conditions.

The three intersection locations where count data was collected in April 2017 were adjusted with MassDOT Yearly Growth Rates for Group U3 to increase volumes from 2017 to 2019 (“existing”) conditions. In order to adjust for COVID conditions, the counts that were conducted in 2021 were adjusted

according to a calculated growth factor that was determined by examining the total entering volumes at the three intersections where counts were collected in 2015, growing those volumes according to MassDOT Yearly Growth Rates from 2015 to 2019, and comparing the total entering volume for the 2021 counts to the 2019 “existing” calculated volumes for both the AM and PM peak hours. To adjust to pre-COVID conditions, a growth factor of 1.23 was applied to the 2021 AM peak hour turning movement volumes, and a growth factor of 1.05 was applied to the 2021 PM peak hour turning movement volumes. The final adjusted existing condition peak hour turning movements are shown in **Figure 6**. Raw Turning Movement Count Data reports are included in **Appendix C**.

3.1.11 *PEDESTRIANS AND BICYCLISTS*

Pedestrian and bicycle volume counts were recorded at all of the intersection turning movement count locations listed above. The highest concentration of pedestrian volumes was observed at the following locations:

- 30-36 pedestrians at Crawford Square in the afternoon peak hour
- 34 pedestrians at Russ Street and Scanlon Drive in the morning peak hour

It is noted that pedestrians were observed crossing North Main Street mid-block in various locations near Crawford Square. Bicycles were observed sparsely throughout the corridor. Some bicyclists were observed riding on the sidewalk in the study corridor. Peak hour pedestrian and bicycle volumes are shown in **Figure 6**.

Figure 6 – Existing Weekday Traffic Volumes

Figure 6 – Existing Weekday Traffic Volumes (continued)

CRASHES

Crash data for the study area intersections were obtained from MassDOT for the most recent three-year period available (January 1, 2016 through December 31, 2018). A summary of the MassDOT crash data at each of the study area intersections is provided in Table 6. Figure 7 displays the number of crashes that occurred at each study area intersection between 2016 and 2018. Detailed crash data and calculations are included in **Appendix D**.

Crash Rates

Crash rates, measured against traffic exposure, or vehicle miles traveled, are an effective analysis tool to understand roadway safety and design. For intersection locations where turning movement count data was collected as part of this project, the crash rate was calculated. A summary review of important crash factors is included in the description of each intersection below.

Center Street at Route 28

Center Street at Route 28 is an unsignalized intersection. The MassDOT crash data indicate that this intersection experienced 17 reported collisions over the three-year period analyzed.

- Crash rate: 0.65
- Primary crash types: Angle (7); Rear-end (4)
- 8 injuries reported out of 17 total crashes

Stoughton Street at Route 28

Stoughton Street at Route 28 is an unsignalized intersection. The MassDOT crash data indicate that this intersection experienced 49 crashes over the three-year period analyzed.

- Crash rate: 0.53
- Primary crash types: Rear end (6), Sideswipe (2)
- 8 injuries reported out of 11 total crashes – high injury rate

North Street at Route 28

North Street at Route 28 is a signalized intersection. The MassDOT crash data indicate that this intersection experienced 48 crashes over the three-year period analyzed.

- Crash rate: 1.06
- Primary crash types: Angle (16), Sideswipe (12)
- 18 injuries reported out of 48 total crashes

Memorial Parkway

Memorial Parkway at Route 28 is a signalized intersection. The MassDOT crash data indicate that this intersection experienced 15 crashes over the three-year period analyzed.

Short Street / Diauto Drive at Route 28

Route 28 between Short Street and Diauto Drive has a signalized pedestrian crossing. The MassDOT crash data indicate that this intersection experienced 6 crashes over the three-year period analyzed.

- Primary crash types: Angle (3), Rear end (12)

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Warren Street (Route 139)

Warren Street / State Route 139 at Route 28 is a signalized intersection in the corridor study area. The MassDOT crash data indicate that this intersection experienced 52 reported collisions over the three-year period analyzed.

- Crash rate: 1.39
- 2 collisions involved a pedestrian that resulted in injuries
- Primary crash types: Angle (25); Rear end (9)
- 16 possible were reported out of 52 total crashes, there was 1 fatal crash

West Street and Pleasant Street

West Street and Pleasant form two unsignalized intersections in the study area. They are offset approximately 210 feet. The MassDOT crash data indicate that these intersections have experienced 21 reported collisions over the three-year period analyzed.

- Crash rate: 0.65
- Primary crash types: Angle (8); Rear end (8)
- Four pedestrian- or bicycle-involved crashes
- 16 reported injuries out of 23 total crashes

Nelson Drive at Route 28

Nelson Drive at Route 28 is an unsignalized intersection in the corridor study area. The MassDOT crash data indicate that this intersection experienced 23 reported collisions over the three-year period analyzed.

- Crash rate: 0.61
- 1 collision involved a pedestrian that resulted in injuries
- Primary crash types: Angle (14); Rear end (5)
- 12 reported injuries out of 23 total crashes

Grove Street and Liberty Street

Grove Street and Liberty Street are unsignalized intersections with Route 28. The Liberty Street intersection is north of Grove Street – they are offset by about 230 feet. The MassDOT crash data indicate that these intersections have experienced 13 reported collisions per year over the three-year period analyzed.

- Crash rate: 0.32
- Primary crash types: Sideswipe (5); Rear end (4)
- 4 reported injuries out of 13 total crashes

Simon Fireman Retirement center at Route 28

The Simon Fireman Retirement Center driveway forms a signalized intersection with Route 28. The MassDOT crash data indicate 5 crashes occurred here over the three-year period analyzed.

Boston Higashi School Driveway

The Higashi School driveway is a pedestrian-actuated signal to control traffic at the crosswalk. The MassDOT crash data indicate that this location has experienced a total of 11 reported collisions over the three-year period analyzed.

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- Primary crash types: Rear end (6)
- 8 reported injuries out of 11 total crashes – which could indicate high speeds as a contributing factor

Chestnut Street at Oak Street

Chestnut Street at Oak Street is a signalized intersection. The MassDOT crash data indicate that this intersection experienced 34 crashes over the three-year period analyzed.

- Crash rate: 0.53
- 2 collisions involved a pedestrian, one of which resulted in a pedestrian fatality
- Primary crash types: Rear end (8); Angle (5); Head-on (5)
- 8 reported injuries out of 24 total crashes

Saint Bernadette Church

Saint Bernadette Church at 640 North Main Street has a signalized pedestrian crossing adjacent to the church entry and exit driveways. The MassDOT crash data indicate 3 crashes occurred here over the three-year period analyzed.

- Primary crash types; Rear-end (2)

Reed Street at Pond Street

Reed Street at Pond Street is a signalized intersection. The MassDOT crash data indicate that 23 crashes occurred here over the three-year period analyzed.

- Crash rate: 0.46
- Primary crash types: Angle (11), Rear-end (5)
- 7 reported injuries out of 22 total crashes

Waldo Street at Route 28

Waldo Street at Route 28 is a signalized intersection. The MassDOT crash data indicate that 11 crashes occurred here over the three-year period analyzed.

- Primary crash types: Angle (5), Rear-end (3)
- 5 reported injuries out of 11 total crashes

Scanlon Drive at Russ Street

Scanlon Drive and Russ Street is a signalized intersection at the north end of the study area. The MassDOT crash data indicate 45 crashes occurred here over the three-year period analyzed.

- Crash rate: 0.87
- Primary crash types: Rear-end (19), Angle (12)
- 2 collisions involved a pedestrian that resulted in injuries

Table 6 – Intersection Crash Summary Data

	Center St	Stoughton St	North St	Short St	Memorial Parkway	Warren St	Pleasant St / West St	Allen St / Nelson Dr
Collision Type								
Angle	7	1	16	3	2	25	8	14
Rear-End	4	6	9	2	6	9	8	5
Sideswipe	3	2	12	1	3	7	--	1
Pedestrian / Bicycle	--	--	--	--	--	2	4	1
Single Vehicle Crash	1	1	3	--	--	8	3	2
Crash Severity								
Property Damage	8	3	30	3	9	35	7	12
Non-Fatal Injury	8	8	18	3	3	16	16	11
Fatal Injury	--	--	--	--	--	1	--	--
Ambient Light								
Daylight	13	5	31	2	6	35	12	14
Dusk or Dawn	1	2	2	1	--	3	1	--
Dark - Lighted Roadway	3	4	15	3	6	13	10	9
Weather Condition								
Clear	11	7	38	4	8	38	16	17
Cloudy	--	2	7	1	3	6	2	3
Rain	6	2	3	1	--	7	3	2
Snow	--	--	--	--	1	1	2	1
Time of Year								
December - February	2	2	15	1	3	19	8	4
March - May	1	--	11	--	5	10	3	2
June - August	8	6	11	1	--	13	3	8
September - November	7	3	11	3	4	10	9	9
Year								
2016	7	4	22	--	5	21	8	7
2017	6	4	17	3	2	21	8	8
2018	4	3	9	3	5	10	7	8
Summary								
Total crashes 2016 – 2018	17	11	48	6	12	52	23	23
Average crashes per year	5.7	3.7	16	2	3	17.3	7.7	7.7
Crash Rate*	.65	.53	1.06	--	.34	1.39	.64	.61
District 2 Crash Rate*	Signalized Intersections: 0.71 Unsignalized Intersections 0.52							
Statewide Crash Rate*	Signalized Intersections: 0.78 Unsignalized Intersections 0.57							

*per million entering vehicles

(continued)

	Grove St at Liberty St	Simon Fireman Center	Boston Higashi	Chestnut St / Oak St	Saint Bernadette Church	Reed St / Pond St	Waldo St	Scanlon Dr / Russ St
	Collision Type							
Angle	3	1	1	5	--	11	5	12
Rear-End	4	1	6	8	2	5	3	19
Sideswipe	5	--	1	4	--	3	--	5
Pedestrian / Bicycle	--	--	--	2	--	--	--	1
Single Vehicle Crash	1	1	3	2	1	1	3	5
Head-on	--	--	--	5	--	1	--	1
	Crash Severity							
Property Damage	9	3	8	15	2	15	6	26
Non-Fatal Injury	4	2	3	8	1	7	5	15
Fatal Injury	--	--	--	1	--	--	--	--
	Ambient Light							
Daylight	4	3	7	11	2	14	6	27
Dusk or Dawn	2	--	3	3	--	1	1	5
Dark - Lighted Roadway	7	2	1	10	1	7	4	10
	Weather Condition							
Clear	6	4	8	20	3	15	7	27
Cloudy	1	--	2	2	--	3	2	8
Rain	5	2	1	1	--	3	2	4
Snow	1	--	--	1	--	1	--	3
	Time of Year							
December - February	3	2	3	11	1	8	1	13
March - May	2	2	3	6	2	5	3	13
June - August	2	--	5	3	--	3	3	8
September - November	7	1	--	4	--	6	4	8
	Year							
2016	4	1	6	10	1	10	3	17
2017	4	--	4	7	1	7	4	17
2018	5	4	1	7	1	5	4	8
	Summary							
Total crashes 2016 – 2018	13	5	11	24	3	22	11	42
Average crashes per year	4.3	1.7	3.7	8	1	7.3	3.7	14
Crash Rate*	.27	--	--	.53	--	.46	--	.87
District 6 Crash Rate*	Signalized Intersections: 0.71 Unsignalized Intersections 0.52							
Statewide Crash Rate*	Signalized Intersections: 0.78 Unsignalized Intersections 0.57							

*per million entering vehicles

The following Route 28 intersections have crash rates that exceed the MassDOT District 2 average:

- Center Street
- Stoughton Street
- North Street
- Warren Street (Route 139)
- Pleasant Street
- Allen Street at Nelson Drive
- Scanlon Drive at Russ Street

3.1.12 **HIGHWAY SAFETY IMPROVEMENT PROGRAM**

The MassDOT Highway Safety Improvement Program (HSIP) was evaluated to determine if the study area falls within a known high crash cluster. As shown in Figure 7 on the following page, there are 8 high crash clusters along the study corridor. An equation is utilized during the HSIP crash cluster analysis performed by MassDOT to assign each location an Equivalent Property Damage Only rating (EPDO). The equation factors in serious injuries and fatalities as well as non-serious injuries to determine the final rating. The HSIP high crash cluster intersections (and their EPDO scores) include:

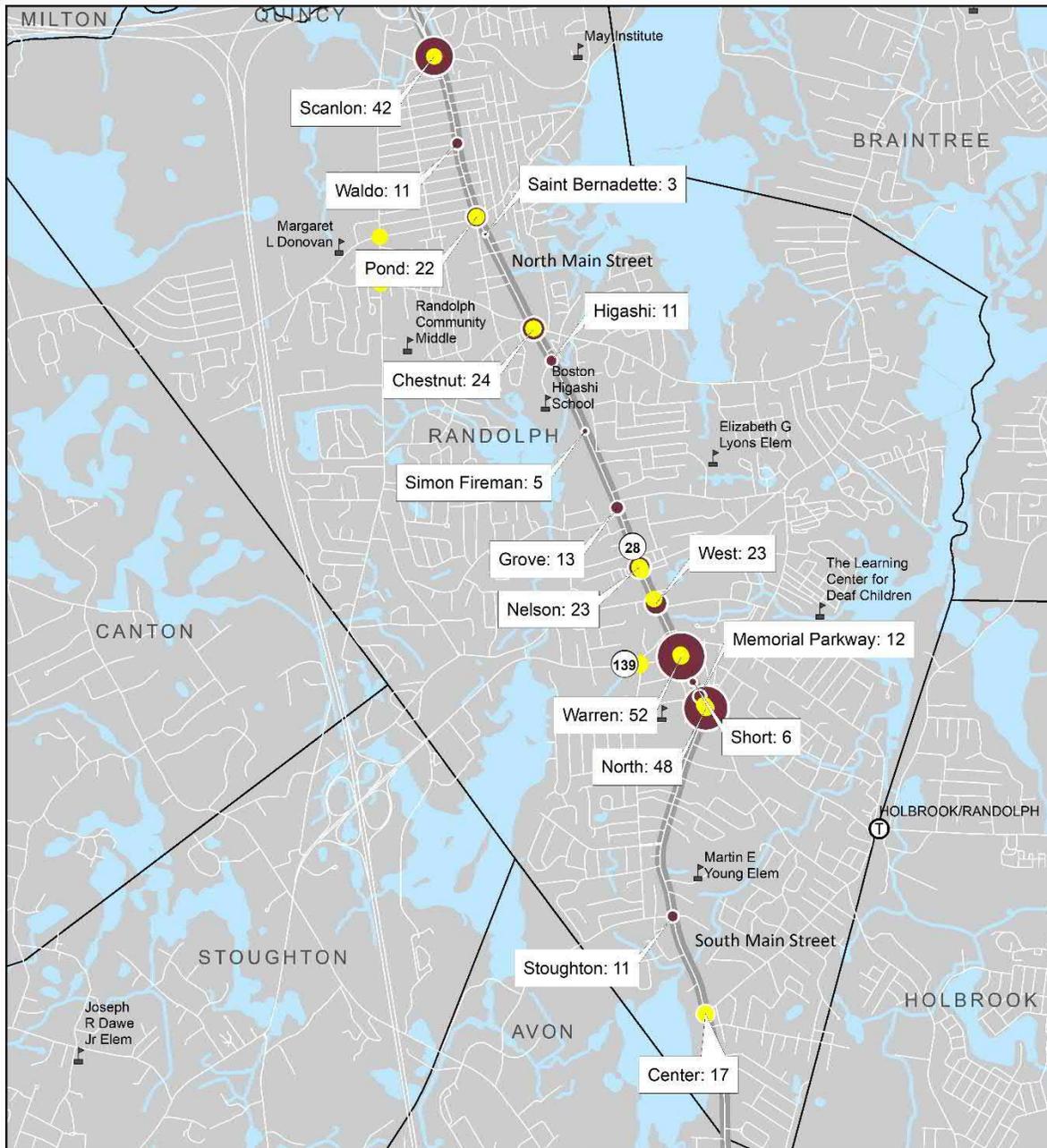
- Scanlon Drive / Russ Street at North Main Street (EPDO 285)
- Reed Street / Pond Street at North Main Street (EPDO 140)
- Chestnut Street / Oak Street at North Main Street (EPDO 202)
- Nelson Drive / Allen Street at North Main Street (EPDO 153)
- West Street at North Main Street (EPDO 128)
- Warren Street (Route 139) at North Main Street (EPDO 193)
- North Street at North Main Street (EPDO 380)
- Center Street at South Main Street (EPDO 134)

3.1.13 **PEDESTRIAN AND BICYCLIST CRASHES**

Of the 324 total crashes that took place between 2016 and 2018 within the study corridor, 10 collisions involved a bicyclist or pedestrian. Of those 10 collisions involving a bicyclist or a pedestrian:

- Eight resulted in injuries, one resulted in property damage only, and one resulted in a fatality
- The fatal injury was a pedestrian struck in the crosswalk at Chestnut Street and Oak Street

Figure 7 – Total Crashes 2016-2018



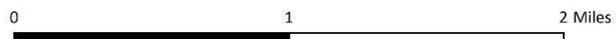
Route 28 Corridor Study - Total Crashes 2016-2018

- Fewest Crashes (3)
- Most Crashes (52)
- HSIP Crash Cluster (2015-2017)

Town of Randolph, MA

Route 28 Corridor Study

Data Source: MassGIS
 Issue Date: June 2021
 This Map is Intended for Planning Purposes Only



4.0 TRANSPORTATION OPERATIONS ANALYSIS

INTERSECTION LEVEL OF SERVICE

Capacity analyses were conducted to assess the quality of traffic flow at each of the study intersections along Route 28. This was performed for the existing weekday AM and PM peak hours using Trafficware's Synchro software package (Version 11).

For intersections, six levels of service (LOS), "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. The relationship between LOS and delay for unsignalized and signalized intersections are summarized in **Table 7** and **Table 8**, respectively.

Table 7 – Level of Service Criteria for Unsignalized Intersections

LOS	Unsignalized Intersection Criteria Average Total Delay (Seconds per Vehicle)	General Description
a	< 10.0	Free Flow
b	10.1 to 15.0	Stable flow (slight delays)
c	15.1 to 25.0	Stable flow (acceptable delays)
d	25.1 to 35.0	Approaching unstable flow (tolerable delay)
e	35.1 to 50.0	Unstable flow (intolerable delay)
f	> 50.0	Forced flow (jammed)

Table 8 - Level of Service Criteria for Signalized Intersections

LOS	Unsignalized Intersection Criteria Average Total Delay (Seconds per Vehicle)	General Description
A	< 10.0	Free Flow
B	10.1 to 20.0	Stable flow (slight delays)
C	20.1 to 35.0	Stable flow (acceptable delays)
D	35.1 to 55.0	Approaching unstable flow (tolerable delay)
E	55.1 to 80.0	Unstable flow (intolerable delay)
F	> 80.0	Forced flow (jammed)

In addition to delay and level of service, the analysis examined the volume to capacity ratio (v/c) and 95th percentile queues for each lane group. Movements that experience a v/c ratio greater than 1.0 operate over capacity and therefore receive a LOS F ranking regardless of the calculated average delay. The 95th percentile queue represents the length of vehicle queuing (in feet) that is only exceeded five percent of the evaluated peak hour.

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A summary of the weekday AM and PM peak hour capacity analysis results are displayed in **Table 9**. Existing conditions capacity analysis (Synchro) reports are provided in **Appendix E**.

Table 9 - Existing AM and PM Peak Hour Capacity Analysis Results

INTERSECTION	AM Peak				PM Peak			
	LOS	Delay (s/veh)	v/c	95% Q (feet)	LOS	Delay (s/veh)	v/c	95% Q (feet)
Route 28 at Center Street – Westbound Stop-Controlled								
Center St. – WBLR	F	419.6	1.78	560	F	738.8	2.47	685
Route 28 – SBL	B	10.7	0.05	5	A	9.4	0.08	5
Route 28 at Stoughton Street/Woodland Parkway – Eastbound/Westbound Stop-Controlled								
Stoughton St. – EB LTR	B	14.0	0.12	10	C	24.6	0.32	33
Woodland Pkwy. – WB LTR	C	17.5	0.02	3	D	27.1	0.02	3
Route 28 – NBL	A	8.2	0.02	3	A	9.8	0.04	3
Route 28 – SBL	A	9.3	0.01	0	A	8.6	0.00	0
Route 28 at Route 139 (Union Street)/North Street – Signalized								
Route 28 – EBLT	B	16.4	0.40	193	C	24.7	0.68	333
Route 28 – EBR	B	16.5	0.14	12	D	38.2	0.24	22
Union St. – WBLTR	C	30.3	0.78	#550	C	32.1	0.64	282
Route 28 – NBL	C	31.9	0.59	227	C	30.3	0.48	229
Route 28 – NBTR	C	28.3	0.56	253	C	26.6	0.40	216
North St. – SBLTR	D	45.8	0.68	113	E	55.6	0.88	#293
OVERALL	C	28.5	0.64		C	34.8	0.60	
Route 28 at Memorial Parkway - Signalized								
Memorial Pkwy – EBL	D	46.5	0.66	129	D	51.9	0.67	132
Memorial Pkwy – EBR	D	37.8	0.13	57	D	43.1	0.20	77
Route 28 – NBTL	B	13.3	0.85	#615	A	6.6	0.74	m#453
Route 28 – SBTR	A	8.8	0.27	156	B	10.9	0.41	262
OVERALL	B	16.6	0.82		B	15.8	0.70	
Route 28 at Route 139 (Warren St.)/Driveway - Signalized								
Warren St.-EBTL	D	46.1	0.86	#431	E	65.8	0.93	#397
Warren St.-EBTR	C	23.2	0.26	0	C	32.6	0.62	26
Driveway-WBL	C	21.4	0.06	24	C	26.5	0.19	37
Driveway-WBTR	C	21.6	0.08	46	C	26.1	0.19	80
Route 28 – NBLT	E	71.0	1.00	#228	F	236.4	1.43	#301
Route 28 - NBTR	E	72.1	1.06	#946	C	20.3	0.59	378
Route 28 - SBTL	D	41.7	0.88	#306	D	41.4	0.90	#463
Route 28 - SBR	C	20.8	0.09	18	C	22.2	0.19	42
OVERALL	D	53.2	0.94		E	60.4	1.13	
Route 28 at Pleasant Street-Westbound Stop-Controlled								
Pleasant St. – WBLR	F	301.5	1.37	235	F	460.1	1.79	373
Route 28 – SBL	B	13.8	0.20	20	B	10.8	0.13	13
Route 28 at West Street- Eastbound Stop-Controlled								
West St. – EBLR	F	975.8	2.87	478	F	1059.2	3.02	463
Route 28 – NBL	B	10.1	0.10	8	B	13.9	0.22	20
Route 28 at Nelson Drive/Allen Street- Eastbound/Westbound Stop-Controlled								
Nelson Dr. – EBLTR	F	150.7	0.66	68	F	66.2	0.41	43
Allen St. – WBLTR	F	1024.8	2.68	250	F	1940.6	4.86	565
Route 28 – NBL	A	9.5	0.01	0	B	10.7	0.03	3

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Route 28 – SBL	B	12.8	0.05	3	A	9.9	0.01	0
Route 28 at Grove Street- Eastbound Stop-Controlled								
Grove St. – EBLR	F	313.9	1.33	193	F	185.9	0.98	133
Route 28 – NBL	A	9.3	0.02	3	B	11.3	0.06	5
Route 28 at Liberty Street- Westbound Stop-Controlled								
Liberty St. – WBLR	F	287.9	1.31	213	F	302.2	1.34	210
Route 28 – SBL	B	12.9	0.12	10	B	10.1	0.07	5
Route 28 at Chestnut Street/Oak Street - Signalized								
Chestnut St. – EBL	F	127.6	1.05	#406	C	30.6	0.25	105
Chestnut St. – EBTR	D	53.1	0.75	#433	D	35.5	0.60	#409
Oak St. – WBLT	F	205.8	1.26	#399	D	38.0	0.65	#307
Oak St. – WBR	C	29.3	0.16	51	B	16.0	0.11	43
Route 28 – NBL	E	71.0	0.67	123	D	49.5	0.56	150
Route 28 – NBTR	D	47.7	0.92	#828	D	36.4	0.66	309
Route 28 – SBL	E	71.2	0.76	204	E	60.8	0.84	#461
Route 28 – SBTR	C	23.6	0.35	247	D	35.7	0.81	548
OVERALL	E	60.6	0.88		D	37.4	0.72	
Route 28 at Pond Street/Reed Street – Signalized								
Reed St. – EBTLR	D	42.1	0.88	#427	C	27.3	0.63	356
Pond St. – WBTLR	C	25.3	0.64	#264	F	143.8	1.21	#765
Route 28 – NBLTR	F	82.6	1.12	#727	C	24.3	0.67	328
Route 28 – SBLTR	B	15.1	0.54	201	E	58.7	1.02	#713
OVERALL	E	56.9	1.11		E	63.3	1.16	
Route 28 at Russ Street/Scanlon Drive - Signalized								
Scanlon Dr. – EBL	F	86.1	1.00	#434	D	35.9	0.59	168
Scanlon Dr. – EBLTR	F	94.0	1.03	#446	D	35.4	0.57	157
Russ St. – WBL	D	46.8	0.34	53	C	30.9	0.27	77
Russ St. – WBTR	F	97.1	0.89	#127	F	88.6	1.00	#247
Route 28 – NBL	D	51.1	0.36	41	D	45.4	0.47	47
Route 28 – NBTR	F	105.6	1.15	#713	C	22.8	0.62	226
Route 28 – SBL	F	150.7	1.13	#313	F	351.3	1.63	#376
Route 28 – SBT	B	16.1	0.35	171	C	30.8	0.89	#524
Route 28 – SBR	A	4.6	0.19	20	A	9.1	0.32	32
OVERALL	F	82.2	1.09		D	53.8	0.92	

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

m Volume for 95th percentile queue is metered by upstream signal.

Traffic patterns in the corridor are highly directional, with higher traffic volumes and congestion in the northbound direction during the AM peak period and higher traffic volumes and congestion in the southbound direction during the PM peak period. Due to the high volumes traveling along Route 28, Levels of Service are poor and delays are high at stop-controlled approaches to unsignalized intersections. The presence of long queues on side streets during peak hours have been confirmed through observations. To enter the Route 28 traffic flow, some drivers have been observed making aggressive maneuvers. Also, some motorists on Route 28 were observed providing a courtesy gap for vehicles entering from the side street during congested conditions. Also noteworthy is the high crash rates at some of these intersections, in particular Route 28 at Allen Street / Nelson Drive, where the high delays are likely a factor in some drivers making unsafe maneuvers which could be contributing to crashes.

Conditions during peak hours at signalized intersections vary throughout the corridor. Intersections in the vicinity of the Crawford Square/downtown area were found to be operating at overall Level of Service D or better for both AM and PM peak hours except for the intersection of Route 28 at Route 139 (Warren

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Street) which operates at an overall Level of Service E during the PM peak hour. The three signalized intersections towards the northern portion of the study area are operating closer to or over capacity, with overall Levels of Service of E or F during the AM peak hour, Levels of Service D or E during the PM peak hour, and several individual lane groups operating at Level of Service F during both peak hours.

TRAFFIC SIGNAL WARRANT ANALYSIS

Traffic signal warrant analyses are conducted to determine if signal control is or will be warranted in accordance with Manual on Uniform Traffic Control Devices (MUTCD) guidelines. A review of the seasonal axle correction factors maintained by the Massachusetts Department of Transportation (MassDOT) Highway Division indicates that traffic volumes in April, May, and June are below average, with seasonal correction factor values of less than one for an Urban Other Principal Arterial. To provide a more conservative analysis, none of the intersection turning movement counts were reduced with a seasonal correction factor. Although other warrants should be considered, MassDOT prefers that the Warrant 1 (Eight Hour Vehicular Volume) is satisfied to confirm consideration of installing a traffic signal.

The available traffic data are generally compared with the requirements established in the MUTCD for the following volume-related warrants:

- Warrant 1 – Eight Hour Vehicular Volume
 - Condition A – Minimum Vehicular Volume
 - Condition B – Interruption of Continuous Traffic
 - Combination of Conditions A and B
- Warrant 2 – Four-Hour Vehicular Volume; and
- Warrant 3 – One-Hour Vehicular Volume.

Typically, at least one of the eight-hour warrants (Warrant 1, Condition A or B) should be met before signal control is considered. The peak-hour volume warrant (Warrant 3) is generally applied only in unusual cases such as driveways serving large office/industrial complexes, manufacturing plants, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short period of time. In addition, the combination of Conditions A and B under Warrant 1 should only be applied after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Traffic signal warrant analysis was conducted for the following unsignalized intersections along the Route 28 corridor:

- Route 28 at Center Street – Westbound Stop-Controlled
- Route 28 at Stoughton Street/Woodland Parkway – Eastbound/Westbound Stop-Controlled
- Route 28 at Pleasant Street-Westbound Stop-Controlled
- Route 28 at West Street- Eastbound Stop-Controlled
- Route 28 at Nelson Drive/Allen Street- Eastbound/Westbound Stop-Controlled
- Route 28 at Grove Street- Eastbound Stop-Controlled
- Route 28 at Liberty Street- Westbound Stop-Controlled

Full reports of the analysis for each intersection are included in **Appendix F**.

Route 28 at Center Street

The following MUTCD Traffic Signal Warrants are satisfied for the Route 28 at Center Street intersection:

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- Warrant 1A (Minimum Vehicular Volume Warrant)
- Warrant 1B (Interruption of Continuous Traffic Warrant)
- Warrant 2 (Four-Hour Vehicular Volume Warrant)
- Warrant 3 (One-Hour Vehicular Volume Warrant)

Route 28 at Stoughton Street / Woodland Parkway

None of the traffic signal warrants evaluated were satisfied for the existing traffic condition.

Route 28 at Pleasant Street

The following MUTCD Traffic Signal Warrants are satisfied for the Route 28 at Pleasant Street intersection:

- Warrant 1B (Interruption of Continuous Traffic Warrant)
- Warrant 2 (Four-Hour Vehicular Volume Warrant)
- Warrant 3 (One-Hour Vehicular Volume Warrant)

Route 28 at West Street

The following MUTCD Traffic Signal Warrants are satisfied for the Route 28 at West Street intersection:

- Warrant 1B (Interruption of Continuous Traffic Warrant)
- Warrant 2 (Four-Hour Vehicular Volume Warrant)
- Warrant 3 (One-Hour Vehicular Volume Warrant)

Route 28 at Nelson Drive / Allen Street

The following MUTCD Traffic Signal Warrants are satisfied for the Route 28 at Nelson Drive and Allen Street intersection:

- Warrant 1B (Interruption of Continuous Traffic Warrant)
- Warrant 2 (Four-Hour Vehicular Volume Warrant)
- Warrant 3 (One-Hour Vehicular Volume Warrant)

Route 28 at Grove Street

None of the traffic signal warrants evaluated were satisfied for the existing traffic condition.

Route 28 at Liberty Street

The following MUTCD Traffic Signal Warrants are satisfied for the Route 28 at Liberty Street intersection:

- Warrant 2 (Four-Hour Vehicular Volume Warrant)
- Warrant 3 (One-Hour Vehicular Volume Warrant)

Although the Route 28 Liberty Street intersection meets the four-hour warrant (Warrant 2) and the one-hour warrant (Warrant 3), the average-month traffic volumes do not currently meet any of the eight-hour warrants (Warrant 1) preferred by MassDOT for signalization.

PEDESTRIANS AND BICYCLES ANALYSIS

4.1.1 PEDESTRIANS

There are four types of crosswalk markings used in the study corridor. There is a lack of consistency in crosswalk type and color. Outside of the downtown area, only the intersection of North Main Street and Pond and Reed Streets has a stamped colored crosswalk. Figure 8 displays a photo example of each crosswalk typology found within the study area.

- Two parallel lines (8 locations)
- Continental, ladder style (10 locations)
- Stamped pavement painted blue with two parallel lines (2 locations)
- Stamped pavement painted red with two parallel lines (3 locations)

Figure 8- Existing Crosswalk Typologies



4.1.2 CURB RAMPS

All of the crosswalks along Route 28 in the study area have curb ramps. Many of the crosswalks have no detectable warning panels, including all six in the South Main Street segment. The curb ramps that **do not currently include** tactile warning panels include:

- South of Acorn Drive
- South of Woodland Parkway
- North of Lou Courtney Drive
- South of Van Beal Road at Hurley Funeral Home
- Chestnut Street at Oak Street

All crosswalks at unsignalized locations have crosswalk signage, except north of West Street. There are only two unsignalized study crosswalks that cross more than two travel lanes: north of West Street and

south of Diauto Drive. The unsignalized crosswalk south of Pleasant Street crosses two travel lanes plus a wide striped flush median.

4.1.3 SIDEWALKS

South Main Street

There are concrete sidewalks with granite curbing on both sides of South Main Street throughout the study corridor. They are in good condition, have few to no obstructions, and do not feature a landscaped buffer between the sidewalk and the curb. Figure 9 displays a map of crosswalk surface materials and conditions throughout the Route 28 study corridor.

North Main Street

While the concrete sidewalks with granite curbing are in good condition, many portions of asphalt sidewalks along North Main Street are in poor or fair condition. There is a sidewalk gap on the west side of North Main Street between #682 North Main Street and the Boston Higashi School north driveway. Trees, utility poles, and other occasional obstructions exist. There are some segments of asphalt sidewalk that need to be replaced or repaired. Between Stacey Street and Jones Street there is little to no sidewalk definition separating the sidewalk from the roadway.

Figure 10 displays a map indicating the presence or absence of sidewalks, their surface materials, and their general condition.

Americans with Disability Act (ADA)

The Americans with Disability Act is a civil rights law mandating equal opportunity for people who identify as being mobility impaired. Towns and cities within the Commonwealth are expected to provide reasonable accommodations for folks using public ways. Pedestrian curb ramps and tactile warning strips are required for crosswalks to make traversing public ways more accessible for mobility or sight-impaired individuals.

Under an existing contract, BETA will soon be assessing sidewalks and curb ramps along town-accepted roads and conducting an ADA-compliance assessment of some of the portion of Route 28 between Depot Street and North Street. The assessment will examine sidewalk and curb ramp materials, conditions, and measure ADA-compliance criteria.

The data will be used to establish an ADA self-evaluation and transition plan required for compliance to the Americans with Disabilities Act. When making an alteration to the roadway which impacts the pedestrian network, all improvements must adhere to the latest ADA and 521CMR standards.

Figure 9 - Sidewalk Presence, Surface Materials, and Condition



Route 28 Corridor Study - Sidewalk Conditions
 South Main Street

Town of Randolph, MA

Route 28 Corridor Study

Data Source: MassGIS
 Issue Date: May 2021
 This Map is Intended for Planning Purposes Only

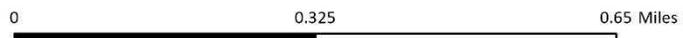
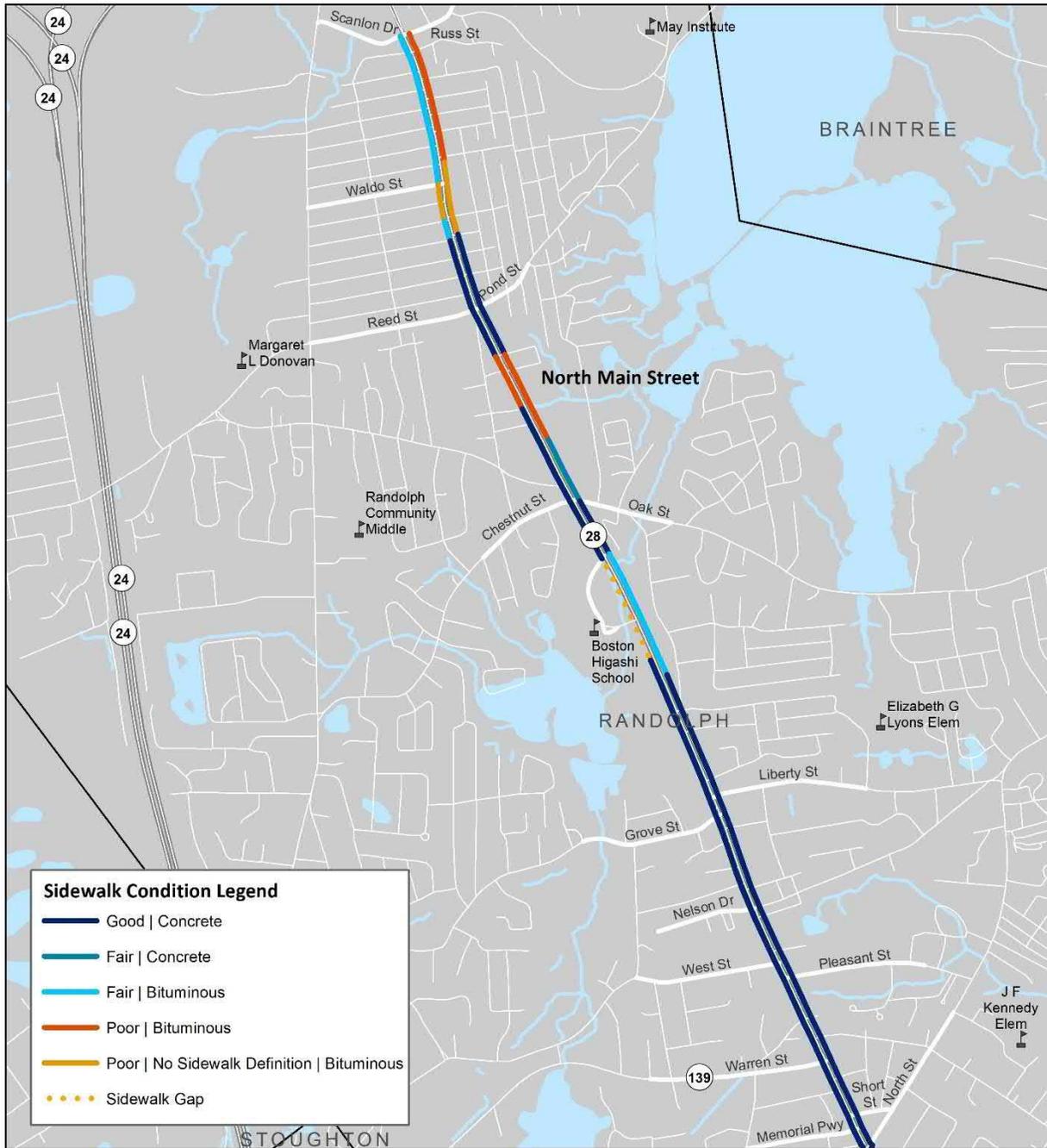


Figure 10 – Sidewalk Presence, Surface Materials, and Condition (continued)

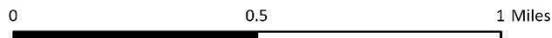


Route 28 Corridor Study - Sidewalk Conditions
 North Main Street

Town of Randolph, MA

Route 28 Corridor Study

Data Source: MassGIS
 Issue Date: May 2021
 This Map is Intended for Planning Purposes Only



4.1.4 BICYCLE LEVEL OF TRAFFIC STRESS

Bicycle Level of Traffic Stress (BLTS) is a rating given to a road segment or crossing indicating the traffic stress it imposes on bicyclists using that road. Factors on inputs including geometric and operational characteristics include:

- Lane width
- Vehicle speed
- Traffic volume
- % of trucks
- Posted speed limits

The level of traffic stress uses a rating system of 1 through 4, and can be defined using the following criteria:

- **LTS 1:** Strong separation from all except low speed, low volume traffic. Simple crossings. Suitable for children.
- **LTS 2:** Except in low speed / low volume traffic situations, cyclists have their own place to ride that keeps them from having to interact with traffic except at formal crossings/ physical separation from higher speed and multilane traffic. Crossings that are easy for an adult to negotiate. Corresponds to design criteria for Dutch bicycle route facilities. A level of traffic stress that most adults can tolerate, particularly those sometimes classified as “interested but concerned”
- **LTS 3:** Involves interaction with moderate speed or multilane traffic, or close proximity to higher speed traffic. A level of traffic stress acceptable to those classified as “enthused and confident”
- **LTS 4:** Involves interaction with higher speed traffic or close proximity to high-speed traffic. A level of stress acceptable only to those classified as “strong and fearless”ⁱ

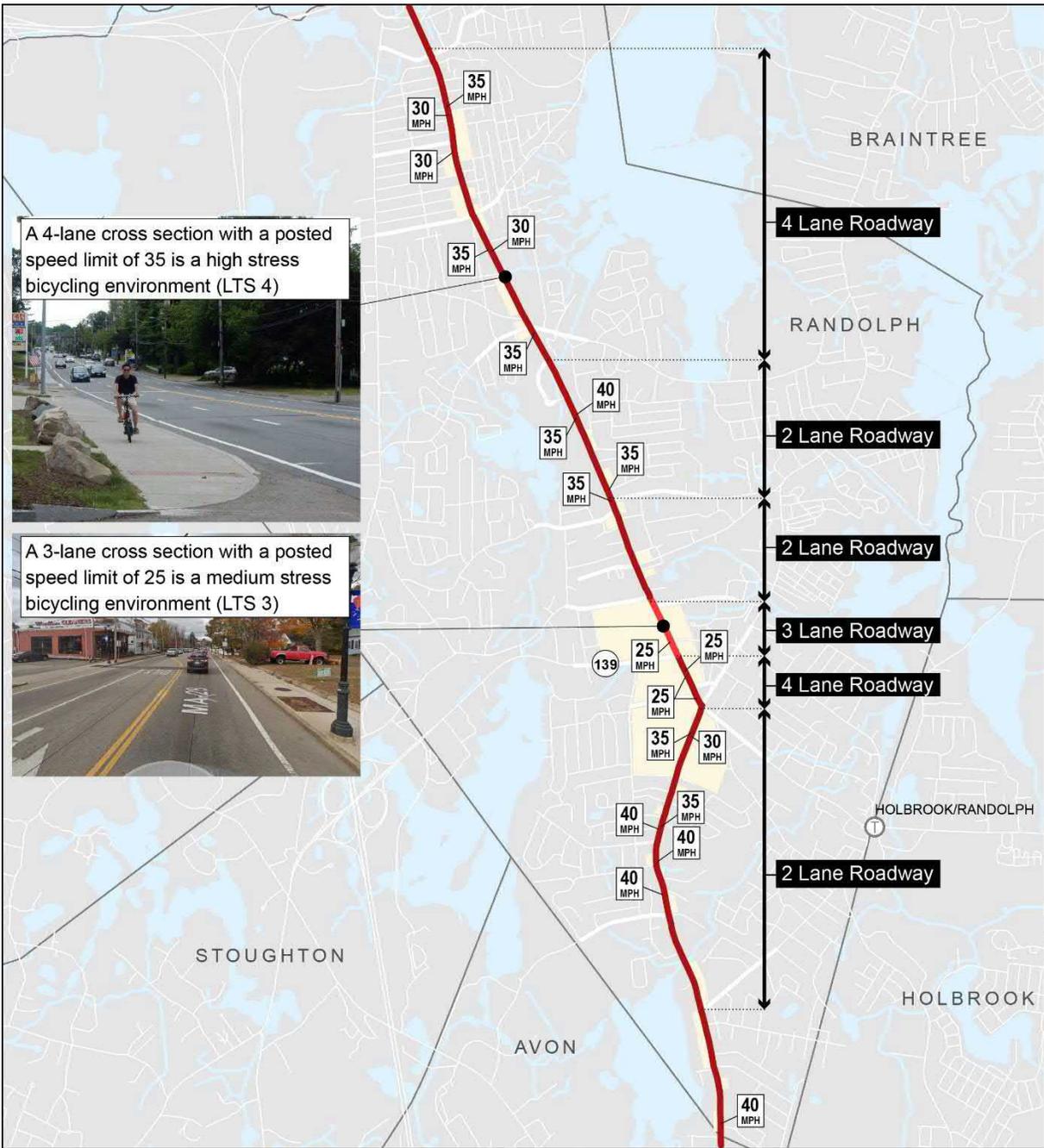
Table 10 was utilized to examine the variety of lane configurations found throughout the corridor, as well as posted speeds, to determine the appropriate LTS rating for Route 28 in Randolph.

Table 10 – BLTS Criteria for Mixed Trafficⁱⁱ

Speed Limit or Prevailing Speed	Street Width		
	2-3 lanes	4-5 lanes	6+ lanes
Up to 25 MPH	LTS 1 or 2*	LTS 3	LTS 4
30 MPH	LTS 2 or 3*	LTS 4	LTS 4
>= 35 MPH	LTS 4	LTS 4	LTS 4
<i>*Use lower value for streets without marked centerlines and with ADT <= 3,000; use higher value otherwise</i>			

Figure 11 displays a map indicating the BLTS score for each roadway segment based on posted speed and number of lanes. It should be noted that on a roadway segment with a different posted speed in the northbound or southbound directions, the high speed was chosen to be used for the BLTS analysis.

Figure 11– Bicycle Level of Traffic Stress, Roadway Lane Configuration, and Posted Speed Limits



Lane Configuration | Posted Speed | Bicycle LTS

Bicycle Level of Traffic Stress

- LTS 4 - High Stress
- LTS 3
- LTS 2
- LTS 1 - Low Stress

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Route 28 Corridor Study

Data Source: MassGIS
 Issue Date: May 2021
 This Map is Intended for Planning Purposes Only



5.0 IDENTIFICATION OF ISSUES AND DEFICIENCIES

This section summarizes existing transportation safety and mobility issues and deficiencies identified along the Route 28 study area. The issues and deficiencies are identified based on the review and analysis of existing transportation conditions summarized in Sections 1 through 5, and a physical inventory and review of the study corridor by BETA staff. Safety and mobility and deficiencies are separated into pedestrians and bicycles, traffic safety and operations, and transit sections.

PEDESTRIAN AND BICYCLE ISSUES

There are several issues which make walking and biking along the Route 28 study corridor challenging. These include:

- The absence of any bicycle facilities along the entire study corridor, combined with high volumes and high speeds of motor vehicles in the corridor, makes bicycle travel unsafe and uncomfortable for those of all ages and abilities.
- A lack of formal bicycle parking - there are two bicycle racks in the downtown area
- A total of 10 crashes involving a pedestrian or bicyclist occurred in the study area between 2016 and 2018. Eight of the 10 crashes involved an injury, including one fatality at the intersection of North Main Street at Oak Street and Chestnut Street.
- There is a one-quarter mile gap in the sidewalk network on the west side of North Main Street between 682 North Main Street on the south and the Boston Higashi School north driveway.
- Overall, most sidewalks along the study corridor are concrete and in fair to good condition. However, there are some locations where the sidewalk is in poor condition and/or are asphalt, including approximately one-quarter mile on the east side of North Main Street between #659 North Main Street and Boston Higashi School north driveway.
- There is generally no buffer strip between the sidewalks and Route 28 which makes it uncomfortable for pedestrians walking besides vehicles and trucks traveling at high speeds.
- In the vicinity of commercial developments throughout the corridor there are areas of sidewalk that are directly adjacent to parking areas with no physical or visual separation to protect pedestrians from potential encroachment.
- There are segments along the corridor that contain numerous closely-spaced access driveways, some of which are continuous and/or excessively wide which increases exposure of pedestrians to more potential areas of conflict with motor vehicles.
- Outside of the downtown area there are very few street trees. Street trees provide shade and make the walking environment more pleasant and inviting for pedestrians.
- Occasional obstructions on the sidewalks are present and include utility poles and mailboxes which make an unfriendly pedestrian environment particularly for people with disabilities.
- There are two unsignalized study crosswalks that cross more than two travel lanes: north of West Street and south of Diauto Drive. The unsignalized crosswalk south of Pleasant Street crosses two travel lanes plus a wide striped flush median. The crosswalk north of Lou Courtney Drive at Martin E. Young School is also unsignalized.
- There is a lack of consistency in crosswalk type and color. Four types of crosswalks are used throughout the study corridor. Some crosswalks are deteriorated.
- Ten of the crosswalks across Route 28 have no detectable warning panels, including all six in the South Main Street segment.

TRAFFIC SAFETY AND OPERATIONS

The following is a summary of traffic safety and operations issues identified withing the Route 28 study corridor:

- The following eight study intersection have been identified as high crash locations that also listed as a Highway Safety Improvement Program (HSIP) crash cluster:
 - South Main Street and Center Street (unsignalized)
 - South Main Street at North Main Street, North Street, and Union Street (signalized)
 - Also listed as Top 200 Intersection Location 2015-2017
 - North Main Street at Warren Street (Rt.139) (signalized)
 - North Main Street at Pleasant Street and West Street (unsignalized)
 - North Main Street at Allen Street and Nelson Drive (unsignalized)
 - North Main Street at Chestnut Street and Oak Street (signalized)
 - North Main Street at Reed Street and Pond Street (signalized)
 - North Main Street at Russ Street and Scanlon Drive (signalized)
 - Also listed as Top 200 Intersection Location 2015-2017
- High traffic volumes and closely-spaced intersections create congestion and long vehicle queues during peak periods, especially in the Crawford Square downtown area.
- The following 10 study intersections experience poor Level of Service (LOS E or F) conditions in the AM and/or PM peak hours:
 - South Main Street and Center Street (AM/PM)
 - North Main Street and Warren Street (Rt. 139) (PM)
 - North Main Street and Pleasant Street (AM/PM)
 - North Main Street and West Street (AM/PM)
 - North Main Street at Allen Street and Nelson Drive (AM/PM)
 - North Main Street and Grove Street (AM/PM)
 - North Main Street and Liberty Street (AM/PM)
 - North Main Street at Chestnut Street and Oak Street (AM)
 - North Main Street at Pond Street and Reed Street (AM/PM)
 - North Main Street at Russ Street and Scanlon Drive (AM)
- High traffic volumes along Route 28 and on unsignalized side streets results in few gaps for motorists to enter the main traffic flow. Motorists tuning left must therefore drive aggressively to fill a short gap in Route 28 traffic and/or rely on the courtesy of a South Main Street motorist to allow them to turn.
- The following unsignalized intersections meet one or more signal warrants:
 - South Main Street and Center Street (8-hour, 4-hour, peak hour)
 - North Main Street and Pleasant Street (8-hour, 4-hour, peak hour)
 - North Main Street and West Street (8-hour, 4-hour, peak hour)
 - North Main Street at Allen Street and Nelson Drive (4-hour and peak hour)
 - North Main Street and Liberty Street (4-hour)
- The following four-way unsignalized intersections have off-set geometric alignments between the side streets that result in conflicts between motorists making turning movements into and out of the side streets
 - South Main Street at Stoughton Street and Woodland Parkway
 - North Main Street at Allen Street and Nelson Drive
 - North Main Street at Mt. Pleasant Street and Wales Avenue

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- North Main Street at Grove Street and Liberty Street
- Several smaller intersections on North Main Street between Pond Street/Reed Street and Russ Street/Scanlon Drive
- High traffic volumes along Route 28 and many closely-spaced commercial driveways create conflicts between vehicles.
- Vehicle speeds were recorded 6 and 11 mph above the 85th percentile speeds on Route 28 south of Chestnut Street and north of Pond Street
- There are various posted speed limits along the Route 28 study corridor that include 25, 30, 35, and 40 mph. Drivers frequently travel above posted speed limits.
- The southbound right turn lane from North Main Street to Grove Street has a large turn radius that encourages high speed and is a safety issue for pedestrians in the crosswalk.
- Turner Lane intersects the North Main Street less than 50 feet north of the signalized intersection with South Main Street, North Street, and Union Street. Vehicles turning left from Turner Lane onto North Street northbound conflict with vehicles entering and exiting the signalized intersection.

TRANSIT

The following is a summary of transit issues identified withing the Route 28 study corridor:

- Of the 92 bus stops along the Route 28 study corridor, only five have shelters and only three have benches. There are several high ridership stops along the study corridor with no shelter or bench. Providing a high-quality bus stop and other amenities can improve the transit and pedestrian experience and help to encourage transit use, especially in inclement weather.
- Several of the 92 bus stops along the Route 28 study corridor are closely spaced, some with very low ridership. Having too many stops can increase bus travel time and conflicts between vehicles.

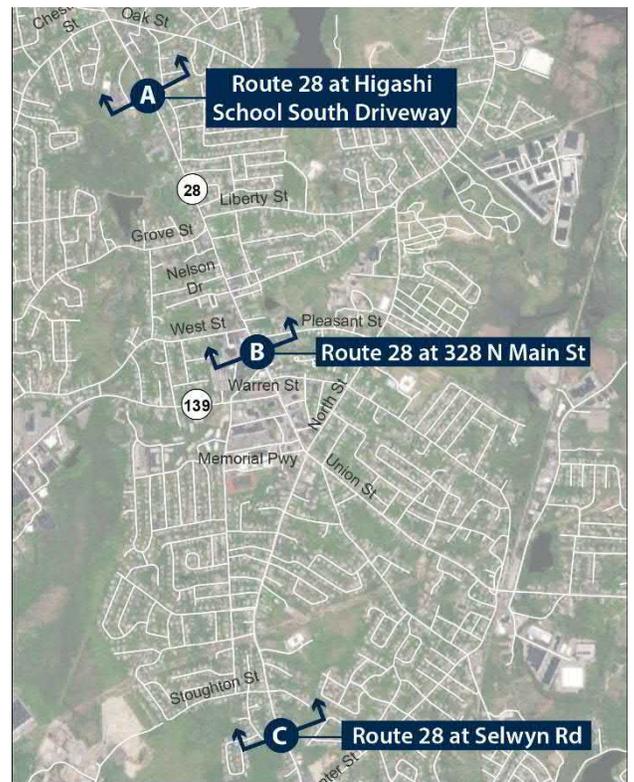
6.0 PROPOSED IMPROVEMENTS

Transportation improvements were developed for the Route 28 study corridor in Randolph. Recommendations were developed to improve safety, mobility, accessibility, and connectivity for traffic, pedestrians, bicyclists, and transit. The improvements were based on the analysis results, inventory, and observations along the study corridor during peak and off-peak periods. The recommendations were divided into short-, mid-, and long-term measures. The short- and mid-term recommendations include many safety measures that can be implemented quickly to improve safety conditions for all users. Many of the recommendations can be implemented within the existing roadway right-of way.

The recommendations have been separated into four segments along the Route 28 study corridor. In addition, an Other category includes measures that apply to the entire Route 28 study corridor.

Figure 12 at right shows the location of cross section graphics that depict proposed roadway improvements.

Figure 12 - Section Graphic Locations



SEGMENT 1 - SOUTH MAIN STREET

Figure 13, Figure 14, and Figure 15 show the improvements developed for the South Main Street segment between Acorn Street and North Main Street at North Street. The improvements include:

Short-Term

- Repaint faded crosswalks across South Main Street with continental striping
- Optimize signal timing at South Main Street/North Main Street including adequate time for the pedestrian phase and the northbound left-turn phase.

Mid-Term

- Stripe buffered bicycles lanes on both sides of South Main Street
- Provide enhanced pavement markings (green lanes with dotted white lane lines) for bicycle lanes at conflict points such as major intersections and bus stops.
- Install a Rectangular Rapid Flashing Beacon (RRFB) at the intersection of South Main Street at Lou Courtney Drive for the Martin E. Young School
- Install detectable warning panels at pedestrian curb ramps
- Install Adaptive Signal Control at the intersection of South Main Street and North Main Street and coordinate with signal at Memorial Parkway

Long-Term

- Signalize the intersection of South Main Street and Center Street
- Consider the installation of sidewalk street trees and a landscaped grass buffer throughout the corridor

Figure 13 – Section A: Proposed Buffered Bike Lane Cross Section on South Main Street at Selwyn Road

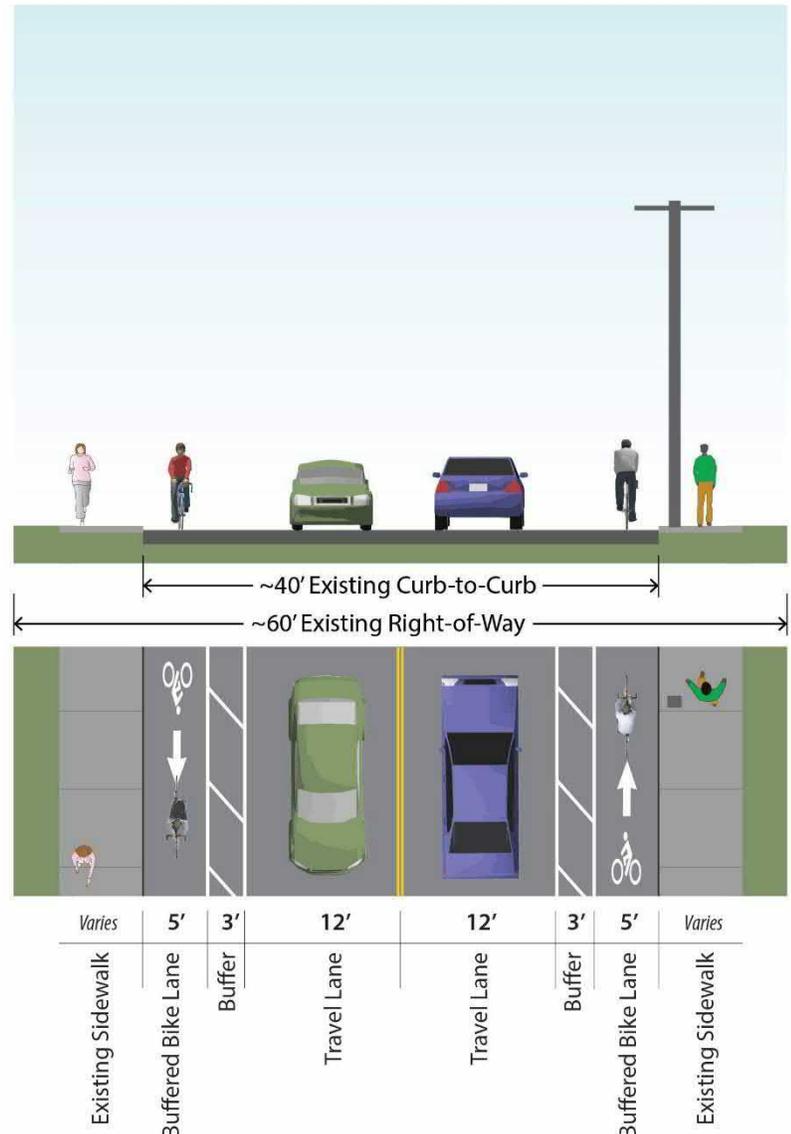
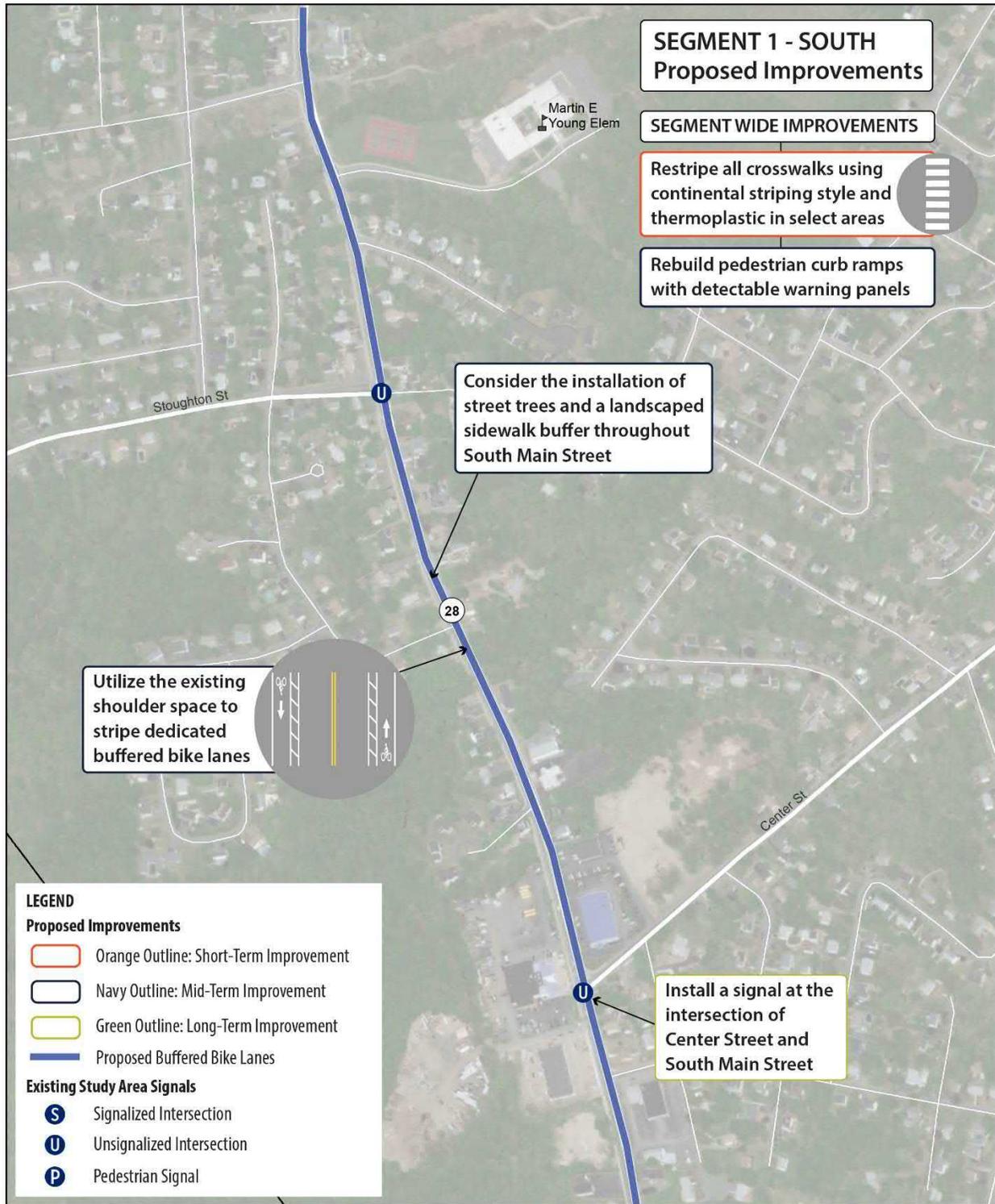


Figure 14 - Proposed Improvements Inset Map 1 (Segment 1-South)



Inset 1: South Main Street - Martin Young Elem. to Center Street

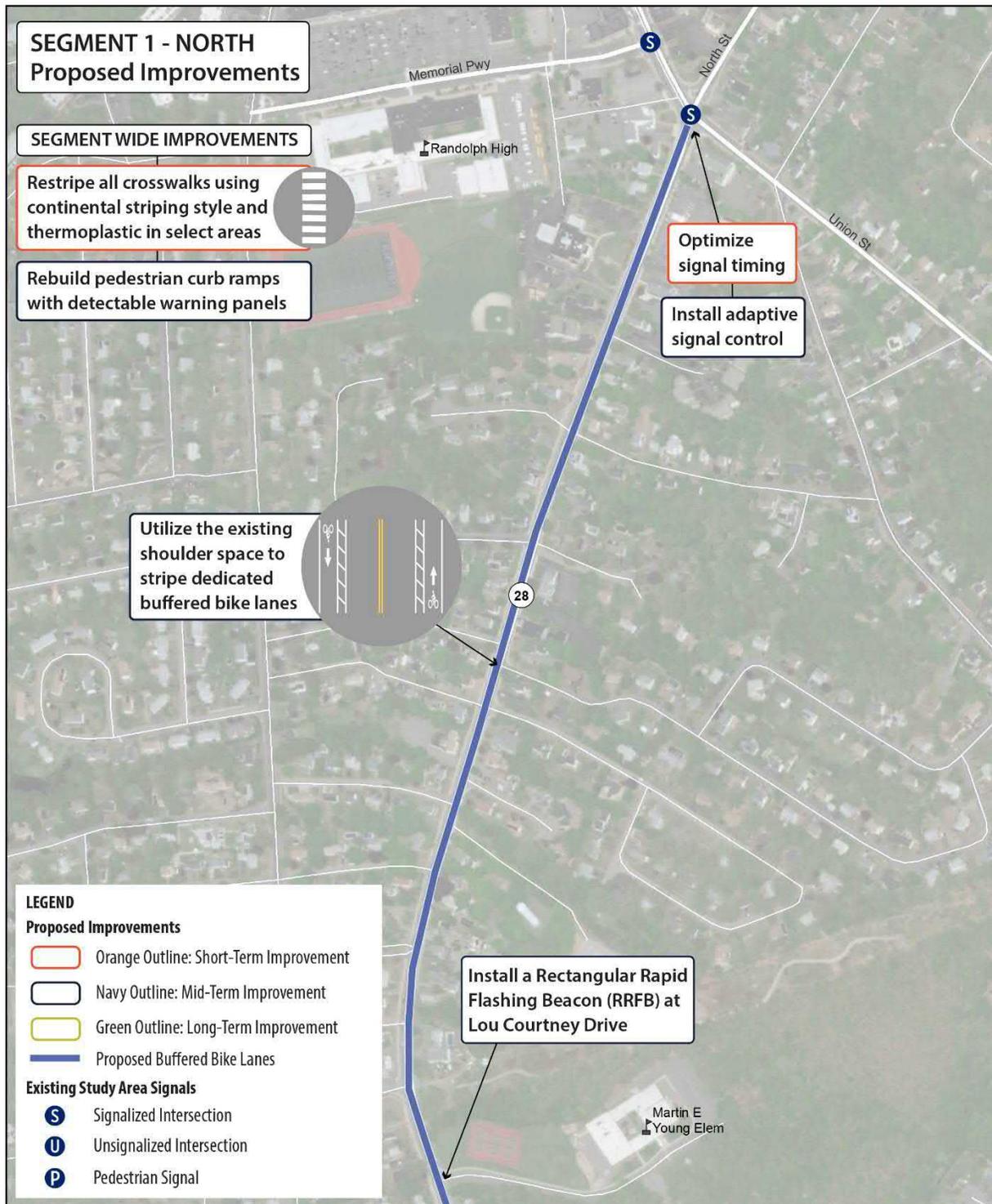
Route 28 Corridor Study

0 0.125 0.25 Miles



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Figure 15 – Proposed Improvements Inset Map 2 (Segment 1-North)



Inset 2: South Main Street - North Street to Martin Young Elem.

Route 28 Corridor Study

0 0.125 0.25 Miles

SEGMENT 2 - NORTH MAIN STREET BETWEEN SOUTH MAIN STREET AND WEST STREET

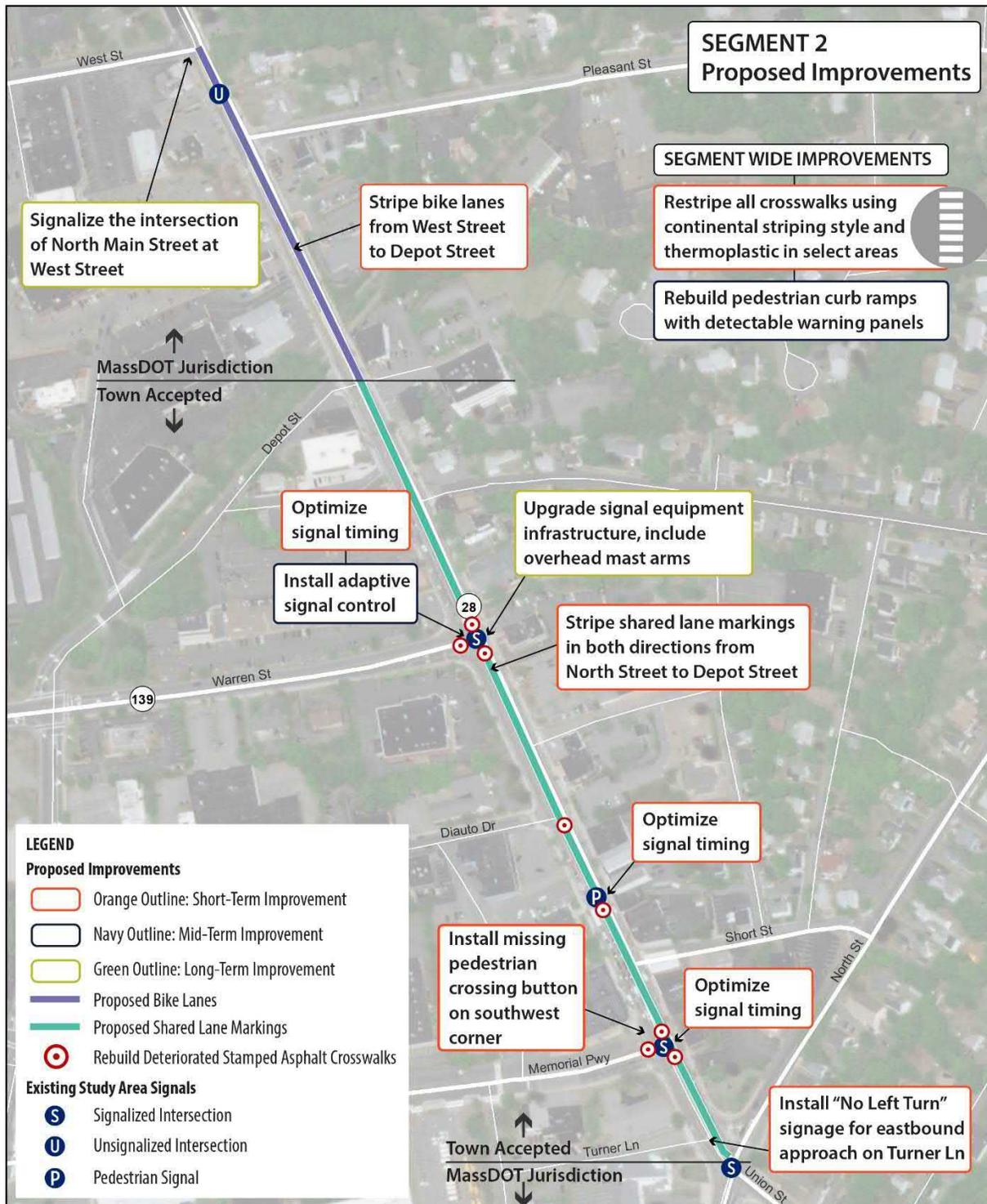
This segment includes the Crawford Square downtown area which is comprised of retail and commercial businesses and on-street parking.

Figure 16 and Figure 17 show the improvements developed for this segment. The improvements include:

Short-Term

- Repaint faded crosswalk across North Main Street at West Street with continental striping
- Raise the height of the crosswalk signs at Diauto Drive to seven feet (bottom of sign)
- Install No Left Turn sign on the eastbound Turner Lane approach to North Main Street
- Install missing pedestrian button on the southwest corner of the North Main Street and Memorial Parkway intersection
- Install bicycle Sharrow pavement markings on North Main Street between North Street and Depot Street in both directions
- Install missing Stop sign on the Nelson Drive eastbound approach to North Main Street
- Optimize signal timing to include adequate time for pedestrian phases at:
 - North Main Street and Memorial Parkway (in coordination with South Main and North Main signal)
 - Warren Street (Rt. 139) including increasing All Red clearance phase
 - Pedestrian signal between Short Street and Diauto Drive
- Stripe bicycle lanes on both direction on North Main Street between Depot Street and West Street

Figure 17 - Proposed Improvements Inset Map 3 (Segment 2)



Inset 3: North Main Street - Pleasant Street to North Street

Route 28 Corridor Study

0 0.075 0.15 Miles



SEGMENT 3 - NORTH MAIN STREET BETWEEN WEST STREET AND BOSTON HIGASHI SCHOOL NORTH DRIVEWAY

Figure 18, Figure 19 and Figure 20 display maps that show the improvements developed for this section of North Main Street. The improvements include:

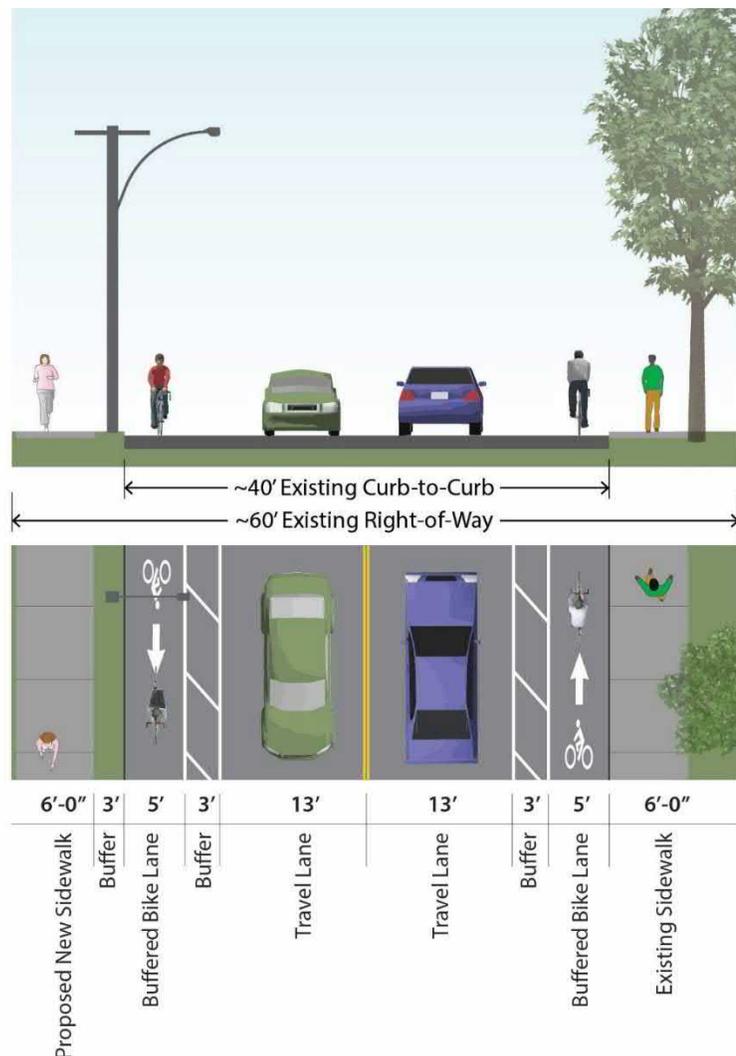
Short-Term

- Repaint crosswalks across North Main Street with continental striping
- Install crosswalk signs on both sides of crosswalk north of West Street

Mid-Term

- Install an overhead flashing beacon at the intersection of North Main Street at Allen Street and Nelson Drive
- Stripe buffered bicycles lanes on both sides of North Main Street between West Street and Boston Higashi School north driveway
- Construct six-foot wide concrete sidewalk, granite curbing, grass buffer strip, and trees on the west side of North Main Street between #682 North Main Street on the south and the Boston Higashi School north driveway (approximately 1,400 feet)
- Install trees and tree pits on the west side of North Main Street in the existing grass buffer strip and sidewalk
- Install detectable warning panels at pedestrian curb ramps
- Tighten radius on southbound right-turn slip lane on North Main Street at Grove Street to slow turning vehicles and improve safety for pedestrians in crosswalk
- Realign crosswalk on Orchard Street to closer to North Main Street to improve visibility of pedestrians in crosswalk

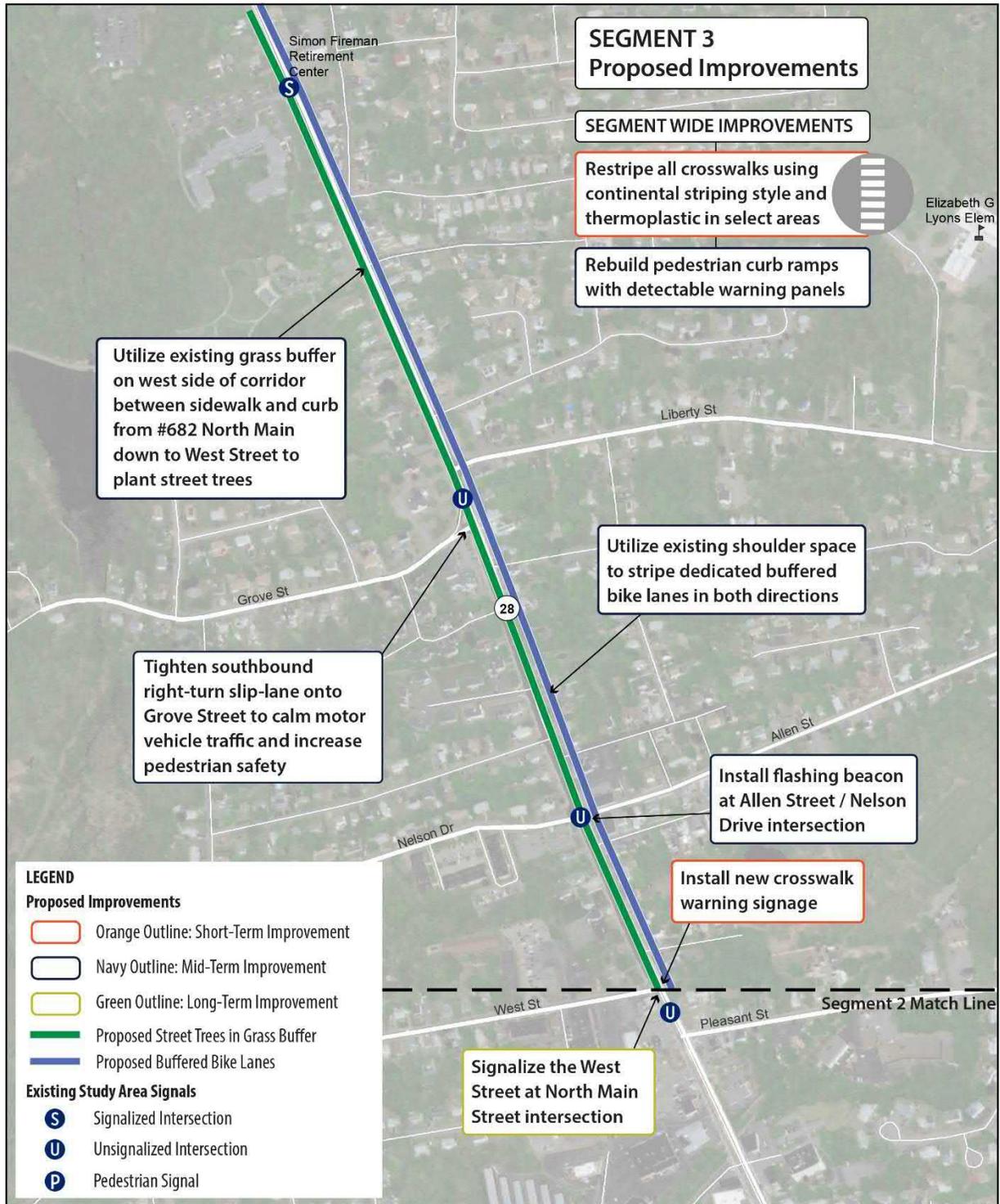
Figure 18 – Section C: Proposed Buffered Bike Lane Cross Section at Boston Higashi School South Driveway



Long-Term

- Replace asphalt sidewalk on the east side of North Main Street between #659 North Main Street and Boston Higashi School north driveway

Figure 19 - Proposed Improvements Inset Map 4 (Segment 3)



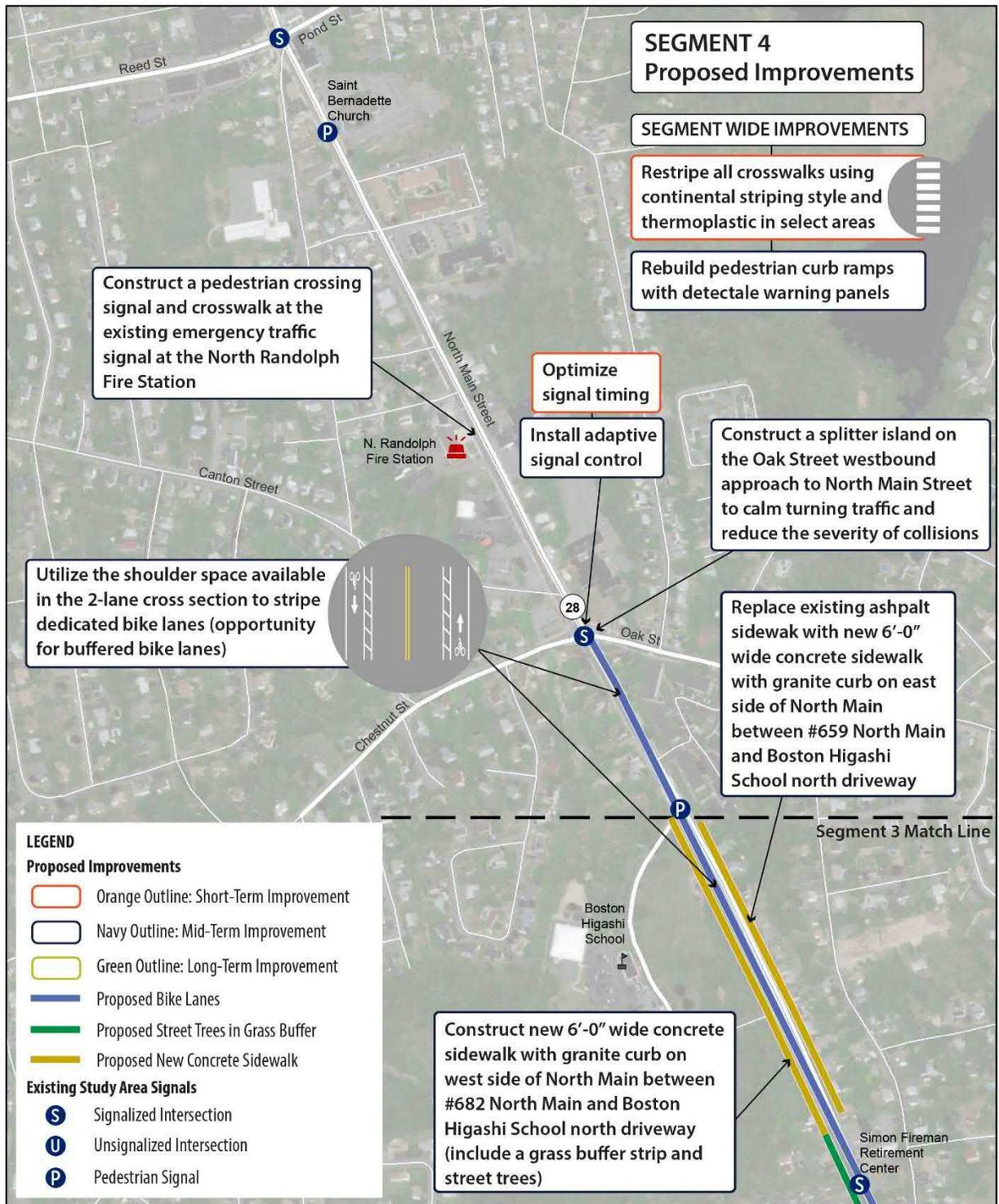
Inset 4: North Main Street - Simon Fireman to Pleasant Street

Route 28 Corridor Study

0 0.125 0.25 Miles



Figure 20 - Proposed Improvements Inset Map 5 (Segment 3 & 4)



Inset 5: North Main Street - Reed Street to Simon Fireman

Route 28 Corridor Study

0 0.125 0.25 Miles



SEGMENT 4 - NORTH MAIN STREET BETWEEN BOSTON HIGASHI SCHOOL NORTH DRIVEWAY AND RUSS STREET AND SCANLON DRIVE

Figure 21 displays a map that shows the improvements developed for this section of North Main Street. The improvements include:

Short-Term

- Repaint crosswalks across North Main Street with continental striping, including crosswalks at the Chestnut Street and Oak Street intersection.
- Optimize signal timing at North Main and Chestnut Street at Oak Street, North Main Street and Reed Street at Pond Street, and North Main Street at Russ Street and Scanlon Drive
- Improve striping on the eastbound Scanlon Drive approach to North Main Street to clarify lane arrangements as one exclusive left-turn lane and one shared left-through-right lane (as the existing signage indicates).

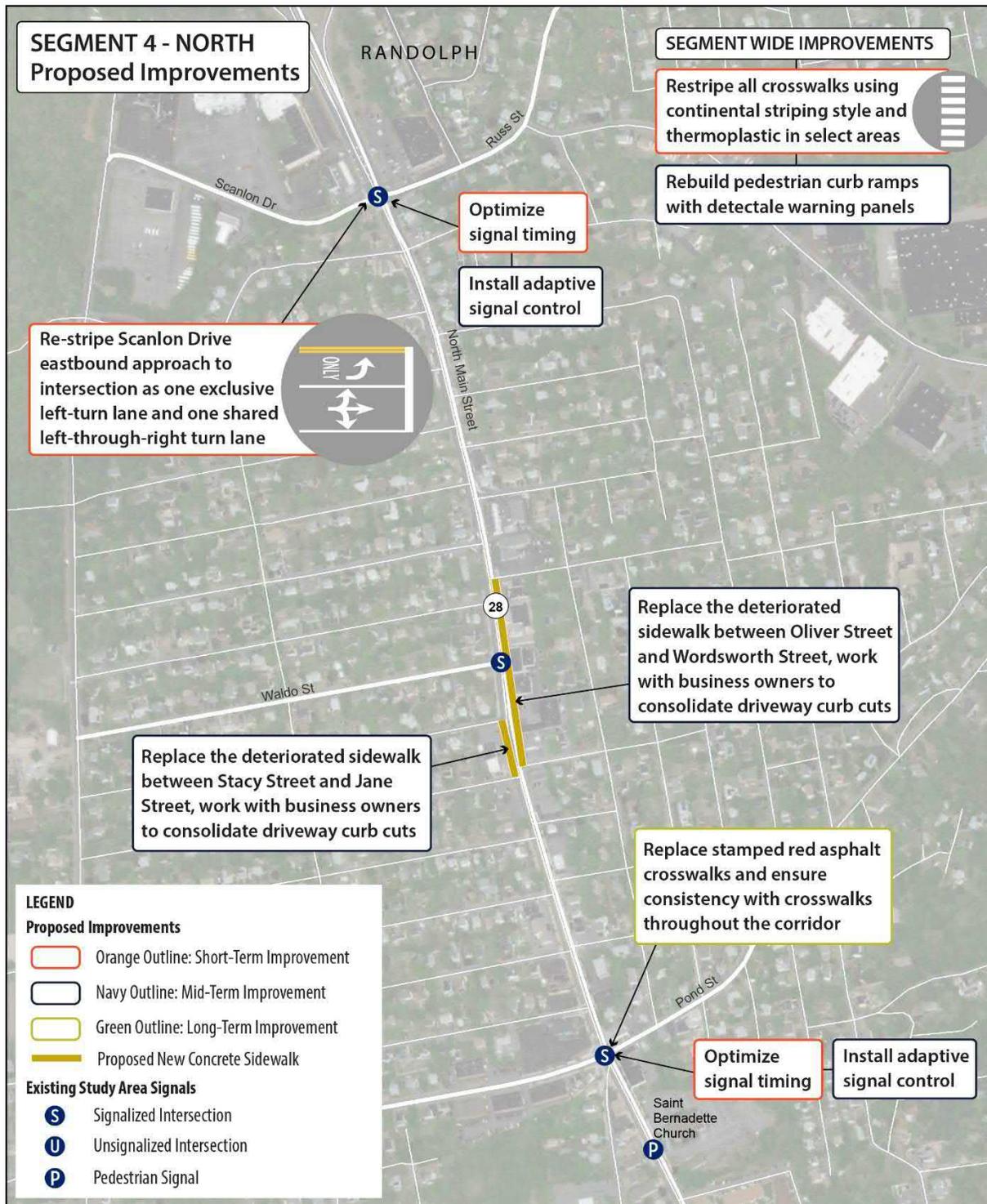
Mid-Term

- Install detectable warning panels at pedestrian curb ramps
- Replace the deteriorated sidewalk on the east side of North Main Street between Oliver Street and Wordsworth Street
- Replace the deteriorated sidewalk on the west side of North Main Street between Stacy Street and Jane Street
- Work with businesses to consolidate and/or narrow driveway curb cuts
- Work with businesses to ensure physical and visual separation between parking areas and directly adjacent sidewalks to discourage vehicular encroachment.
- Consider installing a signalized pedestrian crosswalk at the North Randolph Fire Station on North Main Street which currently has an emergency signal
- Construct a raised splitter island on the Oak Street westbound approach to North Main Street to calm traffic and prevent collisions
- Install Adaptive Signal Control at the intersections of North Main and Chestnut Street at Oak Street, North Main Street and Reed Street at Pond Street, and North Main Street at Russ Street and Scanlon Drive. Evaluate split-phasing for the side streets at North Main Street and Chestnut Street at Oak Street and North Main Street at Reed Street and Pond Street.

Long-Term

- Replace the stamped red asphalt pavement crosswalks at North Main Street at Reed Street and Pond Street with continental striping

Figure 21 - Proposed Improvements Inset Map 6 (Segment 4-North)



Inset 6: North Main Street - Scanlon Drive to Reed Street

Route 28 Corridor Study

0 0.125 0.25 Miles

OTHER

These measures apply to all segments along the study corridor.

Short Term

- As a regular maintenance program, paint all crosswalks in continental ladder style. Thermoplastic material or other may be used for high volume areas.

Mid-Term

- Perform a speed study of the Route 28 corridor with the intent of reducing the number of existing speed regulations which today range from 25, 30, 35, and 40 mph.

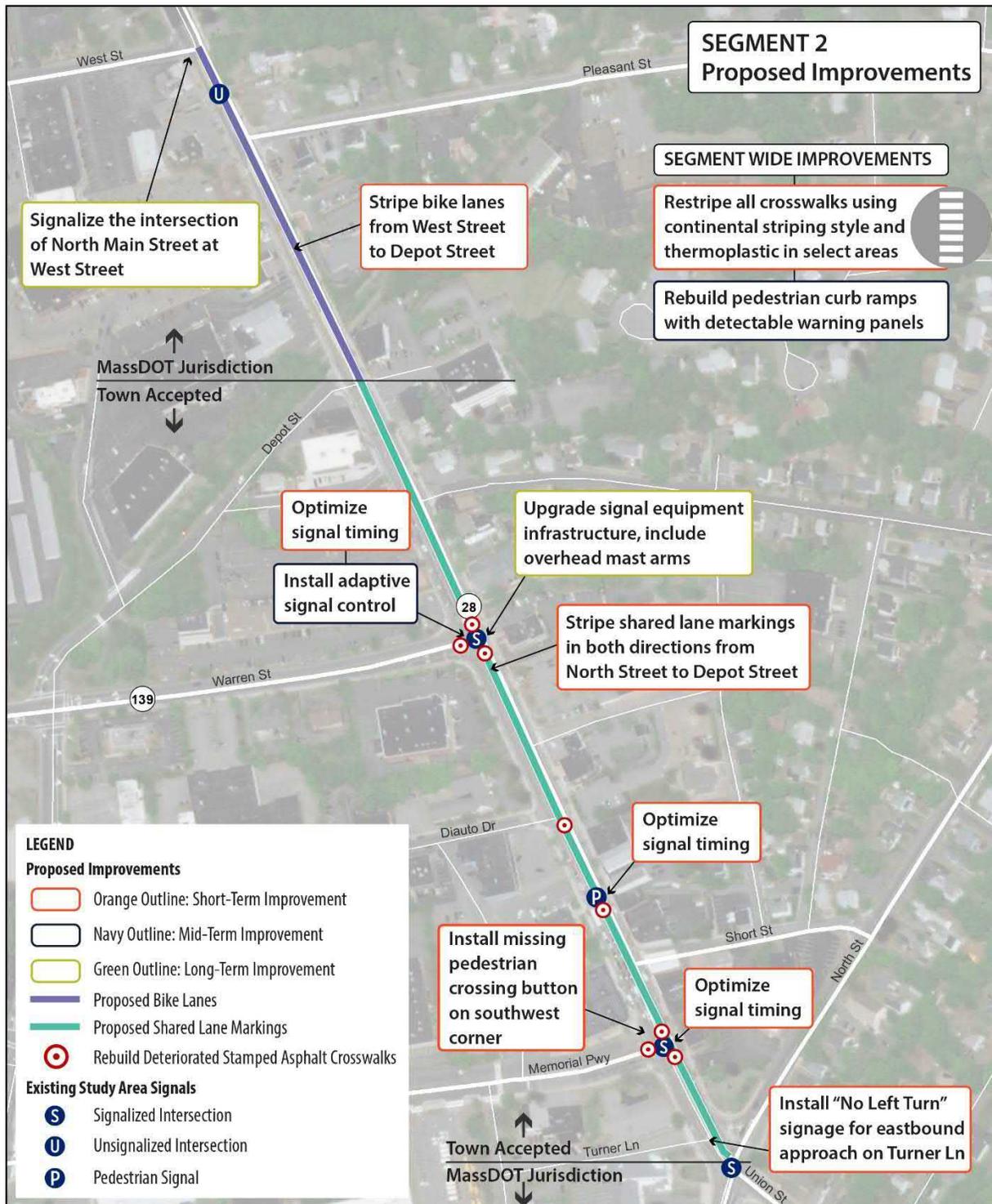
Long-Term

- Develop an Access Management Plan that can be used as a guide to consolidate commercial driveway curb cuts along Route 28. Consolidation of driveways will reduce the number of conflicting vehicle turns to and from Route 28 and improve safety for all users.
- Replace sections of asphalt sidewalk with concrete sidewalk and granite curb.
- Work with MBTA and BAT to evaluate consolidation of bus stops and relocating bus stops from the near side to the far side of intersections.

ⁱ <http://www.northeastern.edu/peter.furth/research/level-of-traffic-stress/>

ⁱⁱ <http://www.northeastern.edu/peter.furth/wp-content/uploads/2014/05/LTS-Tables1.pdf>

Figure 17 - Proposed Improvements Inset Map 3 (Segment 2)



Inset 3: North Main Street - Pleasant Street to North Street

Route 28 Corridor Study

0 0.075 0.15 Miles



SEGMENT 3 - NORTH MAIN STREET BETWEEN WEST STREET AND BOSTON HIGASHI SCHOOL NORTH DRIVEWAY

Figure 18, Figure 19 and Figure 20 display maps that show the improvements developed for this section of North Main Street. The improvements include:

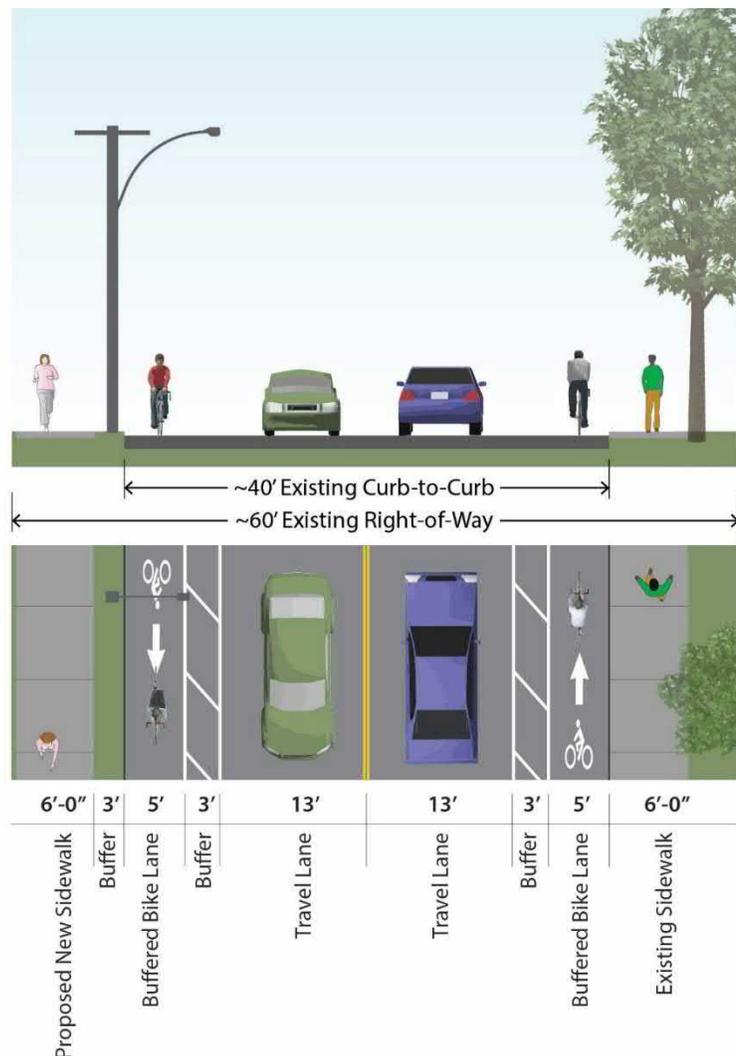
Short-Term

- Repaint crosswalks across North Main Street with continental striping
- Install crosswalk signs on both sides of crosswalk north of West Street

Mid-Term

- Install an overhead flashing beacon at the intersection of North Main Street at Allen Street and Nelson Drive
- Stripe buffered bicycles lanes on both sides of North Main Street between West Street and Boston Higashi School north driveway
- Construct six-foot wide concrete sidewalk, granite curbing, grass buffer strip, and trees on the west side of North Main Street between #682 North Main Street on the south and the Boston Higashi School north driveway (approximately 1,400 feet)
- Install trees and tree pits on the west side of North Main Street in the existing grass buffer strip and sidewalk
- Install detectable warning panels at pedestrian curb ramps
- Tighten radius on southbound right-turn slip lane on North Main Street at Grove Street to slow turning vehicles and improve safety for pedestrians in crosswalk
- Realign crosswalk on Orchard Street to closer to North Main Street to improve visibility of pedestrians in crosswalk

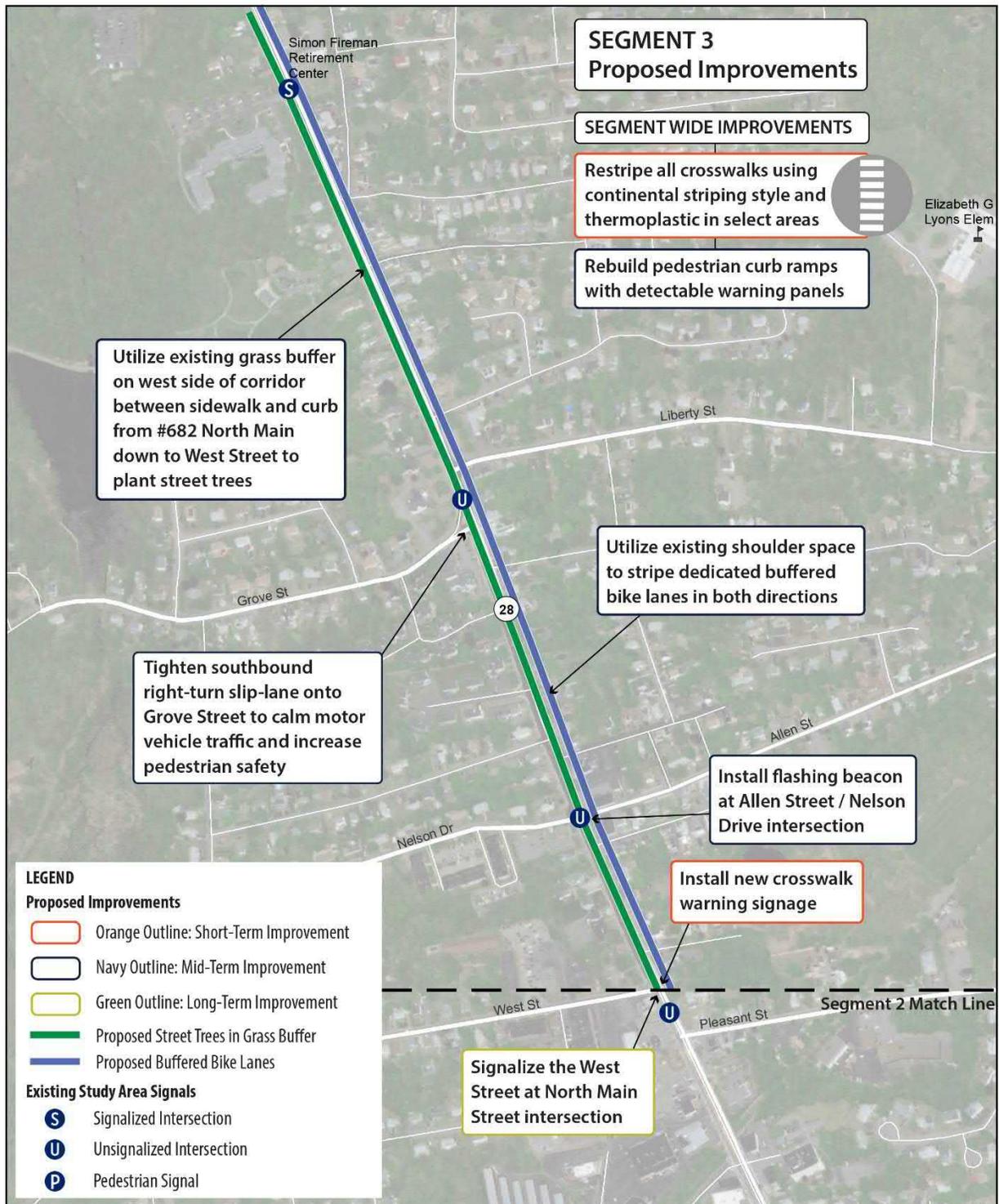
Figure 18 – Section C: Proposed Buffered Bike Lane Cross Section at Boston Higashi School South Driveway



Long-Term

- Replace asphalt sidewalk on the east side of North Main Street between #659 North Main Street and Boston Higashi School north driveway

Figure 19 - Proposed Improvements Inset Map 4 (Segment 3)



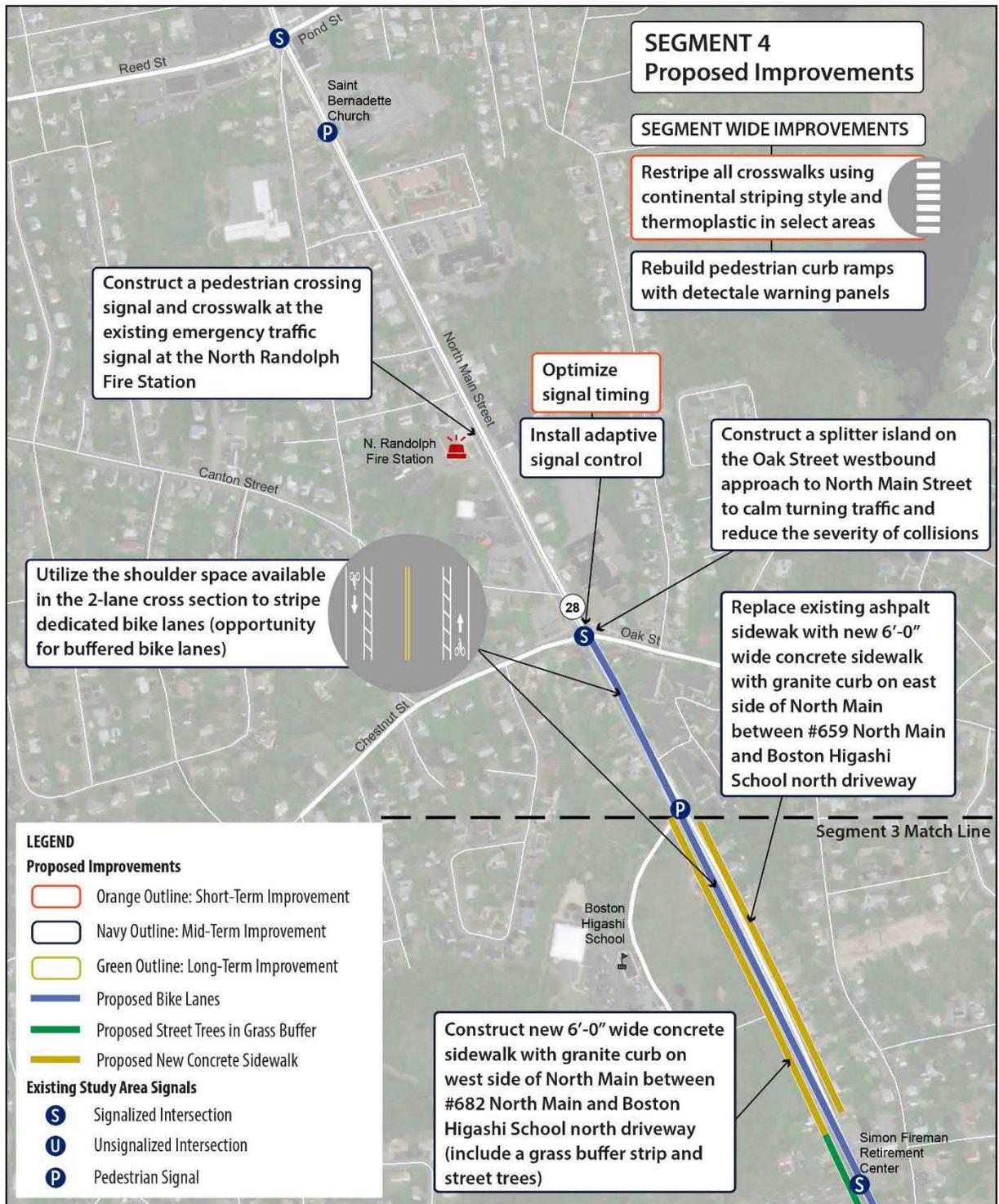
Inset 4: North Main Street - Simon Fireman to Pleasant Street

Route 28 Corridor Study

0 0.125 0.25 Miles



Figure 20 - Proposed Improvements Inset Map 5 (Segment 3 & 4)



Inset 5: North Main Street - Reed Street to Simon Fireman

Route 28 Corridor Study

0 0.125 0.25 Miles



SEGMENT 4 - NORTH MAIN STREET BETWEEN BOSTON HIGASHI SCHOOL NORTH DRIVEWAY AND RUSS STREET AND SCANLON DRIVE

Figure 21 displays a map that shows the improvements developed for this section of North Main Street. The improvements include:

Short-Term

- Repaint crosswalks across North Main Street with continental striping, including crosswalks at the Chestnut Street and Oak Street intersection.
- Optimize signal timing at North Main and Chestnut Street at Oak Street, North Main Street and Reed Street at Pond Street, and North Main Street at Russ Street and Scanlon Drive
- Improve striping on the eastbound Scanlon Drive approach to North Main Street to clarify lane arrangements as one exclusive left-turn lane and one shared left-through-right lane (as the existing signage indicates).

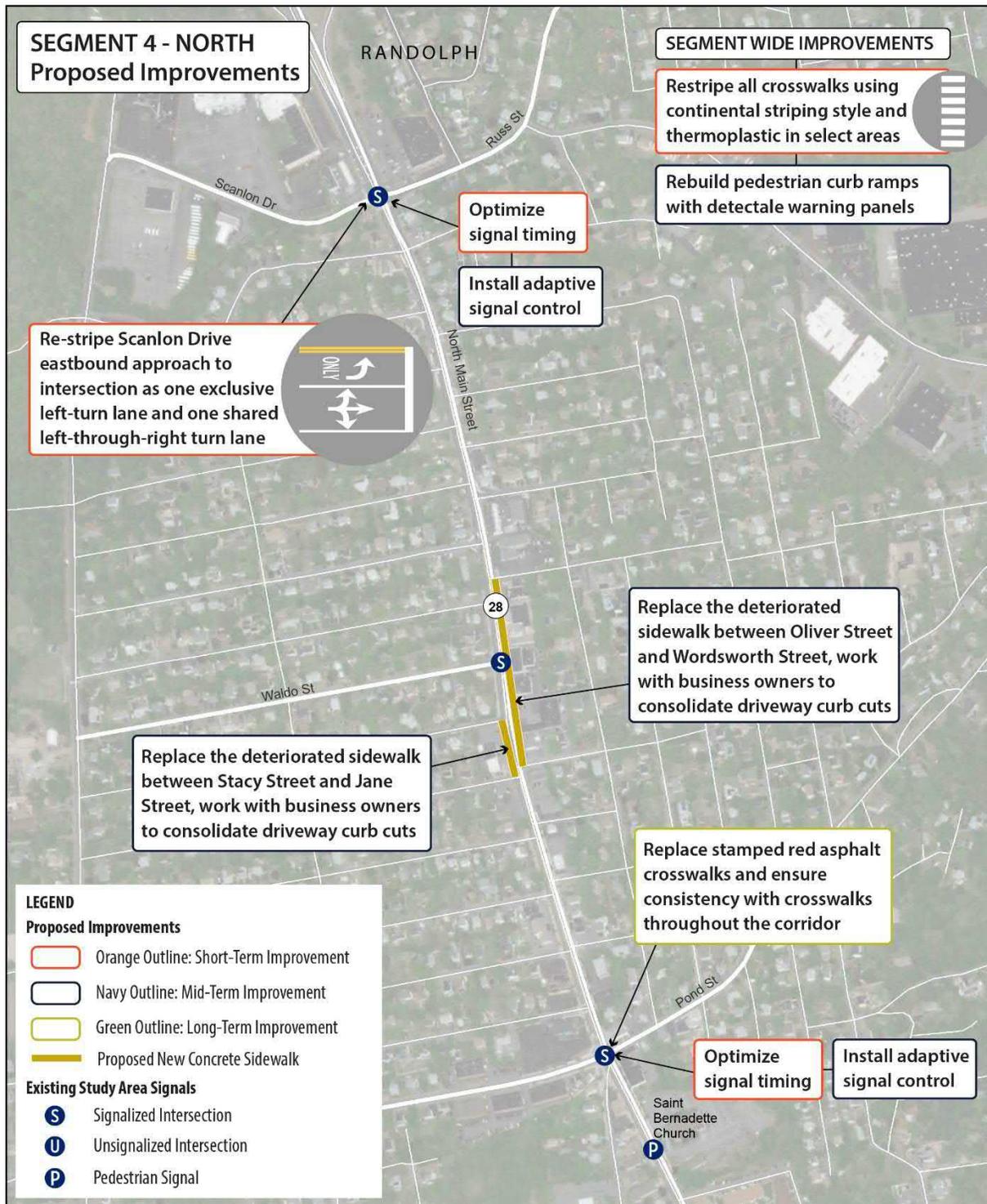
Mid-Term

- Install detectable warning panels at pedestrian curb ramps
- Replace the deteriorated sidewalk on the east side of North Main Street between Oliver Street and Wordsworth Street
- Replace the deteriorated sidewalk on the west side of North Main Street between Stacy Street and Jane Street
- Work with businesses to consolidate and/or narrow driveway curb cuts
- Work with businesses to ensure physical and visual separation between parking areas and directly adjacent sidewalks to discourage vehicular encroachment.
- Consider installing a signalized pedestrian crosswalk at the North Randolph Fire Station on North Main Street which currently has an emergency signal
- Construct a raised splitter island on the Oak Street westbound approach to North Main Street to calm traffic and prevent collisions
- Install Adaptive Signal Control at the intersections of North Main and Chestnut Street at Oak Street, North Main Street and Reed Street at Pond Street, and North Main Street at Russ Street and Scanlon Drive. Evaluate split-phasing for the side streets at North Main Street and Chestnut Street at Oak Street and North Main Street at Reed Street and Pond Street.

Long-Term

- Replace the stamped red asphalt pavement crosswalks at North Main Street at Reed Street and Pond Street with continental striping

Figure 21 - Proposed Improvements Inset Map 6 (Segment 4-North)



Inset 6: North Main Street - Scanlon Drive to Reed Street

Route 28 Corridor Study

0 0.125 0.25 Miles



OTHER

These measures apply to all segments along the study corridor.

Short Term

- As a regular maintenance program, paint all crosswalks in continental ladder style. Thermoplastic material or other may be used for high volume areas.

Mid-Term

- Perform a speed study of the Route 28 corridor with the intent of reducing the number of existing speed regulations which today range from 25, 30, 35, and 40 mph.

Long-Term

- Develop an Access Management Plan that can be used as a guide to consolidate commercial driveway curb cuts along Route 28. Consolidation of driveways will reduce the number of conflicting vehicle turns to and from Route 28 and improve safety for all users.
- Replace sections of asphalt sidewalk with concrete sidewalk and granite curb.
- Work with MBTA and BAT to evaluate consolidation of bus stops and relocating bus stops from the near side to the far side of intersections.

ⁱ <http://www.northeastern.edu/peter.furth/research/level-of-traffic-stress/>

ⁱⁱ <http://www.northeastern.edu/peter.furth/wp-content/uploads/2014/05/LTS-Tables1.pdf>