Morrissey Boulevard Corridor Study

- *DRAFT* -

Final Report

March 2025

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List of Abbreviations

ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
ATR	Automated/Automatic Traffic Recorder
BH-FRM	Boston Harbor Flood Risk Model
BNRD	Bus Network Redesign
CFROD	Coastal Flood Resilience Overlay District
CLOS	Coastal Flood Resilience Level of Service
CMAQ	Congestion Mitigation and Air Quality
CMF	Crash Modification Factor
CRP	Carbon Reduction Program
CTPS	Central Transportation Planning Staff
DCR	Department of Conservation and Recreation
DFE	Design Flood Elevation
EEA	Executive Office of Energy and Environmental Affairs
EJ	Environmental Justice
EMU	Electric Multiple Unit
ENF	Environmental Notification Form
FEMA	Federal Emergency Management Agency
FFRMS	Federal Flood Risk Management Standard
FHWA	Federal Highway Administration
HSIP	Highway Safety Improvement Program
I-93	Interstate 93
IIJA	Infrastructure Investment and Jobs Act
LOS	Level of Service
LSCSF	Land Subject to Coastal Storm Flowage

LTS	Level of Traffic Stress
MassDep	Massachusetts Department of Environmental Protection
MassDOT	Massachusetts Department of Transportation
MBTA	Massachusetts Bay Transportation Authority
MC-FRM	Massachusetts Coast Flood Risk Model
MEMA	Massachusetts Emergency Management Agency
MEPA	Massachusetts Environmental Policy Act
MOE	Measures of Effectiveness
MPH	Miles Per Hour
MPO	Metropolitan Planning Organization
NCRF	National Coastal Resiliency Fund
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NFWF	National Fish and Wildlife Foundation
NHPP	National Highway Performance Program
NRHP	National Register of Historic Places
O-D	Origins and Destinations
PROTECT	Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation [Grant] Program
RAISE	Rebuilding American Infrastructure with Sustainability and Equity
RITIS	Regional Integrated Transportation Information System
RMAT	Resilient Massachusetts Action Team
ROW	Right-of-Way
RSA	Road Safety Audit
SHMCAP	State Hazard Mitigation and Climate Adaptation Plan
STBG	Surface Transportation Block Grant

TAZ	Traffic Analysis Zone
TIFIA	Transportation Infrastructure Finance and Innovation Act
TIP	Transportation Improvement Program
TMC	Turning Movement Count
USACE	U.S. Army Corps of Engineers

Chapter 1: Introduction

The Massachusetts Department of Transportation (MassDOT), the Executive Office of Energy and Environmental Affairs (EEA), the Department of Conservation and Recreation (DCR) and the City of Boston, including the City of Boston Planning Department (City of Boston Planning), carried out a joint conceptual planning effort to develop and analyze alternatives for the Morrissey Boulevard corridor intended to improve the public realm, mobility, connectivity, safety, and climate resiliency throughout the area for the City of Boston and other communities in the surrounding region, in line with the above legislation.

This document examines both existing and future conditions in the transportation and resiliency spheres and summarizes the existing and future conditions corridor-wide for the following topics:

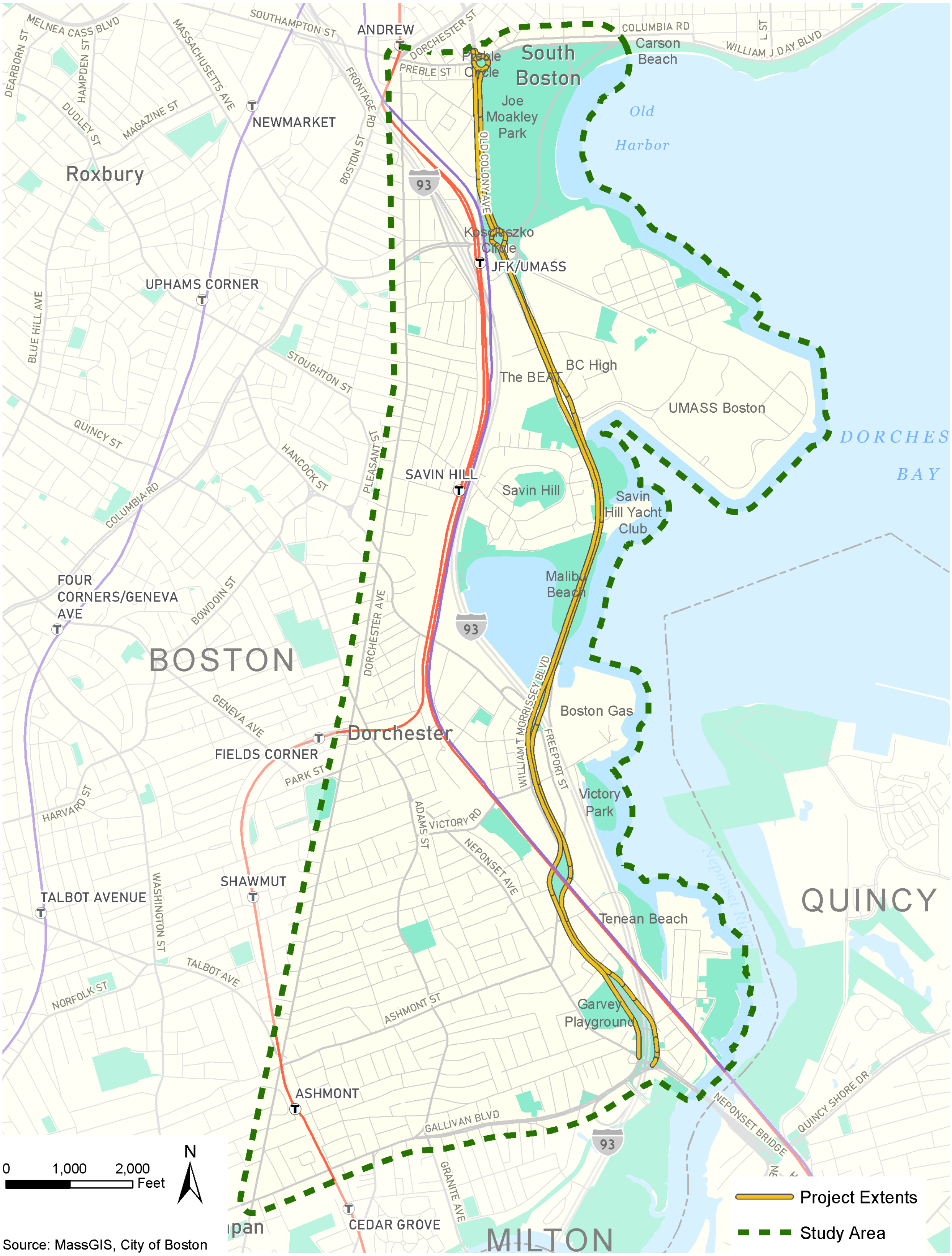
- Vehicle Roadway Network (including operations and safety)
- Transit Network
- Bicycle and Pedestrian Network (including operations and safety)
- Environmental Conditions

The importance of considering and promoting equity within all aspects of the study guided this effort. An equity lens was used to assess the Morrissey Boulevard corridor and understand how any alternatives may benefit or impact the community.

1.1 Study Area

The local study area is located in Boston's Dorchester neighborhood, with a portion extending northward into South Boston, as shown in Figure 1-1. The area incorporates the full length of Morrissey Boulevard from Columbia Road to Neponset Circle. In addition, the corridor includes a segment of Preble Street, west of Preble Circle, and a segment of Old Colony Avenue/Columbia Road south to Kosciuszko Circle. The area extends on either side of the corridor, stretching from Boston Harbor on the east to Dorchester Avenue on the west.

Figure 1-1: Local Study Area Map

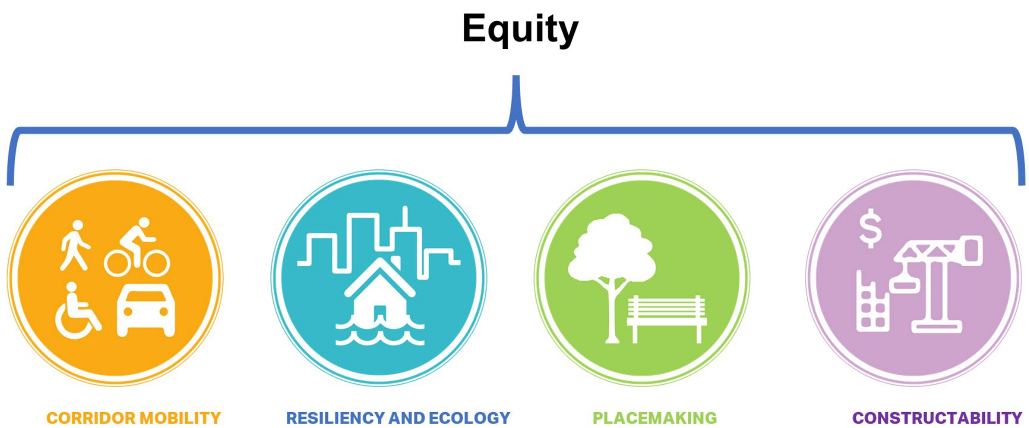


1.2 Goals, Objectives, and Evaluation Criteria

As seen in Figure 1-2, the following goals were identified for the effort in coordination with the Morrissey Boulevard Commission and stakeholders:

- Corridor Mobility
- Resiliency and Ecology
- Placemaking
- Constructability

Figure 1-2: Goals for Development of Alternatives



The mobility component examines all modes but is primarily focused on enhancing and protecting historically underserved modes such as bicycling, walking, and transit. The resiliency component focuses on mitigating existing stormwater flooding and addressing future climate change and sea level rise impacts. The placemaking component seeks to restore the parkway character while enhancing inclusive placemaking along the corridor. Constructability focuses on consideration of the feasibility of implementing the alternatives considered.

1.3 Public Involvement

The Morrissey Boulevard Corridor Study employed varied methods and strategies to engage and collaborate with stakeholders in planning for the future of this corridor.

Study Communications

A critical component to the study process was the utilization of differing communication avenues to receive and share information with stakeholders. A website was created and maintained to host meeting information, documents, contact information, and additional resources pertaining to related efforts. A link for stakeholders to sign up for study updates was also available.

Meeting announcements were shared via social media, flyers, media advisories, the study website, and by an email distribution list.

Morrissey Boulevard Commission[1,2]

The Morrissey Boulevard Commission was established pursuant to §53 of Chapter 176 of the Acts of 2022 (amended in §71 and 72 of Chapter 28 of the Acts of 2023). The Commission was comprised of the following officials:

- Massachusetts Department of Transportation Secretary & Chief Executive Officer
- Massachusetts Executive Office of Energy and Environmental Affairs Secretary
- University of Massachusetts Building Authority Executive Director
- Mayor of the City of Boston
- Director of the City of Boston Planning Department (formerly the Boston Planning and Development Agency)
- Boston City Councilor District 3
- State Senator of the First Suffolk District
- State Representative of the Fourth Suffolk District
- State Representative of the Thirteenth Suffolk District

The Acts of 2022 set out the following tasks for the Commission:

- Evaluate and recommend transportation and infrastructure improvements to (A) improve mobility for pedestrians, transit users, cyclists, and motorists and (B) strengthen climate resiliency at Kosciuszko Circle in the Dorchester section of the city of Boston and along Morrissey Boulevard in the city
- Develop a comprehensive plan for the Morrissey Boulevard corridor
- Identify short-term investments to improve mobility for pedestrians, transit users, cyclists, and motorists along the Morrissey Boulevard corridor.

In support of the Commission's goals, the Morrissey Boulevard Corridor Study aimed to identify public realm, mobility, connectivity, safety, and climate resiliency improvements developed through collaboration with the Commission and stakeholders.

Eight Commission meetings were held over the course of the effort and were open to the public. The first hybrid meeting of the Commission was held on November 28, 2023, to introduce the Commission, outline the Commission's goals, and present existing conditions, design approaches, planned public outreach, and the overall schedule.

The second hybrid meeting of the Commission, held on January 30, 2024, presented an assessment of future conditions along the corridor, as well as potential coastal flood mitigation options and an overview of the evaluation criteria. Building upon this foundation, the third hybrid meeting of the Commission was held on May 2, 2024, to present overview of transportation conditions and potential alternatives at key intersections along with information on short-term improvements underway along Morrissey Boulevard.

On May 31, 2024, the fourth meeting of the Commission was held virtually for Commission members to discuss extending the deadline for the Commission and approve an interim status report.

[1] https://malegislature.gov/Laws/SessionLaws/Acts/2022/Chapter176
[2] https://malegislature.gov/Laws/SessionLaws/Acts/2023/Chapter28

The fifth hybrid meeting of the Morrissey Boulevard Commission, held on August 6, 2024, included a review of feedback received previously and a presentation on transportation modeling and simulation processes.

The hybrid sixth Morrissey Commission meeting was held on September 25, 2024, where a review of previous feedback was presented, as well as updates on short-term improvements and relevant efforts in the area, full corridor layouts, and the initial alternatives analysis.

The seventh hybrid meeting of the Morrissey Boulevard Commission was held on November 21, 2024. Detailed alternatives analysis of previously presented alternatives for the corridor were discussed, which included the evaluation criteria for alternatives and portions of the Vissim model that was created for traffic analysis.

An in-person public workshop will be held in early 2025 to present the full corridor layouts and garner feedback.

An eighth virtual meeting of the Morrissey Boulevard Commission is to be held in early 2025 to present the public comments received in response to the draft final report and to submit the final report to the Commission.

Chapter 2: Existing Conditions

The Morrissey Boulevard corridor has long been the focus of efforts to address challenges related to transportation connectivity and placemaking. To better plan for the future of the study corridor, an in-depth understanding of the existing transportation network characteristics and conditions is required. The existing conditions transportation network operation evaluation includes the following:

- Vehicle Roadway Network
- Transit Network
- Bicycle and Pedestrian Network

2.1 Vehicle Roadway Network

As part of the Morrissey Boulevard Corridor Study, a vehicle traffic operational impact analysis was conducted. The traffic operational analysis included the following elements:

- Roadway Characteristics (classification, jurisdiction, bicycle/pedestrian infrastructure, speed limit, lane configuration, traffic control, significant grade changes, and connections/access points)
- Vehicle Data (counts, speed, travel time, origin-destination)
- Operational Analysis
- Safety Overview

2.1.1 Key Findings of the Vehicle Road Network

- Morrissey Boulevard is a DCR Urban Principal Roadway that runs parallel to Interstate 93 (I-93) and intersects a variety of important east-west corridors. Morrissey Boulevard has varying cross sections, which require different solutions along the study area.
- Morrissey Boulevard carries almost 50,000 vehicles a day (both directions) in its highest-volume section (north of the I-93 ramps at Neponset Circle).
- Weekday traffic volume in the project corridor peaks from 8:00 to 9:00 AM and 4:00 to 5:00 PM.
- Morrissey Boulevard northbound and southbound mainlines south of Kosciuszko Circle reported the highest average and 85th percentile speeds.
- Average weekday morning and evening peak hour speeds are significantly lower than off-peak hours. Low speeds are primarily caused by intersection traffic operations with high delay and long queues.
- Seventy-three percent of northbound drivers along the corridor have a destination in the City of Boston during the weekday morning peak period. Eighty-five percent of southbound drivers along the corridor originate in the City of Boston during the weekday evening peak period. Most drivers using the Morrissey Boulevard corridor (which includes I-93) are pass-through trips with local trips being less common.

2.1.2 Roadway Characteristics

The study area corridor incorporates the full length of Morrissey Boulevard, approximately 3 miles, from Columbia Road to Neponset Circle. In addition, the corridor includes a segment of Preble Street west of Preble Circle and a segment of Old Coloney Avenue/Columbia Road south to K-Circle. Roadway characteristics for the corridor are outlined in Table 2-1, which provides roadway classification and jurisdiction for the most prominent sections. Figure 2-1 provides additional information at key corridor locations.

Table 2-1: Characteristics of the Road Network

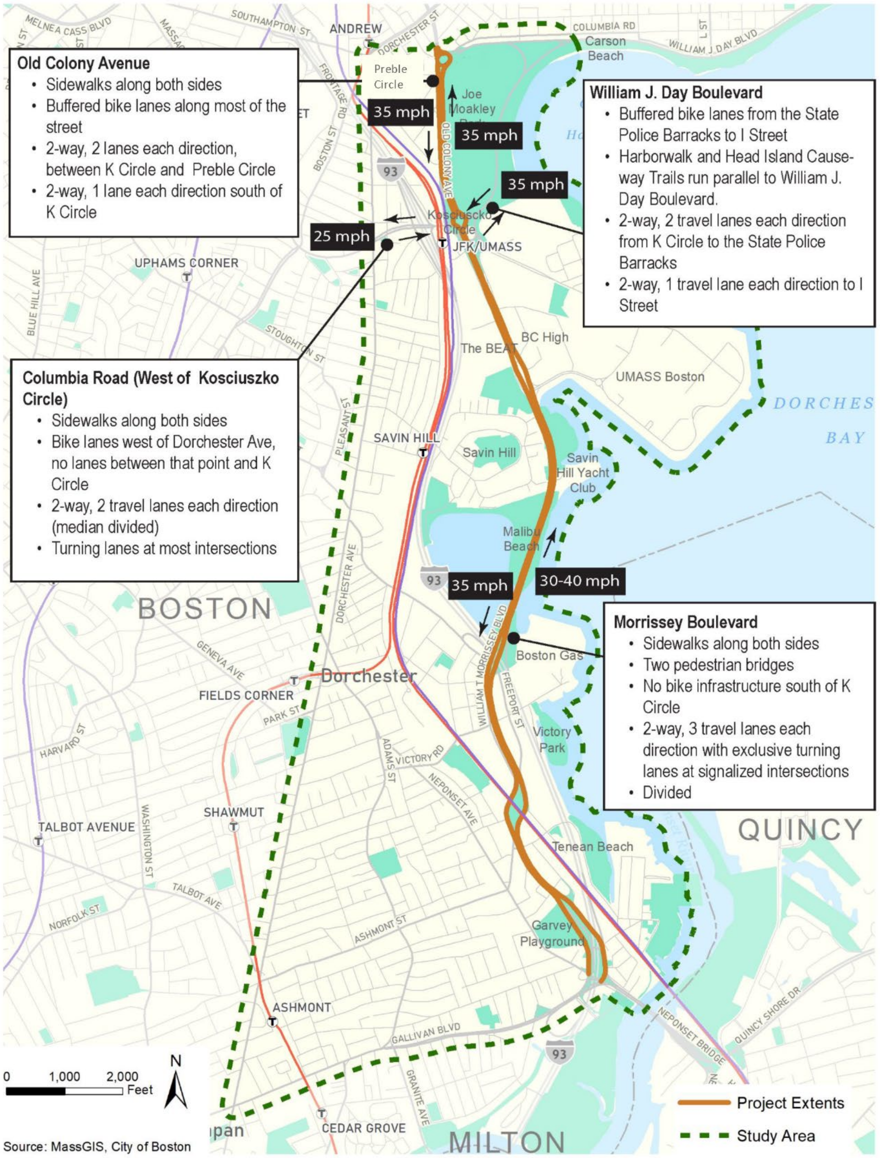
Name	Classification	Jurisdiction
Morrissey Boulevard	Urban Principal Arterial	DCR
Old Colony Avenue / Columbia Road	Urban Principal Arterial, except for the section between Columbia Road and Morrissey Boulevard, which is Urban Minor Arterial	Southbound - DCR Project Extents Northbound - DCR, MassDOT, and City of Boston
Columbia Road (west of Kosciuszko Circle)	Generally Urban Principal Arterial	MassDOT
William J. Day Boulevard	Urban Principal Arterial	DCR

Key roadways that influence the study area and part of the traffic operational impact analysis include the following, roughly from north to south:

- Old Colony Avenue/Columbia Road (including a short section of Columbia Road west of Preble Circle)
- Kosciuszko Circle
- Mount Vernon Street
- Bianculli Boulevard
- Popes Hill Street
- Neponset Avenue
- Freeport Street

Additionally, within the study area, I-93 runs parallel to Morrissey Boulevard corridor with several access points that influence traffic flow along the corridor.

Figure 2-1: Characteristics of the Road Network



2.1.3 Vehicle Data

Volume Data

Existing vehicle volume data was collected and summarized for the weekday morning and evening peak hours and daily volume totals. In January 2023, MassDOT collected the turning movement counts (TMCs) and automated traffic recorders (ATRs) for the corridor intersections, with supplemental ATR data collected in June 2023. The vehicle collection locations are shown Figure 2-2.

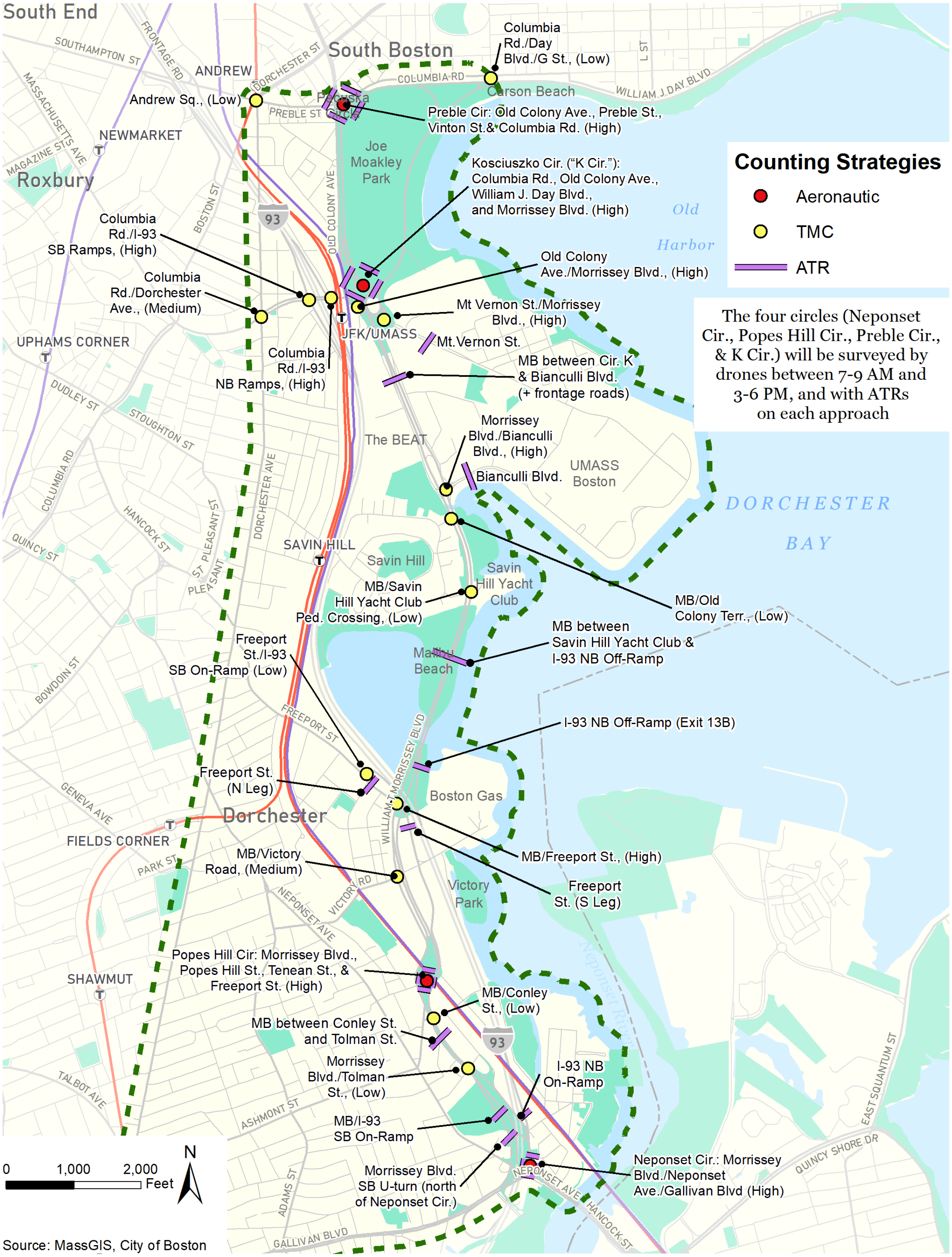
For the corridor and key roadways, the ATR data was utilized to determine average daily traffic (ADT) volumes and heavy vehicle percentages as summarized in Table 2-2.

Table 2-2: Average Daily Traffic Volume Summary

Roadway	ADT	HV%
Morrissey Boulevard NB Frontage Road	5,200	6%
Morrissey Boulevard SB Frontage Road	7,900	5%
Morrissey Boulevard NB Mainline, South of Kosciuszko Circle	15,100	5%
Morrissey Boulevard SB Mainline, South of Kosciuszko Circle	15,000	3%
Morrissey Boulevard NB U-Turn	1,500	2%
Morrissey Boulevard NB North of I-93 Ramps	25,900	N/A
Morrissey Boulevard SB North of I-93 Ramps	23,700	N/A
Morrissey Boulevard NB South of Freeport Street	20,000	N/A
Morrissey Boulevard SB South of Freeport Street	22,000	N/A
I-93 SB Off-Ramp to Columbia Road	18,000	4%
Bianculli Boulevard WB, East of Morrissey Boulevard	3,300	4%
Freeport Street EB, East of Morrissey Boulevard	900	2%
Freeport Street WB, East of Morrissey Boulevard	4,800	4%
Freeport Street EB, West of Morrissey Boulevard	8,600	3%
Freeport Street WB, West of Morrissey Boulevard	14,600	3%
Gallivan Boulevard NB, South of Neponset Circle	23,500	3%
Gallivan Boulevard SB South of Neponset Circle	16,100	2%
Neponset Avenue EB over Neponset River	15,700	3%
Neponset Avenue WB over Neponset River	14,800	4%

ADT = Average Daily Traffic; HV% represents percentage of heavy vehicles; NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

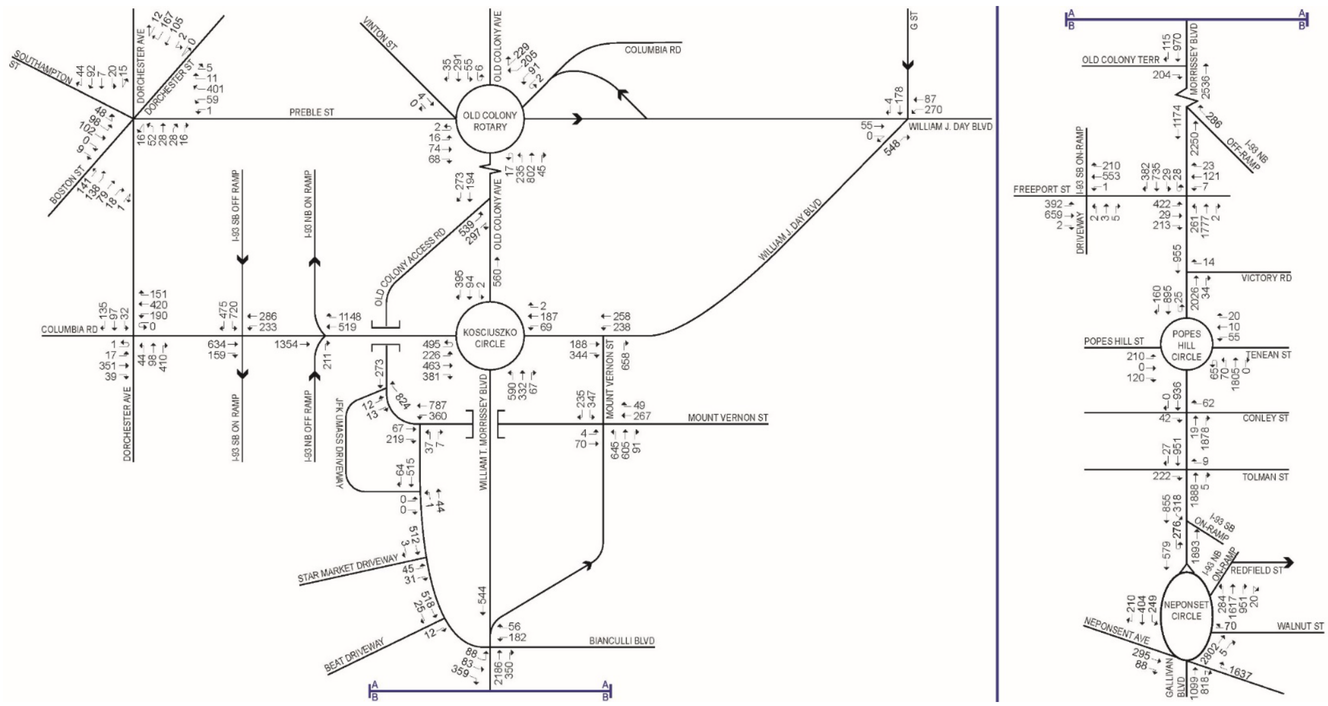
Figure 2-2: Traffic Volume Counting Locations



Source: MassGIS, City of Boston

The TMC data was utilized to determine the weekday morning and evening peak hours for the corridor. The overall weekday morning network peak hour is from 8:00 to 9:00 AM and an overall weekday evening network peak hour is from 4:00 to 5:00 PM. Peak hour volumes were balanced for the corridor to create the vehicle weekday morning and evening peak hour volume network shown in Figure 2-3 and Figure 2-4.

Figure 2-31: 2023 Existing Conditions Vehicle Volume Networks, Weekday Morning Peak Hour[3]



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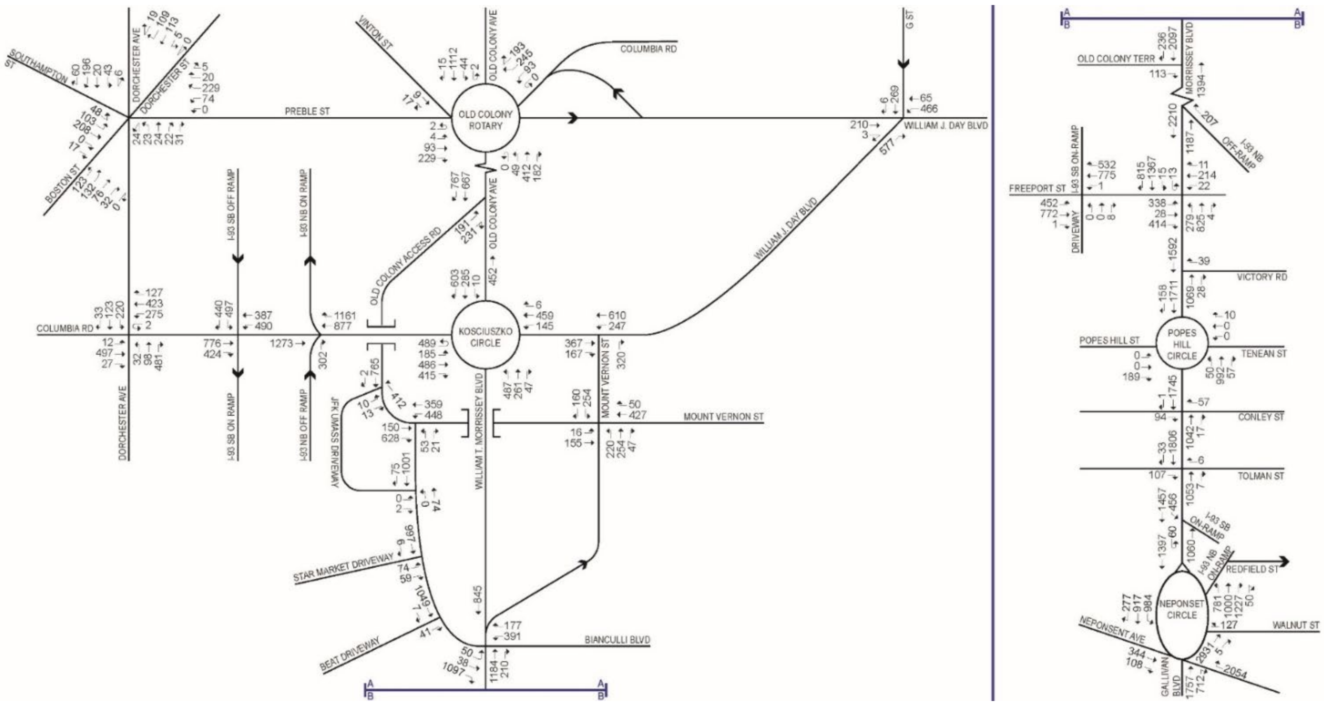
[3] TMC data collected in 2023

Figure 2-4: 2023 Existing Conditions Vehicle Volume Networks, Weekday Evening Peak Hour[4]



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[4] TMC data collected in 2023

Speed Data

The ATR data was utilized to determine daily average vehicle speed and daily 85th percentile speed in miles per hour (mph), as summarized in Table 2-3, for the corridor and key roadways. The 85th percentile speed is the speed at or below which 85 percent of drivers travel on the roadway segment. Morrissey Boulevard northbound and southbound mainlines south of Kosciuszko Circle reported the highest average and 85th percentile speeds. Additionally, INRIX[5] data was used to gather supplemental vehicle speeds along the corridor and the parallel route of I-93.

Table 2-3: Vehicle Speed Summary

Roadway	Average Speed (mph)	85th Percentile Speed (mph)
Morrissey Boulevard NB Frontage Road	22	29
Morrissey Boulevard SB Frontage Road	25	32
Morrissey Boulevard NB Mainline, South of Kosciuszko Circle	41	50
Morrissey Boulevard SB Mainline, South of Kosciuszko Circle	44	52
Morrissey Boulevard NB U-Turn	22	25
I-93 SB Off-Ramp to Columbia Road	38	46
Bianculli Boulevard WB, East of Morrissey Boulevard	30	36
Freeport Street EB, East of Morrissey Boulevard	22	27
Freeport Street WB, East of Morrissey Boulevard	19	25
Freeport Street EB, West of Morrissey Boulevard	26	32
Freeport Street WB, West of Morrissey Boulevard	31	46
Gallivan Boulevard NB, South of Neponset Circle	31	38
Gallivan Boulevard SB South of Neponset Circle	33	39
Neponset Avenue EB over Neponset River	52	60
Neponset Avenue WB over Neponset River	42	53

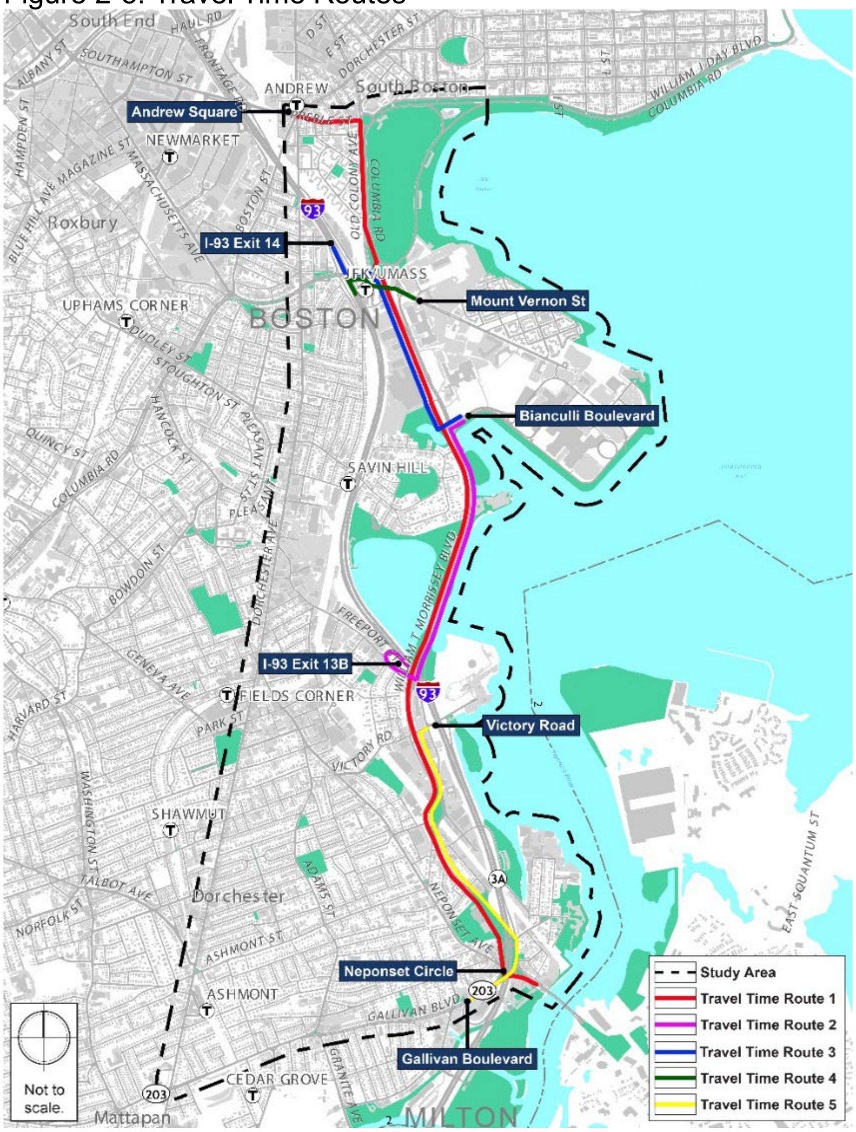
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

[5] INRIX Analytics, a traffic data sourcing and aggregation platform

Travel Time Data

Travel time data was obtained through the StreetLight data platform.[6] Due to the traffic flow influences from adjacent roadways, such as the I-93 ramp connections, the corridor was divided into five (5) different traffic segments shown in Figure 2-5. The five (5) travel time routes represent typical driver experiences along the corridor. Route 1 represents a full drive of the corridor, while Routes 2 through 5 represent short routes drivers might utilize along the corridor. Route travel times are shown in Table 2-4.

Figure 2-5: Travel Time Routes



Source: Streetlight Data Platform, MassDOT, MassGIS

[6] StreetLight data platform collects anonymous smartphone data to estimate roadway operational conditions.

Table 2-4: Travel Time Results in Minutes

Route Description		AM Peak		PM Peak		All-Day Average	
		NB	SB	NB	SB	NB	SB
1	Andrew Square to Neponset Circle	14.6	15.3	15.2	10.6	13.5	11.8
2	Bianculli Boulevard to I-93 Exit 13B	3.5	2.5	4.5	1.7	3.8	1.8
3	I-93 Exit 14 To/From the North to Bianculli Boulevard	4.9	6.9	6.3	5.3	5.6	5.8
4	I-93 Exit 14 To/From the South to Mount Vernon Street	4.4	4.4	4.3	7.1	4.3	5.3
5	Victory Road to Gallivan Boulevard	4.1	6.2	5.6	4.6	5.0	4.6

Source: StreetLight Data Platform

Origin-Designation Data

Origins and destinations (O-D) of vehicles using the corridor were also obtained from INRIX. O-D information was obtained for the dominant vehicle travel directions northbound during the weekday morning peak period and southbound during the weekday evening peak period. Based on the data, most vehicles traveling along the corridor originate from and travel to locations within the City of Boston.

Table 2-5 shows the O-D information for the morning peak period in the northbound vehicle travel direction along the Morrissey Boulevard corridor by jurisdiction. During the morning peak period, approximately 73 percent of motor vehicle trips traveling northbound on the Morrissey Boulevard corridor are destined to locations also in the City of Boston (likely to the urban core such as Downtown Boston or Back Bay). During the morning peak period, approximately 48 percent of motor vehicle trips traveling northbound on the Morrissey Boulevard corridor originate in Boston neighborhoods south of corridor, including origin points within the study area. Table 2-5 provides the top three (3) origin and destination locations for the weekday morning peak period (northbound). This same information is shown graphically in Figure 2-6.

Table 2-51: Top Three Origin and Destination Location for Trips along the Morrissey Boulevard Corridor, Weekday Morning Peak Period (Northbound)

Town	Origin	Destination
Boston	48%	73%
Quincy	16%	4%
Braintree	4%	2%

Source: INRIX Analytics

Table 2-6 provides the O-D information for the evening peak period in the southbound vehicle travel direction along the Morrissey Boulevard corridor. The evening peak period shows the reverse travel patterns compared to the morning peak period. During the evening peak period, approximately 85 percent of motor vehicle trips traveling southbound on the Morrissey Boulevard corridor originate in the City of Boston, likely Downtown Boston or Back Bay. Also, during the evening peak period approximately 45 percent of vehicles traveling southbound on the Morrissey Boulevard corridor are destined for Boston neighborhoods to the south, including destination points within the Project study area. Table 2-6 provides the top three (3) origin and destination locations for the weekday evening peak period (southbound). The same information is shown graphically in Figure 2-7.

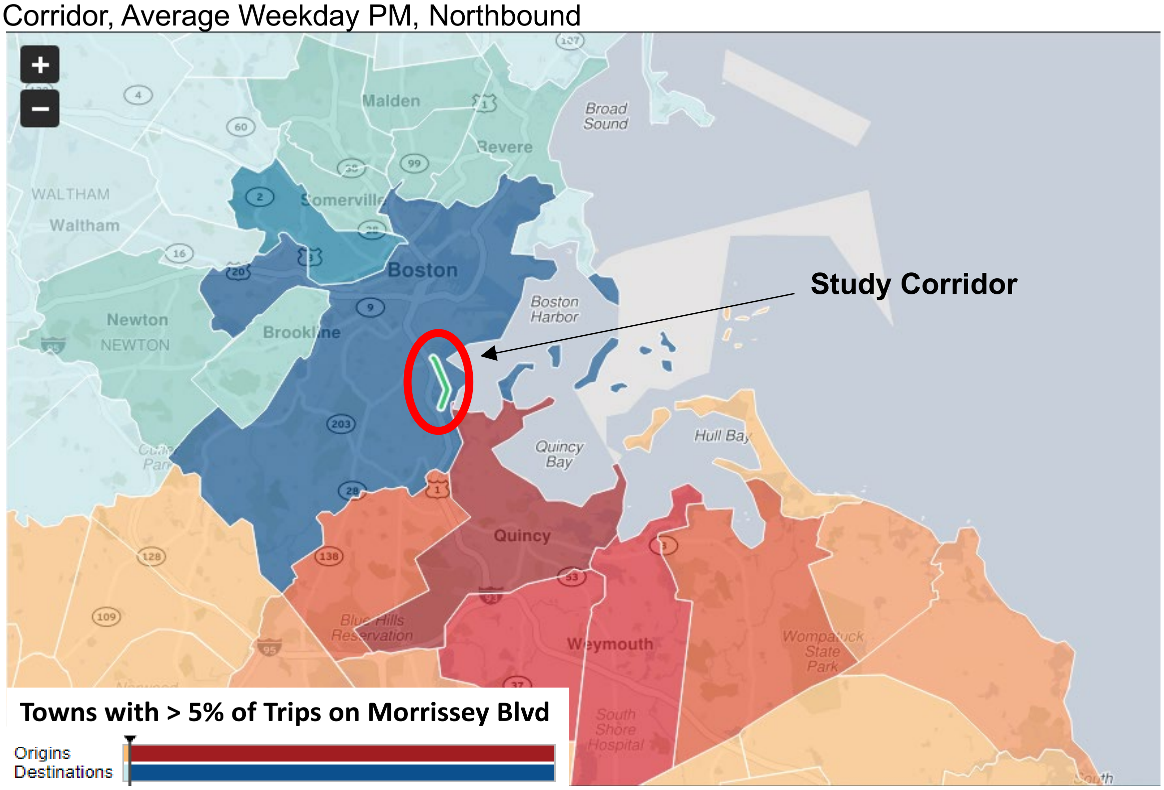
Table 2-6: Top Three Origin and Destination Location for Trips along the Morrissey Boulevard Corridor, Weekday Evening Peak Period (Southbound)

Town	Origin	Destination
Boston	85%	45%
Quincy	2%	20%
Braintree	1%	5%

Source: INRIX Analytics

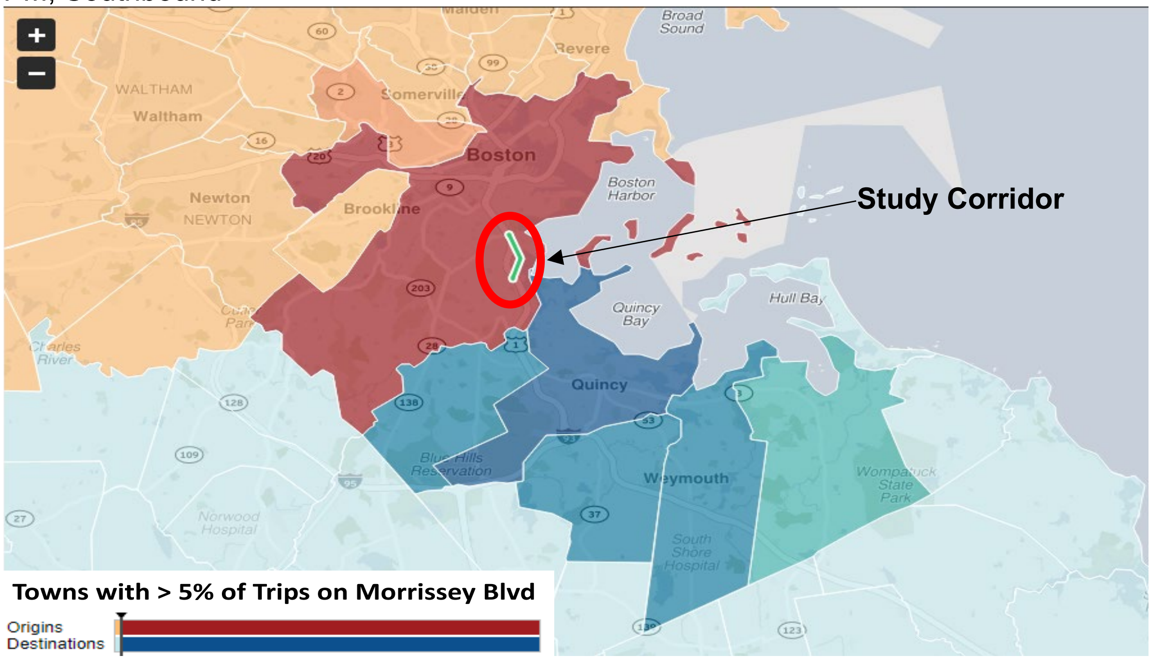
Overall, on an average weekday, INRIX was used to show that roughly 84 percent of total trips in the study area are pass-through (originating and ending outside the study area) while only 14 percent of the trips originate outside the study area and are destined for points within the study area. Only 2 percent of all trips stay within the study area. This data suggests that while local traffic is significant, many vehicles are using Morrissey Boulevard as an alternative to I-93.

Figure 2-6: Top 3 Origin and Destination Location for Trips along the Morrissey Boulevard Corridor, Average Weekday PM, Northbound



Source: INRIX Analytics, using the RITIS (Regional Integrated Transportation Information System) Platform

Figure 2-7: 2021 Origins and Destinations for Trips on Morrissey Boulevard, Average Weekday PM, Southbound



Source: INRIX Analytics, using the Regional Integrated Transportation Information System (RITIS) platform

2.1.4 Vehicle and Roadway Operational Analysis

To assess quality of vehicle flow along the corridor, an operational or roadway capacity analysis was conducted. Operational analysis provided an indication of how well the roadway facilities serve the vehicle demand. The operational analysis results are then summarized by different measures of effectiveness (MOE), which describe traffic operational conditions along a segment or at an intersection. Due to the complexity of the corridor, the operational analysis was conducted by creating a calibrated existing condition microsimulation model within the Vissim software.[7] The microsimulation model was calibrated to reflect observed field conditions such as existing vehicle volumes and travel times. The operational analysis results reflect the average of 10 model runs.

The following subsections summarize the MOEs provided by the microsimulation model output results. The MOEs include vehicle hours of delay, congestion duration, travel time, intersection control delay, and intersection approach queue length for the weekday morning and evening peak hours.

Vehicle Hours of Delay

Total hours of delay were estimated at key intersections along the corridor for the weekday morning and evening peak hours. To estimate total vehicle hours of delay, the microsimulation model output results for average delay per vehicle was multiplied by the intersection peak hour vehicle volume. Table 2-7 summarizes the total vehicle hours of delay by intersection and the cumulative total delay along the corridor between Preble Circle and Neponset Circle during the weekday morning and evening peak hours.

[7] Vissim is a multimodal simulation software that performs transportation operational analysis.

Table 2-7: Vehicle Hours of Delay

Intersection Name	Vehicle Hours of Delay	
	AM Peak Hour	PM Peak Hour
Preble Circle	14.7	20.7
Columbia Road at Old Colony Avenue	3.9	4.4
Kosciuszko Circle	82.7	42.1
Morrissey Boulevard at Bianculli Boulevard	113.8	60.3
Morrissey Boulevard at Freeport Street[8]	90.1	159.1
Morrissey Boulevard at Popes Hill Street	2.3	3.0
Morrissey Boulevard at the U-turn north of Neponset Circle	5.5	15.3
Neponset Avenue at Gallivan Boulevard West	10.1	18.4
Neponset Avenue at Gallivan Boulevard East	116.9	50.3
Total	**340.0**	**373.8**

Congestion Duration

Capacity along the corridor is limited due to conflicts and delay caused by intersection traffic control such as circular and/or signalized control types. The duration of congestion for roadway segments between intersections along the corridor was estimated by comparing the average weekday (Tuesday through Thursday) hourly traffic volume provided via the ATR count data to the roadway capacity for the associated roadway segment. Roadway capacity refers to the maximum hourly traffic flow for a given roadway segment or point using all available lanes. Roadway capacity is expressed in vehicles per hour. Hours in which the vehicle volume exceeded the roadway capacity were considered the congested duration.

Figure 2-8 to Figure 2-12 show the comparison of average weekday hourly volumes to the roadway capacity for roadway segments approaching Kosciuszko Circle, Bianculli Boulevard, and Freeport Street. While the figures show capacity and volume along a link, the intersection is the main capacity constraint.

[8] Analysis reflects existing conditions at Morrissey Boulevard and Freeport Street as of June 2023, prior to implementation of intersection geometry and signal improvements.

Figure 2-82: Morrissey Boulevard Northbound at Kosciuszko Circle

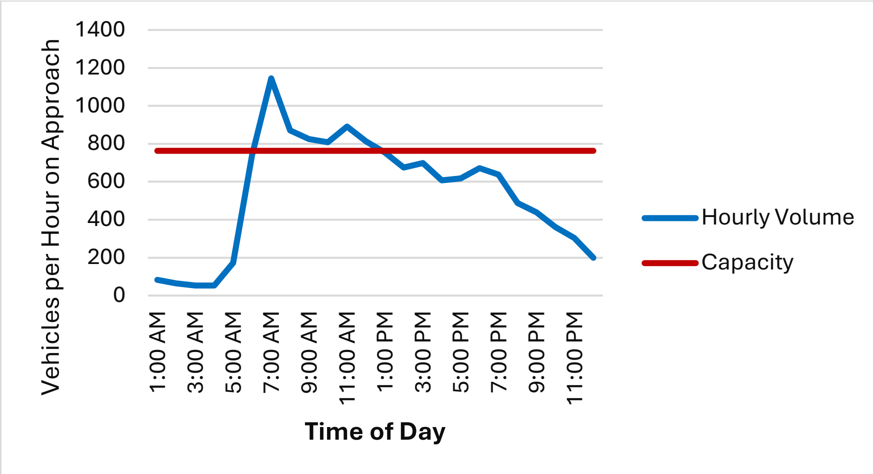


Figure 2-93: Morrissey Boulevard Southbound at Bianculli Boulevard

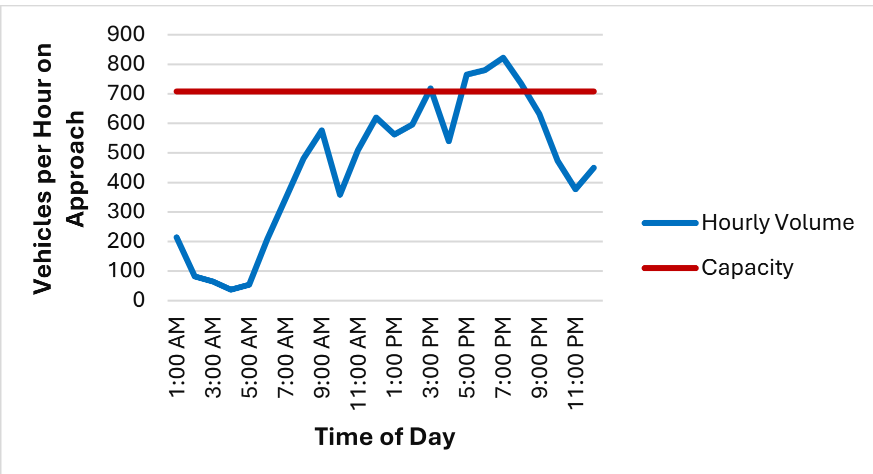


Figure 2-104: Morrissey Boulevard Northbound at Bianculli Boulevard

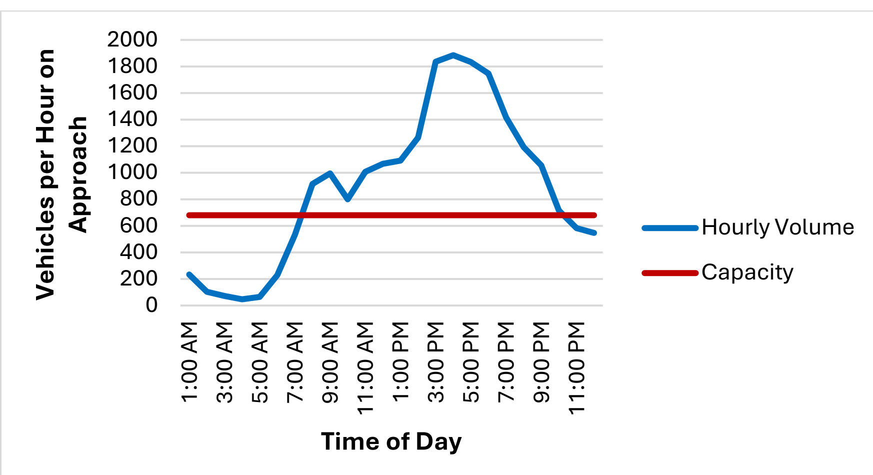


Figure 2-115: Morrissey Boulevard Southbound at Freeport Street

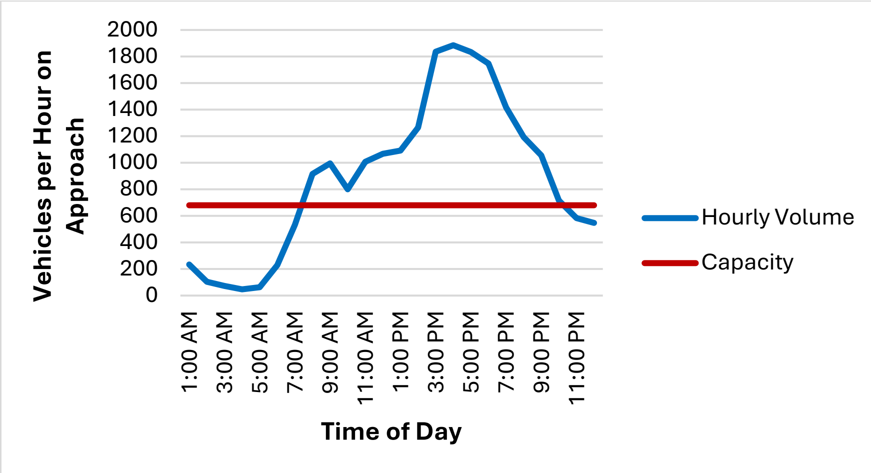
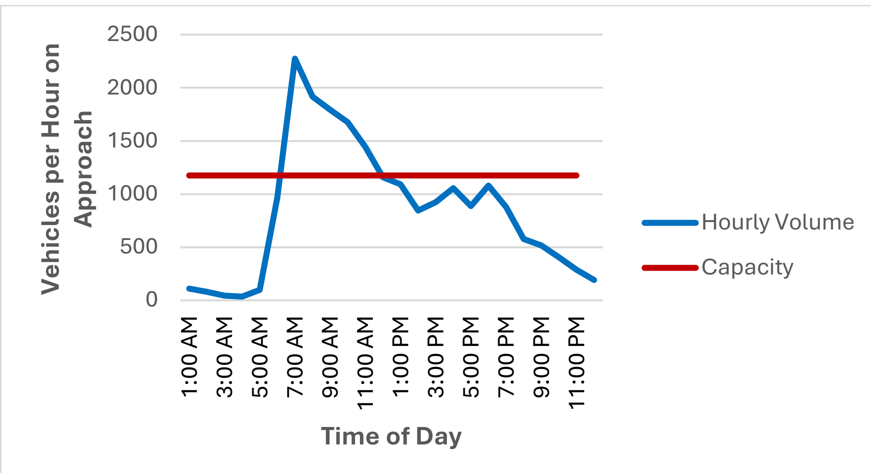


Figure 2-126: Morrissey Boulevard Northbound at Freeport Street



Travel Time

Average vehicle travel times were calculated using the microsimulation model for corridor segments, as shown in Table 2-8. Average vehicle travel speeds for each of these segments were calculated by dividing the segment length with the associated travel time.

Table 2-82: Corridor Travel Times

		AM Peak Hour		PM Peak Hour	
	Distance (miles)	Travel Time (min)	Average Speed (mph)	Travel Time (min)	Average Speed (mph)
Morrissey Boulevard Northbound					
Gallivan Boulevard to Freeport Street	1.4	9.1	9	5.6	15
Neponset Avenue Westbound to Freeport Street	1.4	8.8	10	6.8	13
Freeport Street to Bianculli Boulevard	0.8	3.8	13	1.4	37
Bianculli Boulevard to Mount Vernon Street	0.8	3.7	13	2.7	17
Bianculli Boulevard to I-93 NB via Columbia Road	1.1	7.0	9	4.5	14

	Distance (miles)	AM Peak Hour Travel Time (min)	AM Peak Hour Average Speed (mph)	PM Peak Hour Travel Time (min)	PM Peak Hour Average Speed (mph)
Bianculli Boulevard to Preble Circle	1.2	6.4	12	5.0	15
Morrissey Boulevard Southbound					
Preble Circle to Bianculli Boulevard	1.2	4.2	18	5.9	12
Mount Vernon Street to Bianculli Boulevard	0.9	4.3	12	4.9	10
I-93 Southbound to Bianculli Boulevard via Columbia Road	1.0	4.4	14	4.7	13
Bianculli Boulevard to Freeport Street	0.9	5.6	9	7.0	8
Freeport Street to Gallivan Boulevard	1.1	2.9	23	2.6	26
Freeport Street to Neponset Avenue Eastbound	1.3	4.0	19	3.0	26

As shown in Table 2-8, the majority of average weekday peak hour vehicle travel speeds along the corridor do not exceed 20 mph. As would be expected, these figures are lower than those shown in Table 2-3 (which were daily averages).

The following corridor segments experienced longer than average travel times when compared to free flow travel times:

- Morrissey Boulevard between Freeport Street and Neponset Circle northbound, which could be attributed to a combination of vehicle queue spill back at the I-93 northbound on-ramp—which blocks travel on the Morrissey Boulevard corridor—and signal delay at Freeport Street;
- Morrissey Boulevard from Bianculli Boulevard to I-93 northbound via Columbia Road northbound, which could be attributed to congestion when approaching and traversing through Kosciuszko Circle;
- Bianculli Boulevard and Freeport Street southbound, which could be due to signal operations at the Freeport Street intersection.

Intersection Control Delay

Intersection control delay was obtained from the microsimulation model at key intersections for the existing weekday morning and evening peak hours. The control delay is equated to a corresponding level of service (LOS). Level of Service is a qualitative measure to describe traffic operational conditions along a segment or at an intersection under various traffic conditions. For roadway segments, LOS is defined by the volume of vehicles per lane. For intersections, it is defined by the average control delay (in seconds) each vehicle encounters due to the intersection control mechanism (signal, stop sign, etc.).

The LOS provides an index to the operational qualities of an intersection and range from LOS A to F. The control delay corresponding to specific LOS are shown in Table 2-9.

Table 2-9:3 Level of Service Criteria

Level of Service	Unsignalized/Traffic Circle Intersection Control Delay Per Vehicle (in seconds)	Signalized Intersection Control Delay Per Vehicle (in seconds)
A	<10	<10
B	10.1-15	10.1-20
C	15.1-25	20.1-35
D	25.1-35	35.1-55
E	35.1-50	55.1-80
F	>50	>80

Source: Highway Capacity Manual, 12-19

Table 2-10 summarizes the overall intersection LOS and average vehicle control delay at key intersections along the corridor. Additionally, Figure 2-13 provides a graphical representation of the overall intersection operations for the weekday morning and evening peak hours.

Several corridor intersections, such as Bianculli Boulevard, Columbia Road, and Freeport Street, experience excessive vehicle delay (LOS E or F) during the morning and evening peak hours. Other segments and approaches vary by location.

Table 2-104: Overall Intersection Level of Service

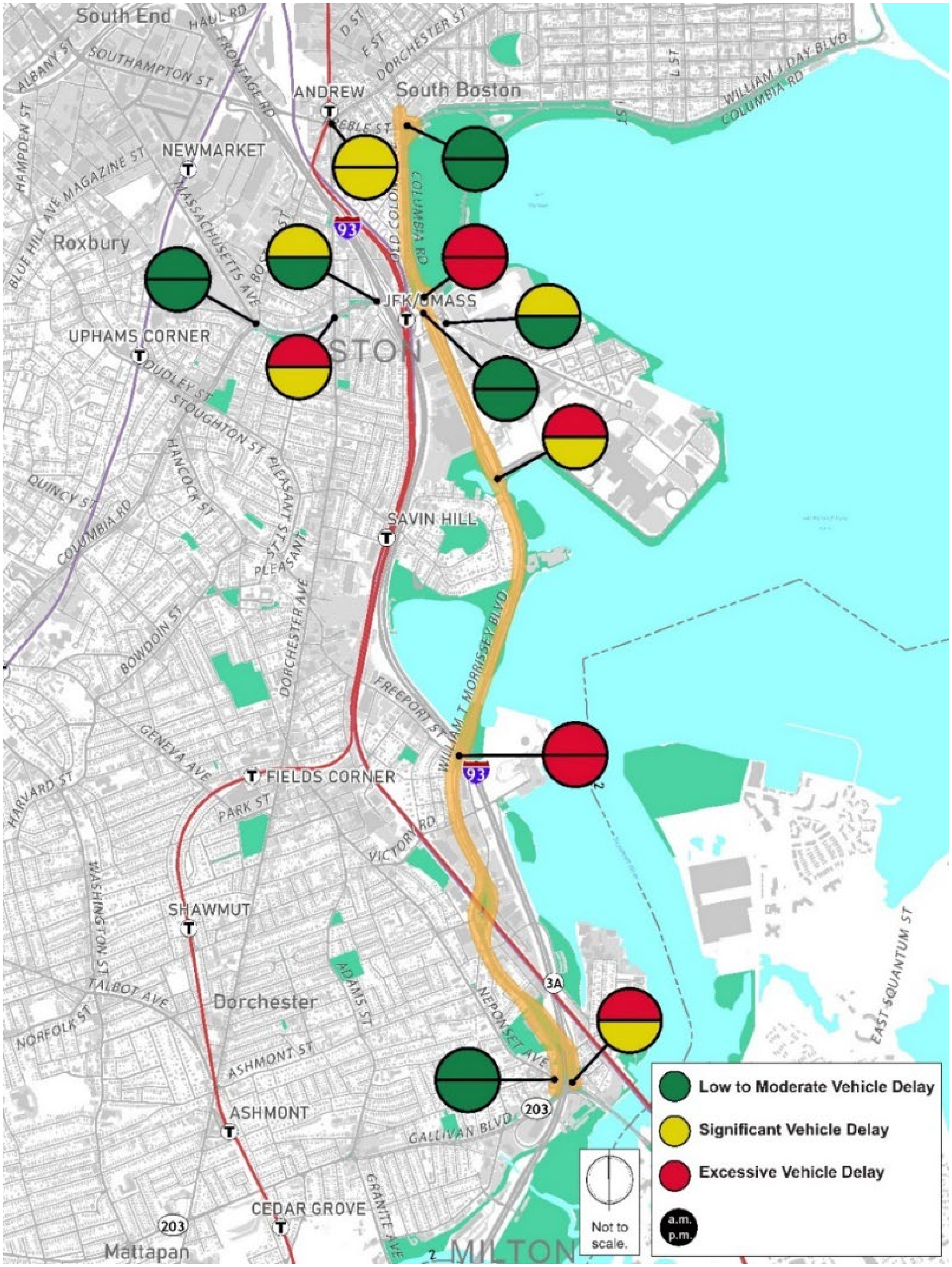
	AM Peak Hour		PM Peak Hour	
Intersection/Lane Group	LOS	Delay (sec)	LOS	Delay (sec)
Andrew Square	E	70.9	E	67.3
Preble Circle at Old Colony Avenue - *Unsignalized*	A	5.2	D	30.1
Preble Circle at Preble Street - *Unsignalized*	A	1.8	A	7.4
Preble Circle at Columbia Road (south) - *Unsignalized*	A	5.9	A	4.3
Preble Circle at Columbia Road (east) - *Unsignalized*	E	36.8	B	14.2
Columbia Road at Old Harbor Roa - *Signalized*	E	67.3	B	17.2
Columbia Road at G St | Day Boulevard - *Unsignalized*	D	42.3	D	47.4
Edward Everett Square - *Signalized*	D	42.9	D	41.9
Columbia Road at Dorchester Avenue - *Signalized*	F	82.7	E	74.6
Columbia Road at I-93 SB Ramps - *Signalized*	E	69.9	D	37.7
Columbia Road at I-93 NB Ramps - *Unsignalized*	E	77.0	D	44.1
Columbia Road at Old Colony Avenue	B	12.6	A	8.6
Kosciusko Circle at Columbia Road (north) - *Unsignalized*	C	17.2	B	10.4
Kosciusko Circle at Columbia Road (west) - *Unsignalized*	D	34.3	D	25.8
Kosciusko Circle at Morrissey Boulevard - *Unsignalized*	F	104.6	D	32.7
Kosciusko Circle at Day Boulevard - *Unsignalized*	B	14.3	B	12.9

	AM Peak Hour		PM Peak Hour	
Intersection/Lane Group	LOS	Delay (sec)	LOS	Delay (sec)
Day Boulevard at Morrissey Boulevard - *Unsignalized*[9]	D	31.9	D	26.4
Morrissey Boulevard NB Service Road at Mount Vernon Street - *Signalized*	E	67.5	C	30.3
Morrissey Boulevard SB Service Road at Old Colony Avenue - *Signalized*	B	11.8	B	19.4
Morrissey Boulevard at Bianculli Boulevard - *Signalized*	F	117.2	E	58.9
Morrissey Boulevard at Freeport Street[10]- *Signalized*	F	117.2	F	160.3
Morrissey Boulevard at Popes Hill Street - *Unsignalized*	A	6.5	A	5.8
Morrissey Boulevard SB at U-Turn north of Neponset Circle - *Unsignalized*	C	29.5	C	27.4
Morrissey Boulevard SB at Neponset Avenue - *Signalized*	C	34.8	C	27.2
Gallivan Boulevard NB at Neponset Avenue- *Signalized*	F	256.1	E	55.7

SB = Southbound; NB = Northbound

[9] This intersection is marked as unsignalized because there is a light at the intersection, but it is just on an automatic blink signal.
[10] Analysis reflects existing conditions at Morrissey Boulevard and Freeport Street as of June 2023, prior to the implementation of intersection geometry and signal improvements.

Figure 2-137: Vehicle Delay at Critical Study Area Intersections



MassDOT, MassGIS

Queue Length Assessment

A queue evaluation was conducted using the microsimulation model at key intersections for the existing weekday morning and evening peak hours. Queuing is a quantitative measure of the back up left over after a signal cycle and how long the traffic back ups are anticipated to be from the stop line at an intersection. Maximum queue lengths were assessed at selected intersection by approach.

Based on the queue evaluation, these maximum queue lengths may block movements between the Morrissey Boulevard mainline and the Morrissey Boulevard service road. As shown in Figure 2-14 and Figure 2-15, maximum weekday morning peak hour queue along the Morrissey Boulevard corridor occurs in the northbound direction extending from Kosciuszko Circle to Bianculli Boulevard. This could be attributed to the I-93 northbound on-ramp queue that extends west, blocking vehicle movements traversing the circle. Additionally, the Kosciuszko Circle westbound queues block the I-93 northbound off-ramp which may cause additional congestion for vehicles exiting I-93.

Figure 2-16 and Figure 2-17 illustrate the queues blocking circulation around Preble Circle, Kosciuszko Circle, and Neponset Circle during the weekday evening peak hour. Queues extending west from Kosciuszko Circle may block the I-93 northbound off-ramp, causing congestion for vehicles exiting I-93 while the I-93 northbound on-ramp queue extends into Kosciuszko Circle, obstructing vehicle circulation within the circle. Based on the queue evaluation, during the weekday evening peak hour, northbound queues from Neponset Circle extend along Neponset Avenue over the Neponset River and into Quincy.

Figure 2-149: Maximum Vehicle Queues, Weekday AM Peak Hour (North Section)

Figure 2-158: Maximum Vehicle Queues, Weekday AM Peak Hour (South and Central Sections)

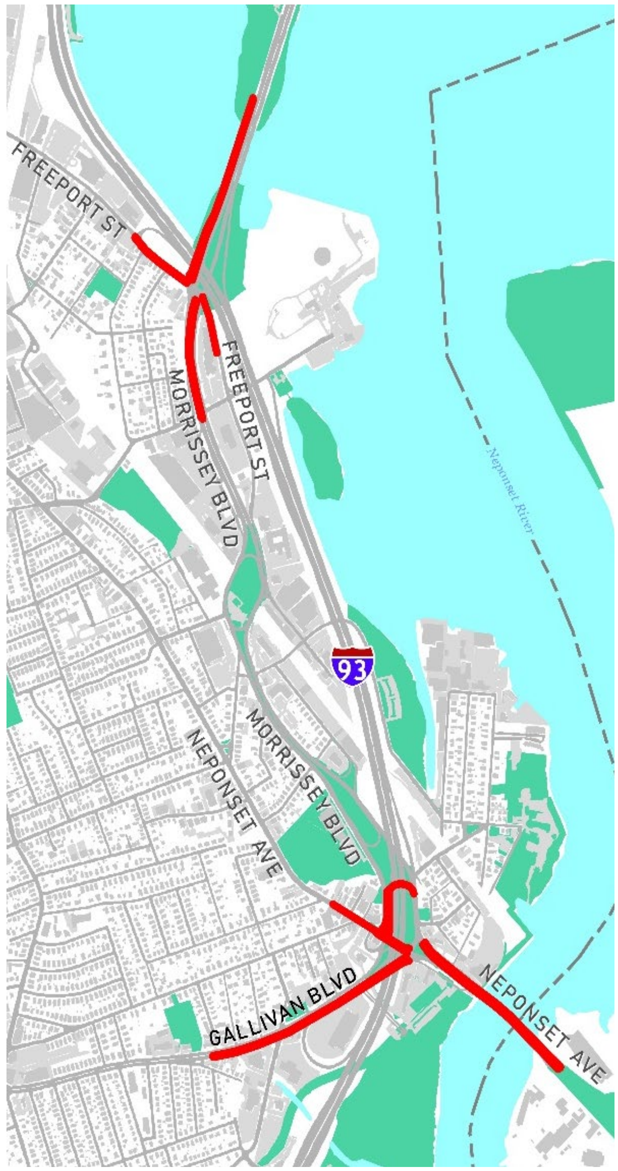
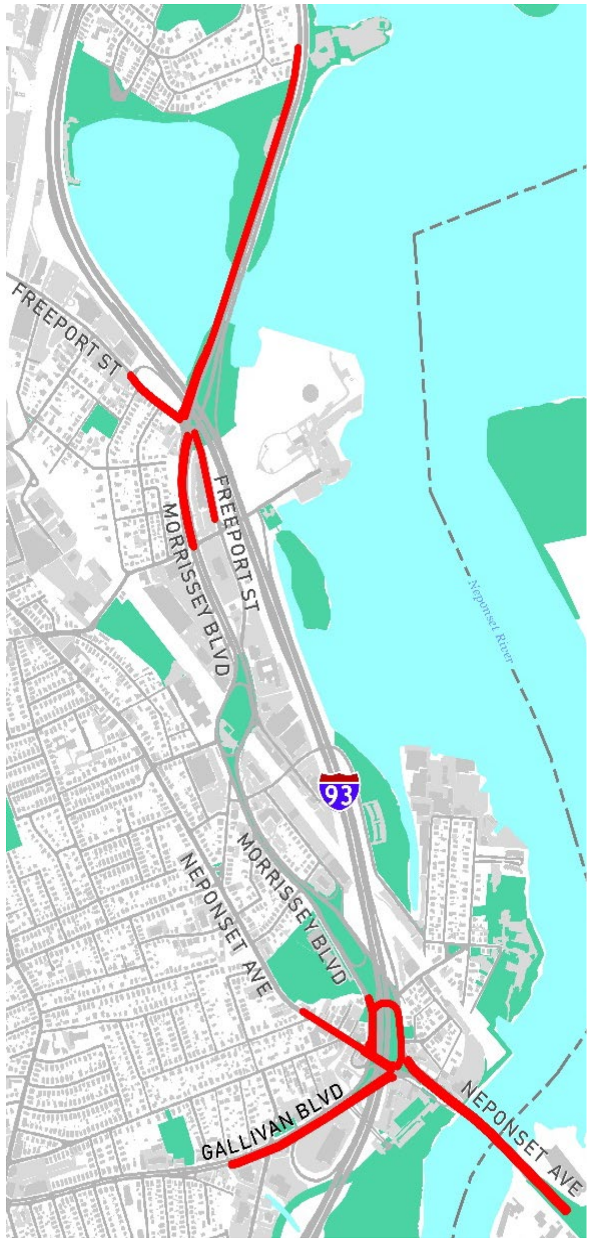


Figure 2-16: Maximum Vehicle Queues, Weekday PM Peak Hour (North Section)

Figure 2-17: Maximum Vehicle Queues, Weekday PM Peak Hour (South and Central Sections)



2.1.5 Safety Overview

To identify motor vehicle crash trends within the corridor, crash data (2017-2019) was obtained through the MassDOT IMPACT crash data portal. The following subsections provide a safety overview that includes a review of the high crash locations and crash typologies within the study area.

Key Findings of Safety Evaluation

- Of the reported crashes in the study area, 65.7 percent were property damage only, 30.6 percent were personal injury, 0.3 percent were fatal, and 3.4 percent did not report the severity.

- The northern section of the study corridor, which sees higher pedestrian volumes, also experiences higher numbers of pedestrian-involved crashes, with multiple pedestrian crashes reported at Preble Circle and Kosciuszko Circle.

- Over half of the reported crashes within the study area occur at the major intersections of Kosciuszko Circle, Freeport Street, Popes Hill Circle, and Neponset Circle.

- The following locations are considered high crash locations: Preble Circle, Kosciuszko Circle, Morrissey Boulevard at Bianculli Boulevard, and Morrissey Boulevard at Freeport Street.

Key Term Definitions

Road Safety Audit (RSA): A plan that summarizes historic crash data, identifies existing safety concerns, and proposes potential enhancements.

Ideally, an RSA should be collaborative and involve a variety of safety professionals.

Crash Cluster Locations

MassDOT's Highway Safety Improvement Program (HSIP) identifies crash clusters totals that are eligible for safety funding. For a location to be classified as an HSIP crash cluster, the total number of equivalent property damage only crashes in the area have to be within the top 5 percent of all crash clusters within the region. The crash cluster are categorized as intersection as well as pedestrian or bicycle. MassDOT has created a Top Crash Location Interactive Map for the Commonwealth that provides details on the region's HSIP crash clusters. According to the interactive map, the following locations are top crash clusters:

- Preble Circle – Top 5% Pedestrian Crash Cluster 2011-2020
- Kosciuszko Circle – Top 5% Pedestrian Crash Cluster 2011-2020 and Top 5% Bicycle Crash Cluster 2011-2020
- Morrissey Boulevard at Bianculli Boulevard – Top 5% Intersection Crash Cluster 2011-2020
- Morrissey Boulevard at Freeport Street – Top 5% Intersection Crash Cluster 2011-2020

A Road Safety Audit (RSA) is a plan collaboratively developed by a variety of safety professionals that summarizes historic crash data, identifies existing safety concerns, and proposes potential enhancements.

RSAs have been conducted at the four (4) crash clusters listed above (the Kosciuszko Circle RSA was completed in 2019 and one RSA completed in 2021 covered the other three locations). A common safety observation made across the four (4) RSAs was the lack of bicycle facilities, whether due to specific bicycle crashes or simply due to the presence of many cyclists traveling through the area forced to use sidewalks or travel alongside high speed or even congested vehicle flow.

Historic 85th percentile speeds were found to be 45 mph at various locations along Morrissey Boulevard, which places vulnerable road users (pedestrian and bicyclist) at high risk for fatality or serious injury.

Crash Typologies

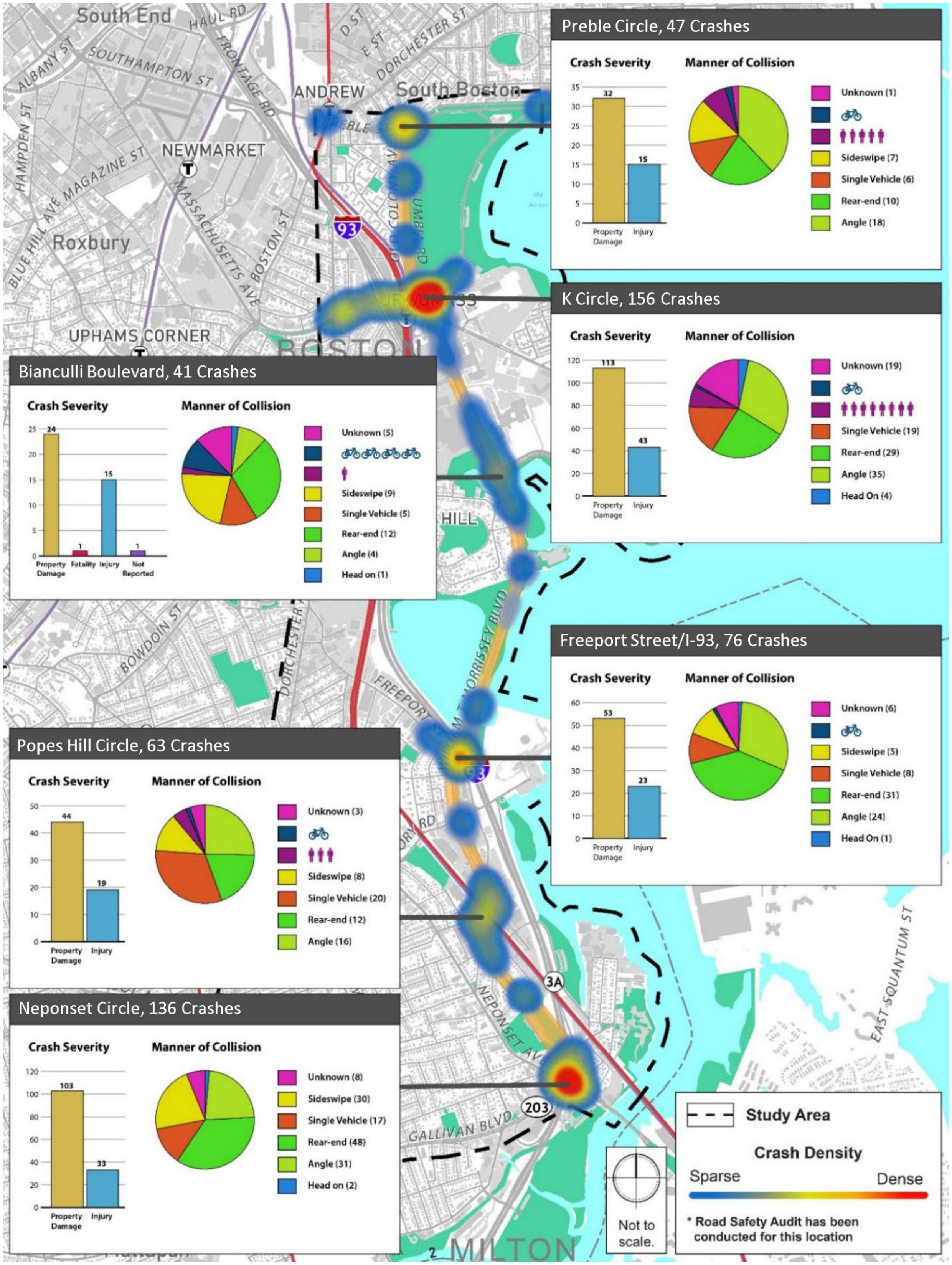
From 2017 to 2019, the MassDOT IMPACT Portal and the Boston Vision Zero crash data reported a total of 732 crashes along the corridor. Of those, 481 were property damage crashes, 224 were personal injury crashes, and two were fatalities.

The most common crash types were rear-end (27 percent of crashes), angle (25 percent of crashes), and sideswipe (19 percent). Of the reported crashes, 65.7 percent resulted in property damage only, 30.6 percent involved personal injury, and 0.3 percent (two crashes) resulted in fatalities.

There were 37 crashes within the corridor involving bicyclists or pedestrians. The northern section of the corridor, which incurs higher pedestrian volumes, also experiences a higher number of pedestrian crashes. Multiple pedestrian crashes were reported at Preble Circle and Kosciuszko Circle. The corridor segment between Kosciuszko Circle and the Beades Bridge reported four (4) bicycle crashes, including one (1) fatal crash.

A heat map of the study area crashes with the significant trends across manner of collision and crash severity shown for the higher crash clusters is shown in Figure 2-18.

Figure 2-1810: Crash Heatmap and Summary, Major Study Area Intersections



Data from MassDOT Impact Portal and the City of Boston Vision Zero Crash Portal, 2022

2.2 Transit Network

The study area is served by Massachusetts Bay Transportation Authority (MBTA) Rapid Transit (the Red Line), buses (public and private), and MBTA Commuter Rail. Together, these different modes serve transit users living, working, and traveling through the study area.

2.2.1 Key Findings of Transit Evaluation

- The MBTA Red Line is the most utilized transit service in the study area. The most utilized MBTA Red Line station in the study area is JFK/UMass Station.
- There are eight (8) bus routes serving the study area (although some of them only serve a small section of the study area). The most frequent and well-used study area bus routes are Routes 8 and 16, although most of the boardings and alighting on that route occur outside of the study area. Both these routes are cross-city routes, linking the study area to points west, such as the Orange Line and the Longwood Medical Area.
- On Morrissey Boulevard itself, bus service is limited. Route 201 runs for only a short section on Morrissey Boulevard, from Victory Road to Freeport Street.
- The study area is served by three different Commuter Rail lines and one commuter rail stop (JFK/UMass). The multiple services means that passengers going between JFK/UMass Station and South Station benefit from higher frequency. This stop also offers transfer possibilities with the MBTA Red Line and with buses.

2.2.2 Rapid Transit (MBTA Red Line)

The study area is served by the MBTA Red Line, a 22-stop, 2-branch (Ashmont and Braintree) rapid transit line running north-south between Ashmont and Braintree Stations to Alewife Station in Cambridge. At Ashmont Station, passengers can transfer to the Ashmont-Mattapan High Speed Line, which is a light rail line. In central sections of Boston, the MBTA Red Line runs underground, while in the study area, it generally runs above ground.

The MBTA Red Line has connections with other public transportation services, including:

- MBTA Silver Line (connection at South Station)
- MBTA Green Line (connection at Park Street)
- MBTA Orange Line (connection at Downtown Crossing)
- MBTA Mattapan Trolley (connection at Ashmont)
- MBTA Commuter Rail (connection at JFK/UMass)
- Amtrak intercity passenger rail at South Station
- Various intercity private bus operators at South Station
- Various MBTA bus and private local bus operators throughout the line

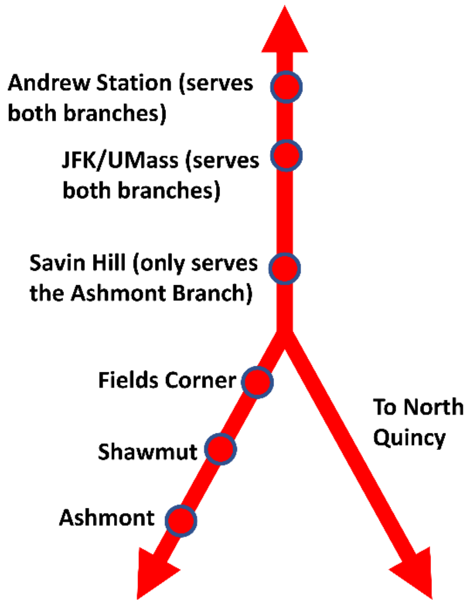
Figure 2-19 shows the connections made by the MBTA Red Line to other rail services, as well as to high-frequency bus routes. The study area contains four MBTA Red Line stations: Andrew, JFK/UMass, Savin Hill, and Ashmont. Two other stations (Shawmut and Fields Corner Stations) are immediately adjacent to the study area.

Figure 2-1911: Study Area in the Overall Transit System

Source: MBTA, with the study area added in

Andrew and JFK/UMass Stations have Ashmont and Braintree branch service. At JFK/UMass, the MBTA Red Line splits, with one branch traveling through Dorchester (the Ashmont Branch) and the other traveling to Quincy/Braintree (the Braintree Branch). Savin Hill Station and stations to the southwest (Fields Corner, Shawmut, and Ashmont) are only served by the Ashmont branch.

Figure 2-2012: MBTA Rapid Transit Service Diagram within the Study Area



MBTA Red Line service operates seven days a week. The MBTA schedules 16- to 21-minute weekday headways (i.e., the amount of time between train cars or buses) on each branch, meaning there are approximately 8- to 11-minute headways within the shared trunk line.

Existing Demand

Boardings refers to any time an individual boards a subway, bus, or other transit vehicle. In 2019, prior to the COVID-19 pandemic, over 250,000 passengers boarded the Red Line on weekdays along the entire length of the Red Line, from Alewife and Ashmont Stations to Braintree Station. On an average weekday in 2019, 39,856 passengers boarded at a MBTA Red Line station at one of the six stations that are either within the study area (Andrew, JFK/UMass, Savin Hill, and Ashmont), or immediately adjacent to it (Fields Corner and Shawmut). Among all MBTA Red Line stations in the study area, JFK/UMass reported the highest percentage of these boardings (27.1 percent).

Alightings, which refers to any time an individual exits a subway, bus, or other transit vehicle, follow a similar trend, with approximately 39,612 passengers alighting at all study area stations during a given weekday. Among all MBTA Red Line stations in the study area, JFK/UMass accounts for the largest percentage of study area alightings (27.9 percent). With the exception of JFK/UMass, study area stations typically serve as origins in the AM peak and early-midday before serving as destinations during the afternoon and PM-peak periods. JFK/UMass Station has a more balanced boarding/alighting pattern likely due to UMass Boston classes throughout the day and evening.

Table 2-115: Boarding Metrics (2019)

Station	Total Boardings	% Boardings in study area	Total Alightings	% Alightings in study area
Andrew	6,130	15.4%	6,391	16.1%
JFK/UMass	10,805	27.1%	11,047	27.9%
Savin Hill	2,341	5.9%	2,468	6.2%
Fields Corner	5,425	13.6%	5,659	14.3%
Shawmut	6,130	15.4%	6,391	16.1%
Ashmont	9,025	22.6%	7,656	19.3%
All 6 Stations	39,856	N.A.	39,612	N.A.

Source: Data from MBTA

The MBTA Station Access study (2020)[11] is an important document that classified levels of station access to MBTA rail stations. The report described stations as belonging to three different classes for rapid transit (Core, Neighborhood, and Regional). Stations in these different classifications have different dominant access modes and different development potentials.

Table 2-126: Station Typologies

Station	Type	Estimated Drive-Alone Mode Share of Rapid Transit Type
Andrew	Regional Rapid Transit	7%
JFK/UMass	Core Rapid Transit	1%
Savin Hill	Neighborhood Rapid Transit	6%
Fields Corner	Neighborhood Rapid Transit	6%
Shawmut	Neighborhood Rapid Transit	6%
Ashmont	Regional Rapid Transit	7%

Source: Data from MBTA, from the 2015-2017 MBTA Systemwide Passenger Survey. The mode share of those using bus transfers was not captured in this report.

Core Rapid Transit Stations are primarily accessed by pedestrians walking directly to the station. Safe, convenient, and walkable connections between JFK/UMass and its surroundings are crucial.

Neighborhood Rapid Transit Stations are also generally accessed by pedestrians. As such, pedestrian safety and comfort are quite important at Savin Hill, Fields Corner, and Shawmut Stations.

Regional Stations have major bus terminals and/or park-and-ride facilities. Andrew and Ashmont are regional stations, and improving access requires investments that optimize the flow of buses in and out of the station (while also serving pedestrians and bicyclists).

[11] MBTA Station Access study, 2020, MBTA and MassDOT, found here https://www.mass.gov/info-details/massdot-completed-studies#-mbta-station-access-study-%E2%80%93-2020-

Several key elements relate to all stations in the corridor:

- For all station types, park-and-ride is a less common access mode than walking, biking, or using a bus. Consistent with these findings, additional bike parking, improving rail-bus links, and managing pedestrian access and safety are important.
- All rapid transit and commuter rail stations in the study area show high potential demand (a pattern that is seen along most rail lines within Route 128).
- There is moderate to high transit-oriented development potential along the Morrissey Boulevard corridor due to existing land use patterns, as evidenced by development projects such as Dorchester Bay City.

In addition to the *MBTA Station Access Study*, factors that contribute to higher transit demand were also examined. One of these is the presence of zero-car households, which are discussed in a later section. The neighborhoods around some MBTA Red Line stations in the study area were found to have a higher percentage of households with zero vehicles.

Impacts of COVID-19

As with other parts of the MBTA system, the COVID-19 Pandemic caused a rapid decline in MBTA Red Line ridership, followed by a slow increase in ridership as vaccines and COVID-19-related policies changed. MBTA data indicates that the PM peak ridership exceeds AM peak ridership and that MBTA Red Line ridership is more consistent throughout the day. However, overall ridership has yet to fully recover. As of May 2023, the latest data that is available, MBTA Red Line ridership is approximately 50 percent of pre-pandemic levels, with no increase throughout 2023.

2.2.3 Bus Service

The study area has many bus connections between neighborhoods, MBTA rapid transit and Commuter Rail services, and additional destinations. Various bus routes, both public and private, serve the study area and are listed below:

- Public Transit – MBTA service (8 routes)
  - Route 8, operating between Kenmore and Dorchester's Harbor Point neighborhood
  - Route 16, operating between Andrew and Forest Hills; a subset of trips serve South Bay Center or Harbor Point
  - Routes 22 and 23 act as cross-town routes, connecting Ashmont Station to Ruggles via two parallel routes. These routes are not shown in Figure 2-22 because while they connect to Ashmont Station, they run largely outside of the study area.
  - Route 41, operating between JFK/UMass Station and Jamaica Plain
  - Routes 201 and 202, operating in Dorchester between Fields Corner and Adams Village Station
  - Route 210, operating between Fields Corner Station and Quincy Center
- Private Services

- Longwood Collective (formerly MASCO) Shuttle operating between JFK/UMass Station and the Longwood Medical Area
- UMass Boston shuttles operating with the following routes:
  - Route 1: "Links JFK/UMass Station and Bayside with the Campus Center"[12]
  - Route 2: "The Route 2 Americans with Disabilities Act (ADA) accessible van connects the West Garage with the Campus Center"

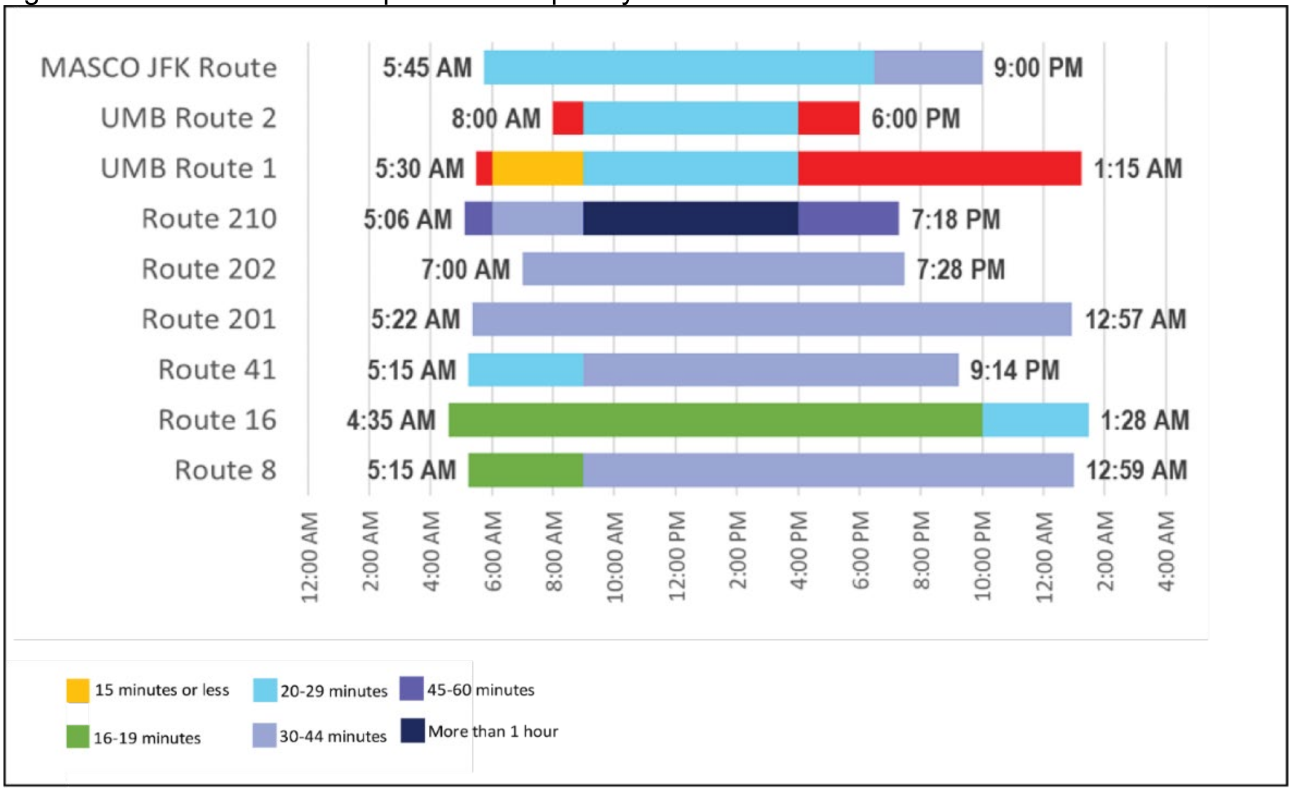
[12] Descriptions are from UMass Boston's Transportation's website: Getting Here - UMass Boston (umb.edu)

Figure 2-21: Current Bus Service with Frequency

Source: MBTA, Better Bus Project website, 2022

Figure 2-22 shows frequency and headways, which vary significantly by route in the study area. MBTA Route 16 has the highest operating frequency (over 20 hours per day) with some of the shortest headways (15 to 19 minutes), while Route 202 (lowest frequency) and Route 210 (longest headways) illustrate other extremes of bus service in the study area.

Figure 2-2213: Bus Service Span and Frequency



MBTA Bus Ridership Database, 2022

Note: Routes 22 and 23 are not included in the chart above because they do not serve main sections of the study area.

Existing Demand

The MBTA currently carries about 250,000 people daily on its bus network systemwide (not counting the Silver Line). This number represents about 40 percent of the overall ridership on the MBTA system.

Impact of COVID-19

Like other modes, the COVID-19 Pandemic impacted study area bus ridership. Collectively, in the fall of 2022, weekday ridership on the main MBTA routes in the study area (8, 116, 41, 201, 202, and 210) was over 20 percent lower than in the fall of 2019, as measured by average boardings.

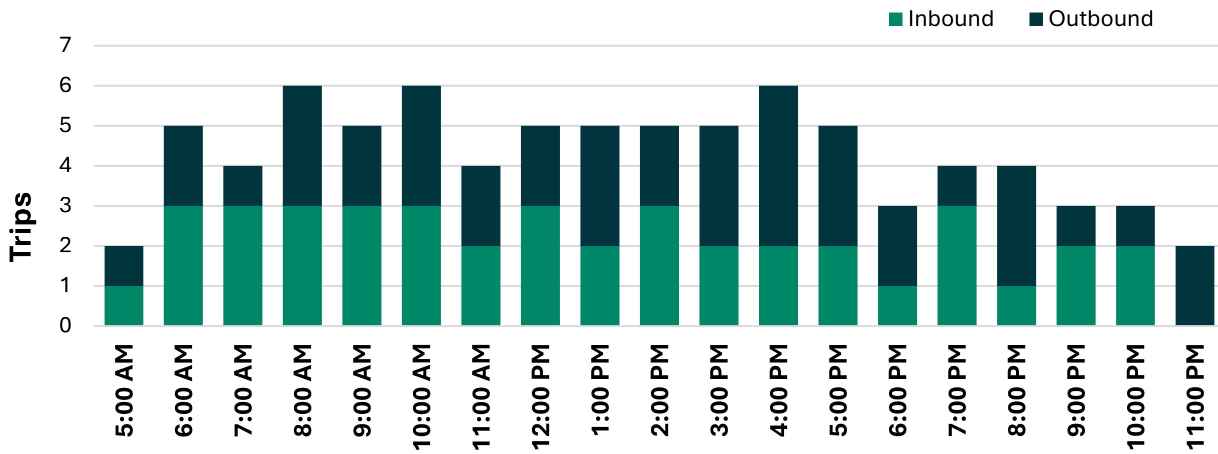
2.2.4 Commuter Rail

MBTA Commuter Rail service with connections in the study area includes three lines: the Greenbush Line, the Kingston Line, and the Middleborough/Lakeville Line. These lines connect to locations in Bristol, Plymouth, and Norfolk Counties.[13] The lines run parallel to the Morrissey

[13] Once operational, the Fall River and New Bedford lines will also operate within the corridor.

Boulevard corridor, and all lines stop at JFK/UMass before terminating at South Station in Downtown Boston. At JFK/UMass Station, transfers to bus or Red Line service can be made using an on-site walkway. Between 6 am and 5 pm, there are between four and six trains (split evenly between inbound and outbound) per hour calling at JFK/UMass Station. In the early morning and late evening, it can be as low as two (one inbound and outbound) trains per hour (Figure 2-23).

Figure 2-2314: Number of Commuter Rail Trains per Hour at JFK/UMass Station



Existing Demand

Ridership varies by line with slightly over 50 percent of JFK/UMass Commuter Rail riders using the Greenbush Line. Like MBTA Red Line rapid transit patterns at JFK/UMass, the station is a commuter destination in the mornings and origin in the evenings. This is largely explained by nearby trip generators like UMass Boston and Boston College High School.

Impact of COVID-19

MBTA Commuter Rail ridership during the COVID-19 pandemic declined the most dramatically of any MBTA service modes, falling almost 90 percent from January 2020 to January 2021. This likely represents that the Commuter Rail serves a higher percentage of passengers with daily commutes to office destinations, aligning with typical AM inbound / PM outbound patterns. Nonetheless, Commuter Rail ridership is returning; in fact, if measured between December 2021 and December 2023, systemwide daily ridership grew from about 13,300 to over 93,800 (increasing 700 percent).

2.3 Bicycle and Pedestrian Network

The bicycle and pedestrian networks within the study area were generally analyzed for safety, network completeness, and comfort using a variety of data sources. While Morrissey Boulevard is currently a key north-south corridor in the southern section of Boston, it lacks a complete and connected network that would allow all bicyclists and pedestrians of all comfort levels and abilities to use it for commuting or recreational purposes.

2.3.1 Key Findings of Pedestrian and Bicycle Evaluation

- Bicycle Network: Morrissey Boulevard currently lacks dedicated bicycle facilities along the corridor.
- Bicycle Level of Traffic Stress (LTS): Most segments of Morrissey Boulevard are a high-stress environment for bicyclists due to the adjacent vehicular travel speed, number of travel lanes, amount of vehicular traffic, and a lack of separated bike facilities. Old Colony Avenue has formalized bicycle facilities compared to the section of the Morrissey Boulevard Corridor south of Kosciuszko Circle.
- Bicycle Demand: The Strava[14] heatmap for pedestrian activity shows there are higher levels of cycling on roads with bicycle facilities. Morrissey Boulevard, despite not having dedicated cycling facilities, sees higher levels of demand for bicycle facilities. MassDOT's geospatial analysis for the Massachusetts Bicycle Transportation Plan, Potential for Everyday Biking, identifies areas of opportunity to increase bike trips. The analysis identifies Morrissey Boulevard as an area of medium potential.
- Pedestrian Network: Critical network gaps in pedestrian facilities exist throughout the study area either in the form of limited crossings or sidewalk gaps. Additionally, there are significant sections of Morrissey Boulevard that do not provide any separation between the sidewalk and the edge of vehicular travel. This can create an unpleasant environment for pedestrians.
- Sidewalk condition along much of the corridor was rated as fair or poor, particularly in the southern section where less durable asphalt sidewalks are more common.
- Pedestrian Environment and Crossings: There are limited opportunities for pedestrians to make east-west connections between the Morrissey Boulevard corridor and neighborhoods west of I-93 and the rail line.

2.3.2 Pedestrian Network

Walkability, or the ability to access goods and services safely and comfortably on foot, was assessed for the study area.

While there are extensive pedestrian accommodations in the study area, the quality is varied and connectivity east-west across Morrissey Boulevard is limited. The section below provides an overview of pedestrian conditions in the existing network in the study area.

Sidewalk Conditions

Sidewalks are generally provided along each side of Morrissey Boulevard but vary in condition, as shown in Figure 2-24. In the northern section of the corridor, around Columbia Road and Old Colony Avenue, there are wider cement concrete sidewalks; while in the southern section, narrower asphalt sidewalks are more common. Sidewalks in this section are generally five feet wide, but pinch points exist due to signal equipment, lamp posts, or crash barriers, which reduce the usable width. Sidewalk comfort also depends on if pedestrians have a buffer between them and the street, which is especially important when vehicle speeds are higher. As Figure 2-25 shows, certain segments, especially north of Bianculli Boulevard, lack a buffer.

Pedestrian Network Gaps

While sidewalks are provided for most of the corridor, network gaps in pedestrian facilities exist, either in the form of limited crossings or sidewalk gaps. The sidewalk is discontinuous on the west side of Morrissey Boulevard south of Victory Road. On either end of this discontinuity,

[14] Strava is a company that measures walking, running, and bicycling activity among its members.

nearby connections such as a crosswalk or bridge are not provided to get to the east side of the road. South of Popes Hill Street there are several side streets with missing crosswalks, including Popes Hill Street, Freeport Street, Tenean Street, and others. In general, most of these locations also lack ADA-compliant pedestrian ramps.

Figure 2-26 shows the locations of missing pedestrian curb ramps and where pedestrian curbs ramps lack a detectable warning panel. The prevalence of missing curb ramps in the southern section makes large portions of Morrissey inaccessible to people with disabilities, and those using bikes, strollers, or other mobility devices.

There are three pedestrian bridges along the corridor that allow safer and more comfortable crossings of Morrissey Boulevard:

- Popes Hill Circle
- South of Mount Vernon Street
- South of Murray Way

These crossings provide key connectivity for pedestrians and bicyclists but are limited in number.

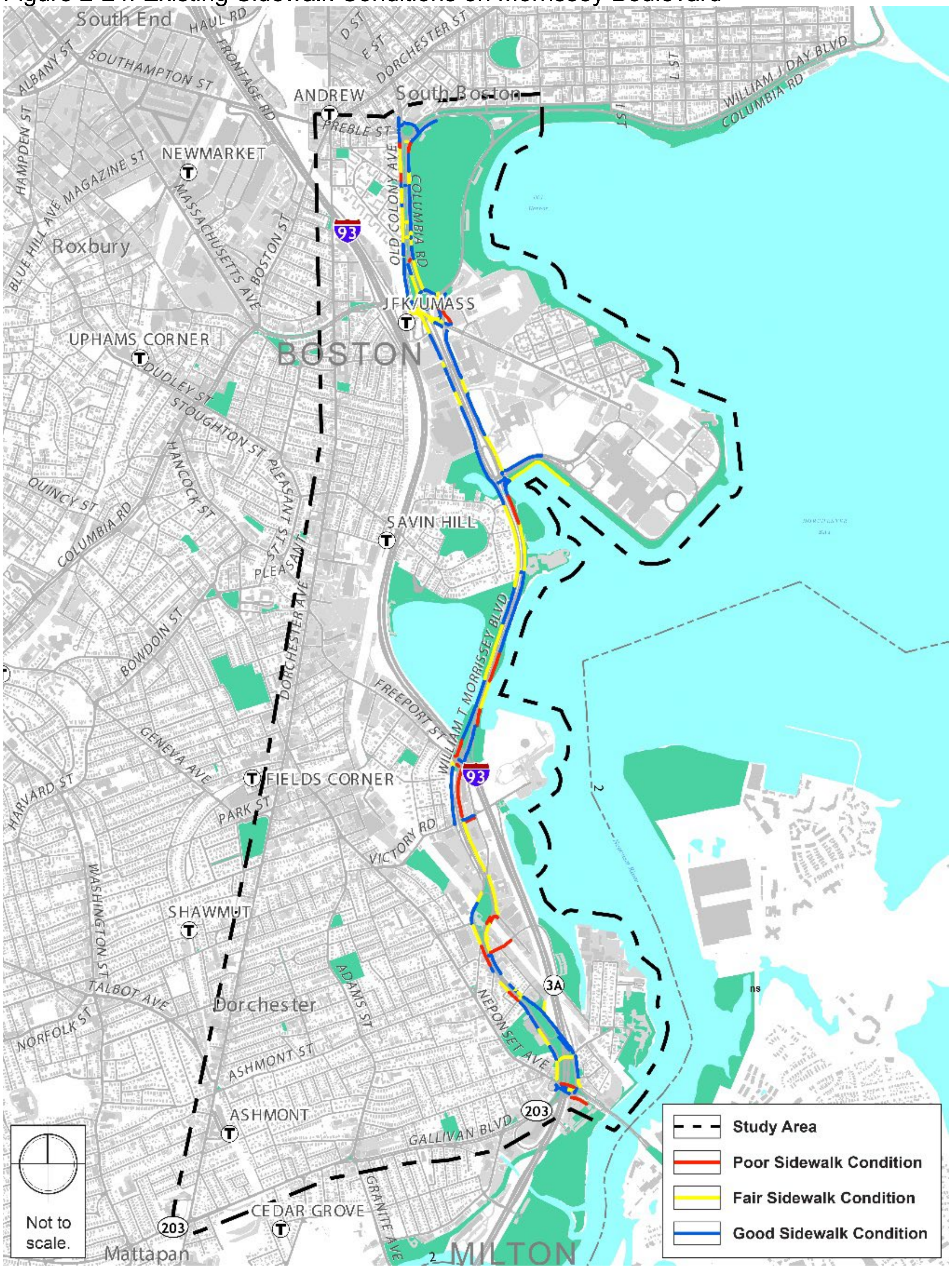
Pedestrian Demand

Strava was also used to analyze pedestrian demand. In the study area, Strava pedestrian activity was highest near UMass Boston and Joe Moakley Park, along with areas near the Neponset River. Pedestrian counts were also collected at key locations for the weekday AM and PM peak hours. Locations with high pedestrian counts include:

- Preble Circle
- Kosciuszko Circle and nearby intersections such as at Morrissey Boulevard and Mount Vernon Street
- Near the entryway to JFK/UMass MBTA Station
- Along Columbia Road to the west of Kosciuszko Circle
- Near the Star Market Driveway

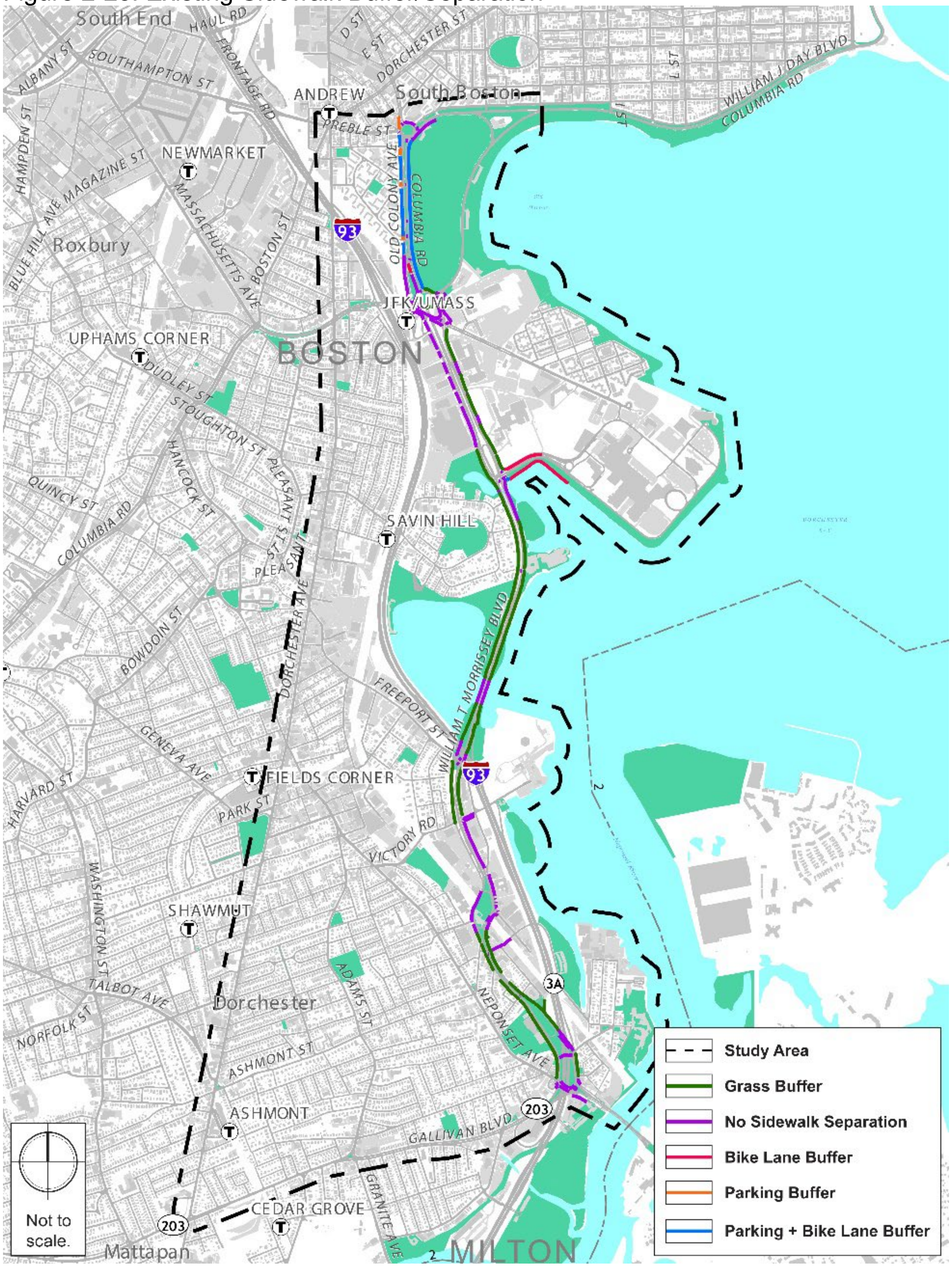
In general, pedestrian volumes in the southern part of the study area are significantly lower.

Figure 2-24: Existing Sidewalk Conditions on Morrissey Boulevard



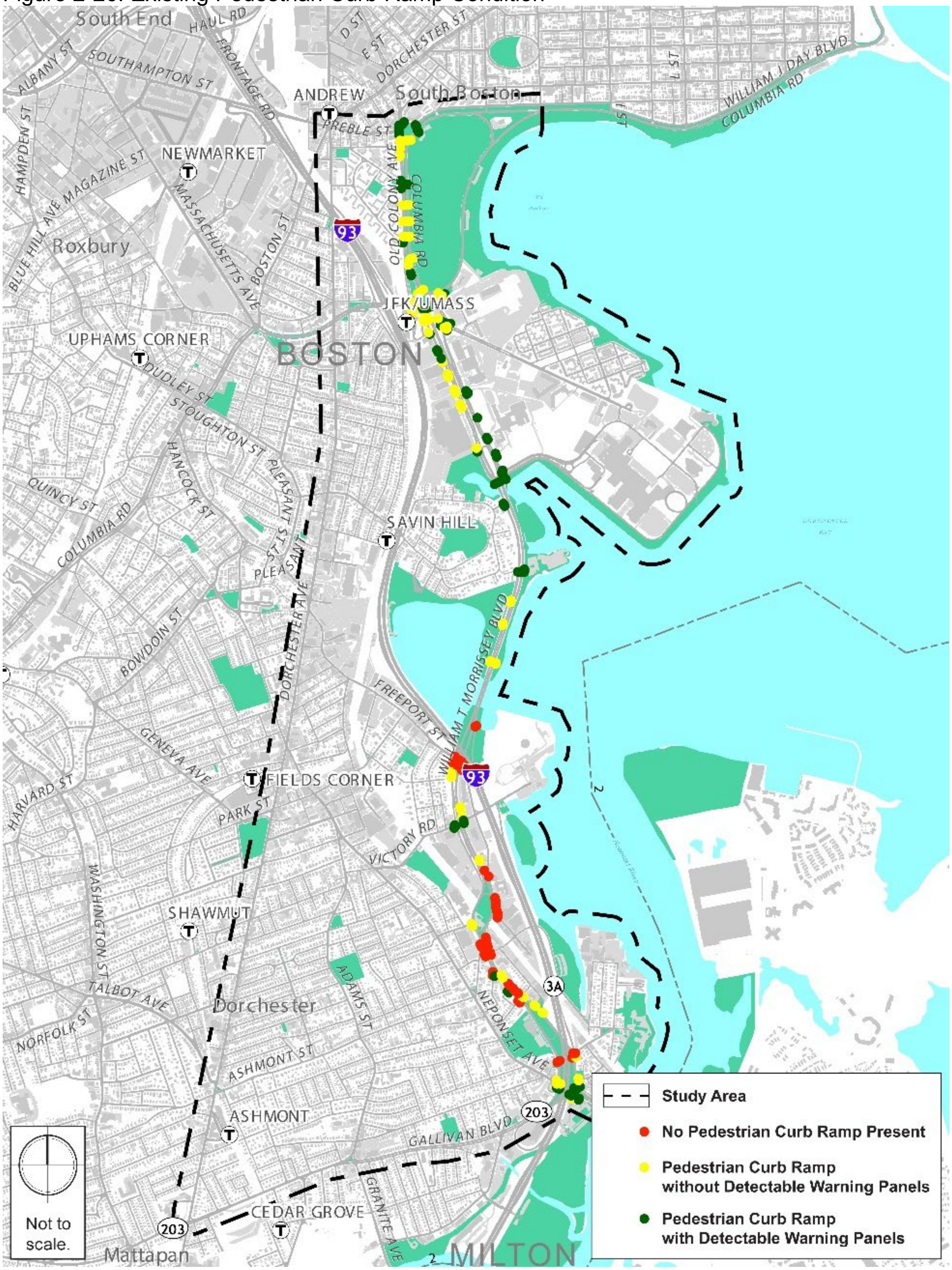
Source: Data from MassDOT, MassGIS (along with field verification)

Figure 2-25: Existing Sidewalk Buffer/Separation



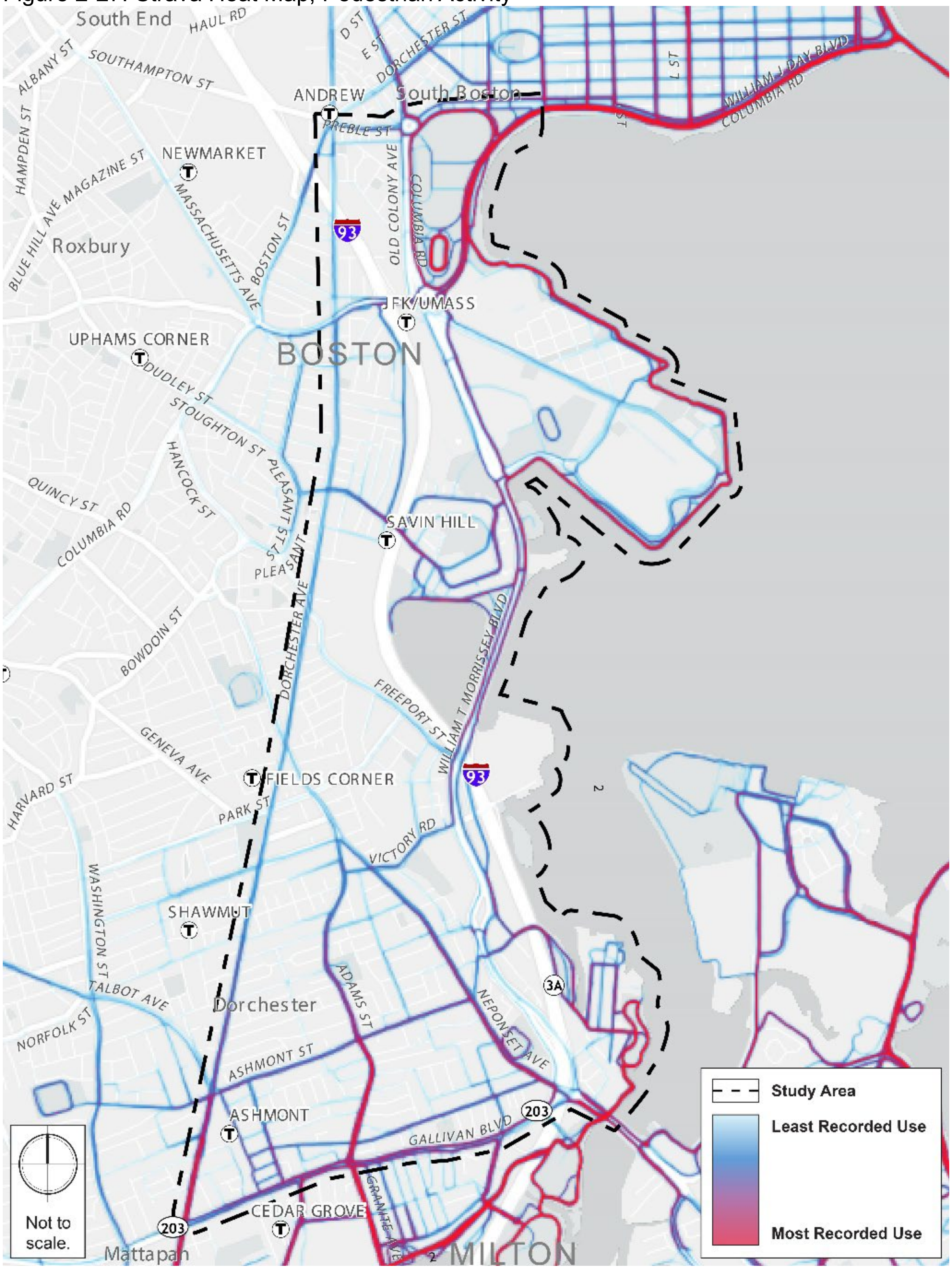
Source: Data from MassDOT, MassGIS (along with field verification)

Figure 2-26: Existing Pedestrian Curb Ramp Condition



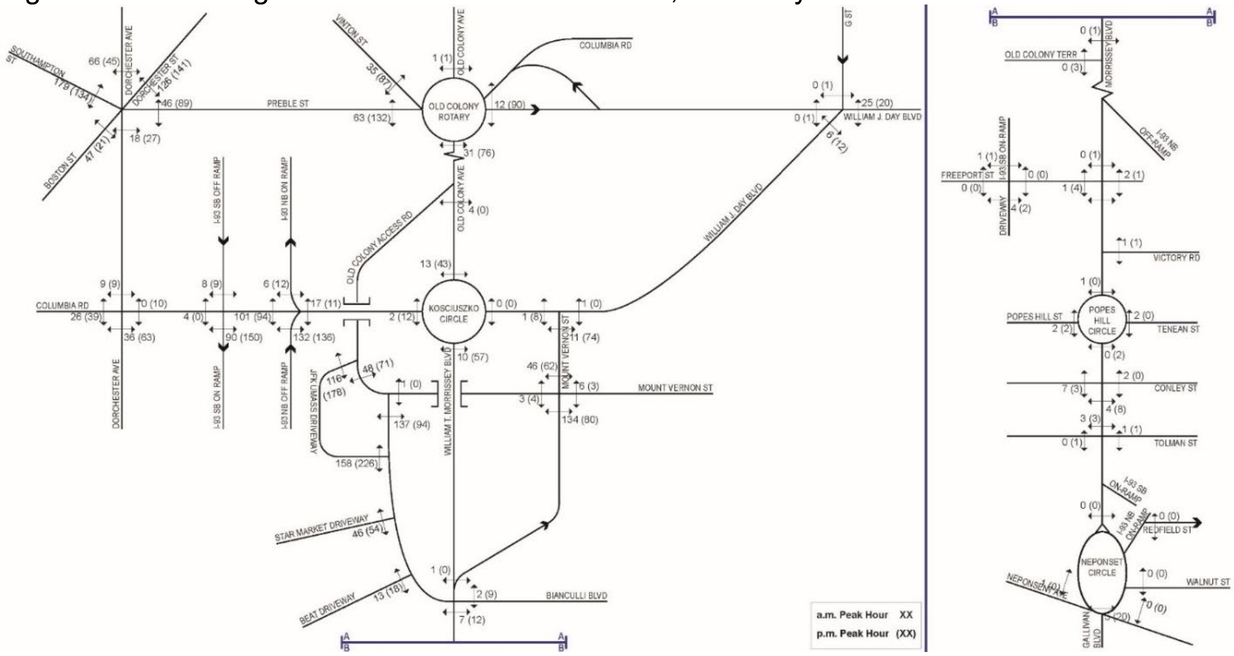
Source: Data from MassDOT, MassGIS (along with field verification)

Figure 2-27: Strava Heat Map, Pedestrian Activity



Source: Strava, 2022

Figure 2-28: Existing Condition Pedestrian Volumes, Weekday AM and PM Peak Hours



Source: TMC data collected in February 2023

2.3.3 Bicycle Network

Bikeability (the ability to access goods and services safely and comfortably on bicycle) was also assessed. While the corridor currently lacks dedicated bicycle facilities, the City of Boston's *Go Boston 2030* planning efforts identified Morrissey Boulevard as a 15-year project for the Boston Bike Network. The corridor's importance in the network is critical for creating a regional north-south link between the Neponset River area to the south and the growing bicycle network throughout South Boston.

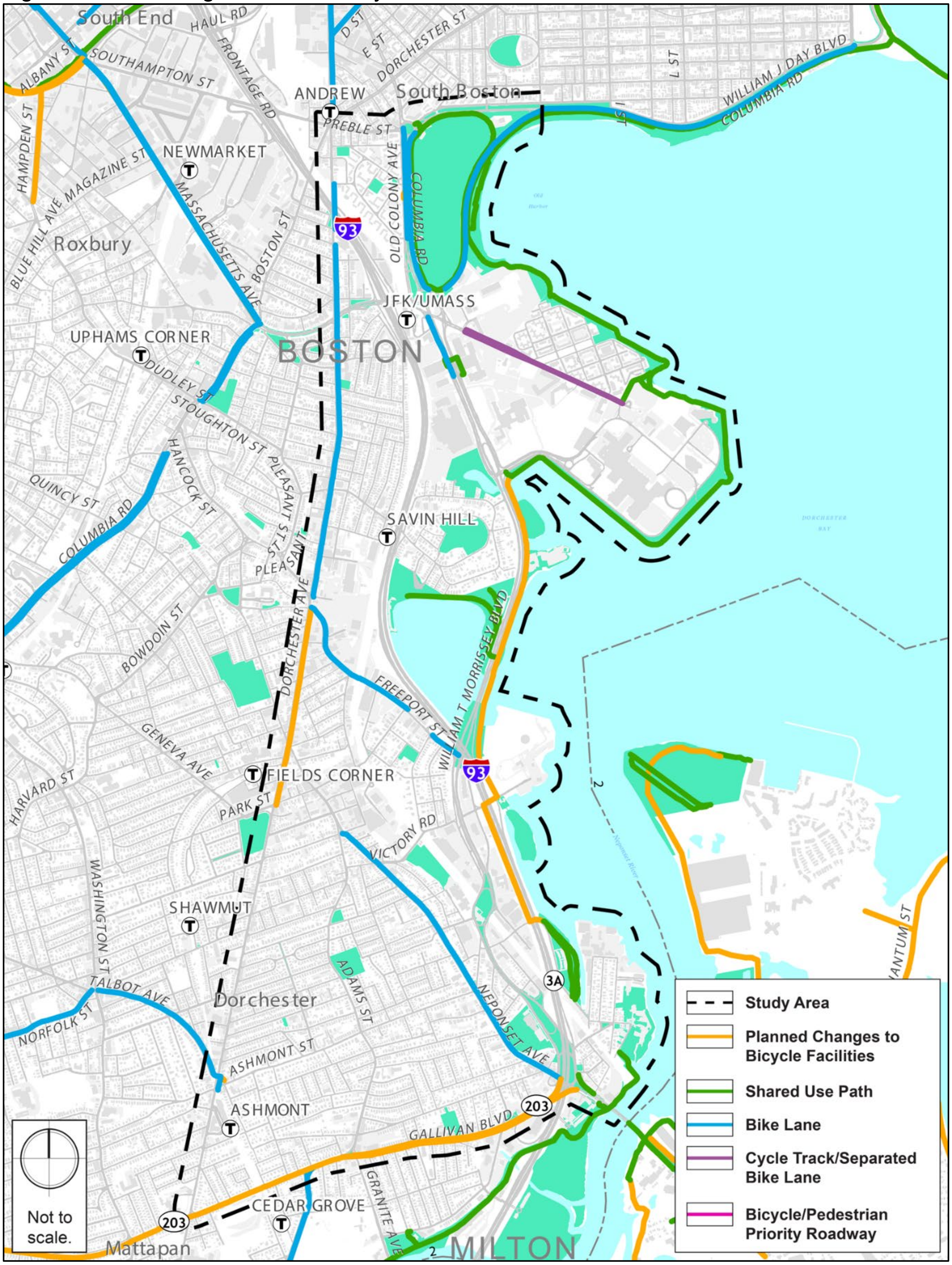
There is strong support for improving bicycling conditions along Morrissey Boulevard. In a Department of Conservation and Recreation (DCR)-organized user experience survey distributed in 2016, 98 percent of respondents stated that they would bike along Morrissey Boulevard if better infrastructure for biking was in place.[15]

Though the corridor lacks facilities, there are other facilities in the study area such as the Harborwalk (shared use path) around the UMass Boston campus in the northern section and the Neponset River Path in the southern section. These routes serve as recreational and commuting paths. Existing buffered bicycle lanes along William J. Day Boulevard and Mount Vernon Street, as well as bicycle lanes on Columbia Road, Dorchester Avenue, and Neponset Avenue, are some of the limited on-road facilities that connect riders to destinations. Additionally, a recently completed two-way protected bike lane is located on Massachusetts Avenue, northwest of the study area.

The existing and planned network is shown in Figure 2-29, while the existing gaps in the network are shown in Figure 2-30. As can be seen, there are many gaps in the study area. Among these gaps, Morrissey Boulevard stands out for its length and for the direct north-south connectivity it provides.

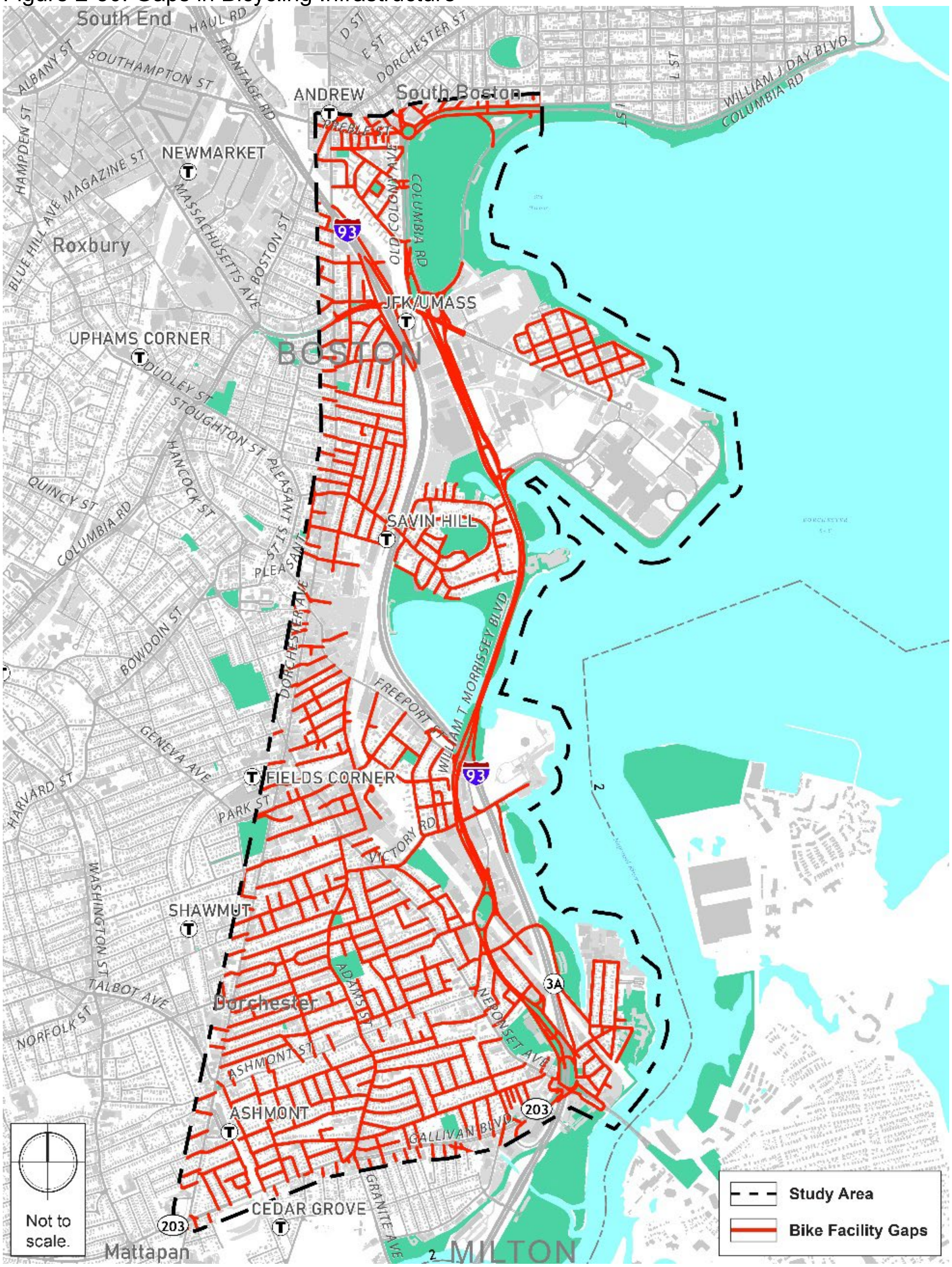
[15] The complete DCR report can be found here: [SurveyMonkey Analyze - Export (mass.gov)]

Figure 2-29: Existing and Future Bicycle Infrastructure



Source: MassDOT, MassGIS

Figure 2-30: Gaps in Bicycling Infrastructure



Source: MassDOT, MassGIS

Morrissey Boulevard is characterized by high vehicular travel speeds and therefore more traffic stress for cyclists. A metric called the Level of Traffic Stress (LTS) was calculated within the study area based on factors such as travel speed, average daily traffic volume, presence of bike lanes and parking lanes, and conflict factors such as bus lanes. Facilities with high vehicle speed and volumes, such as major roadways, require a physical separation of modes to provide a low-stress experience, while streets that carry fewer cars and provide lower speeds may allow for more shared space to achieve a lower LTS.[16]

The majority of Morrissey Boulevard provides a high-stress environment for cyclists due to travel speed, number of lanes, amount of vehicular traffic, and lack of separated bike facilities. The nearby Harborwalk and Neponset River Path and DCR Park Trail connections are the least stressful for cyclists. These facilities, while key to the network, are in places circuitous. A more direct route along Morrissey Boulevard would likely offer a more attractive option for commuters and others who desire the quickest route. Strategic east-west bicycle improvements would allow people living west of I-93 the ability to access the north-south bicycling route and shoreline recreation.

Bicycle Demand

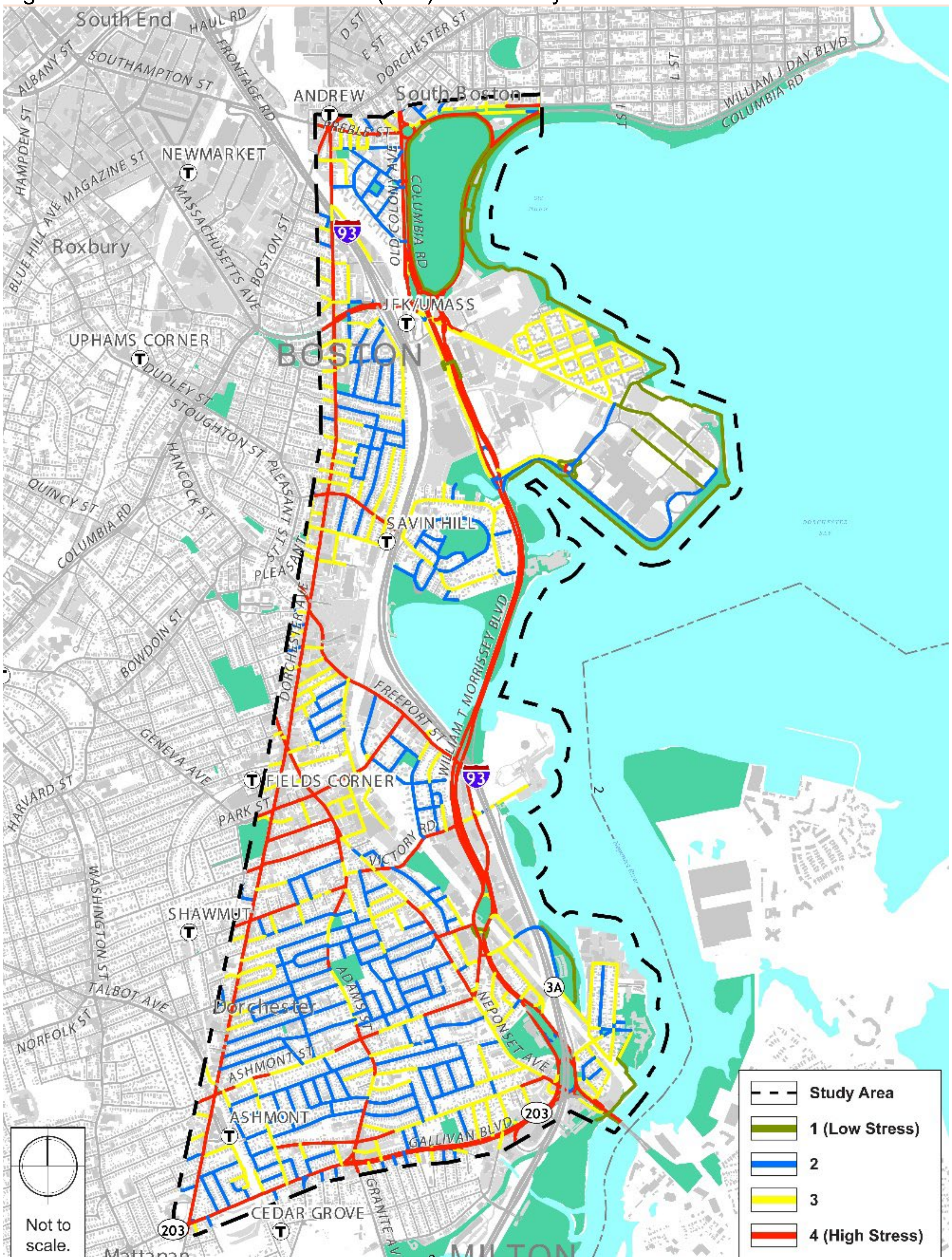
Many bicyclists use Morrissey Boulevard even though it is a high-stress environment for bicyclists. Figure 2-32 is a heatmap generated from bicyclists using the application Strava. On Strava, users track various forms of activity such as bicycling, running, or hiking. The darker shades of red on the map represent the highest usage, purple represents medium-high usage, and blue shades represent lower usage.

This heatmap shows that not only are there higher levels of cycling on roads with bicycle facilities, but also that Morrissey Boulevard, despite not having dedicated cycling facilities, still sees higher levels of demand and use. From the heatmap, it can be inferred that users want to take this direct route to travel and may be completing those trips along uncomfortable or unsafe roads.

The number of bicyclists was also counted at certain locations along the corridor in February 2023. Generally, the greatest concentration of bicyclists was found at Kosciuszko Circle, and at some nearby intersections such as Morrissey Boulevard at Mount Vernon Street. Other locations with elevated bicycling levels were the Morrissey Boulevard access road's intersection with the driveways of Star Market and the BEAT Developments, as well as at Bianculli Boulevard. Tenean Street (Popes Hill Circle) near Tenean Beach and the Boston Bowl also had a higher number of bicyclists.

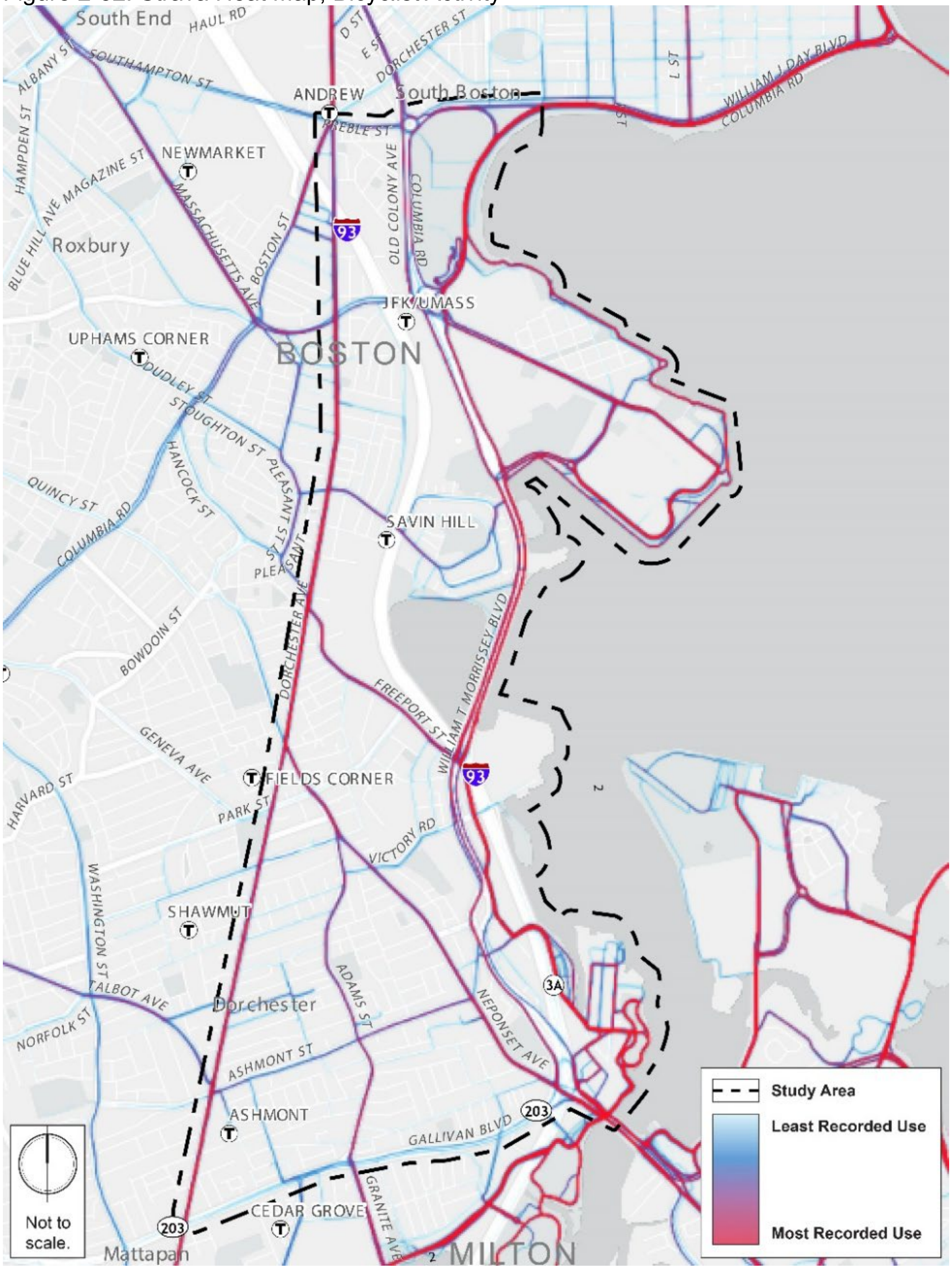
[16] For more information on the LTS methodology, refer to the Bicycle Level of Traffic Stress Technical Documentation here: Bicycle Level of Traffic Stress Report & Guide for Large Developments (boston.gov)

Figure 2-31: Level of Traffic Stress (LTS) in the study area



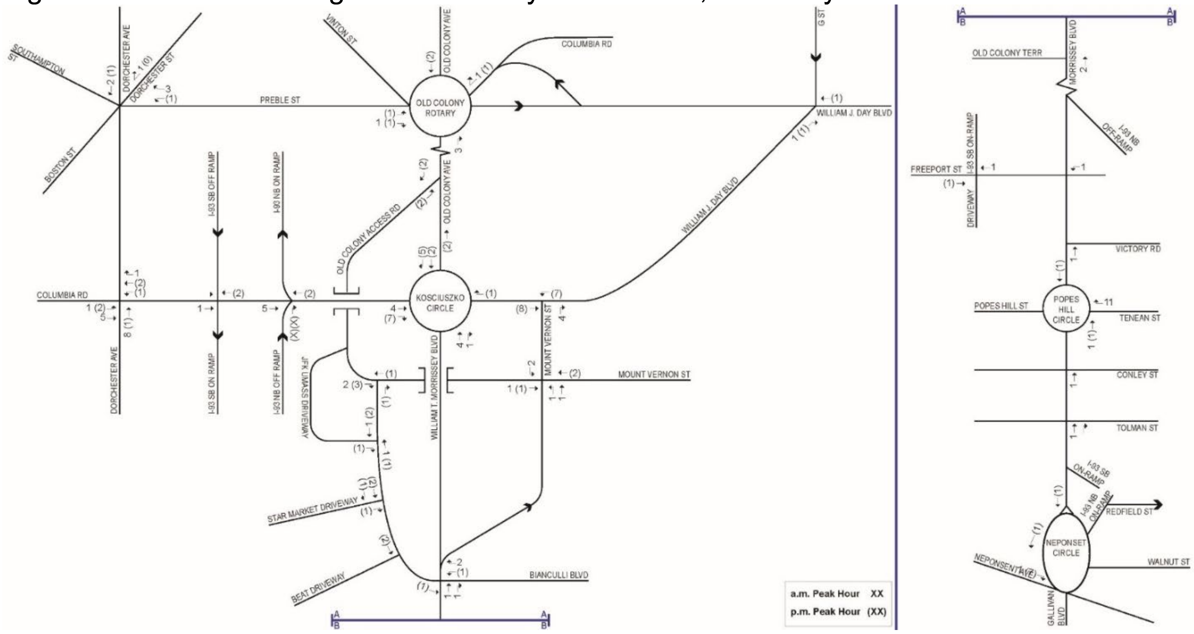
Source: MassDOT, MassGIS, 2022

Figure 2-32: Strava Heat Map, Bicyclist Activity



Source: Strava, 2022

Figure 2-33: 2023 Existing Condition Bicycle Volumes, Weekday AM and PM Peak Hours



Source: TMC data collected in February 2023

2.4 Socioeconomics and Demographics

An analysis of socioeconomic characteristics provides an opportunity to better respond to the transportation, resiliency, social, environmental, and economic needs of the community within the study area. Socioeconomic characteristics such as the location and concentration of environmental justice (EJ) populations, households with zero vehicles, housing prices, and public health data are summarized below.

2.4.1 Key Findings of Socioeconomic and Demographics Evaluation

- The study area has a wide variety of EJ populations. Most of the neighborhoods along the corridor contain at least one EJ block group.
- A greater percentage of households in the northern part of the study area lack vehicles than in the south. However, many households in the study area lack vehicles. Efforts to improve access to key destinations must consider the fact that many people in the corridor walk, bike, or take transit to access jobs and destinations.
- While the lack of affordable housing in the Boston Region is a broader problem outside the scope of this effort, solutions on Morrissey Boulevard that support households not needing a car, or requiring fewer cars, would be financially and socially beneficial.
- The greatest number of individuals with high social vulnerability scores due to health are found in the study area's central and southern sections. Efforts to improve health through transportation improvements should consider this population's geographic pattern.
- The largest concentration of adults with asthma are in Columbia Point and in the southern portion of the study area. Efforts to promote fewer polluting forms of transportation could have the greatest benefits in those neighborhoods.

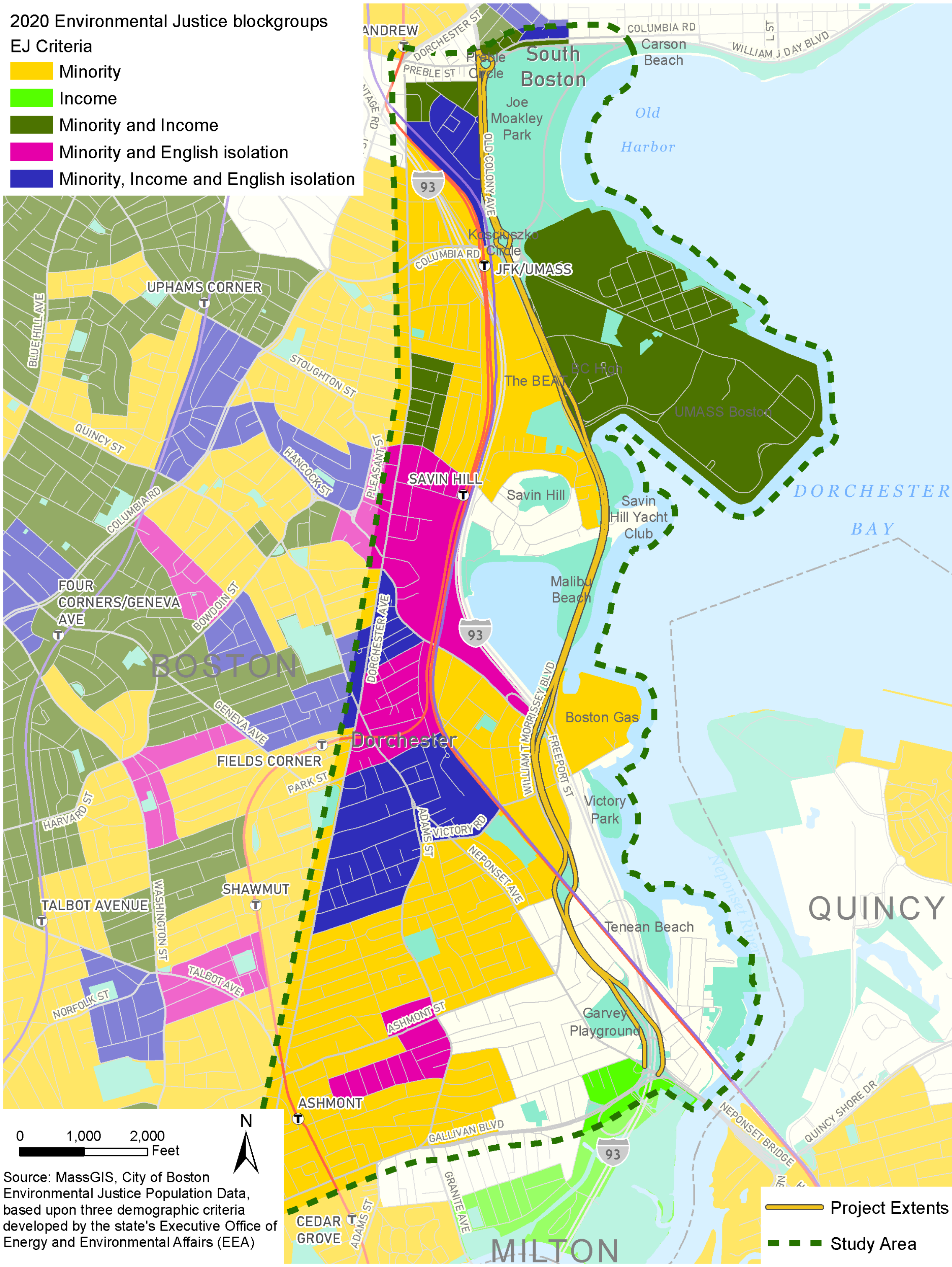
2.4.2 Environmental Justice Population

Environmental Justice neighborhoods are defined in Chapter 8 of the Acts of 2021, Climate Roadmap Act as census block meeting one or more of the following criteria:

- The annual median household income is at or below 65 percent of the statewide median income for Massachusetts.
- 40 percent or more of the residents are minorities.
- 25 percent or more of the households are lacking English language proficiency.
- 25 percent or more of the residents are minorities and the annual median household income does not exceed 150 percent of the statewide annual median household income.

Figure 2-34 illustrates the EJ populations within the study area. Most census block groups in the study area are identified as EJ populations according to the criteria established by Executive Office of Energy and Environmental Affairs (EOEEA). However, the greatest concentration is at Columbia Point.

Figure 2-34: Environmental Justice (EJ) Populations in the Study Area



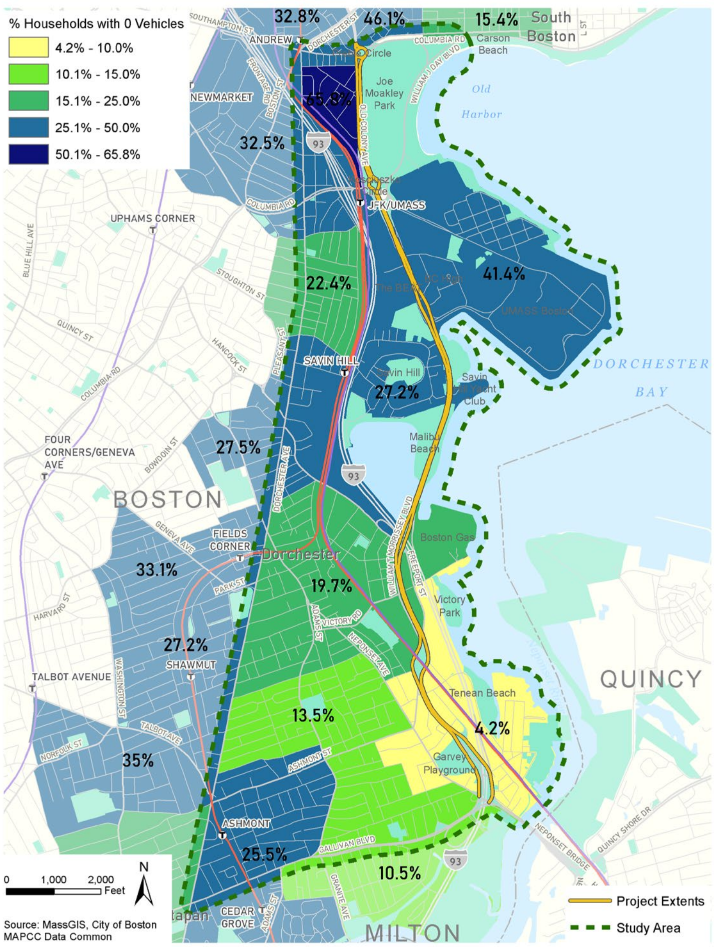
Households with Zero Vehicles

While the Project is intended to benefit all users of the Morrissey Boulevard corridor, zero vehicle households are particularly dependent on transit and other modes (bicycling, walking) to meet employment, health services, grocery shopping and other basic daily responsibilities. The percentage of households with zero vehicles in the study area is illustrated in Figure 2-35.

Generally, the northern sections of the study area have a higher rate of households lacking a vehicle. The neighborhood immediately west of Joe Moakley Park reports the highest number of households without vehicle (66 percent). The second most car-free neighborhood is Harbor Point, with 44 percent of households lacking a vehicle. Outside of the northern sections, the neighborhoods around some MBTA Red Line stations report a high percentage of households with zero vehicles.

Residents in the Port Norfolk and the Neponset/Port Norfolk neighborhoods in the southeastern sections of the study area are the most likely to have access to vehicles. These neighborhoods are served by MBTA local bus services.

Figure 2-35: Households with Zero Vehicles



2.4.3 Public Health Data

The pattern of socially vulnerable populations with medical illness in the study area is illustrated in Figure 2-36. The social vulnerability was determined based on the datasets collected for the 2017 Climate Ready Boston Social Vulnerability study where “Social vulnerability is defined as the disproportionate susceptibility of some social groups to the impacts of hazards, including death, injury, loss, or disruption of livelihood."[17] The medical illness experienced by the socially vulnerable population in Figure 2-36 includes asthma, heart disease, emphysema, bronchitis, cancer, diabetes, kidney disease, and liver disease. Understanding this population's geographic pattern is important because experience from past transportation investments can potentially worsen such diseases through additional pollution. Conversely, creating a Morrissey Boulevard corridor that supports active transportation and improves green space and recreation options can play a primary role in supporting a healthy lifestyle.

Climate change events can make it difficult for socially vulnerable populations to access healthcare and medical facilities. Populations with medical illnesses are more affected by extreme temperatures since heat can trigger asthma attacks or increase already high blood pressure due to the stress of high temperatures. The number of people suffering from asthma is illustrated in Figure 2-37.

[17] Climate Ready Boston Social Vulnerability, 2016, Report is found here: https://www.boston.gov/sites/default/files/file/2023/03/2016_climate_ready_boston_report.pdf

Figure 2-36: Population by Social Vulnerability – Health

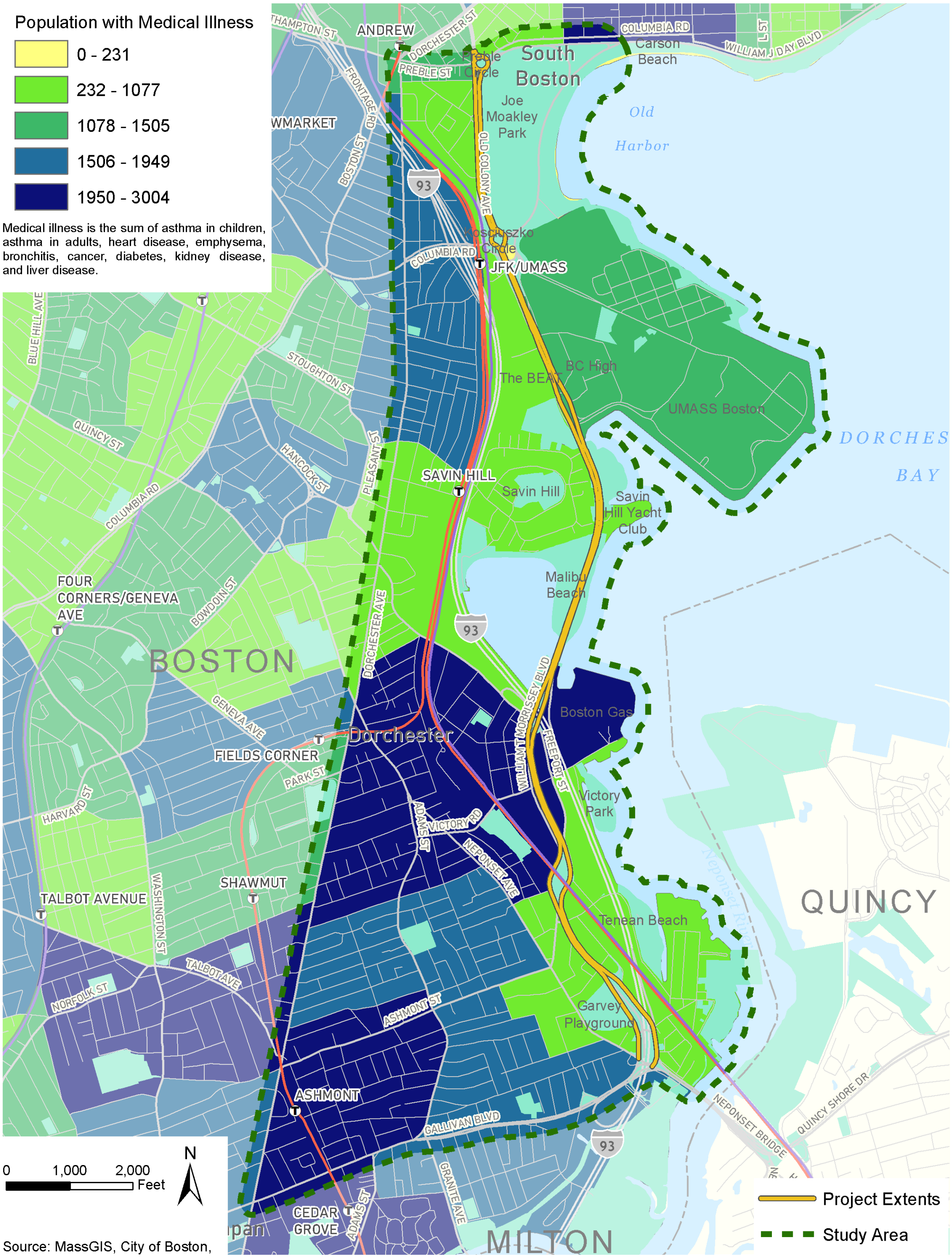
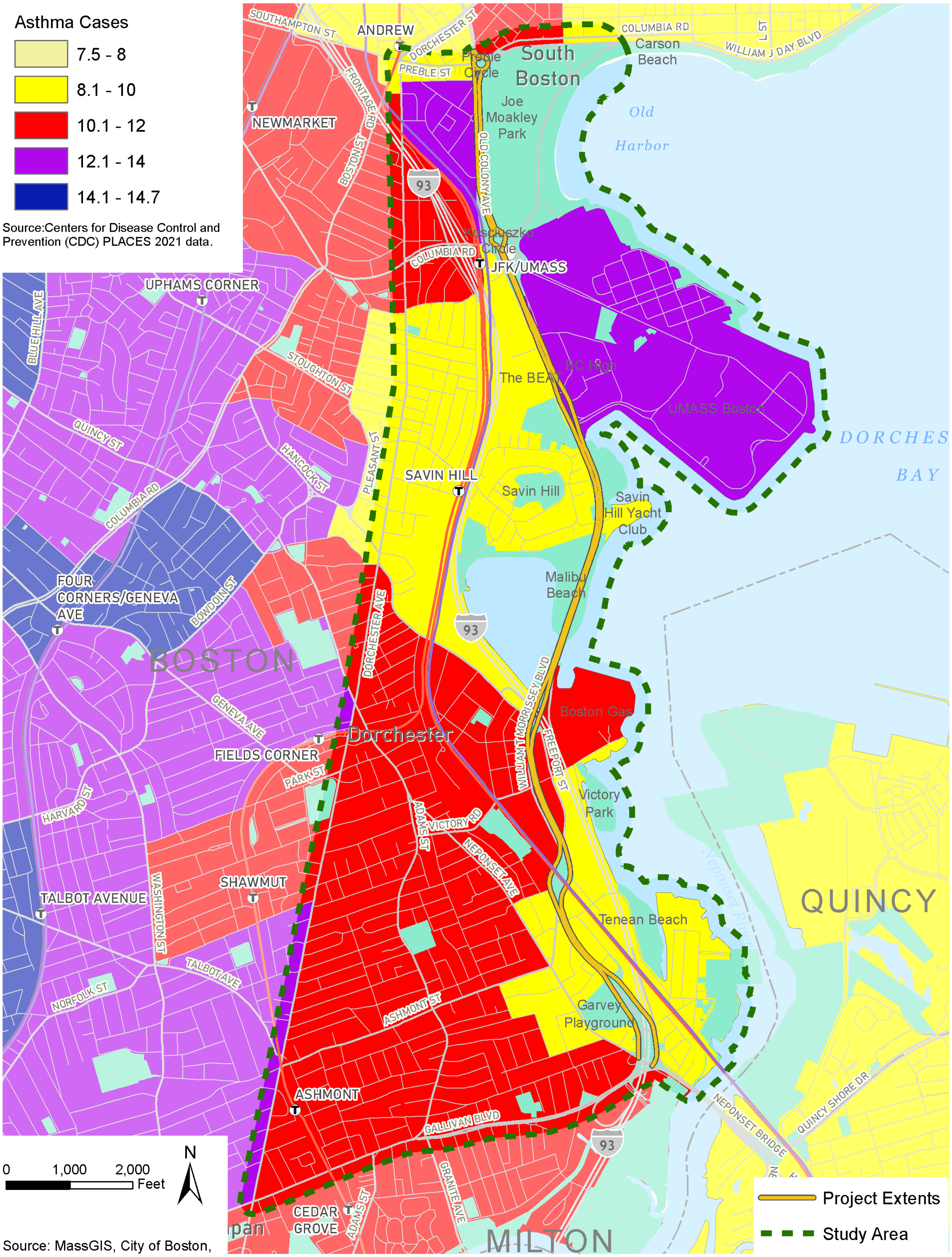


Figure 2-37: Population with Asthma



Source: MassGIS, City of Boston,

2.4.4 Housing Conditions

While often positive for homeowners, high home prices can push out families and eventually push up rental prices, increasing the risk of displacement for renters. Boston has one of the nation's most expensive real estate markets, with a citywide average of $728,000 according to Redfin.[18] There are differences in total price by property type. Residential condominiums are the least expensive, while two- and three-family properties are more expensive.

Housing prices do not differ dramatically within the study area. Areas northwest and east of Savin Hill MBTA Red Line stop, as well as the area immediately northeast of the Ashmont MBTA Red Line stop, report the most expensive homes. Less expensive homes are dispersed throughout the study area.

Table 2-13: Property Values by Property Type

Property Type	Home Type	Average Value
Residential Condominium	40%	$392,966
Single-Family Residential	24.3%	$521,630
Two-Family Residential	19.4%	$625,610
Three-Family Residential	16.3%	$783,893

Data from City of Boston Parcel Data, 2022

High housing costs are a city- and region-wide problem. However, transportation improvements along the corridor have the potential to lower total household costs by providing alternative transportation options and potentially decreasing the number of household vehicles. Reducing the number of cars and car trips can be supported through improved pedestrian, bicycle, and transit infrastructure. Improved alternative transportation options was a goal throughout this study that shaped the alternatives development process for Morrissey Boulevard.

2.5 Land Use and Environmental Conditions

The study area includes a mix of land uses, including residential, institutional, transportation, railroads, public open space, commercial, industrial, and other types of uses. Neighborhoods also demonstrate a variety of environmental conditions, including noise and air pollution, historic and natural resources, and heat islands. Flooding conditions are discussed in the following section.

2.5.1 Key Findings of Land Use and Environmental Conditions

- Land use maps show that except for commercial and other uses on Dorchester Avenue, the study area is largely separated east-west, with residential uses to the west and a mix of commercial, industrial, and institutional uses to the east, divided by I-93, Morrissey Boulevard, and rail lines. As part of the process, efforts to improve east-west access for residents in the study area should be prioritized.

[18] Estimate is from January 2024.

- Large industrial, commercial, and institutional parcels are predominant in the eastern section of the study area. These large parcels are usually auto oriented, with large parking facilities. The large parcels can also limit pedestrian connectivity.
- A significant percentage of the land in the study area is public open space. However, much of this space is not easily accessible to residents.
- The locations of sensitive land uses within the study area increases health risks among students, hospital patients, and the elderly, among others. Concepts for redesign of Morrissey Boulevard should consider ways to reduce both noise and air pollution levels.
- The study area is rich in architecturally significant structures and areas, as identified by the MACRIS Maps website. The greatest concentration of identified historic places is found in the Dorchester Bay Basin/Malibu Beach area. This is an asset for the quality of life of residents.
- In devising flood solution strategies and promoting resiliency, care is necessary to protect these architecturally rich neighborhoods in a way that is effective, context-sensitive, and does not place an undue financial burden on residents.
- Flooding in the central area of the corridor would impact the greatest number of historically significant properties.
- The two districts with sites designated on the National Register of Historic Places (NRHP) are located in the central part of the study area and are isolated from surrounding neighborhoods by I-93, Morrissey Boulevard, and the MBTA rail lines, with limited access points.
- There are oil and hazardous materials sites within the study area. A redesign of Morrissey Boulevard should consider the location of these sites, especially in the context of flood control structures.
- Much of Morrissey Boulevard is threatened by sea level rise, especially the area east of Old Colony Avenue and I-93. Areas along Dorchester Bay and Old Harbor shorelines are in the highest-risk zone.
- The area around Morrissey Boulevard and I-93 reports higher average temperatures, likely because of the concentration of asphalt and impervious surface associated with these roads and connected ramps.
- The study area lacks adequate tree cover, which heats up the area and increases required cooling costs.
- Redesigning Morrissey Boulevard presents an opportunity to increase the tree canopy in the area, which increases comfort and resiliency for the residents and can reduce outflows to the Neponset River by holding a greater amount of water.

2.5.2 Land Use

As shown in Table 2-14 and Figure 2-38, existing land uses in the study area predominantly consist of residential uses (31 percent) followed by institutional uses (23 percent) mostly in the northeast section of the study area. Other major types of land uses in the study area include right-of-way (ROW) land used for transportation; railroads; public open spaces; and commercial establishments.

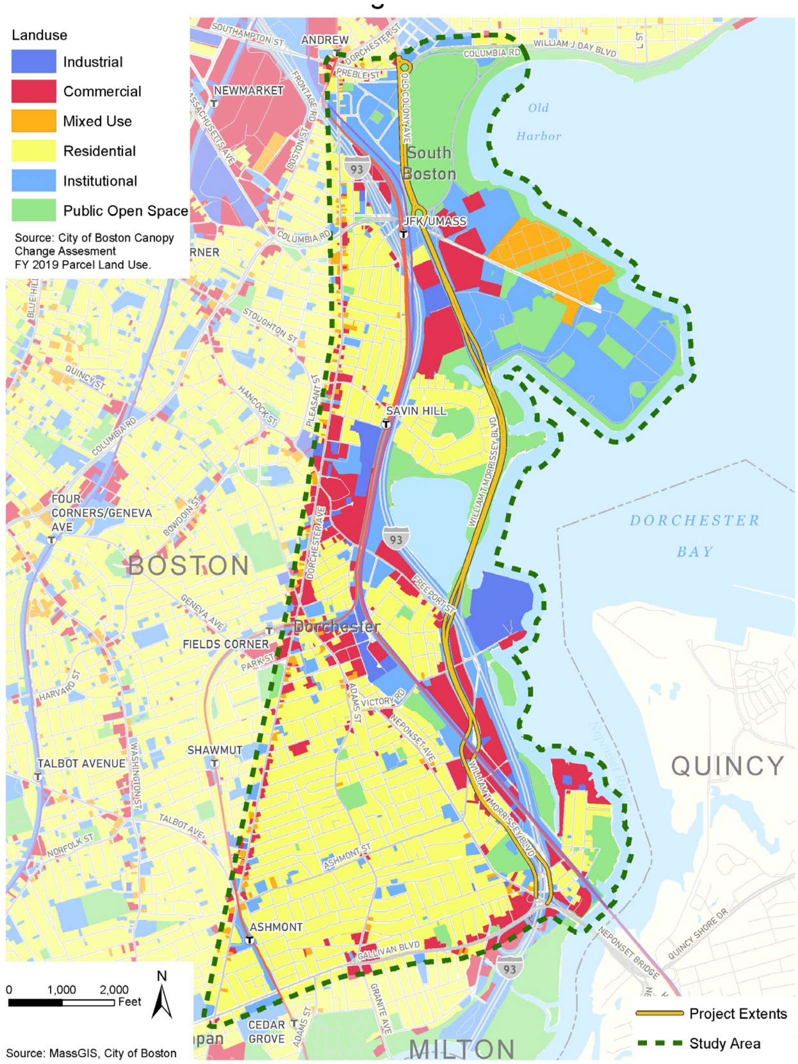
Table 2-14. Existing Land Uses in the study area

Land Use	Acres	Percentage of Total Land Area
Residential	602	31%
Institutional	439	23%
Right-of-Way (ROW)*	289	15%
Public Open Space	274	14%
Commercial	200	10%
Industrial	58	3%
Mixed Use	61	3%
Total	**1,923**	**100%**

Source: City of Boston Canopy Change Assessment Fiscal Year 2019 Parcel Land Use.

Note: ROW includes roadways and railroads within the study area.

Figure 2-38. Existing Land Use Conditions



The study area contains a wide variety of sensitive land uses, which can cause noise and air pollution. Another important vulnerability is that there are heat islands in the study area, potentially worsening the rising heat from climate change. Additionally, there are key natural and built resources in the study area, which were considered in the process.

2.5.3 Noise and Air Pollution

Noise and air pollution can be damaging to members of any group but are particularly harmful to vulnerable groups like children, teenagers, the elderly, and those suffering from respiratory conditions like asthma. Table 2-15 identifies the locations of sensitive land uses in the study area that may potentially be affected by the redesign of Morrissey Boulevard. Any redesign of Morrissey should consider possible impacts on such land uses, and if possible, strategies to improve the status quo.

Table 2-157: Sensitive Land Uses

Type	Facility Name
Hospitals	Bowdoin Streets Health Center; Carney Hospitals
Grade schools	Boston College High School; Community Academy of Science and Health; Cristo Rey Boston High School; Helen Y. Davis Leadership Academy Charter Public School; Paul E. Dever School; Edward Everett Elementary School; Dr. William W. Henderson Elementary School; Thomas J. Kenny School; Mather School; Richard J. Murphy K-8 School; Neighborhood House Charter School (2 campuses); Pope John Paul II Catholic Academy; William E Russell Elementary School; Saint Brendan Elementary School (just beyond study area)
Preschools	Small Wonders Nursery School; A Child's View Preschool
Senior facilities/housing	O'Connor Way Senior Housing; Sarah Care of Dorchester; Saint Joseph Rehabilitation and Nursing Center; Cape Verdian Adult Day Health Care

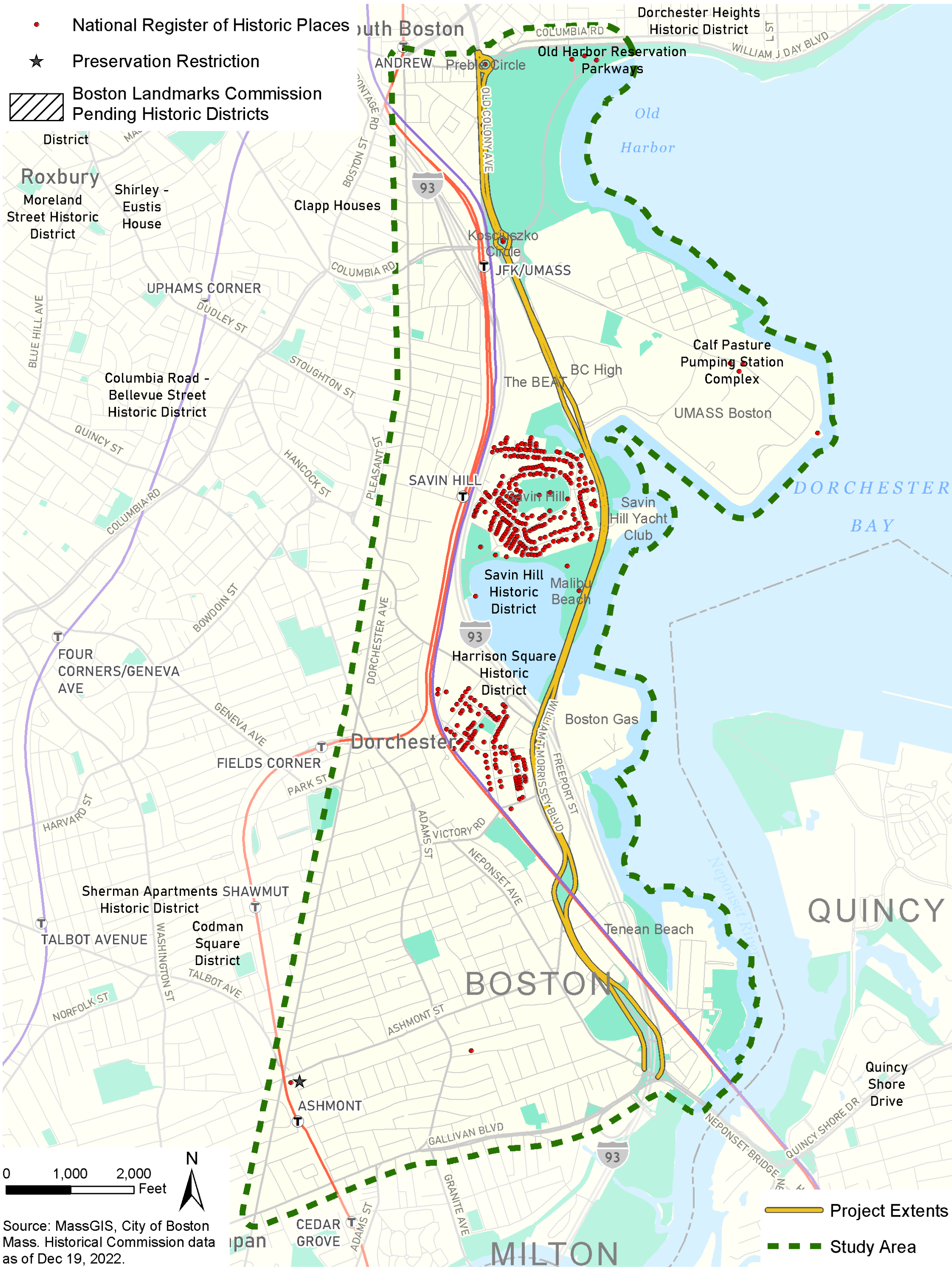
2.5.4 Historic Resources

Historic resources in the study area were identified according to the MACRIS Maps website, maintained by the Massachusetts Historical Commission (Figure 2-39).

The primary national designation for historic preservation is the National Register of Historic Places (NRHP). Individual properties or areas can be included in the NRHP. While there are some individual properties in the study area, most contributing properties are within two districts: the Savin Hill Historic District and the Harrison Square Historic District. There is a third district in the study area (the Old Harbor Reservation Parkways, Metropolitan Park System of Greater Boston, which circles Joe Moakley Park). Importantly, not all buildings have been inventoried in the area, so it is likely that more properties will be added to the NRHP in the future.

There are also city-defined landmark properties and districts. There is one area that is awaiting pending historical district status (the Port Norfolk Architectural Conservation District) within the study area, while there are two others (the Jones Hill Architectural Conservation District and the Ashmont Hill Architectural Conservation District) immediately west of the study area.

Figure 2-39: Historic Resources



Source: MassGIS, City of Boston Mass. Historical Commission data as of Dec 19, 2022.

2.5.5 Natural Resources

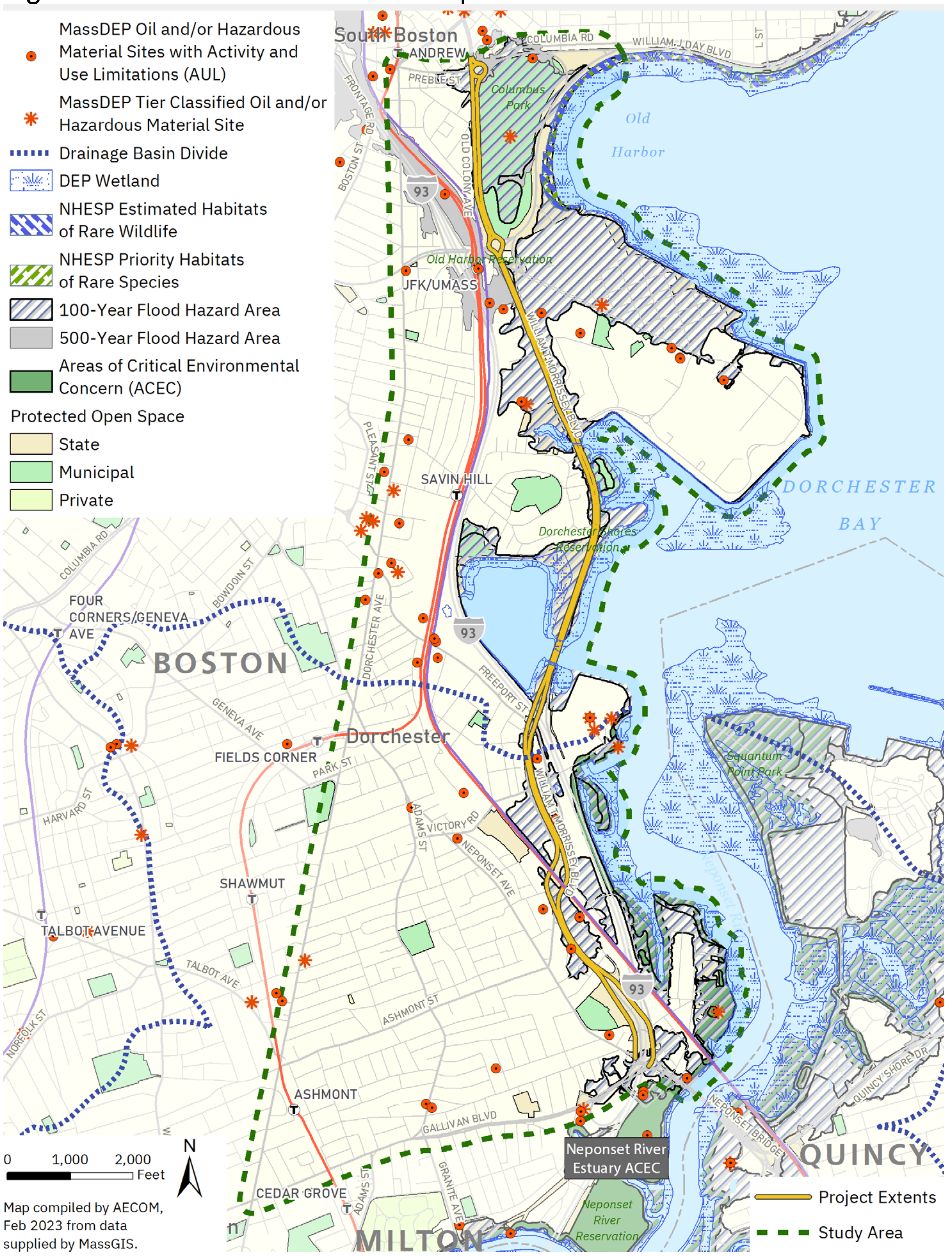
The existing natural resources in the study area are illustrated in Figure 2-40. Most of the resources are located east of I-93 and extend from north to south.

Massachusetts Department of Environmental Protection (MassDEP) wetland resources are located on the eastern edge of the study area along the Old Harbor and Dorchester Bay shorelines. The study area does not contain public water sources, wellhead protection areas, or aquifers.

The sections of the study area east of Old Colony Avenue and I-93 are within the Massachusetts coastal zone. Most of the neighborhoods east of I-93 are within a 100-year flood zone that has a 1 percent chance of flooding occurring in any given year. The coastal areas along the Dorchester Bay and Old Harbor shorelines are categorized as Flood Zone VE, which specifies an area vulnerable from the direct force from storm surge waves.

MassDEP Oil and/or Hazardous Material Sites with Activity and Use Limitations, and Tier Classified Oil and/or Hazardous Material Sites are located throughout the study area.

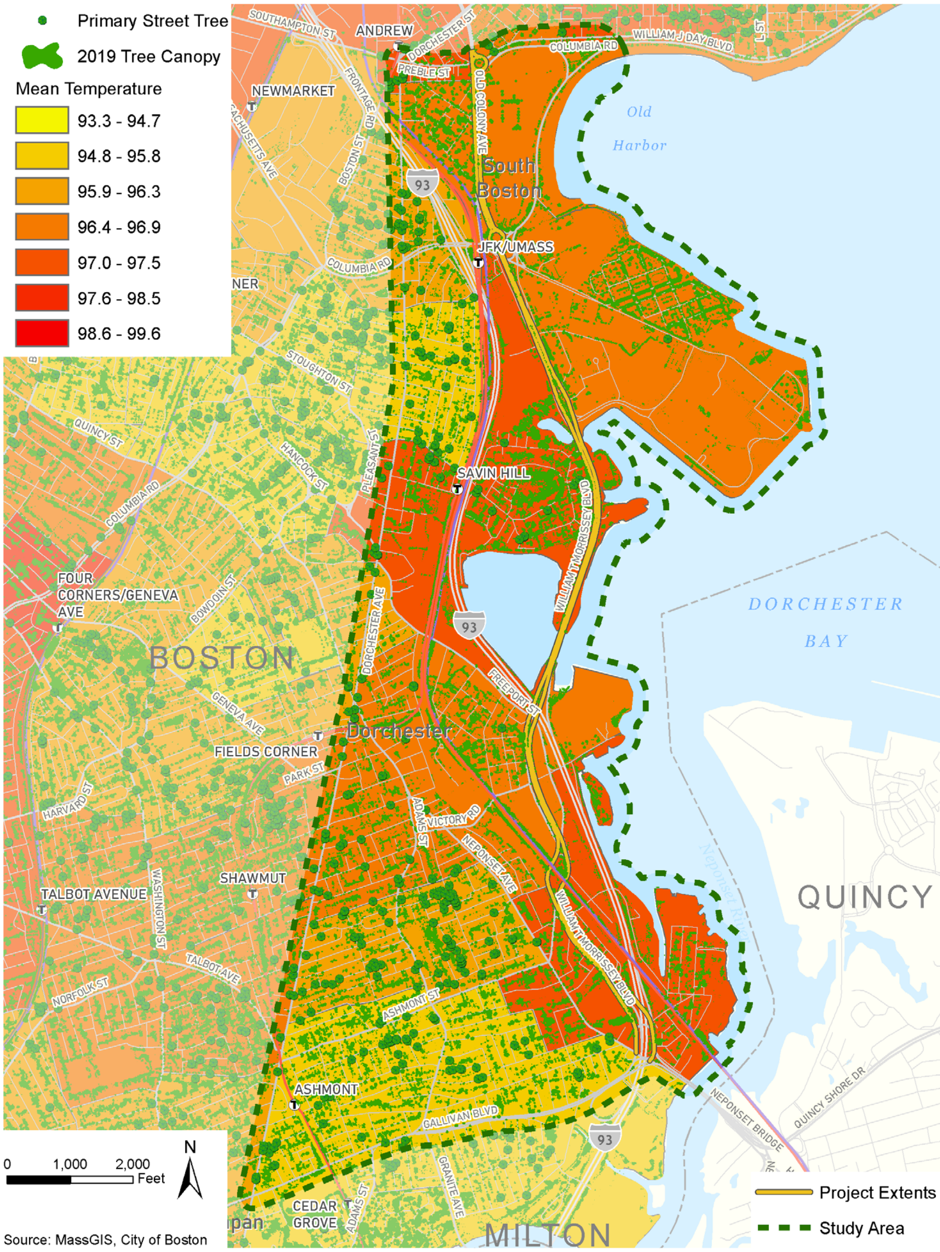
Figure 2-40: Natural Resources Map



2.5.6 Heat Islands

Wide stretches of asphalt commonly found on highways, road corridors, and parking lots can heat up surfaces, buildings, and surrounding areas significantly, thereby creating urban heat islands. These urban heat islands can contribute to neighborhoods being significantly hotter than more shaded neighborhoods during the day and at night. The presence of trees in urban neighborhoods has been found to have a general cooling effect. Increased tree cover can mitigate extreme heat, reduce energy costs for residents, and absorb water. Figure shows mean temperature by census block groups, primary street trees, and 2019 tree canopies in the study area. The areas along Morrissey Boulevard and I-93 have the highest mean temperatures and very little tree canopy.

Figure 2-41: Street Trees, Existing Tree Canopy, and Heat Islands



2.6 Existing Climate Conditions

Morrissey Boulevard currently experiences significant flooding during regular high tide events and significant rainfall periods. The area's current climate conditions are discussed in this chapter. Future climate conditions are discussed in Chapter 3.

2.6.1 Key Findings of Existing Climate Conditions

- Morrissey Boulevard and parts of the study area currently experience the effects of periodic (so-called King Tides and higher spring tides) and episodic (coastal storm) flooding. These climate-related hazards are expected to increase in frequency and severity.

- Under current conditions, multiple locations within the Morrissey Boulevard corridor experience tidal inundation during high-water events, including areas around Tenean Beach and along Morrissey Boulevard near Savin Hill.
- Much larger portions of the study area have a low but existing risk of exposure to coastal flooding in extreme events, including most of Morrissey Boulevard north of the I-93 overpass, the area between Richard J. Murphy School and Tolman Street, and Neponset Circle.
- Numerous projects are planned or in progress that will help protect Morrissey Boulevard and local neighborhoods from flooding, although there is a large gap in protection between Freeport Street and Bianculli Boulevard that must be addressed as part of alternatives for this study.

2.6.2 Baseline Flood Conditions and Resiliency Standards

Morrissey Boulevard frequently floods under current year conditions, including during regularly occurring storms and significant high-tide events ("King Tides"). One of the major supporting aims of this study and the Morrissey Boulevard Commission is to strengthen climate resiliency, particularly as it relates to flooding, so that the corridor and neighborhoods can be protected from projected future climate conditions, namely sea level rise and more frequent and intense coastal flooding from storm surge.

In developing flood protection measures, several variables needed to be determined to establish appropriate elevation specifications for alternatives. Based on available information, the Massachusetts Coast Flood Risk Model (MC-FRM) was used. MC-FRM is also the preferred model of the state's Resilient Massachusetts Action Team (RMAT). Based on the expected service life of the likely improvements to Morrissey Boulevard, a 2070 design year was chosen for resilience purposes.

Coastal flood resilience level of service (CLOS) and associated Design Flood Elevations (DFEs) for transportation and associated flood control infrastructure were established as part of this study to protect the transportation infrastructure and surrounding neighborhoods. The coastal flood resilience CLOS/DFEs reflected the acceptable annual probability or return period in which the corridor or portions of it could be exposed to flooding and resistant to damage from flood hazards (for the transportation infrastructure itself), accounting for reasonably foreseeable influences of climate change. With any CLOS/DFE, there will be residual risks from less likely and more extreme storm events and sea level rise scenarios.

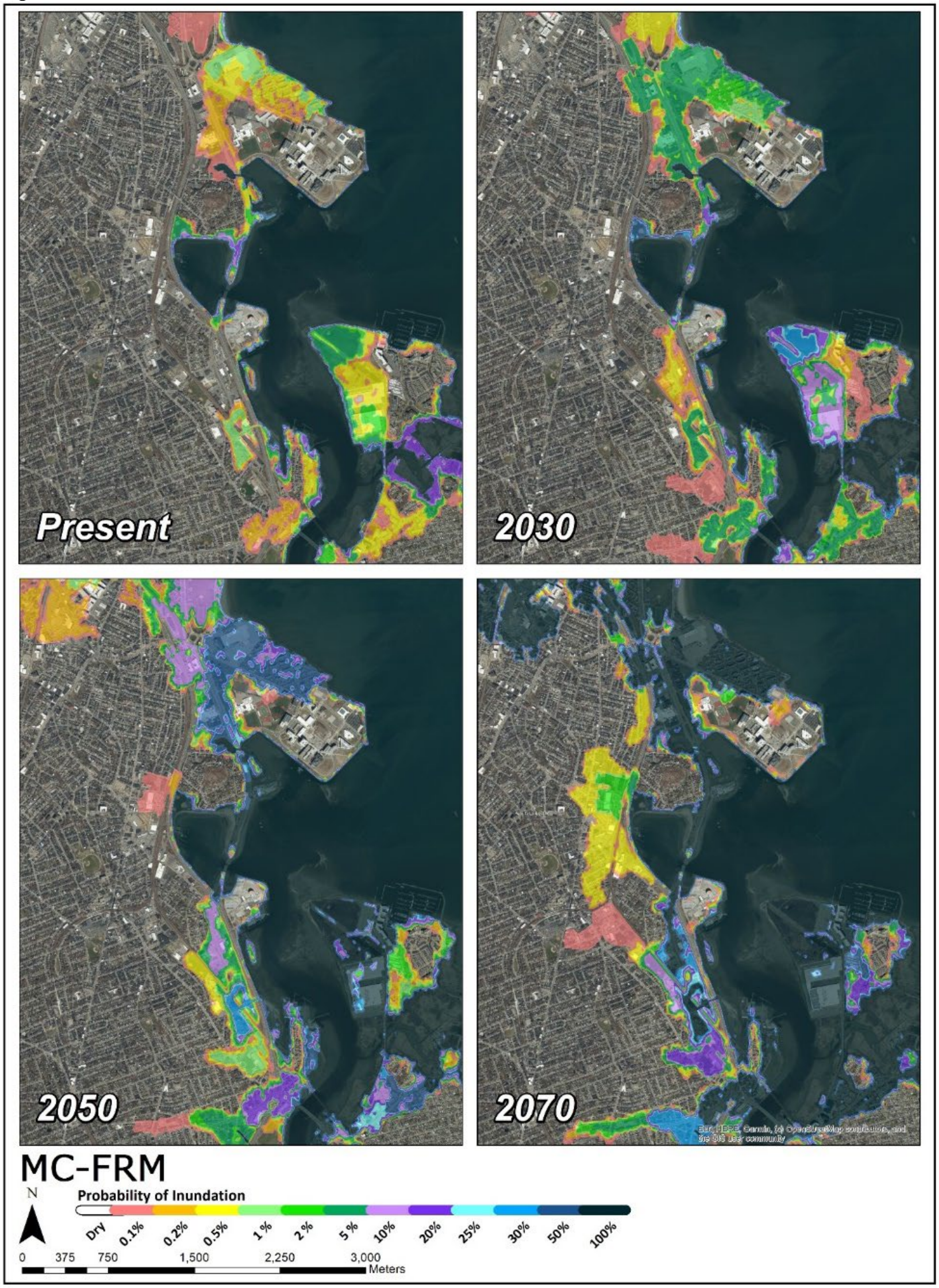
While risk cannot be fully eliminated, the corridor could be protected to a level of mitigation of future flooding to reduce its severity.

The probability of inundation maps for the corridor and surrounding area are shown in Figure 2-42. These maps assume that no adaptation to coastal flooding risk occurs in the future. The maps show that in each future time horizon, the probability of flooding in areas that are presently vulnerable increases significantly, and the extent of the floodplain expands to new areas. With no adaptation, almost the entire corridor is at risk of inundation in an extreme 0.1 percent annual chance (1,000-year recurrence) event in 2030 and a nuisance (high-tide flooding) 100 percent annual chance (1-year recurrence) event in 2070.

The risk of flooding on routes leading to the corridor must also be considered to ensure reliable evacuation and/or recovery efforts.

The section of the corridor that is currently most vulnerable is between Bianculli Boulevard and the I-93 underpass to the south. Present flood pathways come from Tenean Beach/Conley Street, the area immediately southeast of Kosciuszko Circle, Bianculli Boulevard, Pattens Cove, and Quincy Shore Drive/Neponset Trail. In a 2030 extreme event, the present flood pathways expand, and new flood pathways come from Moakley Park and the I-93 underpass. During a 2070 storm surge event, there is an anticipated 2070 flood pathway from Pine Neck Creek across the MBTA Red Line tracks and a regional flood pathway from the Fort Point Channel.

Figure 2-42: Inundation: Present, 2030, 2050, and 2070



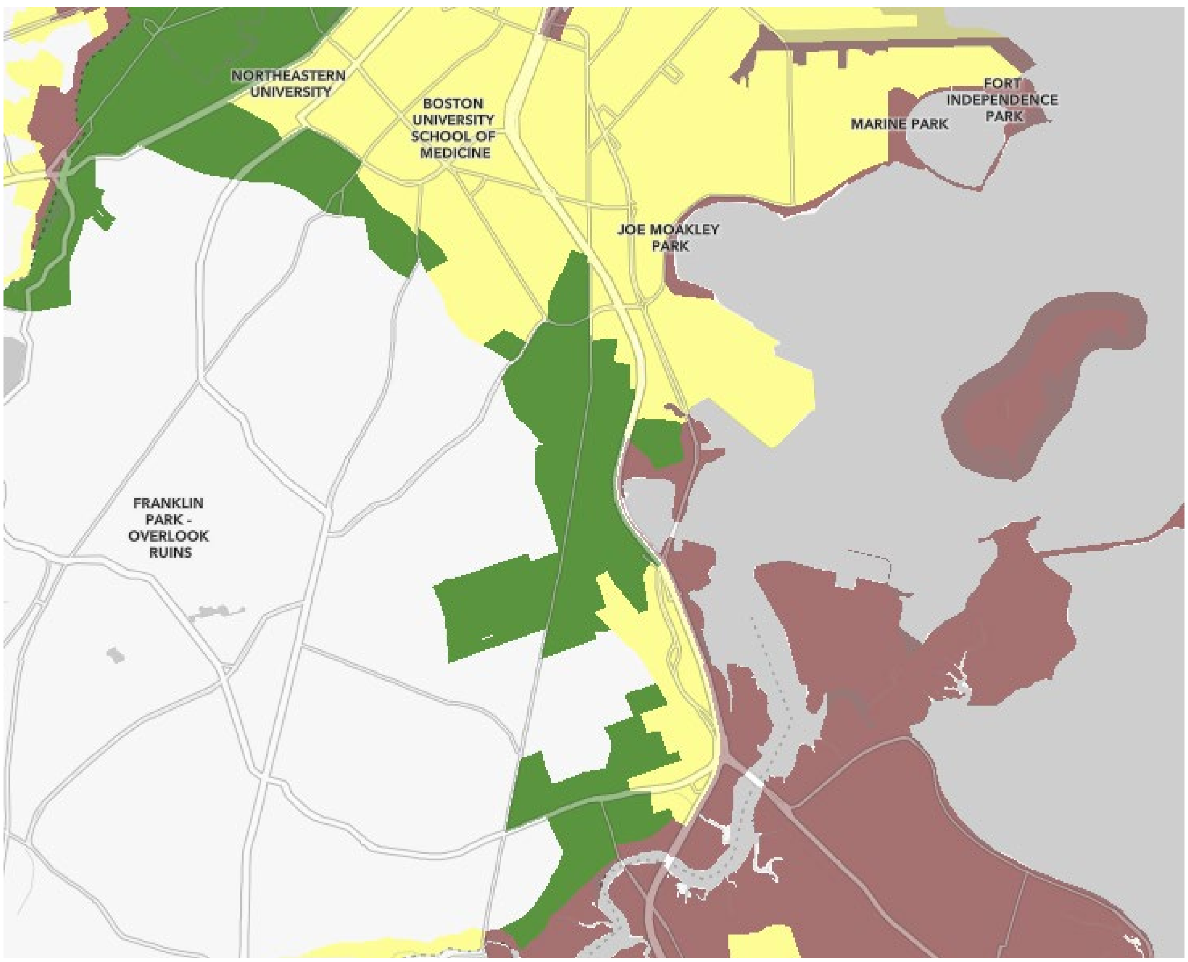
2.6.3 Evacuation Considerations

Flooding can pose dangers to populations in the study area even if flooding does not reach their home, business, or school. For example, flooding near Bianculli Boulevard and points to the north could cut off Columbia Point and UMass Boston, while flooding near the Tenean Beach area could potentially cut off the Port Norfolk neighborhood. While available evacuation route guidance is limited, the Massachusetts Emergency Management Agency (MEMA) divides sections of the Massachusetts coastline into three levels of vulnerability: Zone A, B, and C:

- Zone A and B: Areas that may flood first from storm surges during a tropical storm or hurricane (Areas in A would likely flood before those in Zone B).
- Zone C: Areas in the City of Boston or Cambridge which may flood depending on the storm's features and intensity.

Zone A is labeled brown, Zone B is labeled yellow, and Zone C is labeled green in Figure 2-43.

Figure 2-43: Zones of Vulnerability, from the Massachusetts Emergency Management Agency



Source: Massachusetts Emergency Management Agency

2.6.4 Coastal Resiliency Context

As part of the study, the team reviewed the existing coastal resiliency context, including work completed for planning and in-progress flood protection process and anticipated flood pathways that have been established by previous efforts. Expected 2070 coastal flooding is shown in Figure 2-44, which exhibits that without protection, inundation will progress inland to Dorchester neighborhoods such as Port Norfolk and Columbia Point.

Figure 2-4415: Coastal Resiliency Context and Flood Pathways

The consequences of coastal flooding through these pathways are not limited to impacts on Morrissey Boulevard's transportation functions. It can also extend to other residential neighborhoods, businesses, infrastructure and critical facilities, and recreation and open space assets. For these reasons, the City of Boston–notably, the Planning Department–and other stakeholders have made significant efforts to identify, evaluate, and advance towards implementing specific coastal flood mitigation improvements along the waterfront.

The City of Boston's Climate Ready Dorchester planning initiative, summarized in the 2020 *Coastal Resilience Solutions for Dorchester* final report, was a comprehensive effort to develop a flood protection strategy for Dorchester. Climate Ready Dorchester developed coastal flood mitigation design concepts for the entire Dorchester waterfront, including within the Morrissey Boulevard right-of-way. The final report sets out a phasing plan and timeline for implementing recommended near- and long-term projects, informed by projected changes in flood risk. Figure 2-45 shows the expected 2070 100-year flood paths as well as where there is current protection in the study area.

Figure 2-4516: Existing Corridor Flood Protection

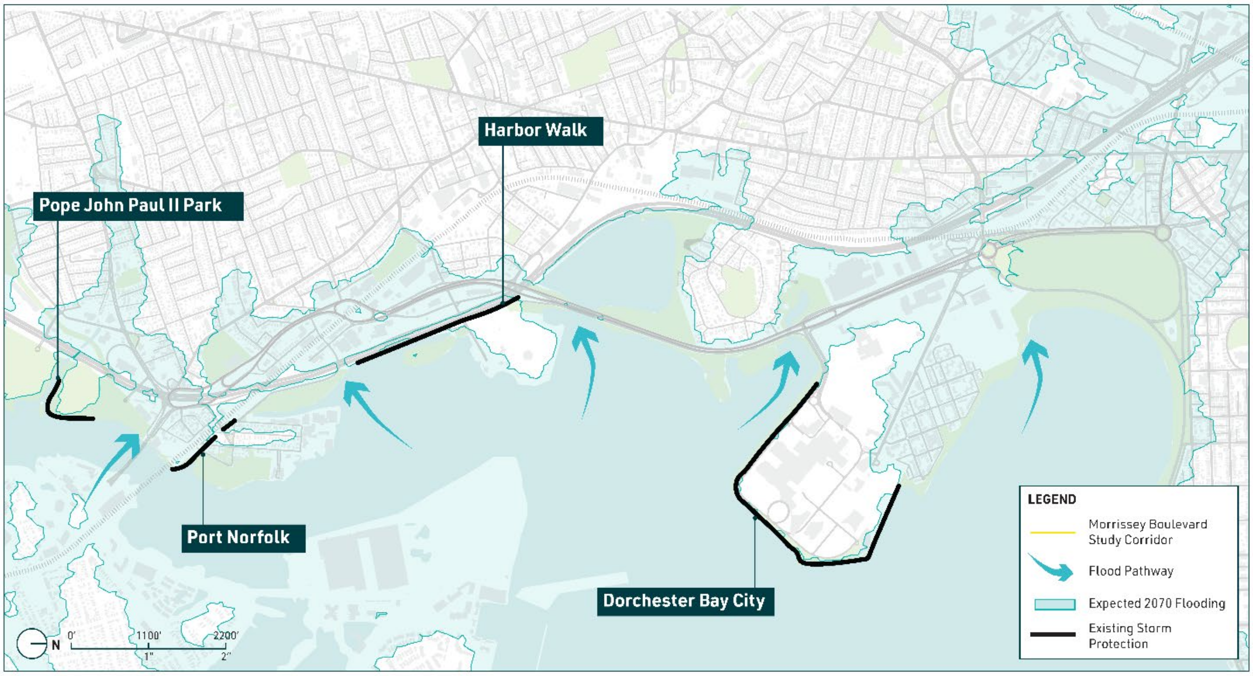
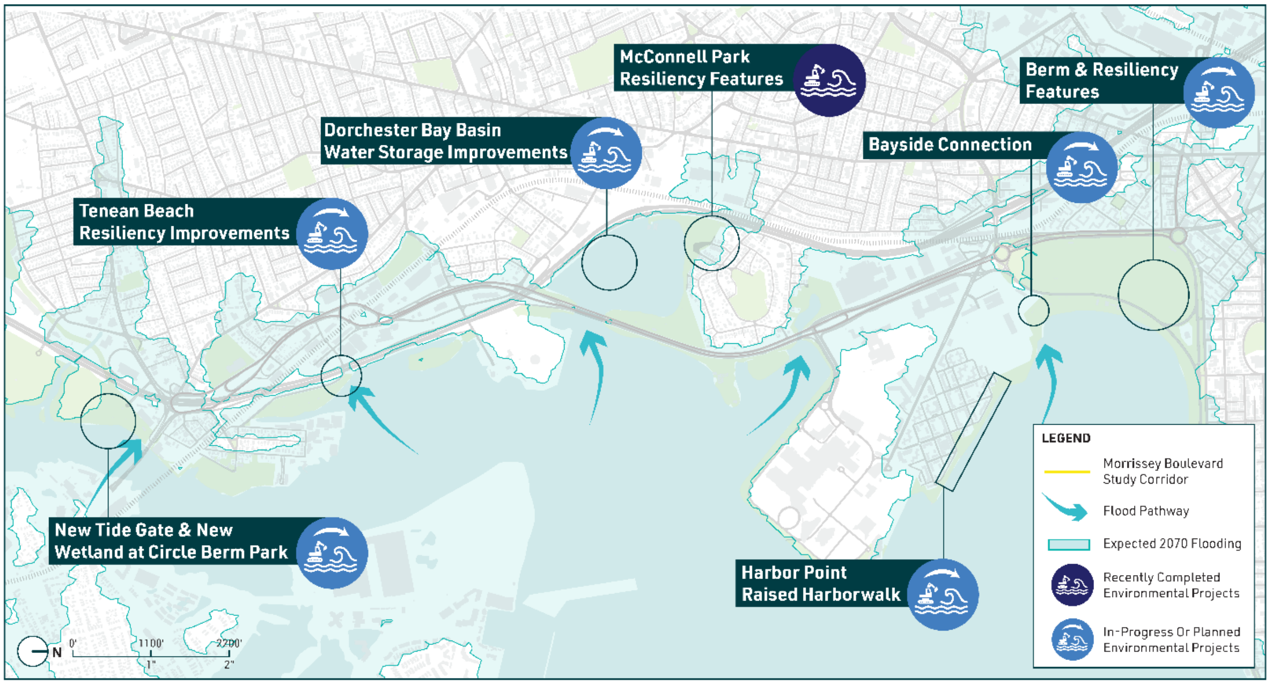


Figure 2-46 shows recently completed and in-progress resiliency programs, which will provide additional levels of protection along segments of the corridor. While the entire corridor has been and will continue to be assessed for resiliency factors, the main section of the corridor that will continue to remain unprotected after the completion of the projects in Figure 2-46 is the central section, roughly between Bianculli Boulevard and the I-93 underpass at Freeport Street. The main resiliency-related goal of the study is the protection of this central section, as protection along the rest of the corridor already exists or is planned by other responsible parties.

Figure 2-4617: Recently Completed and In Progress Resiliency Improvement Projects



Chapter 3: Future Year Conditions

As part of the study, "No-Build" conditions were developed for the year 2050. This process included projections for land use changes, development, population, and demographics in the study area in the future. Based on projections and available data, this information was used to develop a No-Build traffic model, representing the Morrissey Boulevard area without significant roadway changes.

Future year conditions were developed to assess the benefits and impacts of potential improvements to Morrissey Boulevard and gain understanding of how the transportation system might operate in the absence of such changes.

3.1 Vehicle Network

Existing conditions of the vehicle network characteristics for the study area are laid out in Chapter 2. Projections for future vehicle trip growth and characteristics were used to carry out the traffic modeling process.

3.1.1 Key Findings of Vehicle Operations Analysis

- Without significant changes, the existing corridor infrastructure along Morrissey Boulevard is anticipated to be insufficient to accommodate future growth in vehicle traffic volumes.
- The corridor already experiences periods of significant congestion and vehicle hours of delay, which is expected to worsen under future conditions (elaborated on further in this chapter).
- Level of Service (LOS) of existing corridor infrastructure is expected to significantly worsen at key corridor intersections, increasing corridor travel time and complicating vehicle operations.

3.1.2 No-Build Vehicle Volumes

No-build vehicle traffic volumes were projected for key corridor intersections. This process builds upon current year traffic volumes that were collected in 2023 and assume no changes other than those currently planned to existing infrastructure. Volumes were projected for morning and peak hours (6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM, respectively), as it is likely these are the periods that would experience the highest levels of vehicle traffic and are typically used for alternatives development.

Preble Circle

During the morning and afternoon peak hours, Preble Circle is expected to see 6,346 vehicles, with 2,786 across the morning peak hours and 3,540 across the afternoon peak hours.

First Street

First Street is a proposed intersection stemming from the new street layout for the planned Dorchester Bay City development. The study team evaluated the addition of this intersection as part of the future year modeling and alternatives analysis. The proposed intersection falls between Bianculli Boulevard and Kosciuszko Circle, where opportunities are provided to enter/exit Morrissey Boulevard via frontage roads to/from Mount Vernon Street. Under future conditions, First Street is expected to see 8,195 vehicles across the morning and afternoon peak hours, 4,378 across morning peak hours and 3,817 across afternoon peak hours.

Bianculli Boulevard

Across the morning and afternoon peak hours, the Bianculli Boulevard intersection is expected to see 8,531 vehicles, 4,140 across the morning peak hours and 4,391 across the afternoon peak hours.

Freeport Street

Across the morning and peak hours, the intersection of Morrissey Boulevard and Freeport Street is expected to see 9,168 vehicles, 4,277 across the morning peak hours and 4,891 across the afternoon peak hours.

Victory Road

While this is a partial intersection at Morrissey Boulevard and Victory Road, no-build vehicle volumes were projected here because the alternatives development process considered several alterations to this location. Across the morning and peak hours, this location is expected to see 6,002 vehicles, 3,069 across the morning peak hours and 2,933 across the afternoon peak hours.

Neponset Circle

Neponset Circle is a major connecting intersection on the border of Boston and Quincy with direct connections via highway on/off-ramps to I-93 northbound and southbound. Across the morning and peak hours, Neponset Circle is expected to see 20,446 vehicles, 7,768 across the morning peak hours and 12,678 across the afternoon peak hours.

3.1.3 Vehicle Hours of Delay

Vehicle hours of delay is a metric used to express how many cumulative hours of traffic drivers experience under average travel conditions. Future vehicle hours of delay were projected and evaluated for key intersections along Morrissey Boulevard. Vehicle hours of delay noted for each intersection are emblematic of the combined morning and afternoon peak periods (6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM, respectively).

Preble Circle

Preble Circle is expected to see an increase in vehicle hours of delay under the existing infrastructure, which are estimated at 103.8 hours.

First Street

The existing infrastructure at Morrissey Boulevard does not include an intersection at the proposed First Street. Due to queue lengths at Kosciuszko Circle, vehicle hours of delay at this point are expected to be 116.5 hours during the morning peak hours and 0 hours during the afternoon peak hours.

Bianculli Boulevard

The intersection of Bianculli Boulevard and Morrissey Boulevard is anticipated to see a significant increase in vehicle hours of delay under the existing infrastructure to 371.1 hours. Most of these hours stem from the morning peak hour, which is anticipated to see 258 hours of vehicle delay, 113.1 hours during the afternoon peak hour.

Freeport Street and Victory Road[19]

Freeport Street and Victory Road are expected to see an increase in vehicle hours of delay under existing infrastructure with 341.1 hours across both morning and afternoon peak hours, 135.9 hours across the morning peak hours and 205.2 across the afternoon peak hours.

Neponset Circle

Neponset Circle is expected to see 443 vehicle hours of delay across the morning and afternoon peak hours, with most of these at 286.9 hours across the morning peak hours, contrary to 156 hours across the afternoon peak hours. These results do not reflect the impact of downstream congestion from the I-93 on-ramp on Morrissey Boulevard northbound, which was evaluated during alternatives analysis (described in Chapter 4).

3.1.4 Corridor Travel Times

Anticipated future travel times between the northern and southern points of the corridor are listed below for both the morning and afternoon peak hours. Travel times are for vehicles, in minutes, assuming no unplanned changes in corridor infrastructure.

Morning (AM) Peak Hour

- Northbound – Gallivan Boulevard to Preble Circle: 28 minutes
- Northbound – Neponset Circle westbound to Preble Circle: 27.6 minutes
- Southbound – Preble Circle to Gallivan Boulevard: 12.9 minutes
- Southbound – Preble Circle to Neponset Circle eastbound: 15.3 minutes

Afternoon (PM) Peak Hour

- Northbound – Gallivan Boulevard to Preble Circle: 16 minutes
- Northbound – Neponset Circle westbound to Preble Circle: 16.9 minutes
- Southbound – Preble Circle to Gallivan Boulevard: 18.1 minutes
- Southbound – Preble Circle to Neponset Circle eastbound: 18.7 minutes

3.1.5 Future Level of Service (LOS)

[19] Under existing infrastructure, there is no full intersection at Victory Road, so delays would be anticipated to originate from the Freeport Street intersection queues that could extend to Victory Road and Morrissey Boulevard.

Level of Service (LOS) is a metric used to evaluate intersection operations and how efficiently vehicles are processed. LOS was projected for future conditions under the existing Morrissey Boulevard corridor infrastructure at key intersections, which are listed below. The First Street intersection was excluded from existing conditions LOS projections, as it does not exist under current corridor infrastructure.

The results of the no-build/existing infrastructure vehicle network (vehicle volumes, vehicle hours of delay, corridor travel times, and level of service) were used to inform refinements to the travel demand model and during alternatives development and analysis.

Table 3-1: Intersection Level of Service

Intersection	Level of Service (LOS)		
	Morning Peak Hour	**Afternoon Peak Hour**	**Average**
Preble Circle	C	E	E
Bianculli Boulevard	F	F	F
Freeport Street/Victory Road	E	F	F
Neponset Circle	F	F	F

3.2 Transit Network

This section outlines future anticipated changes in the transit network in the Morrissey Boulevard corridor. The below changes were considered as part of the future no-build and build traffic modeling.

3.2.1 Key Findings of Transit Evaluation

- Planned improvements in MBTA's "Red Line Program" are expected to allow for 3-minute headways on the core section of the network (between JFK/UMass Station and Alewife). Though some stations in the southern section of the study area are on branches and would not see 3-minute service (e.g., Savin Hill), they would still have improved frequency of service (6- to 7-minute service).
- The new bus network outlined in the MBTA Bus Network Redesign (BNRD) is expected to improve transit access through increased connectivity and higher transit frequency. While no routes are anticipated to run on Morrissey Boulevard, high frequency routes would serve portions of the corridor with connections to Red Line rapid transit, such as at JFK/UMass Station.

3.2.2 Rapid Transit (MBTA Red Line)

The MBTA Red Line is in the process of being upgraded to improve headways and reliability through the acquisition of new trains, upgraded maintenance facilities, and improved signaling, resulting in headways as frequent as 3.5 minutes. These improvements would significantly boost transit access for residents within the study area and is anticipated to lead to an increase in ridership and overall transit use. Improved signaling, which involves replacing the analog system with a new digital system, would allow trains to run closer together and more efficiently.

The improved track quality stemming from this program would also allow trains to run faster, allowing quicker service to destinations, competitive with vehicle travel times.

The improved service along the MBTA Red Line would serve an increased level of residential and employment populations envisioned along the Morrissey Boulevard corridor, including access to and from current and future developments.

Additionally, access improvements to the MBTA Red Line JFK/UMass Station are anticipated. The City of Boston Transportation Department is carrying out an JFK/UMass Station Area Access Plan to identify near- and long-term access improvements in and around the JFK/UMass Station that would allow users to better access the station and surrounding developments, enabling increased connectivity and access to transit services in the neighborhood and Morrissey Boulevard corridor.

3.2.3 Bus Service

The MBTA is carrying out improvements to bus service through the Better Bus Project, with the goal of delivering better service to riders. These include increased service, dedicated bus lanes, transit priority, and modernized facilities.

The MBTA's Transit Priority Vision initiative aims to improve travel times for bus riders through the use of varied tools and strategies including, but not limited to, dedicated bus lanes, shared bus/bike lanes, and transit signal priority.

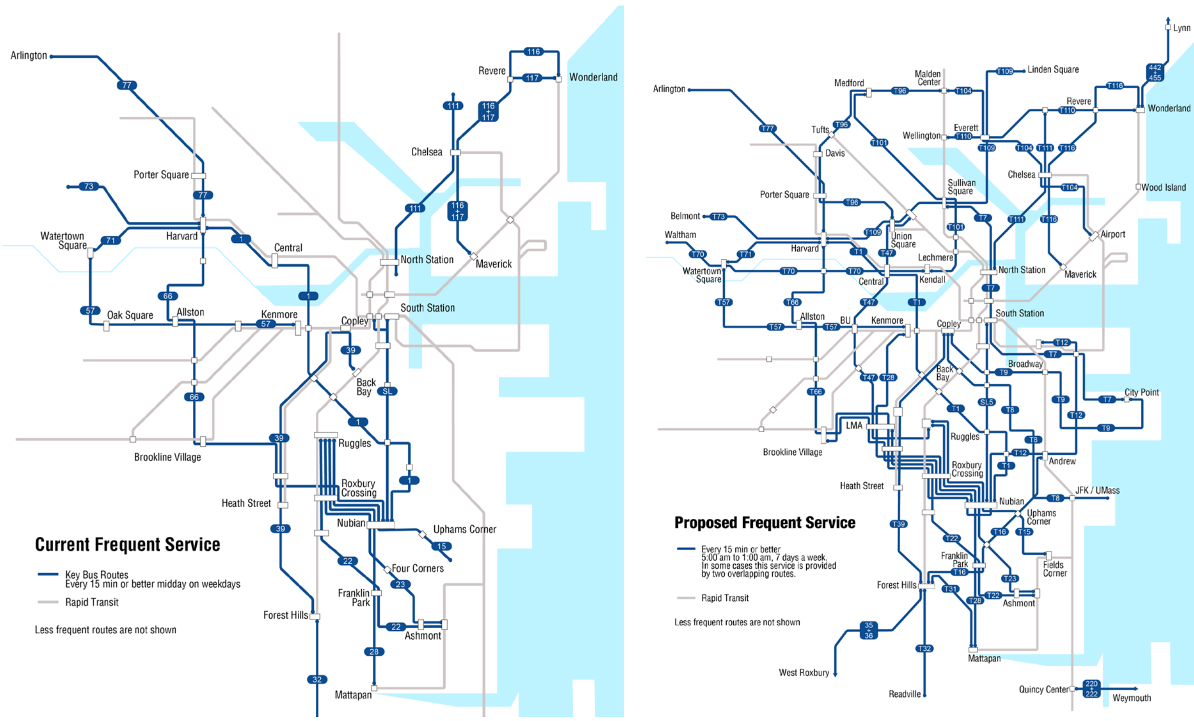
As part of the Better Bus Project, Bus Network Redesign (BNRD) is a multi-year MBTA project that seeks to streamline overlapping services and boost speed and frequency on the core services of the bus network. Systemwide, the MBTA estimates that the project will result in 25 percent more bus service, 70 percent more weekend service, and 275,000 additional residents near a high frequency service (buses running every 15 minutes or more frequently, 5 AM to 1 AM, seven days a week). BNRD in general offers improved frequency at weekday and weekend times on a slightly lower number of routes.

This initiative aims to reshape bus travel within the study area as a variety of changes are planned for the corridor. It is important to note that the recommendations in the Bus Network Redesign will be implemented gradually over time and are reliant upon a variety of factors, such as general funding levels and personnel. Traffic modeling in this study assumes that all proposed changes via BNRD are implemented by the 2050 horizon year.

As shown in Figure 3-1, the northern section of the study area is slated to receive higher transit frequency through bus route T8. A new rapid line, T12, would also run adjacent to the study area's northwestern boundary and link the Seaport, South Boston, and Longwood Medical Area.

This change would also increase MBTA Red Line connections at Fields Corner and Ashmont to points to the northwest. Route 15 would become T15 and extend from Upham's Corner into Fields Corner. Additionally, some of the routes starting at Fields Corner and Ashmont would no longer end at Ruggles but offer direct connections to locations to the northwest, such as the Longwood Medical Area. There is not anticipated to be any bus service on Morrissey Boulevard itself, which roughly parallels the MBTA Red Line.

Figure 3-1: High Frequency Service, Before BNRD (Left) and After BNRD (Right)



Specific changes by route are listed in with changes in the rapid network shown in Table 3-2. In Table 3-2, some of the included routes ending just outside of the study are included because of their proximity to the study area.

Table 3-2: Proposed Network Route Changes, BNRD

Past Route	New Route	Changes in Location and/or Frequency
Routes 201 and 202, operating in Dorchester between Fields Corner and Adams Village Station	Routes 201 and 202, operating in Dorchester between Fields Corner and Adams Village Station	No change
Route 210 Quincy – Fields Corner	Route 210 Quincy – Fields Corner	No change
Route 8 (Harbor Point - Boston Medical Center)	T8 (T8 Harbor Point – Copley)	Route T8 extends from Boston Medical Center to Copley to replace Route 10; does not serve Melnea Cass Boulevard, Nubian, and Kenmore; improves to all-day high frequency service
NA	T12 - Brookline Village - Nubian - LMA - Andrew - Seaport	New all-day hig -frequency Route T12 connects Seaport to Brookline Village via Longwood Medical Area, Nubian Station, and D Street
Route 41 Edward Everett Square – JFK/UMass	T16 Forest Hills - Uphams - Andrew	Route T16 improves to all-day high frequency service; operates consistently to Andrew via South Bay Shopping Center; does not serve Boston Street and JFK/UMass
Route 41 Soldiers Monument South St – JFK/UMass	T8 or 41	Route T8 improves to all-day high frequency between Harbor Point - Copley via JFK/UMass, Routes 41 between Heath Street - JFK/UMass
Route 16 Harbor Point – JFK/UMass	T8 Harbor Point -Copley	Route T8 extends from Boston Medical Center to Copley to replace Route 10; does not serve Melnea Cass Boulevard, Nubian, and Kenmore; improves to all-day high frequency service
Route 16 McCormack – Andrew Station	10,18	Route 10 rerouted via Preble St and Old Colony Avenue between Andrew and Dorchester Street to serve McCormack Housing; Route 18 extends to JFK/UMass via Andrew, McCormack Housing to replace Route 16 on weekdays
NA	Route 18 Ashmont – JFK/UMass	Route 18 extends to JFK/UMass via Andrew, McCormack Housing to replace Route 16; no Saturday service
Route 16 Fields Corners – Andrew Station (Boston Street)	17 Fields Corner – Andrew Station	Same route
Route 22 Ashmont – Orange Line	T22 Ashmont - LMA	Route T22 extends from Roxbury Crossing to Longwood Medical Area and does not serve Ruggles; maintains Orange Line connection at Roxbury Crossing
Route 23	T23 – Ashmont – Nubian Square - Ruggles	Same route; improves early/late-night weekend frequency.

3.2.4 Commuter Rail

The MBTA regularly makes updates to their scheduling patterns and has a number of efforts that could improve Commuter Rail service. MBTA Rail Vision[20] was a 2019 planning effort that identified cost-effective strategies to transition the MBTA Commuter Rail into a service that

[20] MBTA Rail Vision, MBTA, 2019. Access this source here: https://www.mbta.com/projects/rail-vision

serves a greater variety of users in a greater variety of places and times. The original document had a range of alternatives with different service patterns; however, a few key objectives have emerged and are being carried forward which will improve service at JFK/UMass including more frequent service, operating 6 trains per hour (3 in each direction) for most of the day.

The MBTA anticipates deploying EMUs on the Fairmount Line, just outside of the study area, in the coming years in coordination with their operating partner, Keolis. Depending on the outcome of this effort, EMUs could be employed on other Commuter Rail lines, including those serving the Morrissey Boulevard corridor at JFK/UMass, which would result in a reduction in noise and emissions from Commuter Rail.

3.3 Bicycle and Pedestrian Network

Several bicycling and pedestrian improvements that will contribute to a more complete network in the study area and complement improvements in this plan are underway in the study area. These improvements were incorporated into the no-build and build traffic models, which helped evaluate improved pedestrian and bicycle connectivity via Morrissey Boulevard.

3.3.1 Key Findings of Bicycle and Pedestrian Evaluation

- The creation of a coordinated and continuous pedestrian- and bicycle-friendly street grid has the potential to link pedestrian and bicycling routes from Columbia Point to South Boston and Freeport Street, as well as points west, north, and south.

3.3.2 Pedestrian and Bicycle Network

There are several pedestrian and bicycle infrastructure improvement projects planned in the study area that would improve the safety and comfort of those walking and bicycling connecting to Morrissey Boulevard. The primary projects are detailed in the following subsections.

Neponset River Reservation and Greenway Project

The Massachusetts Department of Conservation and Recreation is currently constructing an extension of the Greenway from Tenean Beach to Morrissey Boulevard, as of the writing of this report in 2024. This project involves the creation of a new 3,600-foot-long shared use path for pedestrians, bicyclists, and other users, which includes a boardwalk elevated over a section of salt marsh and tidal flats.

Dorchester Bay City

This multi-stage mixed-use development project on Columbia Point includes several proposed bicycle infrastructure upgrades, which would be incrementally built out as the project phases are implemented.

Figure 3-2: Dorchester Bay City Proposed Bicycle Infrastructure

Source: Dorchester Bay City CAC Public Meeting, Accordia Partners & ARES, 2023. (Original presentation here: 2023-07-26_Presentation_Dorchester Bay City.pdf | Powered by Box

Columbia Road Transportation Action Plan

The City of Boston Transportation Department is leading a project to redesign Columbia Road between Franklin Park and I-93. The City is working to collect and incorporate community feedback into a redesign that will consider potential changes to the travel lanes, sidewalks, and bus stops. The project aims to create a safer street design that increases safety for all road uses and adds trees and placemaking along one of Boston's main streets. This project is anticipated to facilitate increased bicycle connectivity.

Joe Moakley Park

Joe Moakley Park is undergoing a redesign by the City of Boston, anticipated to be carried out in several phases. This project aims to improve both flood resiliency and increase a sense of place for park users and adjacent travelers. Initial conceptual plans show a community path, including a running track, along the perimeter of Joe Moakley Park, which could improve safety, comfort, and attractiveness of area facilities for active transportation.

Figure 3-3: View Looking North on Mount Vernon Street

Source: Dorchester Bay City CAC Public Meeting, Accordia Partners & ARES, 2023. Original presentation here: 2023-07-26_Presentation_Dorchester Bay City.pdf | Powered by Box

The City of Boston is undertaking a review of *GoBoston 2030*, their plan to guide transportation investments and projects to 2030, which are anticipated to improve pedestrian and bicycle connectivity. With this, and the City's expanded bicycle network plans, an increased uptake of active transportation modes were considered when developing the future mode share in the 2050 travel modeling.

3.4 Projected Development

Significant growth is expected in the study area, as residential demand is driven by the high cost of living in nearby neighborhoods such as South Boston and the South End. Planned developments were analyzed to assess this projected change

3.4.1 Key Findings of Development Conditions

- Proposed and planned developments have the potential to substantially increase the quantity of housing, as well as office, lab, and commercial space.
- The added square footage of development projects could significantly increase trips in the study area, adding to the high number of traffic volumes projected for 2050.

3.4.2 Land Use and Economic Development

The City of Boston has adopted guidelines for the development process of large projects (i.e., projects adding more than 50,000 square feet), small projects (i.e., projects adding more than 20,000 square feet), planned development areas (overlay zoning districts for project areas larger than 1 acre), and institutional master plans (planning for academic and medical campuses). These guidelines are known as Article 80.

The City's Article 80 development projects are illustrated in Figure 3-4. This map shows non-completed projects including those under review by the City of Boston Planning Department Board, projects that are Board approved, and projects that are permitted or under construction, as of early 2024. Figure 3-4 also includes some projects outside of the study area that were included as part of the assumptions to ensure that growth was being adequately considered in and adjacent to the study area.

The corridor and the wider study area have seen significant development over the last several years, with additional growth anticipated. A summary of Article 80 projects in the study area by project status are listed in Table 3-3.

Figure 3-4: City of Boston Article 80 Projects in the Development Pipeline

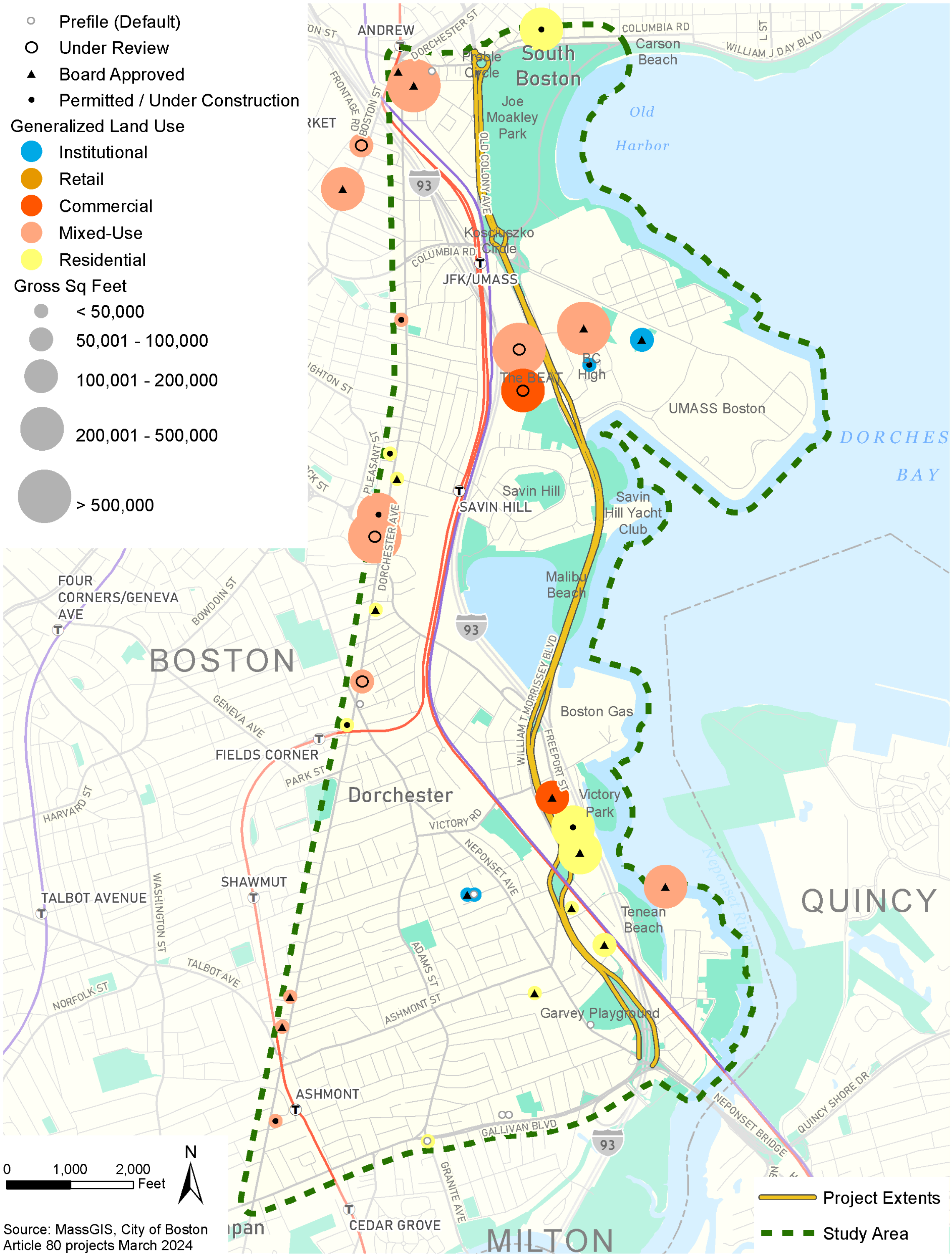


Table 3-3: Development Summary in and Adjacent to the Study Area

Status	#of Projects	New Residential Units (Affordable)	Major Projects
Completed	62	1,633	"The BEAT" expansion 780 Morrissey Boulevard
Permitted/Under Construction	15	1,990	Old Colony Phase 4 & 5
Board Approved	26	5,694	Dorchester Bay City, Mary Ellen McCormack Redevelopment (Phase 1)
Under Review	8	2,108	Mary Ellen McCormack Redevelopment (Phase 2)
Pre-File	15	1,815	Limited Information
Total (All Types)	**126**	**13,240 (11,607 if completed projects are not included)**	

Source: City of Boston Planning Department

Note: Many of the projects marked as "Completed" taken from the City of Boston Planning's Article 80 Database are from the 2010s (with several being from the 2000s). The total of 13,240 reflects all items in the City's database; 11,607 units remain in and adjacent to the study area after subtracting the 1,633 completed units. Additionally, it is important to note that the above figures are "point-in-time" estimates from the City's website, with some additional info added from City of Boston Planning and others. The numbers above are liable to change as projects work their way through the development process.

In total, future development could be expected to include 13,240 residential units, enumerating a significant addition to current trips in the Morrissey Boulevard corridor, as well as already expected growth in trip volumes. These development projections and associated number of trips were incorporated into the transportation modeling to understand future traffic volumes and travel mode share, which could be affected by any potential future changes to Morrissey Boulevard. As changes were incorporated during the modeling process, the refinements to demographic and population projections are further discussed in the following sections.

3.5 Future No-Build, Build Forecasts, and Modeling

This section outlines the no-build traffic and transportation conditions the study team projected for the year 2050 using Boston Metropolitan Planning Organization's (MPO) Central Transportation Planning Staff (CTPS) Massachusetts Statewide Travel Demand Model, based on historic travel patterns, recent traffic counts, and projected development and transportation conditions presented above.

3.1.1 Key Assumptions for the Future No-Build

- The study used 2050 as a horizon year for modeling efforts, in line with standard practices and the Boston MPO Long-Range Transportation Plan.
- Morrissey Boulevard will stay as its current configuration with generally six vehicle travel lanes, sidewalks on both sides, and no bicycle facilities.
- Planned transportation projects by MassDOT, DCR, City of Boston, and the MBTA will progress, as those are planned to be in place by 2050.

- Development projects as approved and under review by the City of Boston Planning Department will move forward and be built, including their anticipated number of vehicle, transit, pedestrian, and bicycle trips.
- Overall traffic volumes in the study area will continue to grow at a rate of 0.6 percent annually, with a more modest growth rate of 0.1 percent to 0.4 percent on Morrissey Boulevard.
- The Kosciuszko Circle/Columbia Road I-93 Interchange will maintain its current processing capacity under the ongoing redesign by MassDOT Highway Division.

3.1.2 Methodology

As part of the no-build forecast, travel demand modeling–a tangible means of projecting future traffic volumes and travel patterns–was carried out. The study used the CTPS Massachusetts Statewide Travel Demand Model (the model). The model is an industry standard tool used in many of MassDOT's studies and projects to gain an understanding of future year transportation conditions.

While the model includes baseline demographic conditions for population, household, and employment, the base model was adjusted based on input from the Morrissey Boulevard Commission, partners, and members of the public. The model was adjusted to reflect all development projects under City of Boston Planning Department review, approval, or construction and planned transportation changes (e.g., more frequent Red Line service, continued uptake of bicycle transportation) as of 2024 to account for how development, new housing, and commercial areas could affect the volume of trips in 2050 and their effects on the transportation network, including Morrissey Boulevard.

With the above assumptions in place, the calibration of the model was finalized with the anticipated traffic volumes and other trips.

3.1.3 CTPS Travel Demand Model

The CTPS Statewide Travel Demand Model is a multimodal travel demand forecasting model. It covers not only Massachusetts, but also adjacent areas in New Hampshire and Rhode Island. The entire geography of the model is divided into 5,839 Traffic Analysis Zones (TAZ), which mirror United States census tracts.

The model network includes all Interstates, Freeways and Expressways, Principal Arterials, Minor Arterials, and some Collectors and Local roads as needed to ensure highway network connectivity. It also includes all the Commonwealth's public transportation services, including MBTA Commuter Rail and rapid transit, MBTA and other private and public bus services, services operated by regional transit authorities, and some local/municipal shuttle buses. The network also includes bicycle and walk links to include additional possible travel modes.

The model employed included two different time scenarios: a base year and a future year. The base year of the model is 2019 (preceding a 2023 update by CTPS). The future year, aligned with ongoing statewide planning work and anticipated growth, is set for 2050. Future year assumptions include all transportation projects set in the 2050 Long Range Transportation Plan for the Boston MPO.

The model outputs (trip patterns and trip numbers) are provided for four daily time periods that represent an average 24-hour period:

- Morning (AM) 6:00 AM to 9:00 AM
- Mid-day 9:00 AM to 3:00 PM
- Afternoon (PM) 3:00 PM to 6:00 PM
- Nighttime 6:00 PM to 6:00 AM

The CTPS statewide model estimates travel demand using demographic information such as population, household, and employment data. Employment data includes 10 employment categories within each TAZ, alongside detailed population and household data. The population and household data relate to each person in existing or future estimated households by census block.

Additional estimated information is associated with each person, such as age, employment status, and wage income. The model uses this dataset to determined additional data associated with each household, for example, the number of children, workers, and seniors in a household. Further submodels have projections for three categories and their application to each household: sufficient vehicle (sv) households where each driver has a vehicle, insufficient vehicle (iv) households where there are more drivers in the household than vehicles, and zero vehicle (zv) households with no vehicles. The vehicle availability of households plays a major role in the model when travel modes are assigned to trips.

The CTPS modeling process generally involves four steps:

1. Trip Generation: Determines the number of trips associated with certain land uses (e.g., residential, office, commercial), including the timing of those trips.
2. Trip distribution: Matches origins and destinations for all trips to create a trip table, which indicates where people are traveling.
3. Mode split: Estimates the percentage of trips made by different travel modes, such as driving, bicycling, walking, or transit.
4. Traffic assignment: Determines the specific routes taken between trip origins and destinations.

The mode split model is constructed as a nested Multinomial Logit model[21] and estimates several different modes including drive-alone car, shared ride, walking, bicycle, and transit trips. Transit trips are estimated by how the service was accessed–walk or via park-and-ride. Several factors determine which mode is used on any given trip, including highway travel time, parking costs at the destination, parking capacity at park-and-ride lots, transit fare, transit frequency, transit travel time, transfer time and wait time, and general walkability and bikeability.

The traffic assignment on the highway network of the auto mode considers the capacity of the roadway. Each highway link is defined by the number of lanes. The model uses a pre-defined highway capacity for vehicles per lane and per hour for each facility type. The model uses 11 facility types with Types 1 through 6 corresponding to the MassDOT functional classification, Types 7 and 8 for ramps, 9 for centroids, 10 for transit, and 11 for non-motorized modes such as walking and bicycling. Based on estimated hourly capacity by facility type and number of lanes, the model determines the overall capacity of each highway link. The final results from the model traffic assignment are the number of vehicles on each highway link during the four time periods–AM, Midday, PM, and Nighttime.

[21] A Multinomial model is a model used to predict the probability of specific outcomes based on a variety of independent variables. As an example, one independent variable might be the parking costs at the destination, which would, in concert with other variables, impact the probability of commuters driving.

The model also includes a transit ridership assignment component. Unlike the traffic assignment, the transit assignment does not constrain capacity due to vehicle or station platform capacity. The only capacity applied during the transit assignment is related to the capacity of park-and-ride locations.

The highway assignments for the 3-hour AM and PM periods from the Base Year (2019) and Future Year models are used to compute the volume change in each time period. This change in volume over the 3-hour period is converted into volume changes from 2023 to 2050 during the peak hour during the AM and PM peak periods. The peak hour volume changes are added to the study Base Year 2023 peak hour volumes to determine the 2050 peak hour volumes.

The peak hour volumes are determined as described above for each highway link in each direction. This also allows the entering and exiting peak hour volumes at each study intersection approach to be calculated for the 2050 AM and PM peak hours. Using an iterative method, the 2023 peak hour turning movement volumes at each study intersection are factored until the entering and existing volumes computed align with the estimated 2050 entering and existing volumes. This process is used to generate the future year no-build 2050 AM and PM peak hour volumes for each study area intersection.

3.1.4 No-Build Forecast

As mentioned, the CTPS Statewide model was provided for the Base (2019) and Future (2050) Years. It was originally envisioned that the 2050 Future Year model would serve as the No-Build model for this corridor study. However, further investigation determined that the 2050 demographic data for the TAZs within the study area needed additional review, as described below.

The study area boundary for this corridor study includes 34 TAZs within the CTPS Statewide model. The demographic data for 2019 and 2050 were extracted from the CTPS Statewide model for these TAZs in terms of population, households, and employment. The demographic change from 2019 to 2050 for each TAZ was computed. The CTPS Statewide model for the 34 TAZs in the study area boundary reflected demographic growth, as shown in Table 3-4.

Table 3-4: Study Area Demographic Summary

Data	Base (2019)	Plan (2050)	Growth
Population	68,919	87,741	18,832
Household	27,294	36,205	8,911
Employment	38,076	44,432	6,356

During the second Morrissey Boulevard Commission meeting in January 2024, input received requested the inclusion of additional housing units. Based on this feedback and further review of planned development projects in the area, a total of 65 projects were identified, which are anticipated to result in 12,246 residential units and roughly 1.8 million gross square footage of non-residential (retail and office/lab) space.

First, the 2050 Plan Year model was updated regarding demographic data to create a 2050 No-Build model. The update included an additional 3,335 households that were added to the demographic data. The above-mentioned projected non-residential development of 1.8 million gross square footage is roughly equivalent to 5,199 jobs. Given that the 2050 Plan Year CTPS

Statewide model already included a growth of 6,356 jobs from 2019 to 2050, no additional changes were made to the employment data.

Further investigation was conducted to identify why the 2050 Plan Year CTPS Statewide model had a lower number of households in 2050 than what was being proposed by Article 80 projects. Comparing the Article 80 projects with projects reflected in the CTPS Statewide model determined that a few new development projects were either proposed or became active when the model was developed. In addition, future phases of certain developments not included in the CTPS Statewide model were incorporated. There are two major developments in particular:

- Mary Ellen McCormack Redevelopment project – 1,932 residential units
- Estimated growth from the City of Boston's PLAN: Glover's Corner, Dorchester – 1,500 residential units

The Article 80 projects, including the above two developments, resulted in a net additional 3,335 residential units. These additional residential units were located based on the street address of the proposed development and allocated into a census block within a specific TAZ within the study area. Table 3-5 presents the updated demographic data for generating the 2050 No-Build forecasts.

Table 3-5: Updated Study Area Demographics Summary

Data	Base (2019)	No-Build (2050)	Growth
Population	68,919	95,548	26,639
Household	27,294	39,540	12,246
Employment	38,076	44,432	6,356

Based on the average household size, average age distribution, and average household income of the census blocks based on the 2050 Plan Year data, the additional 3,335 households were converted into 7,807 persons, with each person assigned characteristics such as age, wage income, and whether the person was a child, a driver, a worker, or a senior.

In addition to the demographic updates, one additional update was made. As mentioned previously, the model uses walkability and bikeability measures as part of the mode split model to estimate the number of trips that would use walk and bike modes of transportation. Given that the study area has several proposed major developments covering major geographic portions of certain TAZs, it was assumed that these developments will also include pedestrian and bicycle facilities to allow greater utilization of walk and bike modes. For this reason, the walkability and bikeability measures within TAZs that are anticipated to have major developments, such as the ones mentioned above and the TAZs where the Dorchester Bay City Development is planned, were updated to match the measures of TAZs within other walk-friendly and bike-friendly areas of the City of Boston.

The CTPS Statewide model was run with the updated demographic information to generate volumes for the 2050 No-Build scenario. Table 3 shows the 6-hour combined AM and PM peak period person trips for vehicles, transit, walking, and bicycling for the study area.

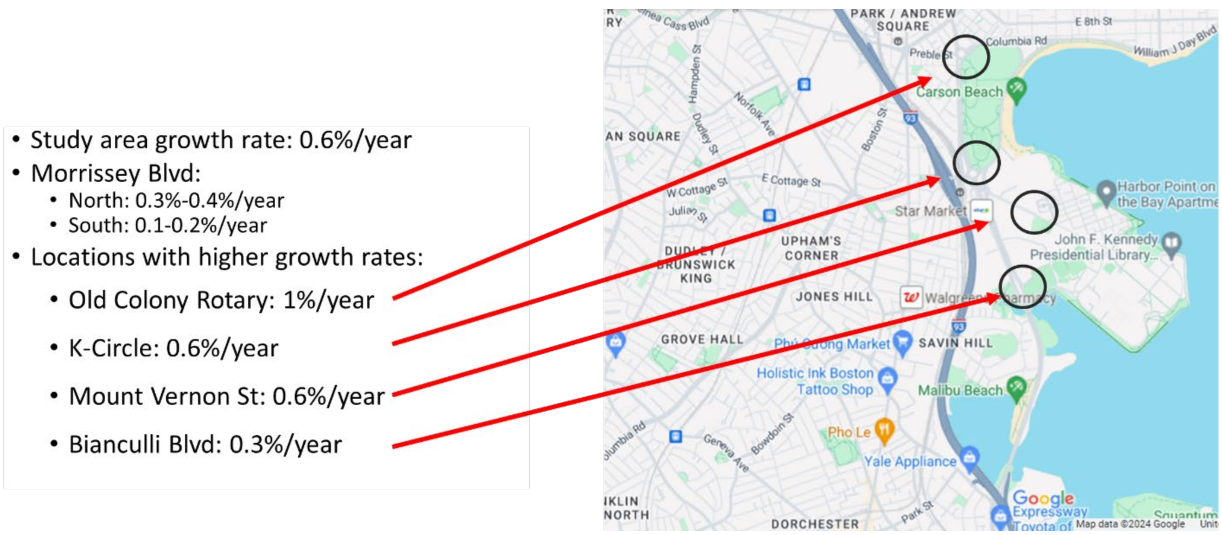
Table 38-6: Study Area Mode Shares – Existing and No-Build

Mode	2019 Person Trips	Percent	2050 No-Build Person Trips	Percent
Autos	200,107	73%	243,573	69%
Walk/Bike	49,898	18%	73,279	21%
Transit	25,803	9%	37,010	10%

The 3-hour AM and PM volumes were processed to generate 2050 No-Build AM and PM peak hour volumes for the intersections identified for traffic analysis in the study area.

Figure 3-5 shows the traffic growth rates at select locations within the study area network. The overall growth rate in the study area was estimated to be 0.6 percent per year. The northern section of Morrissey Boulevard had a slightly higher growth rate of 0.3 percent to 0.4 percent, while the southern section was lower at 0.1 percent to 0.2 percent. The highest growth rates were at the Old Colony Rotary at 1 percent per year, while the other locations had growth rates at or below the study area-wide growth rates. These growth rates and the variation in growth across the study area reflect the demographic changes and anticipated new developments within the study area.

Figure 318-5: Study Area Traffic Growth by Selected Locations, 2019-2050



3.1.5 Build Forecast

The Build alternative was modeled with the following changes to the roadway network:

- Reconfiguration of Morrissey Boulevard from north of Neponset Circle to south of K-Circle. This was reflected by reducing the number of lanes on Morrissey Boulevard from three lanes in each direction to two lanes in each direction.
- Eliminate the frontage road approach (west leg) at the intersection of Morrissey Boulevard and Bianculli Boulevard. This modification is part of the proposed road reconfiguration on Morrissey Boulevard and the construction of pedestrian and bicycle facilities.

- Construction of First Street was represented by adding a new highway link connecting Day Boulevard east of K-Circle to Morrissey Boulevard with a four-legged intersection at Mount Vernon Street.

The Build model was first run with the above roadway network modifications in three steps:

- Step 1: Model incorporates roadway network modifications
  - Results were compared against the auto, walk/bicycle, and transit mode shares included in the no-build condition.
- Step 2: Updates to mitigate potential impacts on vehicle operations
  - The second model run included new walk/bicycle access links expected from development projects that would provide future connections for alternative transportation modes to vehicles.
- Step 3: Updates to modify and better reflect future vehicle availability and use expected from new developments
  - The third and final model run incorporating all the above modifications and anticipated future conditions in the study area under the Build scenario that evaluated a road configuration and tailored development projections in line with planned and proposed developments and community feedback.

The results of the vehicle, walking, bicycling, and transit mode shares were compared to the No-Build forecasts.

Table 3-7: Study Area Mode Shares – Existing and No-Build

Mode	Boston Region MPO Base Year (2019) Trips	Boston Region MPO Future Year (2050) No-Build Forecast Trips	2050 Future Build Forecast Trips
Vehicles	200,107	243,573 (+21.7%)	236,329 (+18.1%)
Walk/bike	49,898	73,279 (+49.9%)	75,812 (+51.9%)
Transit	25,803	37,010 (+43.4%)	41,184 (+59.6%)
Total	275,808	353,862 (+28.3%)	353,325 (+28.1%)

Given the reduction in roadway capacity, there was expected to be an increase in the walking, bicycling, and transit mode shares due to increases in travel time resulting from the reduction in roadway capacity. The model indicated traffic diversions to adjacent highways such as I-93 and other arterials and local roads that run parallel to Morrissey Boulevard. The Build model was run a second time to mitigate the potential impacts to better represent future transit conditions.

The second run of the Build model included new walk/bike access links from a few TAZs to the nearest MBTA Red Line stations. The TAZs selected for this modification were those with proposed major new developments. All of the selected TAZs are close to the Red Line, and it was assumed that each of these new developments will implement Transportation Demand Management measures, such as shuttle buses between the development and the nearest Red Line station. While the new access links were modeled as walking and bicycling links, they were intended to simulate residents' use of shuttle buses to access the transit service. Table 3-8 presents the TAZs and the connected transit station/stop by new walking and bicycling access links.

Table 3-8: TAZs with Simulated Transit Access Links

TAZ	Transit Station/Stop
154 167	Red Line Andrew Station
355 359	Red Line JFK/UMass Station
355	Bus Route 8 Bayside Expo Center Stop
363 365	Red Line Savin Hill Station

The Build model was run a second time with the new walking and bicycling access links. The mode share results were once again compared with the No-Build mode shares shown in Table 3-7. While there was an increase in transit mode share, it was insufficient to alleviate the concerns related to traffic diversions from Morrissey Boulevard to adjacent parallel highways and roads and the potential impact on traffic operations on these roads. Consequently, the Build model was run a third time with additional modifications.

The third run of the Build model involved modifications to better reflect residents' vehicle availability in the new developments. Based on a review of documents submitted to the City for the proposed developments as part of their Article 80 review process, it was noted that the number of parking spaces proposed within each development was far lower than the number of proposed residential units. Given this constraint, it is reasonable to assume that the residents of these new developments will not have vehicles at the same level as residents in other parts of the City or region. In other words, households within TAZs that would have the new developments would have insufficient vehicles where the number of eligible drivers in the household would exceed the number of vehicles available. As described previously, the CTPS Statewide model includes a vehicle availability model that categorizes each household into one of three categories: sv – sufficient vehicles, iv – insufficient vehicles, and zv – zero vehicles.

The modification in the third Build model run converted all sufficient vehicle households in the TAZs with major developments to “iv” households. This was done by stopping the model execution after the vehicle available component of the model was completed and making changes to a database generated by the model during execution. Once the changes were made, the model execution was restarted from when it was stopped. Table 3-9 shows the breakdown of vehicle availability before and after the modification to vehicle availability.

Table 3-9: Vehicle Availability for TAZs with New Developments

Vehicle Availability	Before Modification		After Modification	
	Number of Households	Percent	Number of Households	Percent
Sufficient Vehicles (sv)	8,422	54%	0	0%
Insufficient Vehicles (iv)	5,067	32%	13,489	86%
Zero Vehicles (zv)	2,115	14%	2,115	14%

TAZs include133, 154, 155, 167, 355, 358, 359, 363, 365

At that time, the model assignments would be extracted to generate the 2050 Build AM and PM peak hour volumes. Table 3-10 presents the mode shares resulting from the third model run for all TAZs within the study area.

Table 3-10: Study Area Mode Share Comparison

Mode	Person-Trips (6AM to 9AM + 3PM to 6PM)			Percent Mode Share		
	Auto	**Walk/Bike**	**Transit**	**Auto**	**Walk/Bike**	**Transit**
2019 Base	200,107	49,899	25,803	73%	18%	9%
2050 No-Build	243,573	73,279	37,010	69%	21%	10%
2050 Build	236,329	75,812	41,184	67%	21%	12%
Growth 2019 to 2050 Build	36,222	25,914	15,381	47%	33%	20%

Table 3-10 shows that the final Build model run reflects a greater increase in walking, bicycling, and transit modes than the auto mode. The auto mode would grow at a rate of 0.5 percent per year while the non-auto modes would increase by about 1.5 percent per year from 2019 to 2050 under the assumptions of the modifications made to the 2050 Build model.

3.1.6 Projected Vehicle Diversions

The model run indicated vehicle trip diversions from Morrissey Boulevard to other key vehicle connections inside and outside the study area. Due to the proposed roadway reconfiguration, some drivers who currently use Morrissey Boulevard as a through-road/bypass may shift to travel on I-93. However, some travel mode shift could occur, such as from driving to transit or bicycling, in order to accommodate both increased vehicle volumes and potential future congestion on Morrissey Boulevard. Overall, the modified Travel Demand Model indicated vehicle traffic will likely shift to I-93 during both the morning and afternoon peak travel periods, moving vehicle traffic away from Morrissey Boulevard.

Figure 3-6 and Figure 3-7 show the relative change in volumes between 2050 No-Build and 2050 Build on the major roadways within the study area for the AM and PM peak periods, respectively. Only those roadways that are over capacity in the 2050 No-Build scenario are shown.

Figure 3-6: 2050 Build Condition New AM Driving Trips Occurring on Segments Already Over Capacity

Figure 3-7: 2050 Build Condition New PM Driving Trips Occurring on Segments Already Over Capacity

The results from the modified Build model informed alternatives development, notably the number of lanes included at key corridor intersections, such as Bianculli Boulevard. The results were incorporated into the SYNCHRO and Vissim traffic simulators during alternatives analysis, discussed in Chapter 4.

3.6 Future Climate Conditions

Building off the baseline flood conditions, evacuation considerations, and related coastal protection projects discussed in Chapter 2, Section 2.6, the study evaluated resiliency projections in line with best practices and available flood models. These were used to establish future-planning conditions for resiliency alternatives.

Future flood risks were analyzed to understand:

- How the study area will be exposed to future vulnerability from rising seas and more intense storms
- The ways in which current and future assumptions of vulnerability would be impacted by surrounding flood control projects
- The City of Boston's Climate Ready Dorchester planning initiative, summarized in the 2020 *Coastal Resilience Solutions for Dorchester* final report provides guidance for future investments along with prioritization of investments

Morrissey Boulevard's risk is expected to increase from periodic (such as King Tides and higher spring tides) and episodic (coastal storm) flooding. These climate-related hazards are expected to increase in frequency and severity over time, although the specific level of vulnerability will be impacted by current and future resiliency improvements from other projects in the study area.

3.6.1 Key Findings of Resiliency Evaluation

- Significant sea level rise is anticipated, especially by 2070, which was selected as the horizon year for flood planning in this study to maximize resiliency
- The corridor's central section, roughly between Bianculli Boulevard and the I-93 underpass, is the most vulnerable section of the corridor
- Design flood elevations were established for the central section of Morrissey Boulevard and used to conceptualize and evaluate potential alternatives for flood resiliency

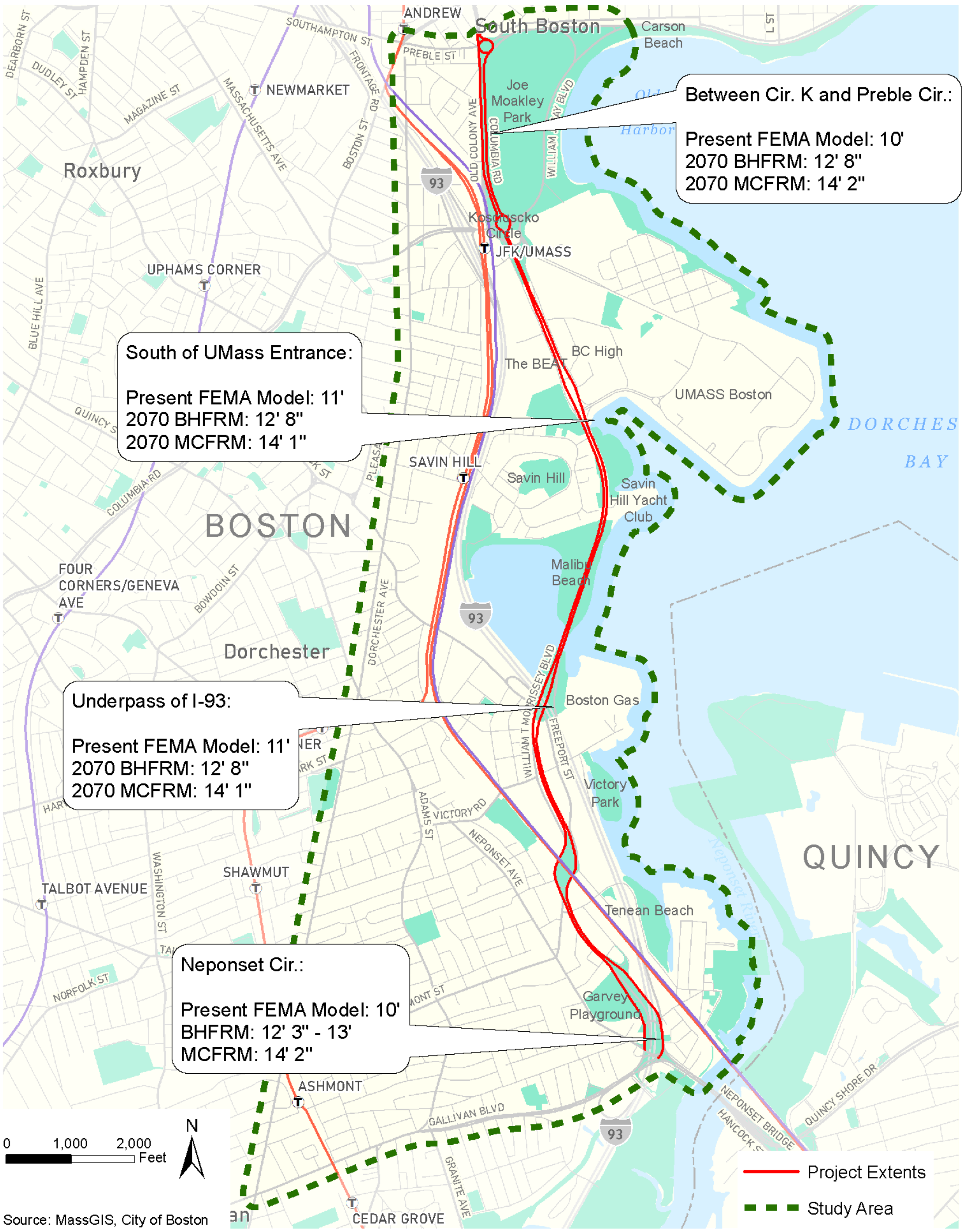
3.6.2 Agency Standards and Guidelines

Potentially applicable standards, guidelines, and funding considerations were reviewed to inform initial discussions on selecting CLOS/DFEs for the study. The findings of this review are summarized and further described in the following sections, organized by level of government (local, state, federal). The interagency partners leading the study have a wide degree of discretion in selecting the flood resilience CLOS/DFEs to be applied. This includes choosing the data source (Boston Harbor Flood Risk Model – BH-FRM; Massachusetts Coast Flood Risk Model – MC-FRM; and the Federal Emergency Management Agency [FEMA]), design storm (2 percent, 1 percent, 0.5 percent, 0.2 percent, 0.1 percent annual probability; 50-, 100-, 200-, 500-, 1,000-year return period), hazard components (stillwater, wave setup, wave runup), freeboard (0 to 3 feet), and time horizon (Present, 2050, 2070). Data is available to translate most CLOS alternatives into specific DFEs for further consideration in evaluating technical and economic feasibility, and the development of conceptual alternatives.

As noted above, the BH-FRM and MC-FRM are potential data sources on which the design corridor resiliency measures can be based. Woods Hole Group and academic partners developed the BH-FRM with funding from MassDOT and the Federal Highway Administration (FHWA) to evaluate coastal flooding risks from sea level rise and increased storm surge to the Central Artery Tunnel system. It is a hydrodynamic, probabilistic model that accounts for the relevant physical processes affecting coastal flooding, including sea level rise and storm surge intensification caused by climate change. The BH-FRM flooding simulations and mapping products were developed for three time horizons: Present, 2030, and 2070. The 2070 results include approximately 42 inches (3.5 feet) of relative sea level rise, compared to the 2013 baseline year, and a late 21st century climatology with more intense tropical cyclones.

Figure 3-8: Comparison of 100-Year Floodwater Surface Elevations for FEMA, BH-FRM, and MC-FRM models

Water Surface Elevation (WSE) in 2070, During a 1-Percent (100-Year) Flood



The BH-FRM was upgraded and expanded with funding from Commonwealth of Massachusetts agencies, led by MassDOT, to include the entirety of coastal Massachusetts. The resulting MC-FRM includes updated probabilistic sea level rise projections consistent with the state standard, expands the storm sets used to include more historical and recent storms as well as hundreds of additional future storms, includes dynamic wave runup and overtopping of coastal structures like seawalls, uses improved statistical methods, and adds regular nuisance flooding by projecting future tidal benchmarks. In addition to the Present, 2030, and 2070, the MC-FRM includes simulations and results for the 2050 time horizon. The 2050 and 2070 results include approximately 2.5 and 4.3 feet of relative sea level rise, respectively, compared to the 2008 (1999 to 2017) baseline year and a late 21st century climatology with more intense tropical cyclones.

Due to the multiple jurisdictions in the study area and their respective departments/agencies with respect to flooding guidance, there are a variety of potentially applicable standards for designing resiliency solutions. Specific considerations for the Morrissey Boulevard corridor are noted throughout.

Table 3-911: Summary of Potentially Applicable Flood Resilience Level of Service Standards

ENTITY	REFERENCE	DESIGN STANDARD	APPLICABILITY/NOTES
LOCAL CONSIDERATIONS			
Boston Conservation Commission	Wetlands / Climate Change Adaptation Ordinance and Regulations	BH-FRM 2070	Applicable to projects in the present and future flood zones
City of Boston Planning	Zoning Code Article 25A, Coastal Flood Resilience Design Guidelines	BH-FRM 2070 1% +1 foot or + 2 feet	Applicable to large development projects
Boston Public Works Department	Climate Resilient Design Standards and Guidelines	BH-FRM 2070 1% +1 foot or + 2 feet	Unclear how this is enforced today
Boston Environment Department and City of Boston Planning	Coastal Resilience Solutions for Dorchester	BH-FRM 2070 1% with waves + 1 foot	Applicable for district-scale flood protection infrastructure design
STATE CONSIDERATIONS			
Massachusetts Executive Office of Energy and Environmental Affairs (MA EEA), Massachusetts Emergency Management Agency (MEMA), All Secretariats	RMAT Climate Resilient Design Standards	MC-FRM 2070 1% to 0.1%	Return period depends on criticality and service life, interim 2050 DFE acceptable with incremental strategy
MA EEA, Massachusetts Environmental Policy Act (MEPA) Office	MEPA Regulations and Policies		
Department of Conservation and Recreation (DCR)	Morrissey Boulevard Redesign Project (2017)	10 ft NAVD88 (< FEMA 1%), <3 tidal flooding closures in 2065	Applied to the “middle segment” around Malibu Beach
Massachusetts Department of Transportation (MassDOT)	Bridge Design Guidelines	Present (assumed FEMA) 2% and 1%	Hydraulic and scour design floods for bridges under present conditions
FEDERAL CONSIDERATIONS			

Office of the President	EO 13690 – Federal Flood Risk Management Standard (FFRMS)	Present (FEMA 0.2%, 1% +2 feet, or 1% +3 feet	All federally funded projects, subject to regulatory adoption by each agency
Federal Highway Administration (FHWA)	Location and Hydraulic Design of Encroachments on Flood Plains (Design Standards)	Present (FEMA) 2%	Applies only to Interstate highways
FHWA	Formula and Discretionary Grants / FFRMS	Present (FEMA) 0.2%, 1% +2 feet, or 1% +3 feet	Strongly encouraged or part of evaluation criteria, depends on criticality
Federal Emergency Management Agency (FEMA)	Hazard Mitigation Assistance Grants / FFRMS	Present (FEMA) 0.2%, 1% +2 feet, or 1% +3 feet	Required or strongly encouraged, depending on criticality and cost-effectiveness
FEMA	National Flood Insurance Program (NFIP) Levee Accreditation / Flood Mapping	Present (FEMA) 1% including wave setup + 2 feet, or 1% wave crest elevation + 1 feet, or 1% max wave runup elevation + 1 feet	Applicable if seeking FEMA map revision for flood insurance requirement/cost relief

Local Considerations

Boston Conservation Commission – Ordinance Protecting Local Wetlands and Promoting Climate Change Adaptation in the City of Boston, Regulations

- Regulates proposed projects within existing FEMA flood zone, 100-foot Buffer Zone, and Coastal Flood Resilience Zone
- Requires applicants to the extent applicable to integrate climate change and adaptation planning considerations into their project to promote climate resilience to protect and promote resource area values and functions into the future.
- Projects in Land Subject to Coastal Storm Flowage (LSCSF) shall take into consideration the impacts of climate change on LSCSF and integrate climate resilience and adaptation strategies to protect the resource area and properties adjacent to the area for the next 50 years.
- Proposed activities shall not inhibit any planned flood resilience, adaptation, or mitigation solutions and shall not inhibit the ability to enact such solutions in a timely and practical manner as referenced by Climate Ready Boston or any successor initiative of the City.

City of Boston Planning Department) – Zoning Code Article 25A and Coastal Flood Resilience Design Guidelines

- Mandatory for large development projects subject to Article 25A Coastal Flood Resilience Overlay District (CFROD), including Dorchester Bay City (Bayside Expo).
- Most of the Morrissey Boulevard corridor is within the district.
- For subject projects, all uses and structures must meet a minimum Sea Level Rise - Design Flood Elevation, which is based on the 2070 1 percent stillwater surface elevations from the BH-FRM plus 1 or 2 feet of freeboard.
- Subject projects are subject to Resilience Review under Article 25A which must find that projects are consistent with certain design principles, including “Relationship to District-Scale

Resilience Solutions: To the extent feasible, enhancements at an individual parcel or project level should support the goals and implementation of plans for coastal resilience throughout the CFROD. Enhancements at an individual parcel or project level should not worsen risk at adjacent parcels or restrict future implementation of larger coastal resilience plans for the CFROD."

City of Boston, Public Works Department – Climate Resilient Design Standards and Guidelines for Protection of Public Rights-of-Way

- Projects subject to Boston Public Improvement Commission and Public Works review are intended to meet design standards for protection of public rights-of-way, though it is unclear how it is enforced today.
- Minimum DFEs should be 1 percent stillwater flood elevation based on BH-FRM plus 1 foot (non-critical facilities) or 2 feet (critical facilities) but could use lower probability events (0.2 percent or 0.1 percent) for protecting more critical assets.
- Generally, 2070 is used as the design time horizon for flood barriers, assumed to have a 50-year useful life, but 2030 or 2050 can be used as interim time horizons if feasibility is a concern, subject to incorporation of incremental design elements.

City of Boston, Environment Department and City of Boston Planning Department – Coastal Resilience Solutions for Dorchester

- The City of Boston's plan for developing district-scale coastal flood protection infrastructure for the Dorchester neighborhood.
- Provides DFEs for specific sections based on BH-FRM 2070 1 percent stillwater elevation plus waves and 1 foot of freeboard: 16.0-16.2 feet NAVD88 along Dorchester Bay and 14.4 feet NAVD88 along the Neponset River.
- Also provides interim target elevations for proposed incremental phasing/raising for some areas (10 feet NAVD88 for Morrissey Boulevard at Malibu Beach, 12.5 feet at Conley Street)

State Considerations

Resilient Massachusetts Action Team (RMAT) – Climate Resilient Design Standards Tool

- Led by the Executive Office of Energy and Environmental Affairs (EEA) and the Massachusetts Emergency Management Agency (MEMA), the RMAT is an inter-agency team comprised of representatives from each Secretariat, called Climate Change Coordinators, who are supported by agency staff, stakeholders, and subject matter experts.
- The RMAT is tasked with monitoring and tracking the State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) implementation process, making recommendations to and supporting agencies on plan updates, and facilitating coordination across State government and with stakeholders.
- The RMAT led development of the Climate Resilience Design Standards Tool, advancing prioritized global (or cross-agency) actions from the SHMCAP. This effort has developed climate resilience design standards and guidance for State agencies in order to incorporate climate resilience into the State's capital planning process and grant-making for local capital projects.
- State projects submitted for inclusion in the State Capital Improvements Plan are scored based on their risk and proposed resiliency measures for the purpose of screening/prioritization.

- Transportation projects have different recommended coastal design storms, depending on asset criticality ratings (low, medium, high) and exposure service life (e.g., 11 to 50 years, 51 to 100 years).
- Flood Control Structures proposed within the Morrissey Boulevard corridor may theoretically be subject to a slightly lower design storm than Transportation assets of equal criticality/service life.
- The Morrissey Boulevard corridor could be disaggregated into different sections if criticality and service life are not uniform throughout the corridor, and different design storms applied accordingly.

Massachusetts Environmental Policy Act (MEPA)

- Morrissey Boulevard improvements may require MEPA review and certification.
- Projects submitted to MEPA are required to attach RMAT Tool outputs, describe if and how the project is designed to meet RMAT design standards, and if in the FEMA 1 percent floodplain describe how and whether the project will have negative effects on floodwater flows paths and/or velocities, in the Climate Change Adaptation and Resiliency section of the Environmental Notification Form (ENF) application.
- Projects submitted to MEPA with Environmental Justice populations within a certain radius (1 or 2 miles) must describe any potential impacts that would increase or reduce the effects of climate change on said populations, alternatives and measures to reduce those impacts, and response to related comments, with reference to RMAT tool climate change risks.

Department of Conservation and Recreation (DCR)

- In the 2017 Morrissey Boulevard redesign project, DCR planned to elevate the roadway for coastal resiliency to the degree necessary to achieve the following CLOS/DFE:
  - "Limit to <3 closures from tidal flooding in 2065"
  - Proposed grades for the "middle segment" around Malibu Beach appear to target elevation 10 feet NAVD88 as the minimum roadway profile elevation.
  - Note, the current effective (2016) FEMA Base Flood Elevation (1 percent annual chance stillwater with wave setup and max wave crest) within the existing roadway footprint in this area is in the 11- to 13-foot NAVD88 range.
- The Amelia Earhart Dam Facility Inundation Vulnerability Assessment Report (November 10, 2016) looked at the risk of facility inundation based on sea level rise scenarios for 2030 through 2070 using data from the BH-FRM. DCR is proceeding with the recommended improvements for hardening the Amelia Earhart Dam against a sustained inundation event of Elevation 120.0 MDC datum (El. 13.6 NAVD88) with wave heights up to Elevation 122 (El. 15.6 NAVD88).
- DCR has incorporated future coastal flooding projections into the design criteria for the Draw 7 Park in Somerville.
  - The crest elevation of an integrated flood barrier within the park will likely be set to elevation 15.6 feet NAVD88–the MC-FRM 2070 0.5 percent flood elevation plus 1 foot freeboard–based on the RMAT tool. This needs to be verified with documentation.

Massachusetts Department of Transportation (MassDOT)

- MassDOT has Hydraulic and Scour Design Guidelines for highway bridges, included in the Load and Resistance Factor Design Bridge Manual, Part I (revised 2020).

- As an Urban Principal Arterial, a 2 percent (50-year) hydraulic design flood and 1 percent for scour design flood are desirable for Morrissey Boulevard.
- These guidelines have been applied by MassDOT to climate vulnerability assessments / adaptation alternatives analysis on a project-by-project basis, using MC-FRM to compare project performance against these guidelines under present versus future flooding conditions.

Federal Considerations

- Adherence to Federal Guidelines relevant to flood protection design would be necessary if federal funding for design or implementation of Morrissey Boulevard resiliency improvements is sought, either through transportation or hazard mitigation funding programs.
- May seek to integrate flood control measures in the design of Morrissey Boulevard improvements, with a secondary goal of providing relief from National Flood Insurance Program (NFIP) flood insurance requirements/costs to property owners within the existing FEMA floodplain.

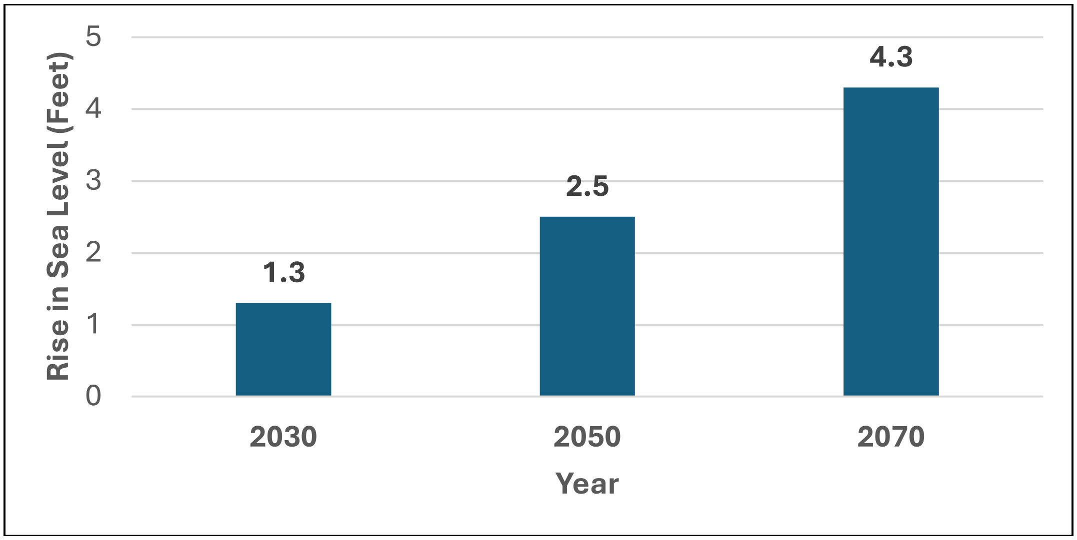
3.6.3 Flood Modeling

The Massachusetts Coast Flood Risk Model (MC-FRM) is a standard tool for projections of nuisance and storm surge flooding through 2070. The MC-FRM is an updated version of the City of Boston's Boston Harbor Flood Risk Model (BH-FRM). This model was used by the City on the Climate Ready Dorchester plan (2020), which is a 2020 neighborhood-level plan based on the citywide Climate Ready Boston plan (2016). The MC-FRM accounts for the relevant physical processes affecting coastal flooding and provides standardized maps and data on coastal flood risks in Present, 2030, 2050, and 2070 periods for the entire Massachusetts coast. The probability of present-day inundation for the study area is shown in Figure 2-42.

The MC-FRM assumes a higher level of sea level rise than the BH-FRM, so designing to the level of the MC-FRM is the "safer" or more conservative option for infrastructure and public safety. All results are compared to the 2008 (1999 to 2017) baseline year.

The MC-FRM was used to analyze 2030, 2050, and 2070 results (in addition to the Present period, which was discussed in Section 3.1.3). As shown in Figure 3-9, the 2030, 2050, and 2070 results include approximately 1.3, 2.5, and 4.3 feet of relative sea level rise, respectively, compared to the baseline year, consistent with the Commonwealth's "High" sea level rise projections. Results for 2050 and 2070 also account for late 21st century climatology with more intense tropical cyclones.

Figure 3-9: Anticipated Sea Level Rise from MC-FRM



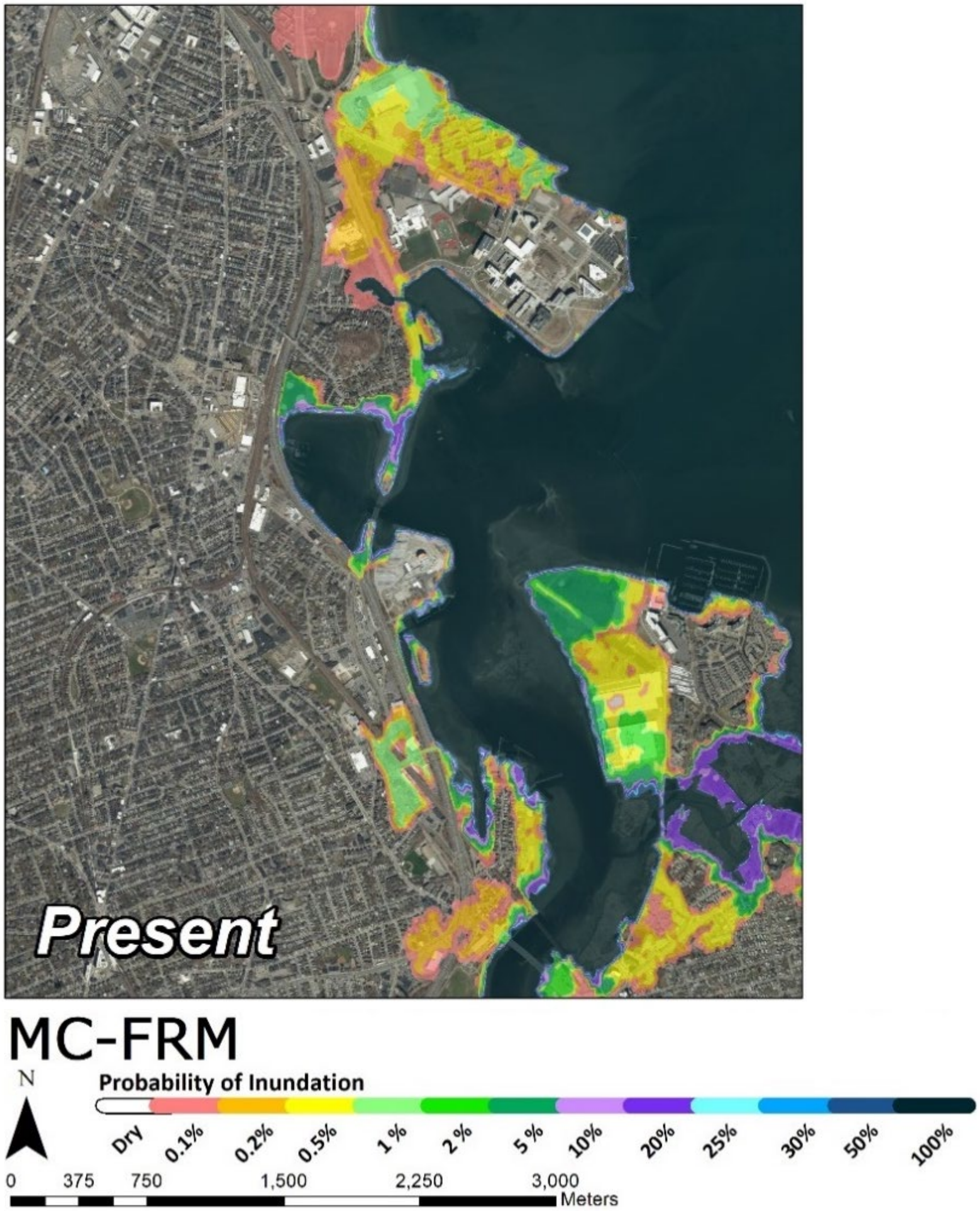
The portion of Morrissey Boulevard between Bianculli Boulevard and the I-93 underpass is vulnerable to flooding hazards due to its waterfront location and low elevation. However, there are also sections of the corridor that are currently at risk from coastal flooding that are inland from the waterfront. These areas are at risk due to flood pathways from low-lying areas along the Dorchester and South Boston waterfront, which are mostly beyond the Morrissey Boulevard right-of-way. Presently, flood pathways come from Tenean Beach/Conley Street, the area immediately southeast of Kosciuszko Circle, Joe Moakley Park, Bianculli Boulevard, Pattens Cove, and Quincy Shore Drive/Neponset Trail. In this case, flood risk is not confined to the immediate coastal zone. The future risk from these inland lower-elevation zones is expected to increase.

After selecting the most appropriate flood model to use, the next step was to select the appropriate design horizon and storm event that would be the focus of infrastructure improvements. This critical decision required an understanding of how to balance the magnitude, impacts, and cost of potential infrastructure solutions with the value provided to study area users and residents. The Climate Resilience Design Standards Tool developed by the Resilient Mass Action Team (RMAT) was used to assist decision-makers in determining design goals for the project. Use of the RMAT Tool is an accepted practice in local and regional resiliency planning and considers the following variables among its input data:

- The number of people that use the facility and would be impacted by its closure
- Sensitive facilities in the study area that would be impacted by flooding
- Whether or not the facility serves as flood control for adjacent areas

The RMAT tool recommended the use of the 2070 design horizon and 1,000-year design storm for developing infrastructure improvements for Morrissey Boulevard. However, after discussions with many stakeholders, it was decided that the use of the 2070 design horizon with the 100-year design storm would be more consistent with recommendations from the City of Boston's *Climate Ready Dorchester*, particularly given that its findings indicated that the central section of Morrissey Boulevard would remain vulnerable to inundation even if designing to the 1,000-year storm event.

Figure 3-10: MC-FRM Probabilistic Flooding Maps (Present)



3.6.4 Design Flood Elevation

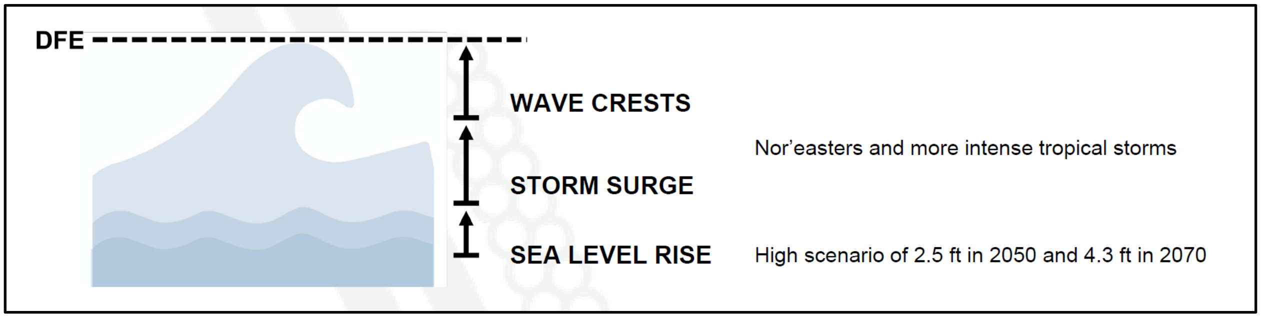
Considerations and standards, flood modeling processes, and baseline resiliency were evaluated and distilled into calculations for a Design Flood Elevation (DFE) for resiliency alternatives.

The design flood elevation is the target elevation to which the study team aimed to design coastal resiliency solutions in order to reduce coastal flood risk in the medium term (2050s) and long-term (2070s). The MC-FRM was used to determine the DFE–as it is the Commonwealth's standard coastal resilience design tool. The DFE accounts for sea level rise, storm surge, and wave action. The DFE developed for the Morrissey Boulevard considers the 1 percent (1 in 100-

year storm) annual chance flood in 2070 (the percentage chance of this particular level of flooding in the given year).

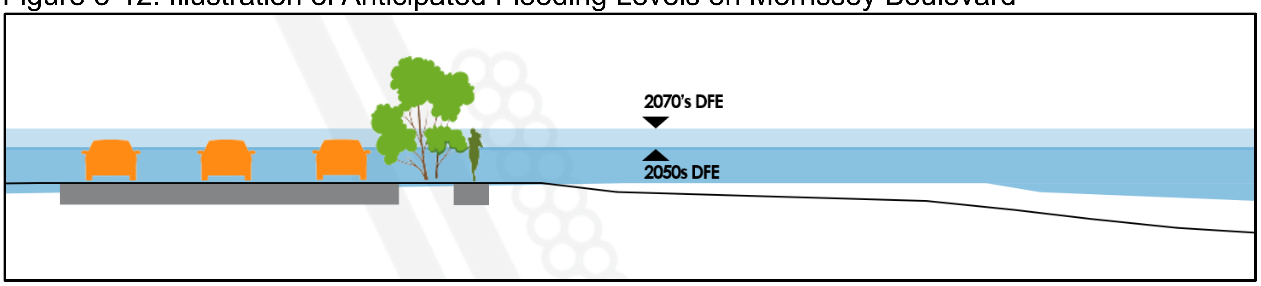
Sea level rise is the baseline of DFE and anticipates a high scenario of 2.5 feet in 2050 and 4.3 feet in 2070. In addition, storm surge during significant rainfall events, such as Nor-easters and more intense tropical storms can be expected; these events also bring wave action and wave crests, which can overtop existing shoreline or any flood barriers. Components of the DFE are shown in Figure 3-11.

Figure 3-11: Design Flood Elevation Components



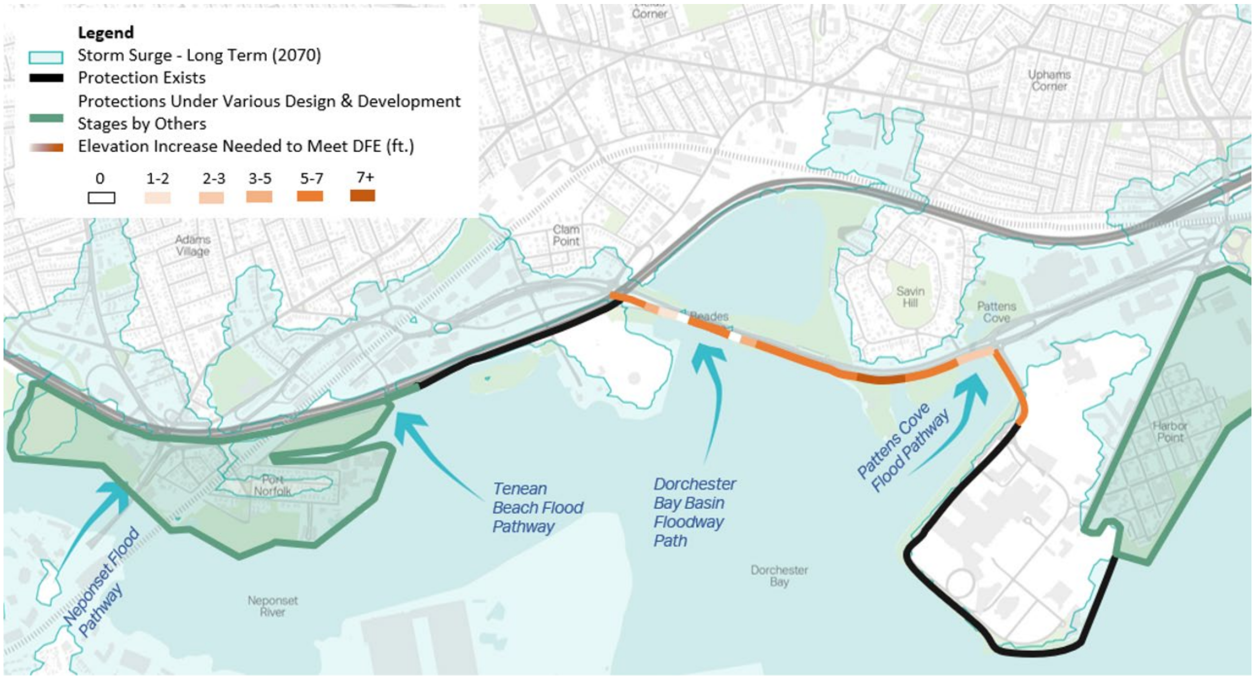
The DFE varies along the Morrissey Boulevard corridor, primarily based on the differences in wave conditions which are dependent on conditions in open water and land barriers. Therefore, different points in the central section would need to be raised to different levels, such as 15 feet near Bianculli Boulevard, which constitutes an increase from existing elevation. Future flood levels–and by extension the DFE–are expected to rise above the level of motor vehicles and pedestrians at the current level of Morrissey Boulevard, indicating significant flood resiliency improvements are necessary.

Figure 3-12: Illustration of Anticipated Flooding Levels on Morrissey Boulevard



The various elevation changes required for the Central Section of Morrissey Boulevard to accommodate the DFE are indicated on the figure below, which also shows long-term (2070) storm surge, existing flood protection, and ongoing flood protection by others. Given the gap in planned flood protection between Freeport Street and Bianculli Boulevard, it was necessary to develop several alternatives to address future flooding. If Morrissey Boulevard were to be elevated, the minimum elevation required would be the DFE. Through the central section, this varies between zero feet and over seven feet.

Figure 3-13: Anticipated Long-Term Storm Surge (2070) along Morrissey Boulevard



Chapter 4: Alternatives Development and Analysis

Based on the existing and projected future conditions, alternatives were developed and analyzed to address the identified issues and opportunities. These options were then evaluated against specific evaluation criteria to help identify and guide the decision-making process in selecting recommended short- and long-term solutions. The following section details this process.

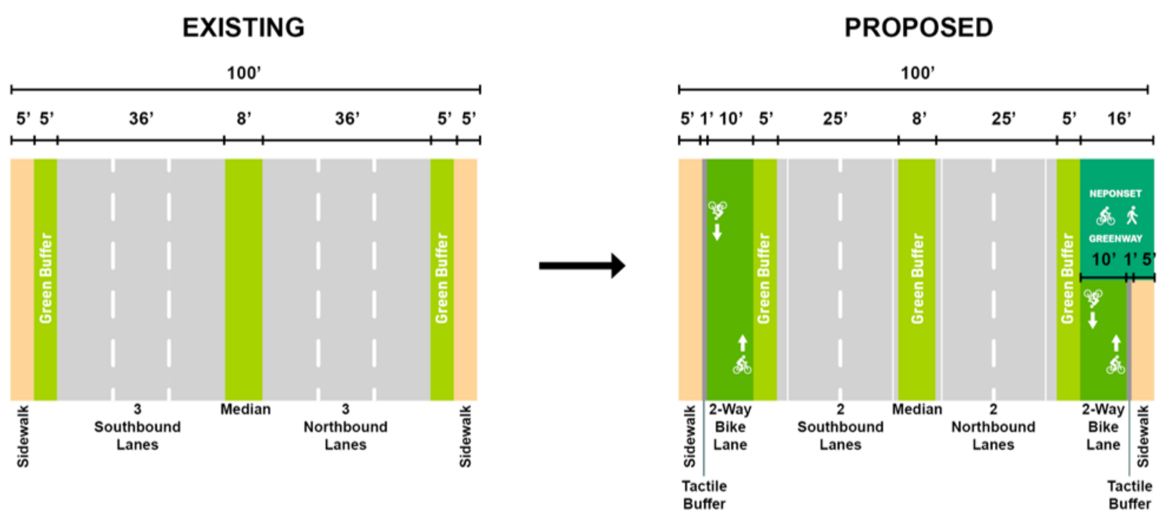
As the primary conflict points are located at intersections along Morrissey, the alternatives were developed and assessed with a focus on these locations.

4.1 Issues and Opportunities

While Morrissey Boulevard was constructed as a parkway, it functions similar to a highway as a result of its wide cross section and frontage roads, limited vehicular crossings, limited bicycle and pedestrian facilities, and a grade change that encourages speeding south of Kosciuszko Circle.

The roadway corridor is characterized by three different sections (the northern, central, and southern zones) and generally has three travel lanes in each direction south of Kosciuszko Circle. This wide cross section also provides opportunities to reconfigure the roadway to improve safety and mobility. Specific issues and opportunities related to each zone are detailed below.

Figure 4-1: Cross Section of Roadway Reconfiguration

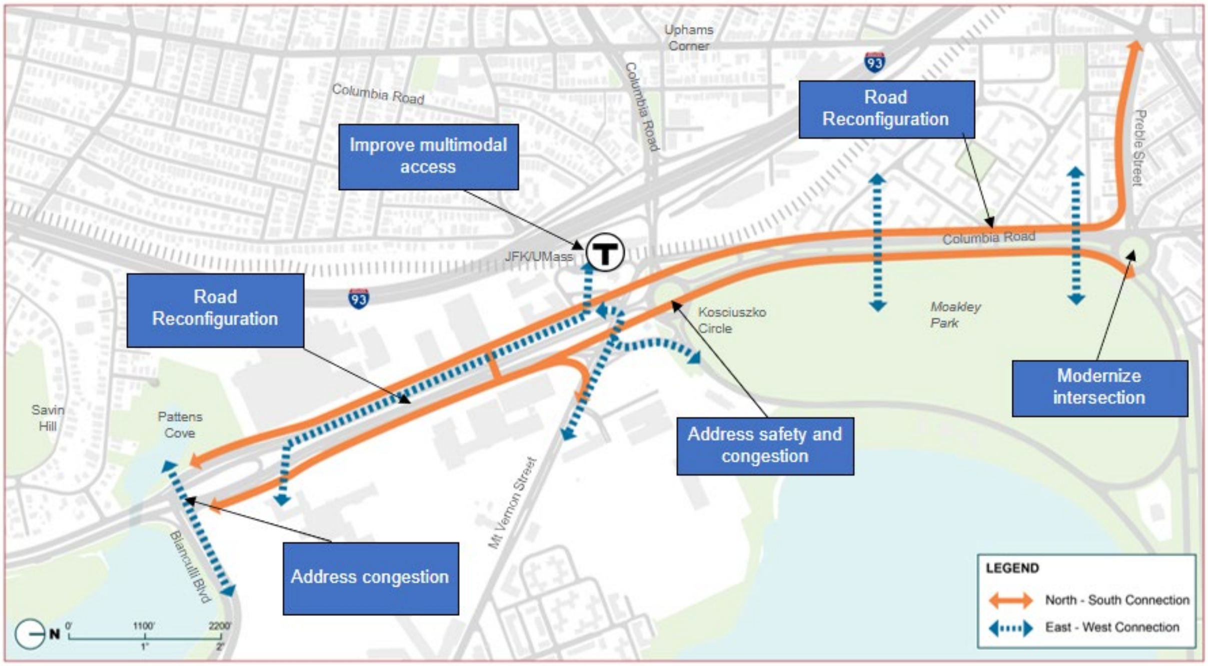


Northern Zone

The northern section of the corridor—from Preble Circle to Bianculli Boulevard—is expected to experience growth in land use, with several projects in differing stages of development including Dorchester Bay City and the Mary Ellen McCormack redevelopment. These developments are expected to create new vehicle, transit, bicycle, and pedestrian trips. Improved bicycle and walking linkages to the JFK/UMass MBTA Red Line Station, as well as First Street—a new roadway to be developed as part of Dorchester Bay City—could enhance access for all modes and play a role in supporting this anticipated growth.

The alternatives development also considered the frontage roads south of Kosciuszko Circle and how this space could be best utilized to increase safety, while creating opportunities for enhanced placemaking and resilience.

Figure 4-2: Northern Zone Issues and Opportunities

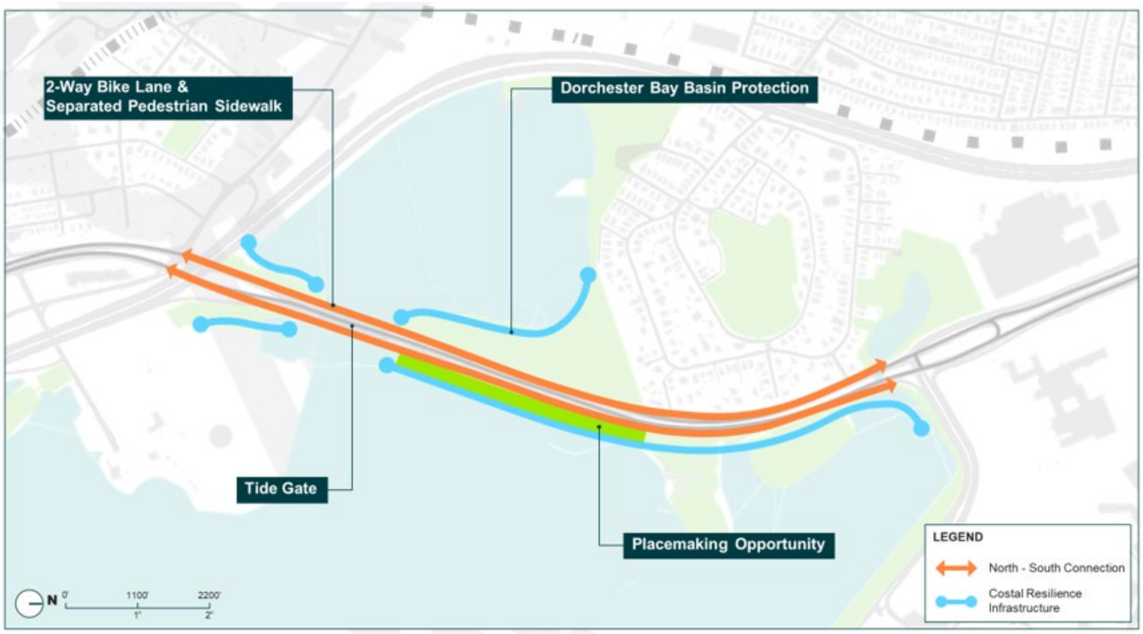


Central Zone

The central section of the corridor—from Bianculli Boulevard to Freeport Street—is characterized by a larger percentage of public and open space. As a result, connections to the waterfront and the Malibu Beach area are critical. The green space also creates opportunities for placemaking. The central zone is the most vulnerable to regular flooding events due to its adjacency to Dorchester Bay.

This zone offers opportunities for increased north-south connections and placemaking, as well as coastal resiliency.

Figure 4-3: Central Zone Issues and Opportunities



Coordination with Beades Bridge Project

The central zone is connected by the Beades Bridge, a drawbridge linking the Dorchester Bay Basin with Dorchester Bay. A MassDOT project is underway to replace the movable bridge and approach spans. Alternatives for the central zone were developed, to the extent possible, to be consistent with the ongoing project development for the bridge.

Southern Zone

The southern zone experiences traffic safety and operations challenges stemming from a wide roadway and the presence of frontage roadways, a lack of safe and comfortable east-west connections from neighborhoods to the coast, and complex intersections at Freeport Street and Victory Road, and Neponset Circle.

Figure 4-4: Southern Zone Issues and Opportunities

4.2 Intersection Countermeasures and Alternatives Development

Along with the roadway reconfiguration applied corridor-wide, the following countermeasures were considered to improve the public realm, mobility, connectivity, safety, and climate resiliency:

- **Signalized Control:** "Squaring up the intersection," or aligning the approaches, and signalizing movements.
- **Quadrant Roadway:** A roadway in which left turns are replaced by a right turn and then a left turn to drive straight through the intersection.
- **Modern Roundabout:** The geometry of the intersection requires drivers to slow down significantly at the entrance to the roundabout (the geometry does not allow drivers to enter straight into the intersection, as is currently seen at Preble Circle) and typically provides improved circulating patterns, signage, and pavement markings.
- **Median U-Turns:** Removing a U-turn and/or a left turn from the intersection and relocating it to a mid-block or alternate location downstream. Drivers would be required to use the U-turn movement to travel back to the intersection to conduct a right-turn movement.
- **Continuous Green-T Intersections:** An intersection in which drivers traveling one way on the major street do not stop, while drivers from minor approaches have a channelized left-turn movement. This can help increase intersection capacity at locations where volumes are comparatively low at the minor approach and very high on the major approach.

Figure 4-5: Intersection Countermeasures

Source: City of Winnipeg Public Works; Virginia Department of Transportation

With the existing conditions and estimated future conditions as context, countermeasures were developed for each of the corridor intersections.

Preble Circle

Preble Circle is a large, five-legged rotary with most approaches currently stop-controlled and one yield-controlled. The Circle has lane space for two circulating vehicles, and its design allows drivers to enter with a very limited skew from most angles, which encourages high speeds in the absence of stop signs. All crossings are marked, and the southern leg of the intersection has a buffered bike lane ending at the intersection.

The Circle is expected to have significant delay by 2050, especially for westbound and northbound approaches in the AM peak and for southbound movements in the PM peak.

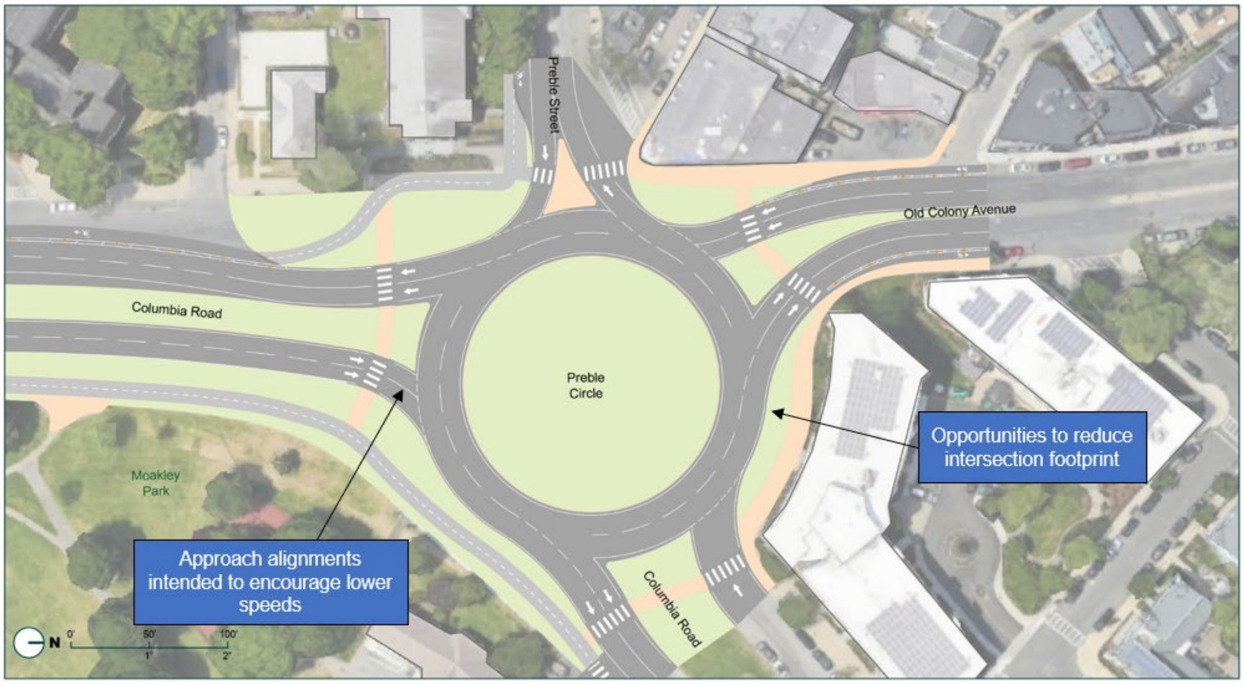
Potential countermeasures at Preble Circle include:

- Creating a Modern Roundabout: A modified circular geometry with more explicitly delineated lane lines; and
- Installing Signalized Control: “Squaring up the intersection” and signalizing movements.

Modern Roundabout

The modern roundabout involves modifying the geometry of the circle using a sharper angle of approach to more explicitly delineate lane lines within the roundabout and leave a large green space in the middle. Northbound and southbound approaches would have two lanes each, while other approaches would have one. Extra space would be used for rounded curb extensions. This option would also include a shared use path.

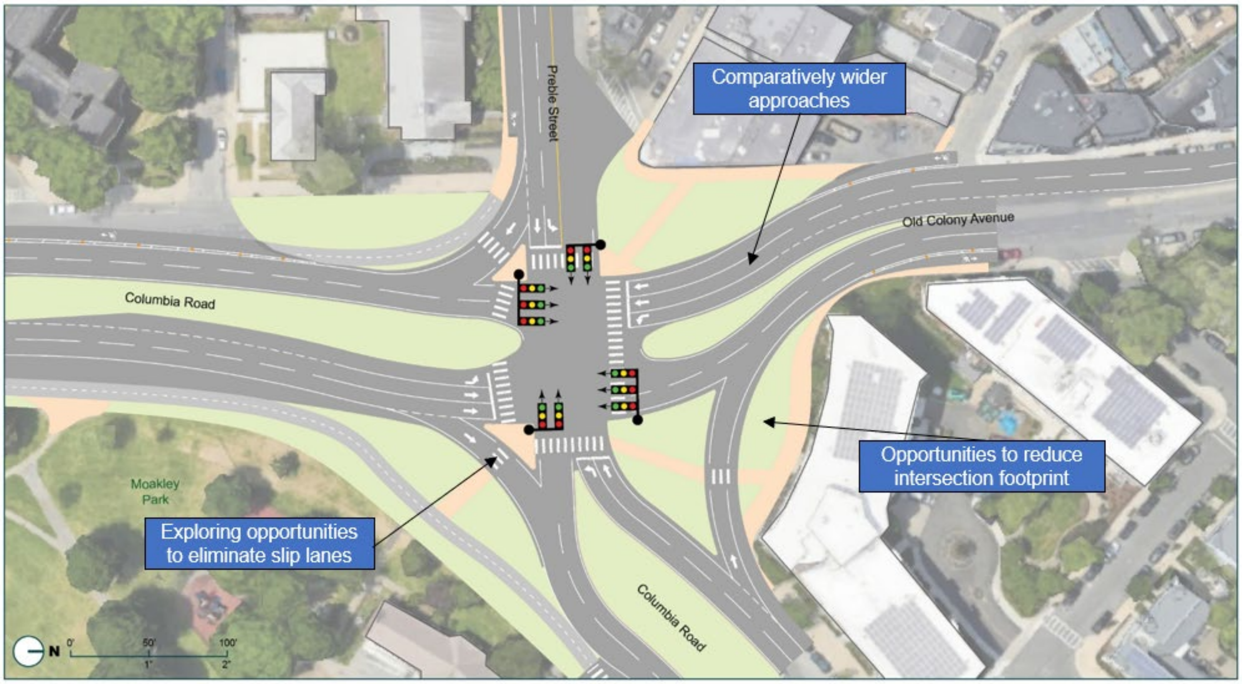
Figure 4-6: Modern Roundabout Option at Preble Circle



Signalized Control

A signalized intersection places a signal controlling all four major approaches, creating a simpler and smaller footprint that the current design. For northbound, southbound, and eastbound approaches, right- and left-turn lanes are introduced. As with the modern roundabout, this option includes a shared use path.

Figure 4-7: Signalized Control Option at Preble Circle



Columbia Road

Columbia Road runs adjacent to Joe Moakley Park, which is a large park that connects to Boston Harbor to the east. Columbia Road is also used by many residents from the Mary Ellen McCormack housing development. The 2019 Moakley Park Vision Plan, which envisioned a green spine with foliage at the western park edge and a protected bike lane/cycle track along Columbia Road, were included as part of alternatives development.

Potential countermeasures at Columbia Road include:

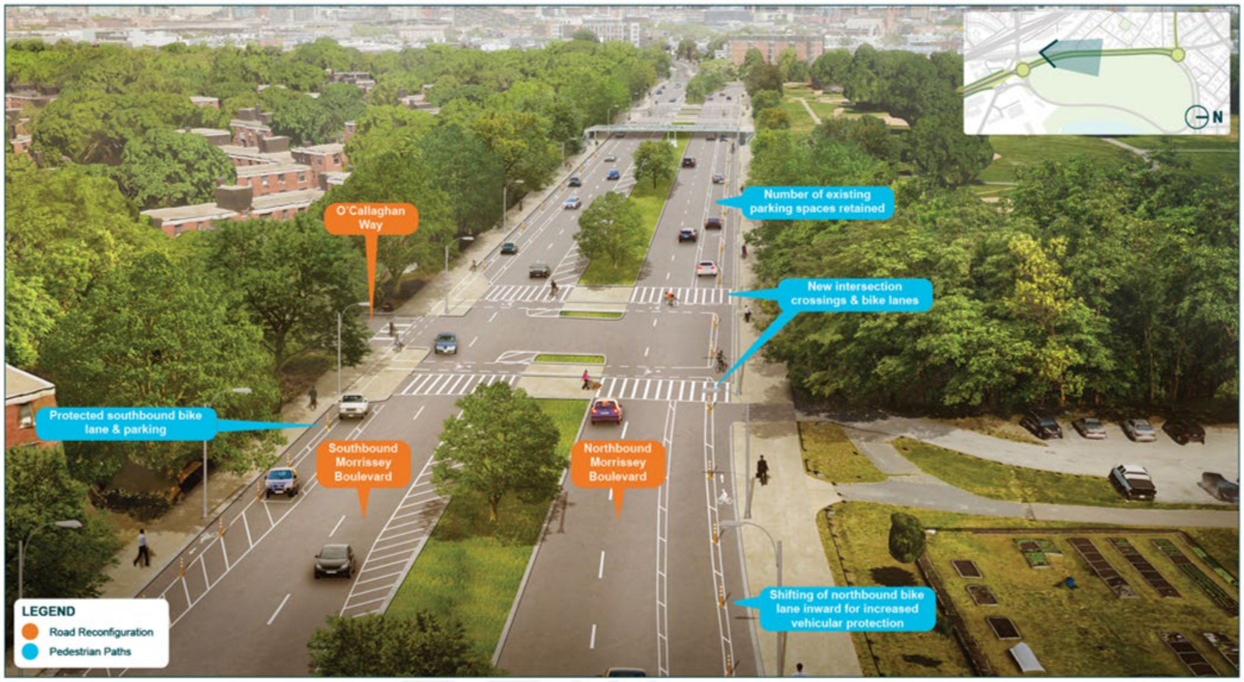
- Creating parking-protected bike lanes with consolidated pedestrian crossings; and
- Incorporating dedicated bus lanes.

Parking-Protected Bike Lanes with Consolidated Pedestrian Crossings

While Columbia Road currently does have buffered bike lanes, this option envisions moving the bike lanes outward toward the curbs and using the well-utilized street parking as a buffer between bicyclists and drivers. As a result of the lack of pedestrian protection at the multiple marked crossings between Kosciuszko Circle and Preble Circle, to address this issue, this alternative maintains two of the marked crossings but signalizes both. The signalization would also lower vehicle speeds along a straightaway.

The segment of Columbia Road is already two lanes in each direction; therefore, no road reconfiguration was included here.

Figure 4-8: Parking-Protected Bike Lanes with Consolidated Pedestrian Crossings Option at Columbia Road

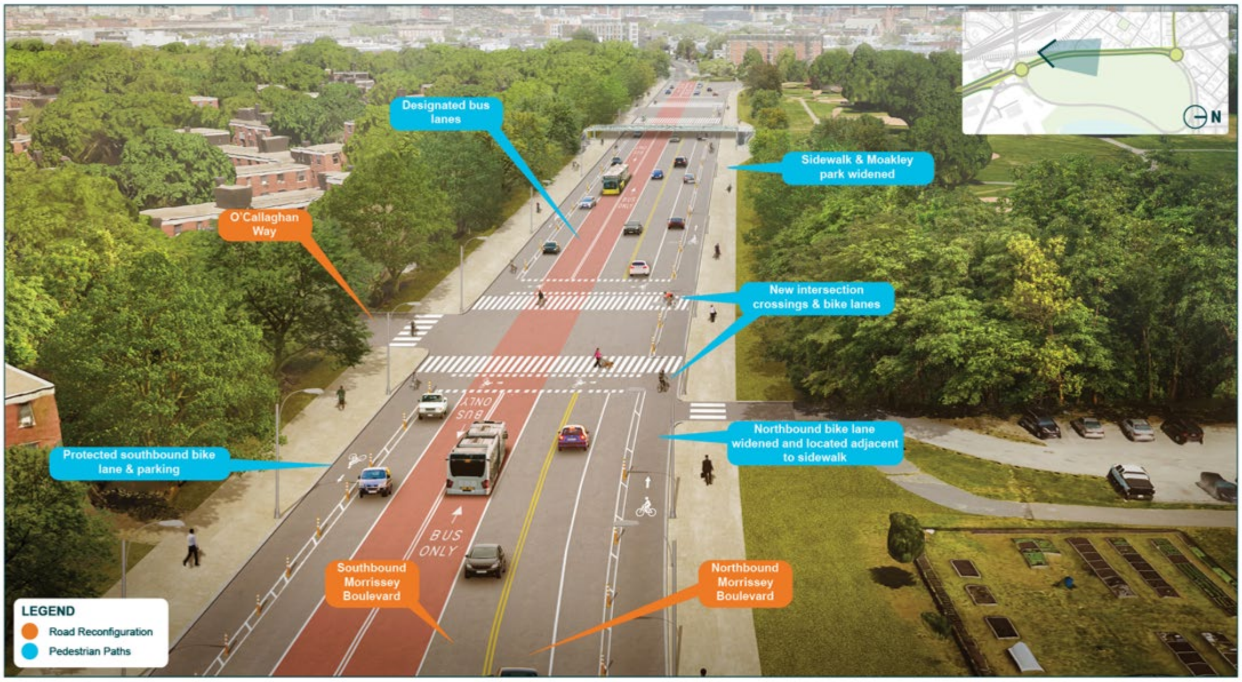


Dedicated Bus Lanes

The second Columbia Road alternative considered repurposing space along the corridor, including removing median space for the expansion of Moakley Park.

Bus lanes were incorporated and envisioned to be served by MBTA Bus Route 18 or other additional services as the area develops in the future.

Figure 4-9: Dedicated Bus Lanes Option at Columbia Road



First Street

First Street is a proposed roadway connection to be developed as part of the Dorchester Bay City development. There is currently no traffic control at the First Street location, only a simple driveway accessible for drivers on the two-lane northbound and southbound frontage road (drivers on the mainline cannot turn). This allows northbound drivers to access Boston College High School and the wider Columbia Point Neighborhood. Surrounding areas are slated to grow significantly in the following decades, largely driven by Dorchester Bay City to the east. The Morrissey Boulevard Frontage Road means that the roadway functions more like a highway here, with no access to businesses on the west side of the roadway for northbound drivers. The presence of the frontage road also creates merging zones north and south of this point.

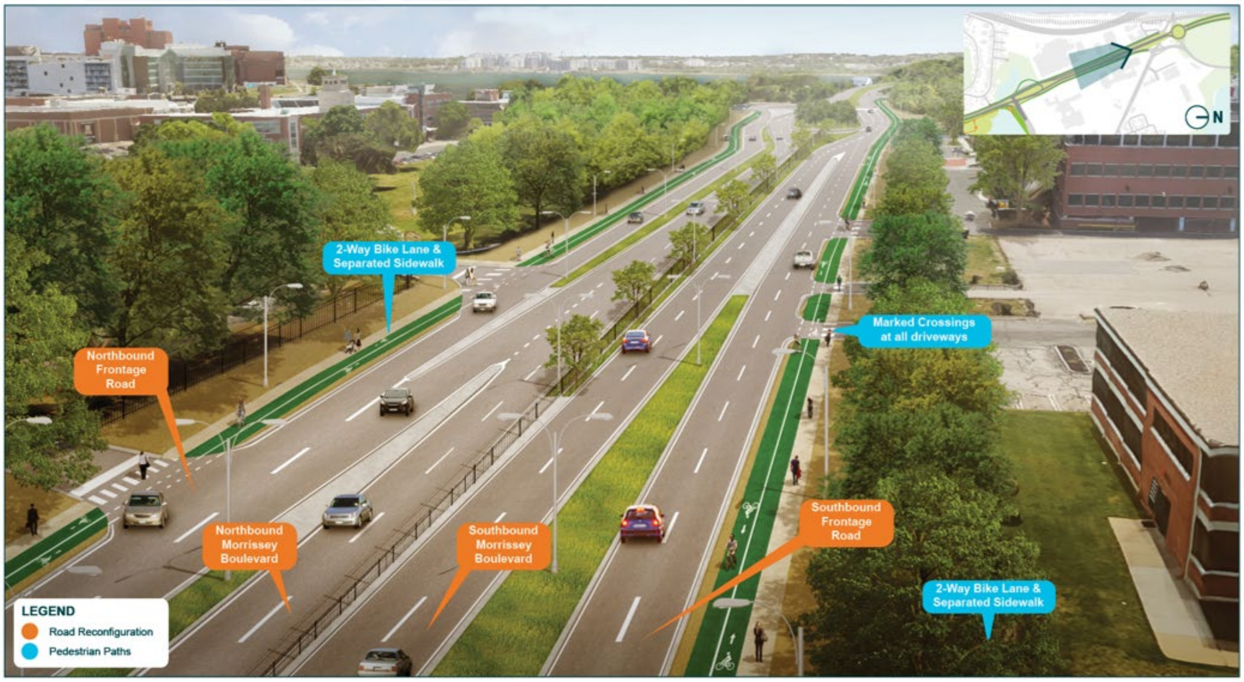
Potential countermeasures at First Street include:

- Reconfiguring Service Roads: Retaining the existing frontage roads, adding bicycle lanes, and modernizing crossings;
- Installing Signalized Control: “Squaring up the intersection” and signalizing movements; and
- Full Reconfiguration: Removing the existing frontage roads.

Service Roads with Right-In / Right-Out

One of the alternatives— the Service Roads with Right-In/Right-Out option—involves maintaining the frontage road. This alternative is based on the 2017 DCR Design, with one primary change—the northbound frontage road is narrowed to one lane to decrease the roadway width and reduce speeding. The northbound mainline in this alternative decreases in width from three to two lanes, while the southbound mainline remains the same (two lanes). The southbound frontage road decreases from two lanes to one lane.

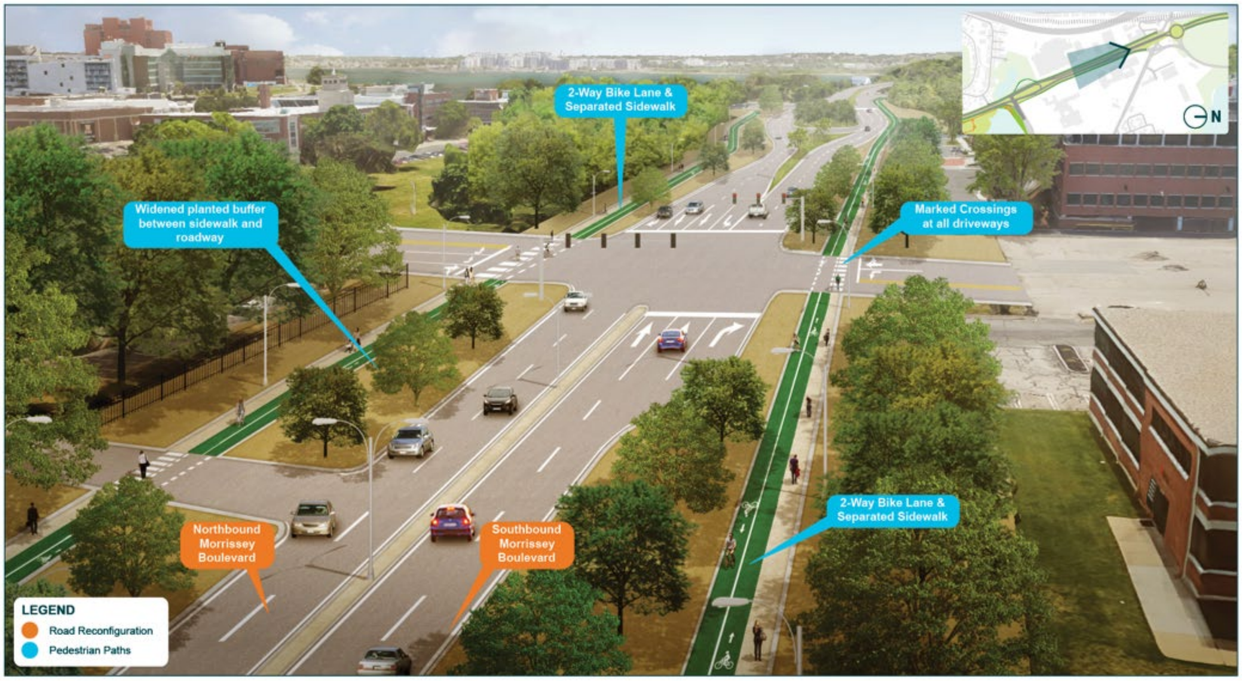
Figure 4-10: Service Roads Option at First Street



Signalized Control

The second alternative—the Signalized Control option—eliminates the frontage road and creates a new signalized intersection at First Street, which narrows the roadway profile and creates a crossing opportunity for drivers as well as pedestrians and bicyclists. This alternative includes a pre-signal in which southbound drivers from the north may enter the mainline in a protected manner from the frontage road.

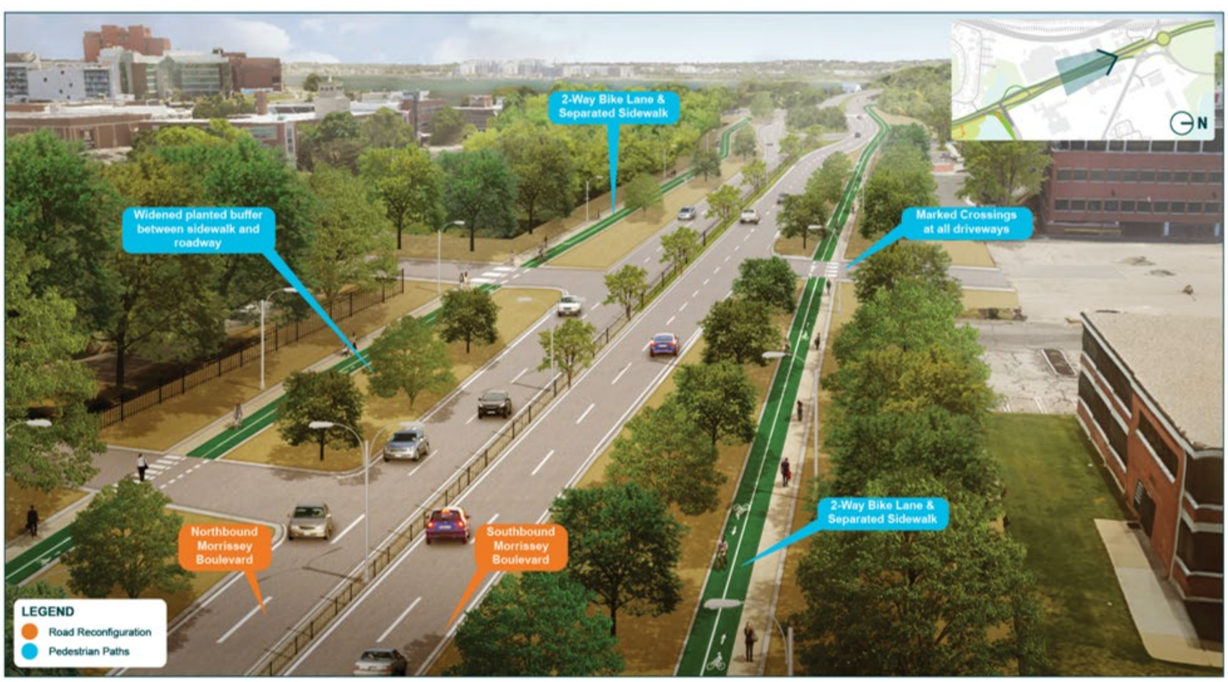
Figure 4-11: Signalized Control Option at First Street



Full Reconfiguration

The third alternative that was developed removes the frontage roads and prohibits left turns along Morrissey Boulevard, providing additional space for bicyclists, pedestrians, and green space.

Figure 4-12: Full Reconfiguration Option at First Street



Bianculli Boulevard

Bianculli Boulevard is a three-legged signalized intersection with a fourth leg that is a southbound frontage road with its own signal phase. At this location, the frontage road segment is wider than the southbound mainline. In addition, there are two slip lanes: one that westbound drivers on Bianculli Boulevard use to turn right onto Morrissey Boulevar; and one that northbound drivers use to turn right onto Bianculli Boulevard. Extending from that slip lane is a merging lane, which then transitions into a two-lane frontage road running north. For northbound drivers attempting a U-turn, there is a pocket north of the intersection.

There are marked crosswalks on the south and east legs of the intersection, and there is a shared use path (the Harborwalk) extending east onto Columbia Point.

Potential countermeasures at Bianculli Boulevard include:

- Creating a Continuous Green-T: Developing an intersection in which drivers traveling one way on the major street do not stop, with drivers from minor approaches having a channelized left-turn movement; and
- Developing a Median U-Turn**:** Removing a U-turn and/or a left-turn from the intersection moving it to a mid-block location downstream.

Continuous Green-T

The Continuous Green-T alternative offers a continuous green light for drivers moving one direction on the main traffic movement (in this case, southbound drivers on Morrissey Boulevard traveling through the intersection). The exception is that drivers would be required to stop for bicyclist and pedestrian crossings. Left-turning motorists traveling from the same direction as this dominant movement have to stop first and then turn left. Drivers traveling in the opposite direction can turn right or continue straight, similar to a T-intersection. Drivers on the minor road would enter a channelized left-turn lane before merging onto the main road.

Due to the nature of the design, this alternative includes a limited number of east-west pedestrian crossings.

Figure 4-13: Continuous Green-T Option at Bianculli Boulevard

Median U-Turn

The Median U-Turn alternative would eliminate southbound left turns at the intersection and instead create two U-turn pockets south of the intersection, near the Vietnam Veteran's Memorial. The eastbound and northbound slip lanes are maintained in this option. Moving the left turns at the intersection and replacing them with U-turns aims to reduce conflict points that can contribute to congestion. Pedestrian and bicycle connections would be maintained across all intersection legs.

Figure 4-14: Median U-Turn Option at Bianculli Boulevard

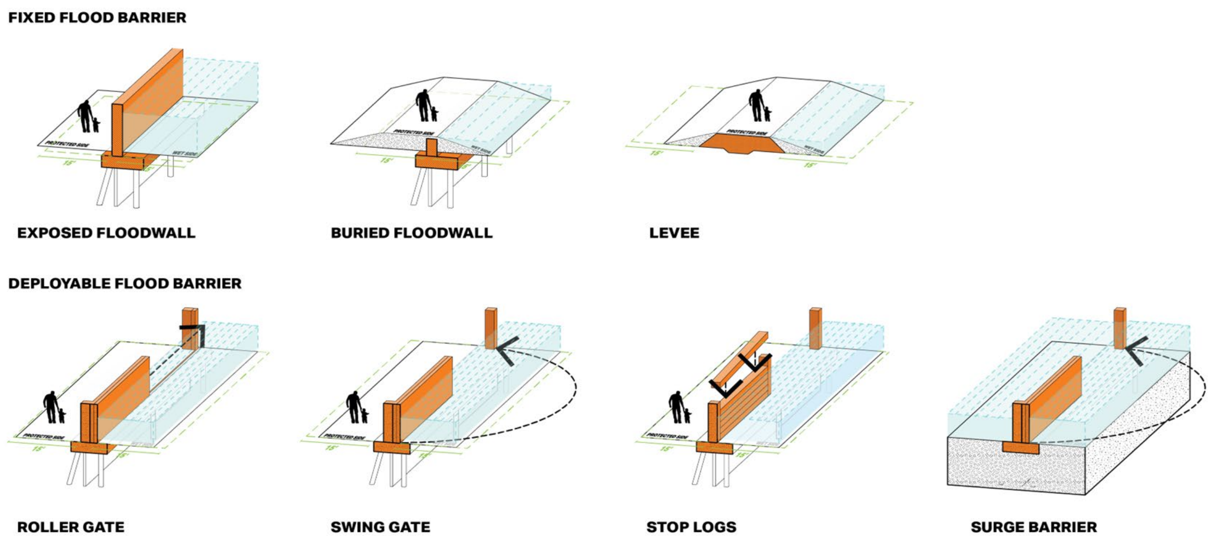
Central Zone Climate Resilience Options

Incorporating coastal resilience infrastructure and identifying opportunities for increasing placemaking through green infrastructure were central to the development of the alternatives in this zone. Each of these resilience options could be incorporated into any of the roadway alternatives.

Potential flood barrier countermeasures for climate resilience in the central section include:

- Fixed Flood Barrier options
  - Exposed Floodwall: Structural above-grade floodwall
  - Buried Floodwall: Structural floodwall buried underneath landscaped berm
  - Levee: Engineered, reinforced berm
- Deployable Flood Barrier options
  - Roller Gate: Deployable gate that is rolled shut prior to storm events
  - Swing Gate: Deployable single or double gate that is swung shut prior to storm events
  - Stop Logs: Deployable walls consisting of stackable metal beams set between columns that are installed before storm events
  - Surge Barrier: In-water deployable gate that is closed prior to storm events and used to prevent storm surge from passing through inlet

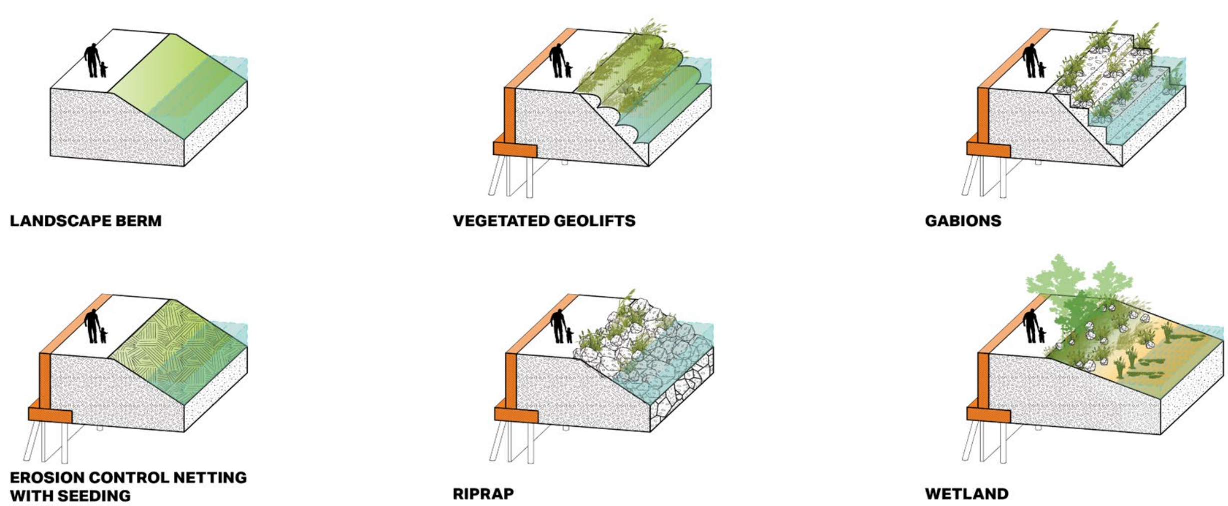
Figure 4-15: Flood Barrier Options



Potential shoreline stabilization, elevation, and restoration countermeasures for climate resilience in the central section include:

- Landscape Berm: Natural elevation changes to reduce the impacts of coastal flooding
- Vegetated Geolifts: Compacted soil layers stabilize banks and support vegetation establishment in constrained conditions
- Gabions: Woven wire cages can provide ecological benefit and shoreline stabilization in a permanent gravity retaining wall
- Erosion Control Netting with Seeding: Erosion control netting is used to stabilize slopes while establishment of vegetation occurs
- Riprap: Riprap can be used alone or in combination with other measures to reduce erosion or create “steps” to lower elevations
- Wetland: Wetland planting is best applied where horizontal space allows for shallow slopes adjacent to the water’s edge

Figure 4-16: Shoreline Options



With this range of flood barrier and shoreline options in the coastal flood mitigation toolkit, the alternatives developed incorporated various countermeasures.

Buried Floodwall

The first option, the Buried Floodwall alternative, features a structural floodwall topped with a nature walk including a multi-use greenway and a bicycle and pedestrian facility on west side. This alternative also includes an at-grade signalized crossing across Morrissey Boulevard.

Figure 4-17: Buried Floodwall Option in the Central Section

Buried Floodwall with Pedestrian Bridge

The second option builds upon the buried floodwall concept and incorporates shoreline stabilization treatments. This alternative includes a pedestrian bridge over Morrissey Boulevard for bicyclists and pedestrians.

Figure 4-18: Buried Floodwall with Pedestrian Bridge Option in the Central Section

Freeport Street

Freeport Street intersects with Morrissey Boulevard underneath I-93, which is on a viaduct at this location. The intersection is characterized by the following features:

- For northbound vehicles, three (3) northbound thru lanes (3 receiving lanes) with a shared thru- and right-turn lane
- For southbound vehicles, 2 thru lanes, 1 left-turn lane, and one right-turn slip lane
- For eastbound vehicles, 1 thru lane, one slip lane right-turn pocket, and 1 left-turn lane
- For westbound vehicles, 1 shared right-turn/thru lane/left-turn lane, and 1 receiving lane
- A frontage road begins south of the intersection

Potential countermeasures for Freeport Street include:

- Creating a Quadrant Roadway**:** Replacing left turns with a right-turn and a left-turn, after which drivers drive straight through the intersection; and
- Developing a Median U-Turn**:** Removing a U-turn and/or a left-turn from the intersection itself and instead placing it at a mid-block location downstream.

Modified DCR Design – Added Southbound Acceleration Lanes

At the intersection, Alternative 1 is broadly similar to the 2017 DCR Design and contains the following components: This Alternative does the following:

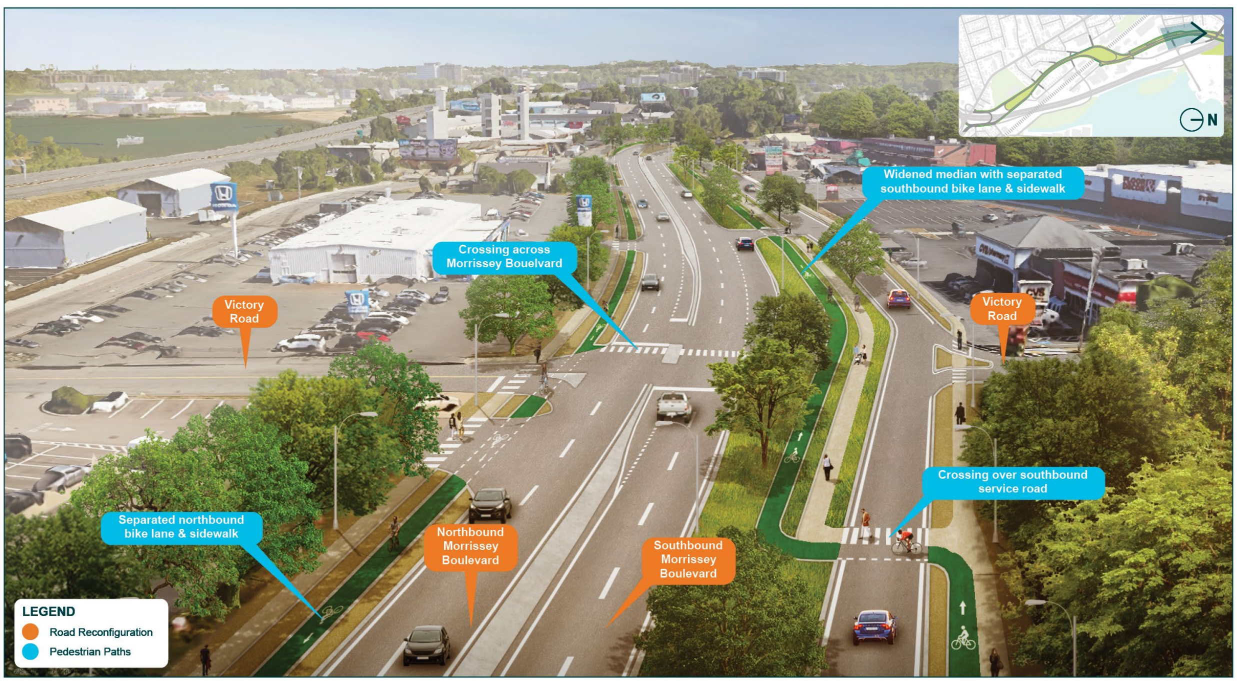
- Narrows the northbound frontage road from 2 lanes to 1 lane
- Narrows the northbound mainline from 3 lanes to 2 lanes north of the intersection
- Narrows the northbound lane from 3 thru lanes and 1 right-turn slip lane to 2 lanes and 1 right turn pocket (no slip lane)

- Narrows the southbound receiving roadway from 3 lanes to 2 lanes
- Eliminates the southbound frontage road, bringing it together into one mainline, with 2 thru lanes, 1 left-turn, and 1 U-turn
- Compared to Existing Conditions, adds a deceleration lane from for drivers on Morrissey Boulevard approaching Old Colony Terrace (this option also adds an acceleration lane for drivers exiting from Old Colony Terrace into Morrissey Boulevard, which the Original DCR Design lacks)
- The existing U-turn north of the intersection is maintained in this option

Median U-Turn

The Freeport Street Median U-Turn alternative envisions creating a Median U-Turn for southbound drivers between Freeport Street and Victory Road. Northbound drivers could make U-turns near Savin Hill Cove, north of Freeport Street, after which they could make a right turn onto Freeport Street southbound.

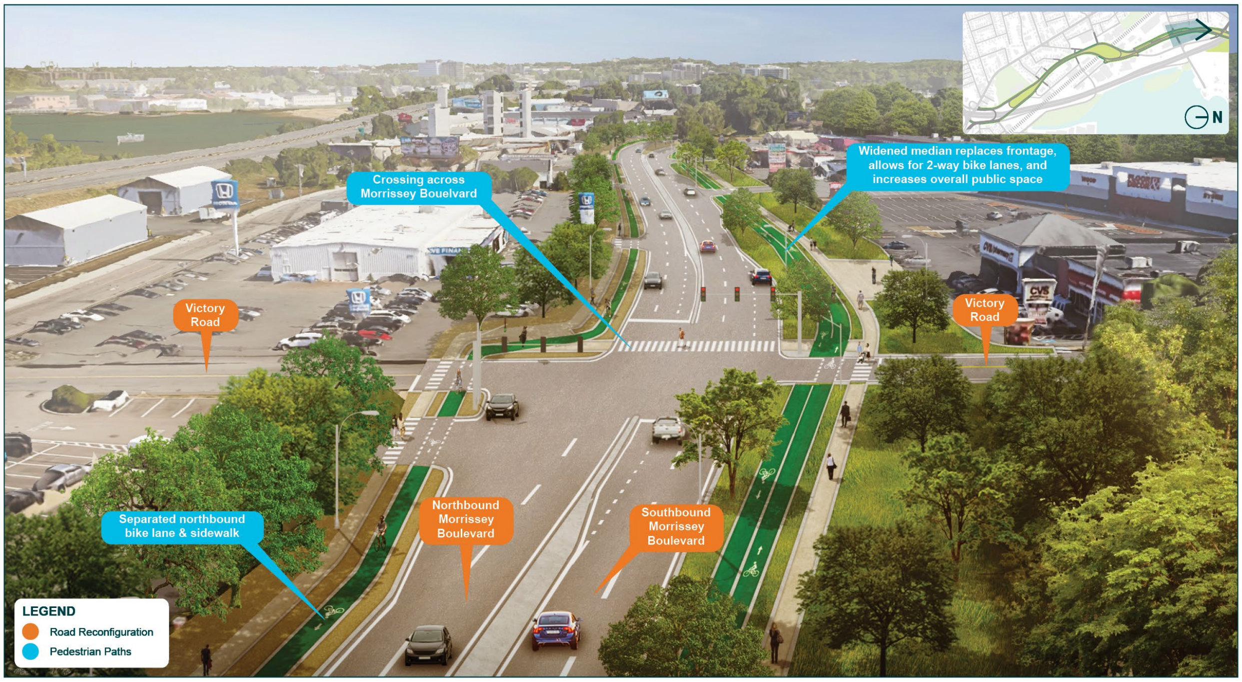
Figure 4-19: Median U-Turn Option at Freeport Street



Quadrant Roadway

The Quadrant Roadway alternative involves relocating the left-turn lanes away from Freeport Street, requiring that drivers wanting to make a left turn onto Freeport from Morrissey Boulevard to make a right turn at Victory Road then a left at Freeport Street and proceed straight through the intersection. This alternative would allow bicyclists and pedestrians to cross Morrissey Boulevard at Victory Road but would not allow thru movements on Victory Road for motorists. The alternative would create a simpler traffic pattern at Freeport Street, as it would move all left turns on the major movements to Victory Road.

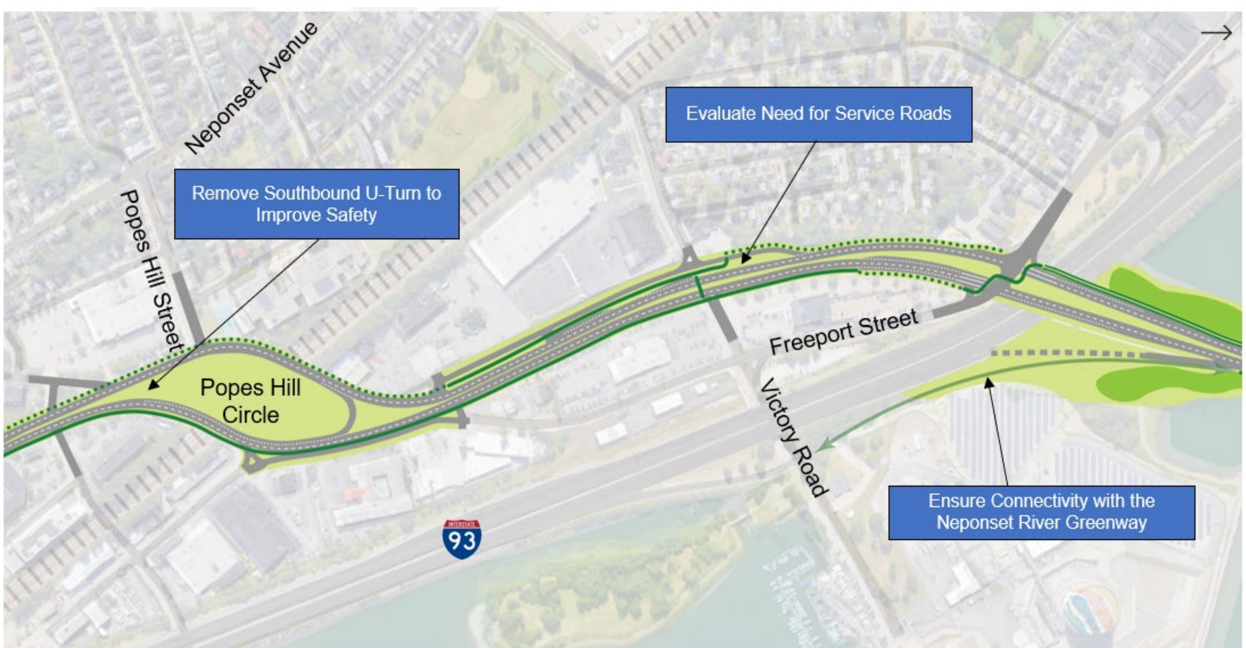
Figure 4-20: Quadrant Roadway Option at Freeport Street



Freeport Street to Popes Hill

The 2017 DCR Plan envisioned two lanes each direction for Morrissey Boulevard, with three lanes in Popes Hill Circle itself to account for U-turns. The Plan suggested a removal of the southbound to northbound U-turn for safety reasons.

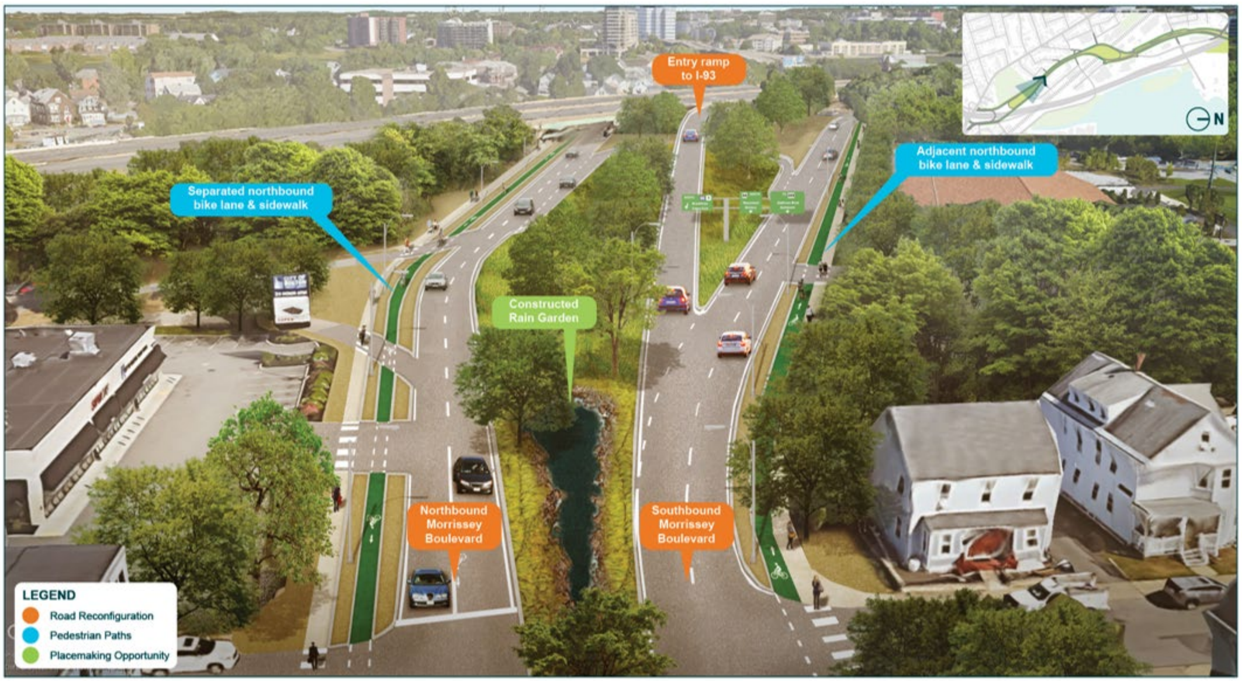
Figure 4-21: Proposed Improvements between Freeport Street and Popes Hill Circle



Popes Hill to Neponset Circle

The segment of roadway between Popes Hill Circle and Neponset Circle provides opportunities to improve north-south and east-west mobility as well as increase placemaking and green infrastructure. The option for this section of the corridor, therefore, includes space for bike lanes and sidewalks as well as the development of a rain garden.

Figure 4-22: Proposed Improvements between Popes Hill Circle and Neponset Circle



Neponset Circle

Neponset Circle is a complex intersection of roadways, including Gallivan Boulevard, Neponset Avenue, and Morrissey Boulevard. North of Neponset Circle, there are on- and off-ramps to I-93 as well as a southbound to northbound U-turn on Morrissey Boulevard. Neponset Circle itself allows both north and south U-turns. There is a southbound cycle track in this area, and a northbound cycle track north of the northbound I-93 on-ramp.

Neponset Circle has several locations with various movements sharing the same space, with significant weaving and merging causing a high number of crashes at the eastern leg of Neponset Circle. At that location, westbound drivers from Neponset Avenue turning right on Morrissey Boulevard—either to continue northbound or to Neponset Avenue—share space with eastbound drivers making a left turn. In addition, there is a heavy volume of drivers from Gallivan Boulevard and continuing onto Morrissey Boulevard.

Potential countermeasures at Neponset Circle include:

- Identifying opportunities for roadway reconfiguration; and
- Incorporating active transportation and placemaking.

Figure 4-23: Proposed Improvements at Neponset Circle

4.3 Initial Alternatives Testing and Refinement

Based on Morrissey Boulevard Commission and stakeholder input, the initial options were updated and additional alternatives were developed prior to testing. A two-part transportation simulation process was then used to test how well the alternatives developed aligned with the goals of the study.

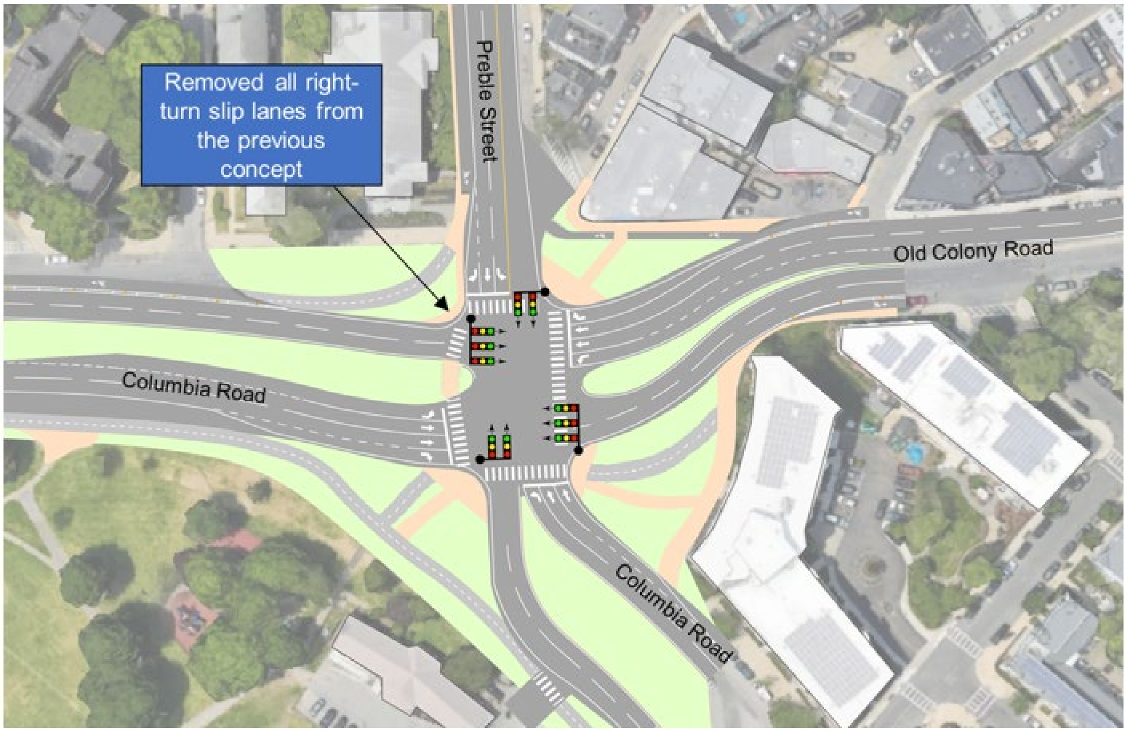
The first step involved the utilization of SYNCHRO. SYNCHRO is a tool used to assess signalized and unsignalized intersections, with a focus on vehicular movement. Using the 2050 Build model traffic volumes, SYNCHRO was used initially to test the five individual intersection alternatives at Preble Circle, First Street, Bianculli Boulevard, Freeport Street, and Neponset Circle to identify operational constraints or "fatal flaws."

Preble Circle

The pros and cons identified for the Modern Roundabout and Signalized Control options at Preble Circle are outlined below. Based on feedback and the addition of multimodal movements to the assessment, the Signalized Control option was updated to remove all right-turn slip lanes prior to conducting the SYNCHRO analysis. Pros and cons of each option are as follows:

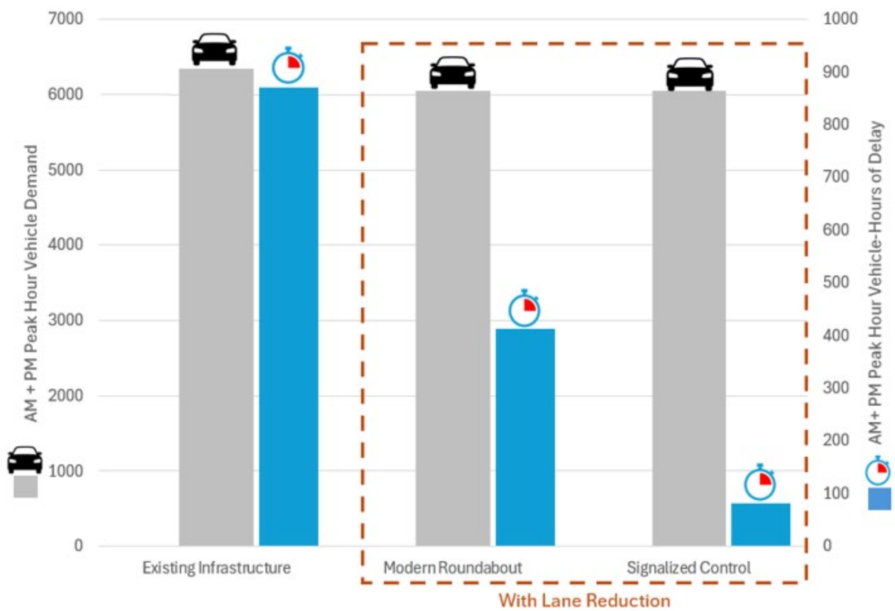
- Modern Roundabout
  - Pros: Reduced vehicle delay overall compared with Existing Infrastructure scenario
  - Cons: Struggles to handle westbound (AM) and southbound (PM) vehicle demand; long bicycle/pedestrian travel routes through intersection
- Signalized Control
  - Pros: Performs more efficiently than the Existing Infrastructure scenario and the Modern Roundabout; shorter pedestrian crossing distance; smaller footprint than a roundabout
  - Cons: Challenges with operations on northbound left turn and southbound through movements in PM peak hour

Figure 4-24: Updated Signalized Control Option at Preble Circle



Overall, the Modern Roundabout option would help reduce delay over Existing Infrastructure but would struggle on certain approaches and could be difficult for pedestrian travel due to the circuitous nature of the sidewalks. While it is estimated to experience some movement challenges, the Signalized Control concept performs better than the Modern Roundabout and Existing Infrastructure with its shorter crossings and smaller right-of-way footprint. Therefore, upon initial analysis, the vehicular operations for the Signalized Control option performed better than the other alternatives.

Figure 4-25: Initial Analysis of the Preble Circle Options



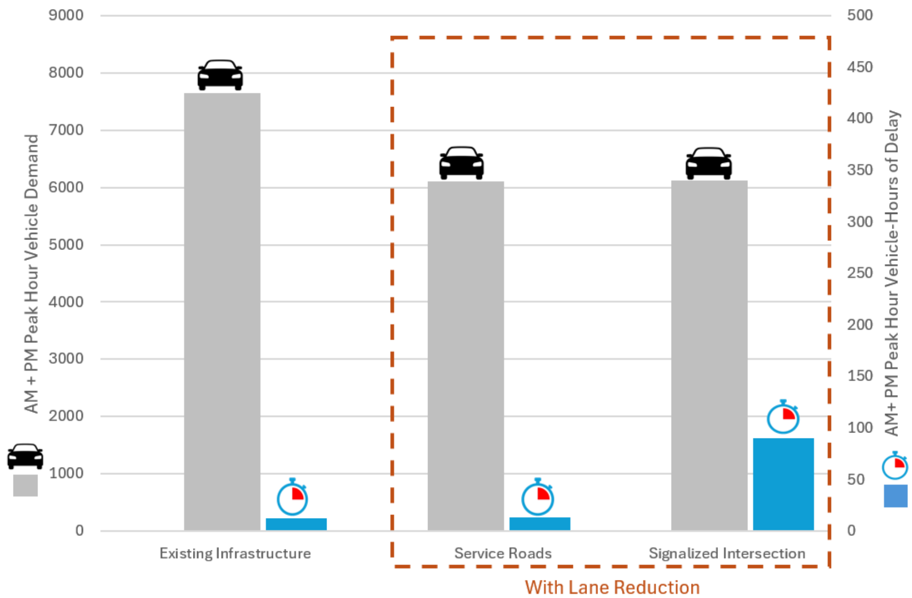
First Street

The following pros and cons identified for the Service Roads and Signalized Control options at First Street are outlined below:

- Service Roads
    - Pros: Uninterrupted traffic flow on Morrissey Boulevard
    - Cons: Limited number of east-west pedestrian crossing opportunities; more traffic reliant on Mt. Vernon Street
- Signalized Control
    - Pros: Reduces vehicle volume on Mt. Vernon Street; provides east-west crossing opportunity; smaller footprint and impervious area; consistent with Columbia Point Master Plan
    - Cons: Increased traffic delay and queuing on Morrissey Boulevard

Overall, the Service Roads option would help reduce delay, as it would provide uninterrupted traffic flow along the corridor but would also be difficult for pedestrian travel due to the lack of east-west access. Although it is estimated to experience some queuing, as this would be a newly created intersection, the Signalized Control option would allow for enhanced mobility and connectivity at this location. Therefore, upon initial analysis, the vehicular operations for the Service Roads option performed better than the other alternatives.

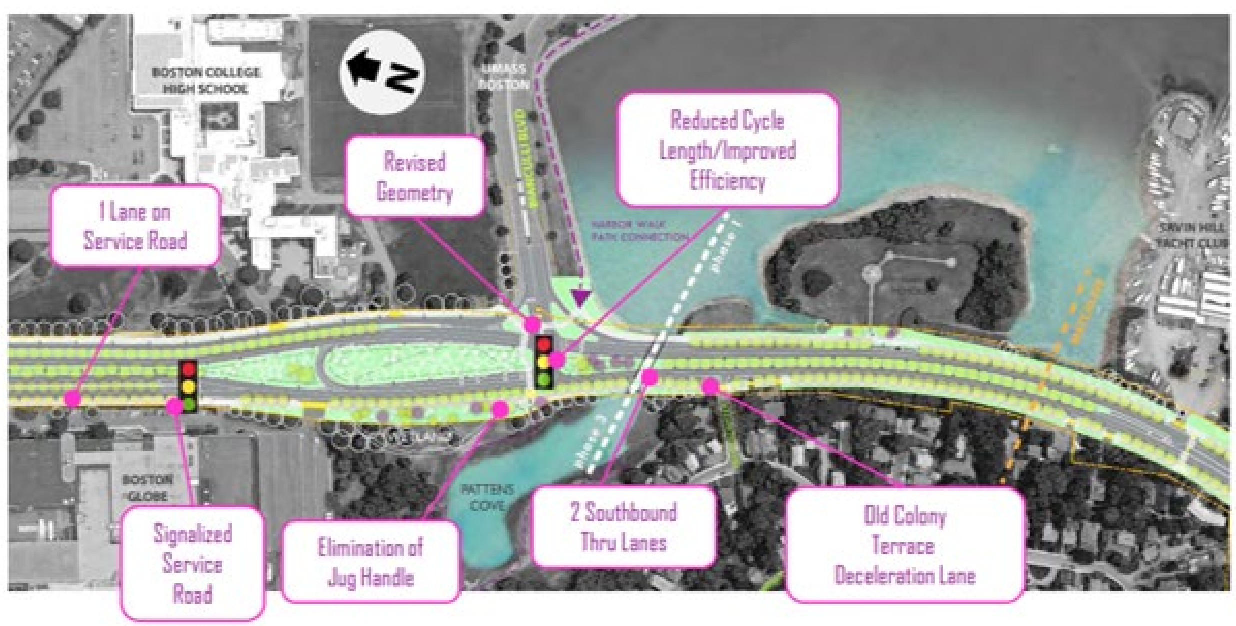
Figure 4-26: Initial Analysis of the First Street Options



Bianculli Boulevard

The pros and cons identified for the Continuous Green-T and Median U-Turn options at Bianculli Boulevard are outlined below. Prior to conducting the SYNCHRO analysis, the original DCR Design option for this location was also included based on stakeholder feedback.

Figure 4-27: DCR Design Option



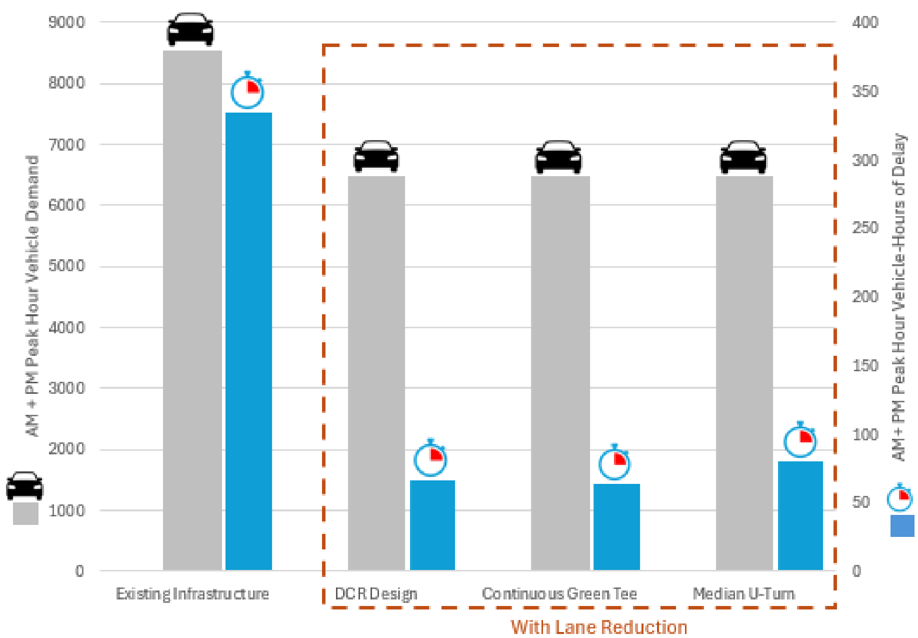
Source: Massachusetts Department of Conservation and Recreation

- Continuous Green-T
    - Pros: Strong overall vehicular traffic operations

- Cons: Limited number of east-west pedestrian crossings and no crossing on the south leg; delay for southbound U-turn in AM peak hour; weave condition to access Old Colony Terrace from Bianculli Boulevard
- Median U-Turn
    - Pros: Pedestrian and bicycle connections across all legs of intersection; fewer conflict points at intersection
    - Cons: Higher overall vehicular delay compared to other alternatives; median U-turn requires wider pavement area south of the Vietnam Veterans Memorial
- DCR Design
    - Pros: Strong overall vehicular traffic operations; pedestrian and bicycle connections across all legs of intersection; smallest footprint and impervious area
    - Cons: Delay for southbound U-turn in AM peak hour

Overall, the DCR Design option performs well for vehicle operations, bicyclists, and pedestrians but is estimated to experience southbound U-turn delays in the AM peak hour. While it performs well for vehicle operations, the Continuous Green-T option is estimated to have impacts on pedestrian mobility, result in southbound U-turn delay, and lead to potential weaving and cut through traffic. For the Median U-Turn option, while pedestrian and bicycle infrastructure are improved and conflict points are reduced, it is estimated to see higher vehicle delay. Upon initial analysis, while the alternatives are comparable, the Median U-Turn option is estimated to provide more benefits and fewer impacts than the other options.

Figure 4-28: Initial Analysis of the Bianculli Boulevard Options



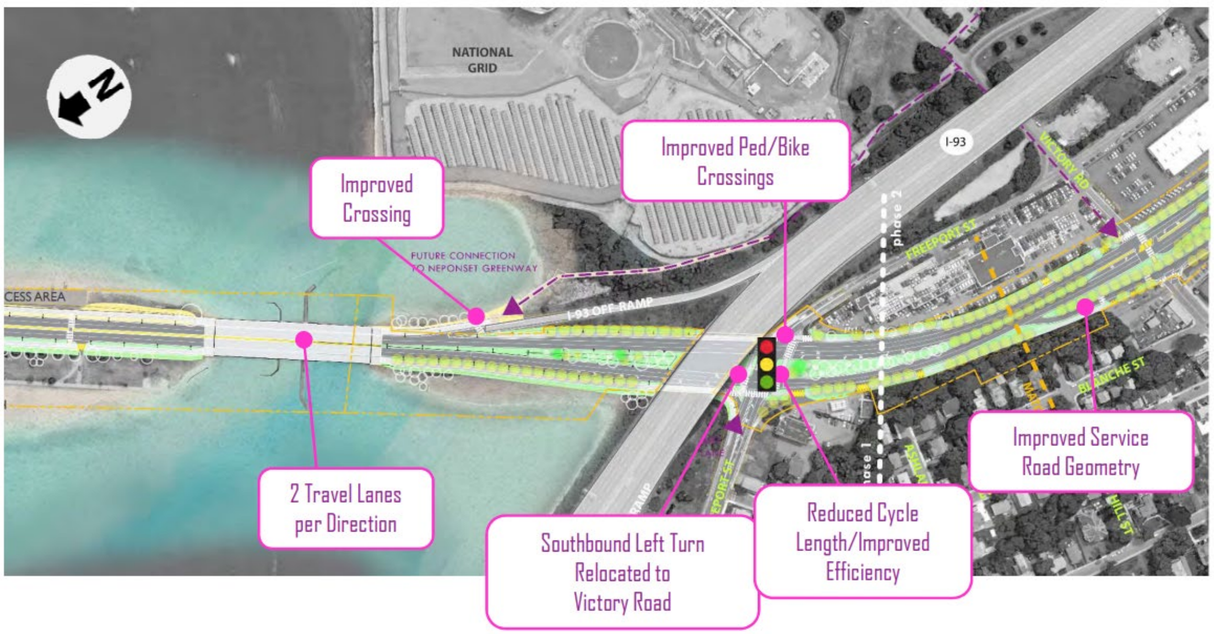
Freeport Street

The pros and cons were identified for the Median U-Turn and Quadrant Roadway options at Freeport Street and are outlined below. Prior to conducting the SYNCHRO analysis, two additional options were incorporated and assessed based on stakeholder feedback, the original DCR Design, and a Full Intersection at Victory Road option.

The DCR Design maintains southbound frontage roads at Victory Road, moves the southbound left turn from Freeport Street onto Victory Road, adds a U-turn for northbound-to-southbound moves, and creates a marked signalized crosswalk for pedestrians and bicyclists. There are no thru movements by drivers on Victory Road allowed in this alternative.

The Full Intersection at Victory Road option removes the southbound frontage road and creates a full signalized intersection at Victory Road, allowing thru movements by drivers on Victory Road in addition to the new pedestrian and bicycle crossing. This option allows thru movements, left turns, and right turns on all approaches and supports a narrower cross section north and south of the intersection, with two lanes in each direction.

Figure 4-29: DCR Design Option



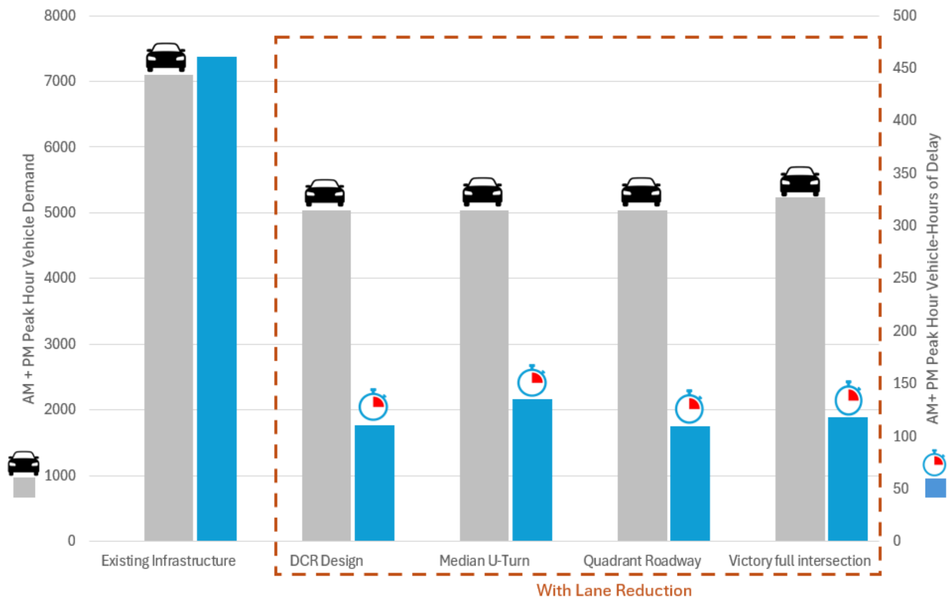
Source: Massachusetts Department of Conservation and Recreation

Figure 4-30: Victory Road Full Intersection Option

- Median U-Turn
  - Pros: Reduced vehicle delay compared with Existing Infrastructure scenario; fewer vehicle conflicts at Freeport Street
  - Cons: More vehicle delay than other alternatives; more impervious surface for median U-turns; no new east-west pedestrian/bike connection at Victory Road
- Quadrant Roadway
  - Pros: Reduced vehicle delay compared with Existing Infrastructure scenario; fewer vehicle conflicts at Freeport Street; new east-west pedestrian/bike connection at Victory Road
  - Cons: Challenging operations on northbound approach in AM peak hour, eastbound and westbound approaches in AM and PM peak hours
- DCR Design
  - Pros: Reduced vehicle delay compared with Existing Infrastructure scenario; fewer vehicle conflicts at Freeport Street; new east-west pedestrian/bike connection at Victory Road
  - Cons: Delay for northbound left turn and westbound approach in PM peak hour
- Victory Road Full Intersection
  - Pros: New east-west pedestrian/bike and vehicular connection at Victory Road; eliminating service road reduces impervious surface; fewer vehicle conflicts at Freeport Steet
  - Cons: Delay for eastbound Freeport Street approach in PM peak hour; challenging operations on southbound Morrissey Boulevard at Freeport Street in PM peak hour

Overall, the DCR Design option performs well for operations with fewer vehicle conflicts. While also performing well for operations, the Median U-Turn option improves intersection efficiency for vehicles by reducing conflict points within the intersection. For the Quadrant Roadway option, it is also estimated to improve intersection efficiency for vehicles by reducing conflict points. Similarly, the Victory Road Full Intersection option is estimated to improve intersection efficiency for vehicles by reducing conflict points. Upon initial analysis, the vehicular operations for the Quadrant Roadway performed better than the other alternatives.

Figure 4-31: Initial Analysis of the Freeport Street Options



Neponset Circle

Prior to conducting the SYNCHRO analysis, a Modified DCR Design option at Neponset Circle was also included based on stakeholder feedback. The key recommendation from the 2017 DCR Plan is converting the southern leg to two-way operation, lessening the weaving and merging that contributes to crashes in this area. In addition, the DCR 2017 Plan suggests the following:

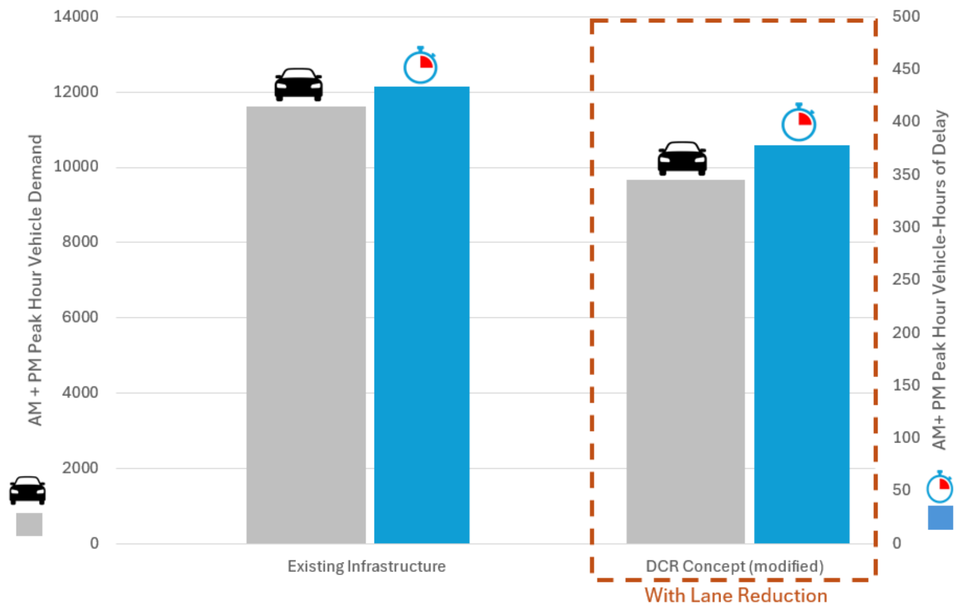
- Add a southbound right-turn pocket from Morrissey Boulevard to Neponset Avenue
- Reduction of lanes and roadway footprint north of the intersection
- Tightening curb radii to ensure slower speeds and decreased crossing distances
- Improving width of sidewalks

Building upon this concept, modern pedestrian and bicycling crossings were incorporated at all relevant intersections. The pros and cons of this Modified DCR Design option identified are outlined below.

- Modified DCR Design
    - Pros: Reduces volume of vehicles having to weave; provides additional pedestrian and bicycle connections; improves ADA accessibility
    - Cons: I-93 on-ramp congestion would remain

Upon initial analysis, the vehicular operations for the Modified DCR Design option performed better than the existing infrastructure scenario.

Figure 4-32: Initial Analysis of the Neponset Circle Option



Initial Alternatives Refinement and Evaluation

The Morrissey Boulevard Commission members and additional stakeholders shared feedback on the initial alternatives development and analysis. Concerns were expressed about reduced roadway capacity and U-turns at Bianculli Boulevard, the need for improved active transportation and access, and the need to further consider environmental aspects such as noise, pollution, and visual barriers.

Based on this feedback and the initial analysis, the intersection options were narrowed down as follows:

- Neponset Circle – Modified DCR Design
- Freeport Street
    - Modified DCR Design
    - Quadrant Roadway
- Bianculli Boulevard – DCR Design
- First Street
    - Service Roads
    - Signalized Control
- Preble Street – Signalized Control

Each of the options were evaluated for its potential benefits and impacts in the following areas:

- Corridor Mobility
    - Intersection Level of Service: Level of traffic delay at specific intersection locations
    - Total Vehicle Hours of Delay: The hours of delay collectively experienced by users of the intersection in the 3-hour AM peak and the 3-hour PM peak.
    - Queuing: The length of the traffic queue
    - Vehicle Access: How alternatives maintain or improve connections to adjacent properties and resources

- Transit Access: The ability to provide suitable transit access along the corridor and to adjacent properties
- Pedestrian Crossing Comfort: The safety and comfort experienced by pedestrians crossing the street based on the number of Crash Modification Factors (CMFs). CMFs are infrastructure improvements that have been shown to reduce crash risk by a certain percentage
- Pedestrian Gaps: The new amount of sidewalk added
- Bicycle Crossing Stress: The perceived comfort of bicyclists along a corridor through such factors as traffic speed, volume, and level of traffic separation
- Potential Safety Effects: The safety and comfort experienced by all users at a location based on the number of CMFs

- Resiliency and Ecology
  - Effects on Environmental Resources: Each option's estimated impacts to environmental resources, including floodplains, surface geology, protected and recreational open space, and Areas of Critical Environmental Concern
  - Impervious Surface: The number of natural surfaces such as wetlands or native grasses
- Placemaking
  - Placemaking/Open Space: The ability of each option to provide enhance and additional opportunities for placemaking and open space
  - Visual Effects: The visual impacts of each option
  - Consistency with Plans: Whether or not an option is consistent with previously approved state and local plans and projects
  - Disruptions to Neighborhoods: The impacts each option, both during and post-construction, may have on the adjacent neighborhoods
  - Recreational Access: The ability to enhance connections to existing and proposed recreational facilities
  - Shade Trees: The ability of each option to provide additional shade trees to mitigate heat island effects
- Constructability
  - Construction Cost: Compares the expected order-of-magnitude construction costs for each option
  - Constructability: Compares the relative ease of construction complexity between alternatives, accounting for potential risks to cost overruns or schedule overruns
  - Maintenance Concerns: The expected cost and effort to maintain and operate the option
  - Environmental Permits/Complexity: The relative complexity and expected difficulty in permitting an option

Tide gate, no tide gate, and hybrid coastal resiliency options were also evaluated.

Neponset Circle Initial Evaluation

Compared to existing infrastructure, the Neponset Circle alternative (the Modified DCR Design) reduces vehicular weaving, provides additional pedestrian and bicycle connections, and improves accessibility and safety.

Figure 4-33: Corridor Mobility Evaluation Criteria for Neponset Circle

Corridor Mobility Criteria	Modified DCR Design
Delay – Intersection Level of Service	✓
Delay - Total Vehicle Hours of Delay	✗
Queueing	✗
Vehicle Access	✓
Transit Access	—
Pedestrian Crossing Comfort	✓
Pedestrian Gaps	✓
Bicycle Crossing Stress	✓
Potential Safety Effects	✓

Compared to Existing Infrastructure, the Neponset Circle alternative (the Modified DCR Design) is estimated to have environmental benefits, increase placemaking opportunities, and have positive visual effects

Figure 4-34: Resiliency and Ecology, and Placemaking Evaluation Criteria for Neponset Circle

Resiliency and Ecology Criteria	Modified DCR Design
Effects on Environmental Resources	✓
Impervious Surface	✓

Placemaking Criteria	Modified DCR Design
Placemaking/Open Space	✓
Visual Effects	✓
Consistency with Plans	✓
Disruption to Neighborhoods	—
Recreational Access	✓
Shade Trees	✓

Compared to existing infrastructure, the Neponset Circle alternative (the Modified DCR Design) is estimated to have high constructability, with some cost, maintenance, and/or permitting considerations.

Figure 4-35: Constructability Evaluation Criteria for Neponset Circle

Constructability Criteria	Modified DCR Design
Construction Cost	—
Constructability	✓
Maintenance Concerns	—
Environmental Permits/Complexity	—

Freeport Street Initial Evaluation

Compared to existing infrastructure, each of the alternatives is estimated to have mobility benefits overall, with some moderate pedestrian comfort based on crossing length, signaling, and infrastructure.

Figure 4-36: Corridor Mobility Evaluation Criteria for Freeport Street

Corridor Mobility Criteria	Modified DCR Design	Quadrant Roadway	Victory Road Full Intersection
Delay – Intersection Level of Service	✓	✓	—
Delay - Total Vehicle Hours of Delay	✓	✓	✓
Queueing	✓	✓	✓
Vehicle Access	✓	✓	✓
Transit Access	✓	✓	✓
Pedestrian Crossing Comfort	—	—	—
Pedestrian Gaps	✓	✓	✓
Bicycle Crossing Stress	✓	✓	✓
Potential Safety Effects	✓	✓	✓

Compared to existing infrastructure, each of the alternatives is estimated to provide high potential for impervious surface installation. The Victory Road Full Intersection is estimated to have the most placemaking benefits.

Figure 4-37: Resiliency and Ecology, and Placemaking Evaluation Criteria for Freeport Street

Resiliency and Ecology Criteria	Modified DCR Design	Quadrant Roadway	Victory Road Full Intersection
Effects on Environmental Resources	–	–	–
Impervious Surface	✓	✓	✓

Placemaking Criteria	Modified DCR Design	Quadrant Roadway	Victory Road Full Intersection
Placemaking/Open Space	–	–	✓
Visual Effects	–	–	✓
Consistency with Plans	✓	✓	✓
Disruption to Neighborhoods	✗	✗	✗
Recreational Access	✓	✓	✓
Shade Trees	✓	✓	✓

Compared to existing infrastructure, each of the alternatives are estimated to have some constructability, maintenance, and/or permitting considerations.

Figure 4-38: Constructability Evaluation Criteria for Freeport Street

Constructability Criteria	Modified DCR Design	Quadrant Roadway	Victory Road Full Intersection
Construction Cost	–	–	✗
Constructability	–	–	–
Maintenance Concerns	–	–	–
Environmental Permits/Complexity	–	–	–

Bianculli Boulevard Initial Evaluation

Compared to existing infrastructure, the DCR Design and the Median U-Turn options are estimated to have the most corridor mobility benefits.

Figure 4-39: Corridor Mobility Evaluation Criteria for Bianculli Boulevard

Corridor Mobility Criteria	DCR Design	Continuous Green Tee	Median U-Turn
Delay – Intersection Level of Service	✓	✓	✓
Delay - Total Vehicle Hours of Delay	✓	✓	✓
Queueing	✓	—	—
Vehicle Access	—	✗	✓
Transit Access	—	—	—
Pedestrian Crossing Comfort	✓	✗	✓
Pedestrian Gaps	✓	✓	✓
Bicycle Crossing Stress	✓	✗	✓
Potential Safety Effects	✓	—	✓

Compared to existing infrastructure, the DCR Design is estimated to have the most resiliency benefits and placemaking opportunities.

Figure 4-40: Resiliency and Ecology, and Placemaking Evaluation Criteria for Bianculli Boulevard

Resiliency and Ecology Criteria	DCR Design	Continuous Green Tee	Median U-Turn
Effects on Environmental Resources	✓	—	✗
Impervious Surface	✓	—	—

Placemaking Criteria	DCR Design	Continuous Green Tee	Median U-Turn
Placemaking/Open Space	✓	✓	✓
Visual Effects	✓	✓	✓
Consistency with Plans	✓	—	—
Disruption to Neighborhoods	—	✗	✓
Recreational Access	✓	✓	✓
Shade Trees	✓	✓	✓

Compared to existing infrastructure, the DCR Design and the Continuous Green-T alternatives are estimated to have high constructability, low anticipated maintenance concerns, and fewer expected permitting issues.

Figure 4-41: Constructability Evaluation Criteria for Bianculli Boulevard

Constructability Criteria	DCR Design	Continuous Green Tee	Median U-Turn
Construction Cost	–	–	–
Constructability	✓	✓	✓
Maintenance Concerns	✓	✓	✓
Environmental Permits/Complexity	✓	✓	–

First Street Initial Evaluation

Compared to existing infrastructure, the Service Roads alternative is estimated to have the most corridor mobility benefits.

Figure 4-42: Corridor Mobility Evaluation Criteria for First Street

Corridor Mobility Criteria	Service Roads	Signalized Control
Delay – Intersection Level of Service	✓	✗
Delay - Total Vehicle Hours of Delay	✓	✗
Queueing	✓	✗
Vehicle Access	–	✓
Transit Access	–	–
Pedestrian Crossing Comfort	✓	–
Pedestrian Gaps	✓	✓
Bicycle Crossing Stress	✓	✓
Potential Safety Effects	✓	✓

Compared to existing infrastructure, each of the alternatives is estimated to have some resilience benefits. The Signalized Control alternative is estimated to have the most placemaking opportunities.

Figure 4-43: Resiliency and Ecology, and Placemaking Evaluation Criteria for First Street

Resiliency and Ecology Criteria	Service Roads	Signalized Control
Effects on Environmental Resources	—	—
Impervious Surface	✓	✓

Placemaking Criteria	Service Roads	Signalized Control
Placemaking/Open Space	✓	✓
Visual Effects	✓	✓
Consistency with Plans	✓	✓
Disruption to Neighborhoods	✓	✓
Recreational Access	—	✓
Shade Trees	—	✓

Compared to existing infrastructure, each of the alternatives are estimated to have some constructability, maintenance, and/or permitting considerations.

Figure 4-44: Constructability Evaluation Criteria for First Street

Constructability Criteria	Service Roads	Signalized Control
Construction Cost	✓	—
Constructability	✓	✓
Maintenance Concerns	—	✓
Environmental Permits/Complexity	✗	✗

Preble Circle Initial Evaluation

Compared to existing infrastructure, Signalized Control is estimated to have less delay and queuing.

Figure 4-45: Corridor Mobility Evaluation Criteria for Preble Circle

Corridor Mobility Criteria	Modern Roundabout	Signalized Control
Delay – Intersection Level of Service	✗	✓
Delay - Total Vehicle Hours of Delay	✗	✓
Queueing	✗	✓
Vehicle Access	–	–
Transit Access	–	–
Pedestrian Crossing Comfort	–	–
Pedestrian Gaps	✓	✓
Bicycle Crossing Stress	✓	✓
Potential Safety Effects	✓	–

Compared to existing infrastructure, Modern Roundabout is estimated to have less impervious surface and increased placemaking opportunities.

Figure 4-46: Resiliency and Ecology, and Placemaking Evaluation Criteria for Preble Circle

Resiliency and Ecology Criteria	Modern Roundabout	Signalized Control
Effects on Environmental Resources	✓	✓
Impervious Surface	✓	✗

Placemaking Criteria	Modern Roundabout	Signalized Control
Placemaking/Open Space	✓	✓
Visual Effects	✓	✗
Consistency with Plans	–	–
Disruption to Neighborhoods	–	✗
Recreational Access	–	–
Shade Trees	✓	✗

Compared to existing infrastructure, Modern Roundabout is estimated to have fewer constructability concerns.

Figure 4-47: Constructability Evaluation Criteria for Preble Circle

Constructability Criteria	Modern Roundabout	Signalized Control
Construction Cost	Neutral	Neutral
Constructability	Positive	Negative
Maintenance Concerns	Negative	Neutral
Environmental Permits/Complexity	Neutral	Neutral

Central Section Climate Resilience Initial Evaluation

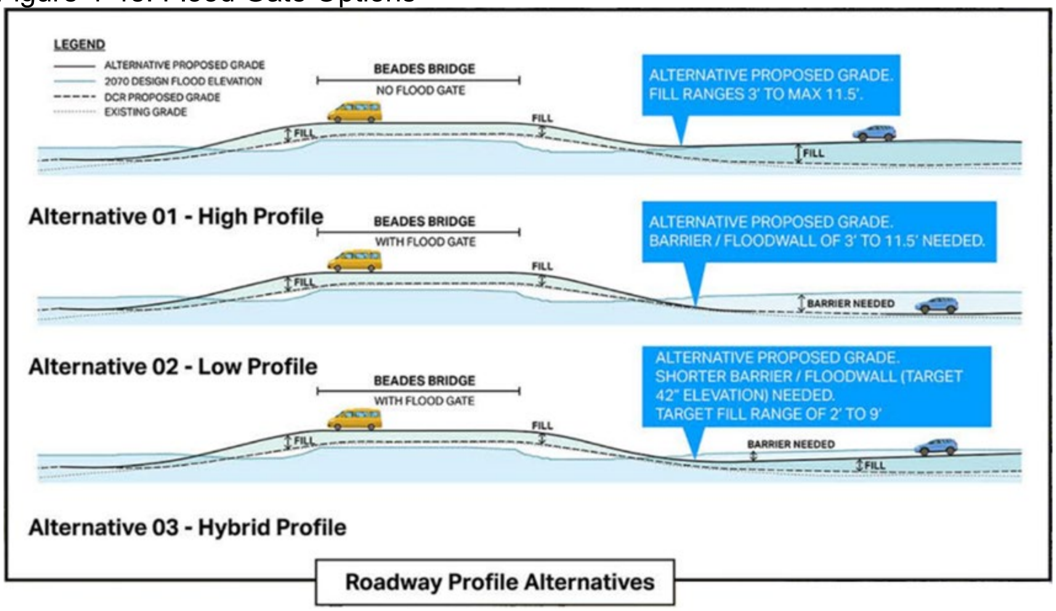
Three options along the Dorchester Bay Basin and Malibu Beach area, which vary based on whether a tide gate would be placed at the Beades Bridge, were assessed. These options are described below.

The *High-Profile* (no tide gate) option does not install a tide gate but keeps the Morrissey Boulevard roadway elevated, using that increased elevation to protect against rising sea levels and flooding (drivers would be driving at the 2070 Design Flood Elevation, or DFE). Because this Alternative lacks a tide gate, Malibu Beach would have to be raised to protect the back side of Morrissey Boulevard from any inundation.

The *Low-Profile* (tide gate) option involves installing a flood gate at the Beades Bridge. The roadway would then be elevated at a lower level traveling north of the Beades Bridge, with a wall or covered berm reaching the 2070 DFE east of Morrissey Boulevard. Because of the flood gate controlling the amount of water entering Dorchester Bay Basin and the Malibu Beach area, Malibu Beach may not need to be elevated depending on flood pathways, and the roadway may be protected from inundation from the west.

The *Hybrid* option involves installing a flood gate, but also raising Malibu Beach to an intermediate level. The flood gate would then have to be opened less often, leading to potential operational and cost advantages. There would be a wall facing Dorchester Bay/Boston Harbor but it would likely be shorter than the Low-Profile option.

Figure 4-48: Flood Gate Options



As these options have no impact on corridor mobility, the initial evaluation pertains to how each option aligns with the resiliency and ecology, placemaking, and constructability evaluation criteria.

Compared to existing infrastructure, the No Tide Gate is estimated to have the most resiliency benefits, and the Tide Gate alternative is estimated to have the most placemaking opportunities.

Figure 4-49: Resiliency and Ecology, and Placemaking Evaluation Criteria for the Flood Gate Options

Resiliency and Ecology Criteria	Tide Gate	No Tide Gate	Hybrid
Effects on Environmental Resources	✗	✓	—
Impervious Surface	✓	✓	✓

Placemaking Criteria	Tide Gate	No Tide Gate	Hybrid
Placemaking/Open Space	✓	✓	✓
Visual Effects	—	✗	✗
Consistency with Plans	✓	✓	✓
Disruption to Neighborhoods	✓	✓	✓
Recreational Access	—	✗	✗
Shade Trees	✓	✓	✓

Compared to existing infrastructure, the No Tide Gate option is estimated to have fewer constructability concerns.

Figure 4-50: Constructability Evaluation Criteria for the Flood Gate Options

Constructability Criteria	Tide Gate	No Tide Gate	Hybrid
Construction Cost	✓	✓	—
Constructability	—	✓	✓
Maintenance Concerns	—	✓	—
Environmental Permits/Complexity	—	✓	—

4.4 Final Alternatives Refinement and Analysis

The second step of the transportation simulation process involved the utilization of Vissim. Vissim is a tool used to assess signalized and unsignalized intersections, with a focus on the interaction between vehicular, bicycle, pedestrian, and transit movements. Following the initial SYNCHRO analysis, Vissim was then used to model subareas of the corridor based on the results of the SYNCHRO testing.

The Morrissey Boulevard Commission members and additional stakeholders shared feedback on the initial refinements related to U-turns and cross-corridor access points; the need for improved connectivity to/from neighborhoods, services, and amenities; concerns about reduced roadway capacity and emergency vehicle access; future project development considerations such as utilities, plantings, signage, and speeds; and noise, pollution, visual barriers, and coastal resilience environmental considerations.

Based on this input, the following updates were made to the options prior to the Vissim analysis:

- Freeport Street
    - Removed Median U-Turn option from consideration due to higher overall vehicular delay, more impervious surface, and limited pedestrian/bicyclist connection at Victory Road
- Bianculli Boulevard
    - Removed Continuous Green-T option from consideration due to limited number of pedestrian crossing opportunities, high delay for certain movements, and unsafe weaving to access Old Colony Terrace
    - Removed Median U-Turn option from consideration due to higher vehicular delay, wider right-of-way needs, and stakeholder feedback
    - Evaluated deceleration and acceleration lanes to Old Colony Terrace
    - Developed a Modified DCR Design
- Preble Circle
    - Removed modern roundabout option from consideration due to inability to handle traffic volumes for certain movements

At this stage of the process, additional corridor mobility and resiliency and ecology evaluation criteria were integrated to further differentiate the options assessed. These additional evaluation criteria are:

- Pedestrian Delay: The delay experienced by the average pedestrian at each intersection
- Quality of East-West Connections: The safety and comfort of people crossing the Morrissey Boulevard corridor, also capturing the key destinations being accessed
- 2070 Coastal Flooding: Flooding associated with rising sea levels, such as that expected from climate change
- 2070 Stormwater Flooding: Flooding associated with a high volume of stormwater falling in a small period of time and overwhelming the flood control network

Neponset Circle Final Analysis

While the existing infrastructure is anticipated to experience less queuing and delay (approximately 440 hours of total delay) than the Modified DCR Design (approximately 725 hours of total delay), the Modified DCR Design option closes gaps in sidewalks and improves vehicle access, primarily by making a key section of the intersection (Neponset Avenue) two way. Compared to the existing infrastructure, the Modified DCR Design reduces overall vehicular weaving and improves multimodal accessibility and safety.

Figure 4-51: Corridor Mobility Evaluation Criteria for the Neponset Circle Options

Corridor Mobility Criteria	Existing Infrastructure	Modified DCR Design
Delay – Intersection Level of Service	✗	✗
Delay - Total Vehicle Hours of Delay	—	✗
Queueing	—	✗
Vehicle Access	—	✓
Transit Access	—	✓
Pedestrian Crossing Comfort	—	✓
Sidewalk Gaps (North-South)	—	✓
Pedestrian Delay	N/A	N/A
Bicycle Level of Traffic Stress	✗	✓
Potential Safety Effects	—	✓
Quality of East-West Connections	✗	✓

Overall, the Modified DCR Design is anticipated to experience a reduction in traffic volume, the introduction of new green space, and the corresponding reduction of impervious surface. This option also benefits from less impervious surface and new stormwater retention opportunities. Additionally, stormwater flooding mitigation would be improved due to a new underground water storage facility.

The Modified DCR Design adds bicycle and pedestrian facilities to the area and creates opportunities for new open spaces due to the narrowing of the roadway. Therefore, compared to the Existing Infrastructure, the Modified DCR Design may have environmental benefits, less impervious surface, and some placemaking opportunities.

Figure 4-52: Resiliency and Ecology, and Placemaking Evaluation Criteria for the Neponset Circle Options

Resiliency and Ecology Criteria	Existing Infrastructure	Modified DCR Design
Effects on Environmental Resources	—	✓
2070 Coastal Flooding	✗	✓
2070 Stormwater Flooding	✗	✓
Impervious Surface	—	✓

Placemaking Criteria	Existing Infrastructure	Modified DCR Design
Placemaking/ Open Space	✗	✓
Visual Effects	✗	✓
Consistency with Plans	—	✓
Disruption to Neighborhoods	✗	—
Recreational Access	—	✓
Shade Trees	✓	✓

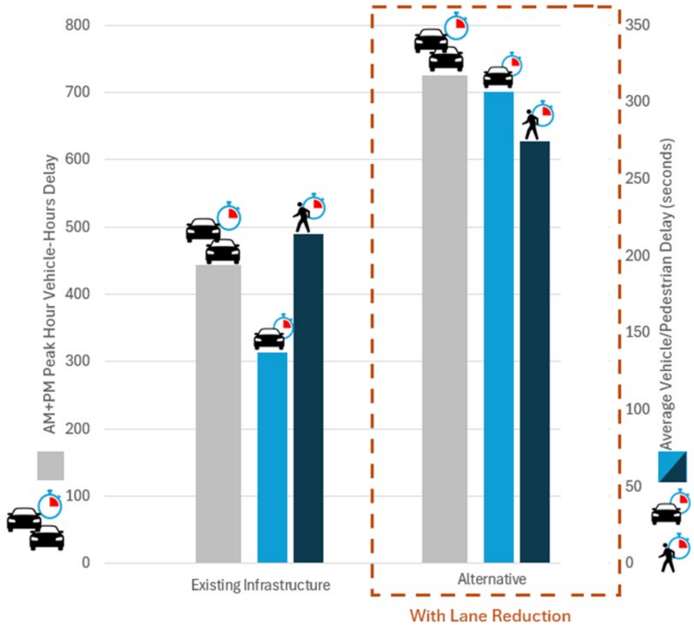
Compared to the existing infrastructure, the Modified DCR Design would have high constructability and low maintenance concerns, with some cost and/or permitting considerations.

Figure 4-53: Constructability Evaluation Criteria for the Neponset Circle Options

Constructability Criteria	Existing Infrastructure	Modified DCR Design
Construction Cost	N/A	—
Constructability	N/A	✓
Maintenance Concerns	✗	✓
Environmental Permits/Complexity	N/A	—

Upon final analysis, the Modified DCR Design option was estimated to experience an increase in vehicle hours of delay and average delay due to queues from I-93 northbound on-ramp blocking three-lane northbound Morrissey Boulevard. This delay could be improved by retaining four northbound lanes on Morrissey Boulevard and improvements on I-93.

Figure 4-54: Final Analysis of the Neponset Circle Option



Freeport Street Final Analysis

The Modified DCR Design and Victory Road Full Intersection options are estimated to experience significantly less total delay (approximately 130 and 91 vehicle hours of delay, respectively) than the existing infrastructure (approximately 340 total vehicle hours of delay). For Victory Road, the Modified DCR Design allows a northbound to southbound U-turn for drivers, which is not currently possible. The Victory Road Full Intersection option substantially improves vehicular access by allowing a thru movement on Victory Road. This option also allows left turns from Victory Road onto Morrissey Boulevard southbound, which is not included as part of the existing infrastructure or in the Modified DCR Design.

Both build options improve east-west access to the MBTA Bus Line 201 bus stop at the driveway to the Puritan Mall Driveway, while also improving east-west access to the bus stops on Neponset Avenue slightly to the west.

The Modified DCR Design option creates a new, signalized east-west pedestrian/bicycle connection at Victory Road; both options improve linkages to Dorchester Shores Reservation and the planned Neponset Greenway northern extension. As a result, Bicycle Level of Traffic Stress in the build options shifts from the "Most Stressful" categories experienced with the existing infrastructure to the "Least Stressful" categories. Therefore, compared to Existing Infrastructure, each alternative would have safety and mobility benefits overall, with moderate pedestrian crossing comfort.

Figure 4-55: Corridor Mobility Evaluation Criteria for the Freeport Street Options

Corridor Mobility Criteria	Existing Infrastructure	Modified DCR Design	Victory Road Full Intersection
Delay – Intersection Level of Service	✗	—	✓
Delay - Total Vehicle Hours of Delay	✗	✓	✓
Queueing	✗	✓	✓
Vehicle Access	✗	—	✓
Transit Access	—	✓	✓
Pedestrian Crossing Comfort	—	✓	✓
Sidewalk Gaps (North-South)	—	✓	✓
Pedestrian Delay	—	✓	✓
Bicycle Level of Traffic Stress	✗	✓	✓
Potential Safety Effects	—	✓	✓
Quality of East-West Connections	✗	—	✓

Both options offer significant resiliency improvements over the existing infrastructure as a result of planned Boston Water and Sewer Commission (BWSC) work in the area; the Victory Road Full Intersection option is estimated to experience the greatest reduction in greenhouse gas emissions and noise.

With the removal for the frontage road, the Victory Road Full Intersection option has increased opportunities for open space and more positive visual effects. While both build options would cause disruptions to neighborhoods compared to the Existing Infrastructure, they provide improvements to the number of shade trees that could be planted in the area and better recreational access to Dorchester Bay with the Victory Road Full Intersection option for all users.

Therefore, compared to the existing infrastructure, each alternative would have environmental and resiliency benefits; the Victory Road Full Intersection would have the most placemaking benefits.

Figure 4-56: Resiliency and Ecology, and Placemaking Evaluation Criteria for the Freeport Street Options

Resiliency and Ecology Criteria	Existing Infrastructure	Modified DCR Design	Victory Road Full Intersection
Effects on Environmental Resources	—	✓	✓
2070 Coastal Flooding	✗	✓	✓
2070 Stormwater Flooding	✗	✓	✓
Impervious Surface	✗	✓	✓

Placemaking Criteria	Existing Infrastructure	Modified DCR Design	Victory Road Full Intersection
Placemaking/Open Space	—	✓	✓
Visual Effects	—	—	✓
Consistency with Plans	✗	✓	✓
Disruption to Neighborhoods	—	✗	✗
Recreational Access	✗	✓	✓
Shade Trees	—	✓	✓

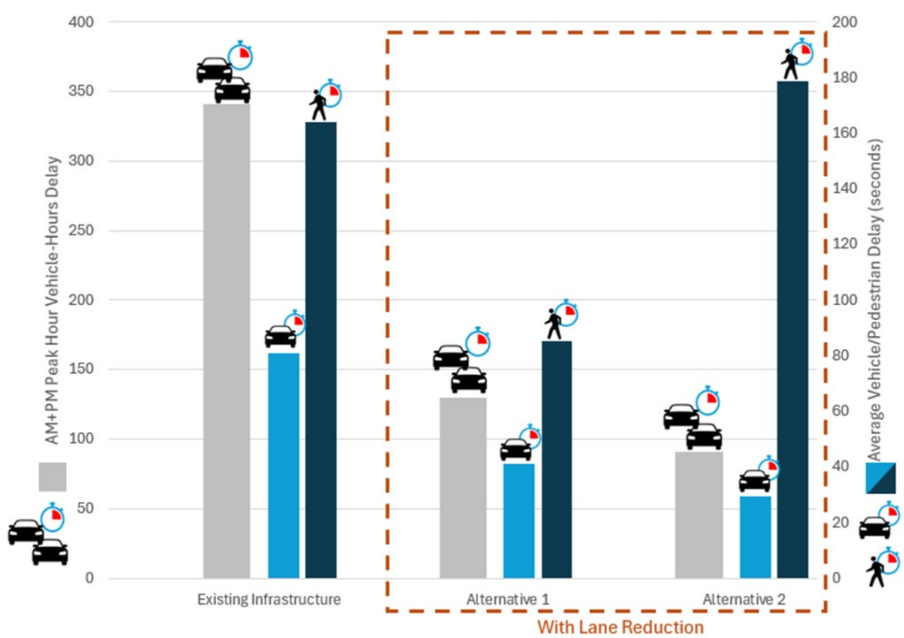
The Victory Road Full Intersection option would be more difficult to construct than the Modified DCR Design option, while both options would have maintenance benefits over the existing infrastructure due to the reduced flooding risk. Therefore, compared to the existing infrastructure, each alternative would have some cost, constructability, and/or permitting considerations, while the Victory Road Full Intersection would have low maintenance concerns.

Figure 4-57: Constructability Evaluation Criteria for the Freeport Street Options

Constructability Criteria	Existing Infrastructure	Modified DCR Design	Victory Road Full Intersection
Construction Cost	N/A	✓	−
Constructability	N/A	✓	−
Maintenance Concerns	✗	✓	✓
Environmental Permits/Complexity	✓	✓	✓

Upon final analysis, the Modified DCR Design and the Victory Road Full Intersection options provided corridor mobility, resiliency, and placemaking benefits compared to existing infrastructure.

Figure 4-58: Final Analysis of the Freeport Street Options



Bianculli Boulevard Final Analysis

The original DCR Design and the Modified DCR Design options are estimated to experience 171 total vehicle hours of delay and 184 total vehicle hours of delay, respectively, compared to the Existing Infrastructure (371 total vehicle hours of delay). While vehicular access is broadly similar among the existing infrastructure and two Build options, the Modified DCR Design option scores slightly higher due to the inclusion of a new southbound acceleration lane at Old Colony Terrace.

Both the original DCR Design and the Modified DCR Design options offer new sidewalk space and bicycle facilities, enhancing safety and connections at Bianculli Boulevard and linking UMass Boston to the Savin Hill area and the Savin Hill MBTA Station.

Therefore, compared to the existing infrastructure, both the original DCR Design and the Modified DCR Design options provide corridor mobility benefits.

Figure 4-59: Corridor Mobility Evaluation Criteria for the Bianculli Boulevard Options

Corridor Mobility Criteria	Existing Infrastructure	Modified DCR Design	DCR Design
Delay – Intersection Level of Service	✗	✗	✗
Delay - Total Vehicle Hours of Delay	✗	–	✓
Queueing	✗	–	✓
Vehicle Access	–	✓	–
Transit Access	–	✓	✓
Pedestrian Crossing Comfort	–	✓	✓
Sidewalk Gaps (North-South)	–	✓	✓
Pedestrian Delay	–	✓	–
Bicycle Level of Traffic Stress	✗	✓	✓
Potential Safety Effects	–	✓	✓
Quality of East-West Connections	✗	✓	✓

Both the original DCR Design and the Modified DCR Design decrease the amount of pavement space and impervious surface and also provide opportunities to install anti-stormwater measures.

Similarly, the narrowed roadway and resulting increase in space may allow for the introduction of new green space and a possible water retention area, leading to positive visual effects. Therefore, compared to the existing infrastructure, the Modified DCR Design and DCR Design would have resiliency benefits and less impervious surface, creating placemaking opportunities.

Figure 4-60: Resiliency and Ecology, and Placemaking Evaluation Criteria for the Bianculli Boulevard Options

Resiliency and Ecology Criteria	Existing Infrastructure	Modified DCR Design	DCR Design
Effects on Environmental Resources	–	✓	✓
2070 Coastal Flooding	✗	✓	✓
2070 Stormwater Flooding	✗	✓	✓
Impervious Surface	✗	✓	✓

Placemaking Criteria	Existing Infrastructure	Modified DCR Design	DCR Design
Placemaking/Open Space	✗	–	✓
Visual Effects	✗	–	✓
Consistency with Plans	–	✓	✓
Disruption to Neighborhoods	✗	–	–
Recreational Access	–	✓	✓
Shade Trees	✗	✓	✓

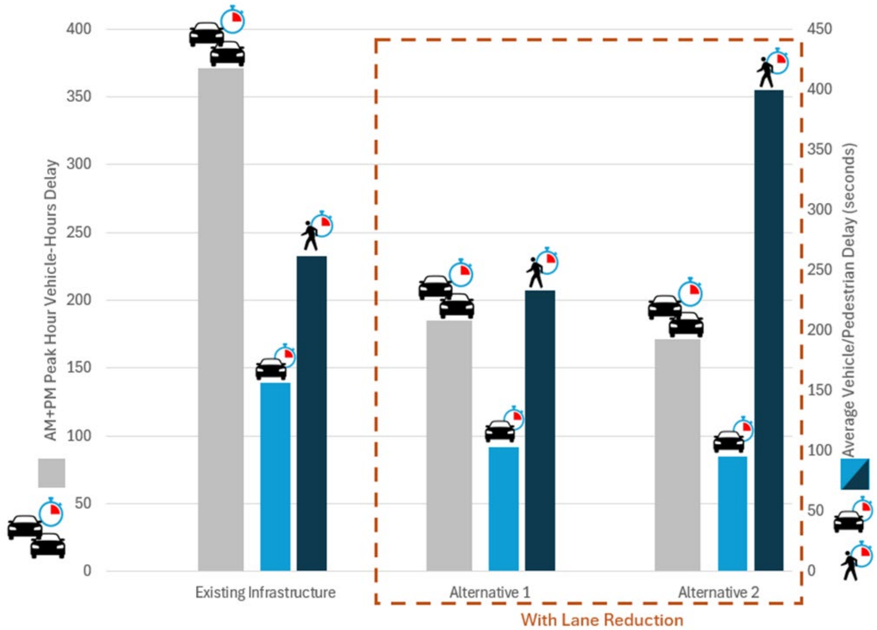
Both build options at Bianculli Boulevard are highly constructable and reduce flooding-related maintenance risks. Therefore, compared to the existing infrastructure, the Modified DCR Design and DCR Design are anticipated to have high constructability, low maintenance concerns, and fewer permitting concerns.

Figure 4-61: Constructability Evaluation Criteria for the Bianculli Boulevard Options

Constructability Criteria	Existing Infrastructure	Modified DCR Design	DCR Design
Construction Cost	N/A	⊖	⊖
Constructability	N/A	✓	✓
Maintenance Concerns	✗	✓	✓
Environmental Permits/Complexity	N/A	✓	✓

Upon final analysis, the Modified DCR Design option and the DCR Design option are expected to provide benefits over the Existing Infrastructure.

Figure 4-62: Final Analysis of the Bianculli Boulevard Options



First Street Final Analysis

The Service Roads option is estimated to experience approximately 18 total vehicle hours of delay, primarily in the PM; the Signalized Control option is estimated to see 140.4 total vehicle hours of delay. Although the addition of an intersection at this location would have some congestion impacts, it would allow for enhanced access, particularly in the Signalized Control option.

These new intersections across all marked legs featured in the Signalized Control option would increase access to the MBTA JFK/UMass Station. Though there is a pedestrian bridge crossing in the area, the new intersection would allow easier linkages between the station and nearby academic institutions and developments.

The Signalized Control option is estimated to increase intersection safety and east-west bicycle and pedestrian crossings and could connect the residential areas to the west to the shore. Therefore, the Signalized Control option could provide the most corridor mobility benefits.

Figure 4-63: Corridor Mobility Evaluation Criteria for the First Street Options

Corridor Mobility Criteria	Existing Infrastructure	Signalized Control	Service Roads
Delay – Intersection Level of Service	N/A	–	N/A
Delay - Total Vehicle Hours of Delay	✓	–	✓
Queueing	✓	–	✗
Vehicle Access	–	✓	–
Transit Access	–	–	–
Pedestrian Crossing Comfort	–	✓	✓
Sidewalk Gaps (N-S)	–	✓	✓
Pedestrian Delay	N/A	N/A	N/A
Bicycle Level of Traffic Stress	–	✓	✓
Potential Safety Effects	–	✓	✓
Quality of E-W Connections	–	✓	✗

Traffic reductions from both Build options are estimated to have positive impacts on greenhouse gas emissions and noise. The Signalized Control option has the greatest potential to reduce the heat island impacts due to the addition of green space developed through the elimination of the frontage roads that remain in the Service Roads option.[22] This additional green space and reduction of impervious surface area could have positive impacts on stormwater flooding mitigation.

At this location, the Signalized Control and Service Roads options are anticipated to increase coastal flooding resilience, provided that the roadway is raised to the DFE and flood control improvements near Pattens Cove and along the Harborwalk are implemented.

The introduction of new bicycle and pedestrian facilities, as well as the increase in opportunities for open space, have positive effects on visual effects and recreational access.

Therefore, both the Modified DCR Design and DCR Design options would have resiliency benefits and less impervious surface while increasing opportunities for placemaking.

[22] The Service Roads option scores higher than the existing infrastructure due to the narrowing of the frontage roads.

Figure 4-64: Resiliency and Ecology, and Placemaking Evaluation Criteria for the First Street Options

Resiliency and Ecology Criteria	Existing Infrastructure	Signalized Control	Service Roads
Effects on Environmental Resources	–	✓	✓
2070 Coastal Flooding	✗	✓	–
2070 Stormwater Flooding	✗	✓	✓
Impervious Surface	✗	✓	✓

Placemaking Criteria	Existing Infrastructure	Signalized Control	Service Roads
Placemaking/Open Space	✗	✓	–
Visual Effects	✗	✓	–
Consistency with Plans	✗	✓	–
Disruption to Neighborhoods	–	✓	✓
Recreational Access	–	✓	✓
Shade Trees	–	✓	✓

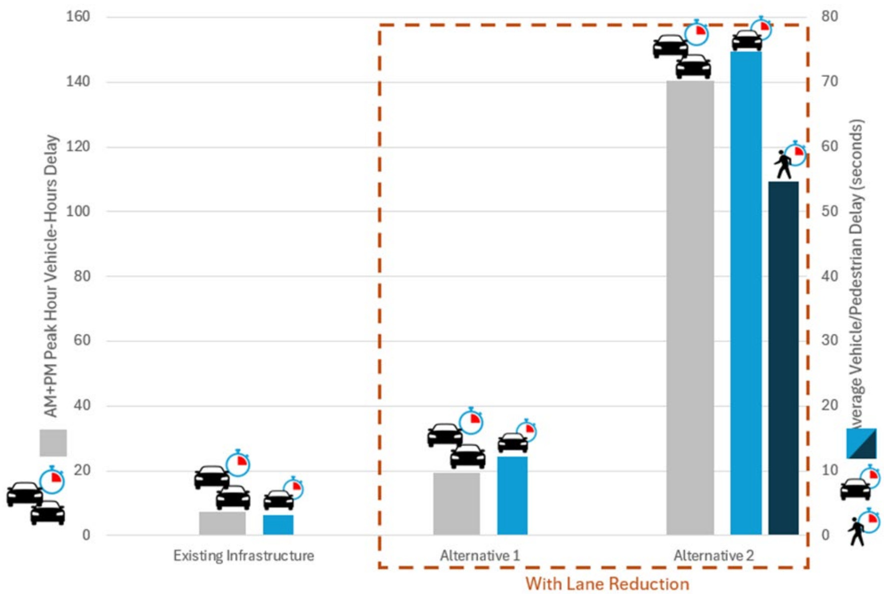
While the Signalized Control option would likely involve more difficulties in construction due to the introduction of the new intersection, it also features a smaller footprint than the Service Roads option. This new intersection could require permits, which impacts the complexity of the Signalized Control.

Figure 4-65: Constructability Evaluation Criteria for the First Street Options

Constructability Criteria	Existing Infrastructure	Signalized Control	Service Roads
Construction Cost	N/A	–	✓
Constructability	N/A	–	✓
Maintenance Concerns	✗	✓	✓
Environmental Permits/Complexity	N/A	✗	✓

Upon final analysis, the Signalized Control option provides the most benefits and would require consideration related to cost, constructability, and permitting.

Figure 4-66: Final Analysis of the First Street Options



Preble Circle Final Analysis

The Signalized Control option features more delay (134.3 total vehicle hours of delay) compared to the existing infrastructure (103.8 total vehicle hours of delay), as well as slightly longer queues. The build option does, however, receive a higher vehicle access score, as it would allow certain movements to be conducted in an easier manner (e.g., avoiding potential weaving movements).

The curb extensions and widening of the sidewalk in all locations around Preble Circle featured in the Signalized Control option provide benefits to transit access and bicycle and pedestrian mobility. Such shaping of this intersection and improving the east-west crossings would assist in linking South Boston on the northeast to Dorchester to the southwest, which is also a key connection point to Joe Moakley Park and the waterfront.

Therefore, compared to the Existing Infrastructure, Signalized Control would improve accessibility and safety, with consideration to delays and queuing.

Figure 4-67: Corridor Mobility Evaluation Criteria for the Preble Circle Option

Corridor Mobility Criteria	Existing Infrastructure	Signalized Control
Delay – Intersection LOS	✗	✗
Delay - Total Vehicle Hours of Delay	—	✗
Queueing	—	✗
Vehicle Access	—	✓
Transit Access	✗	—
Pedestrian Crossing Comfort	—	✓
Sidewalk Gaps (N-S)	—	✓
Pedestrian Delay	✓	—
Bicycle Level of Traffic Stress	—	✓
Potential Safety Effects	—	✓
Quality of E-W Connections	✗	✓

The Signalized Control option would likely have positive air quality, greenhouse gas, and noise effects, while doing more to cool the urban environment. In addition, with its reduction in impervious surfaces, the build option provides new opportunities for stormwater retention.

With its green space increase, the Signalized Control option provides additional opportunities for placemaking and the incorporation of shade trees, resulting in positive visual effects. Recreational access is also expected to be improved compared to the existing infrastructure, as crossings would be shortened for crossing pedestrians, while bicyclists and pedestrians would also benefit from widened sidewalks, a protected bike lane at the northbound approach, and better linkages to the bicycle facility on Day Boulevard.

Construction of this option would likely lead to moderate disruption to neighborhoods.

Overall, compared to the existing infrastructure, the Signalized Control option would have resiliency and placemaking benefits.

Figure 4-68: Resiliency and Ecology, and Placemaking Evaluation Criteria for the Preble Circle Option

Resiliency and Ecology Criteria	Existing Infrastructure	Signalized Control
Effects on Environmental Resources	—	✓
2070 Coastal Flooding	✗	✓
2070 Stormwater Flooding	✗	✓
Impervious Surface	✗	✓

Placemaking Criteria	Existing Infrastructure	Signalized Control
Placemaking/Open Space	—	✓
Visual Effects	—	✓
Consistency with Plans	—	—
Disruption to Neighborhoods	✓	—
Recreational Access	—	✓
Shade Trees	—	✓

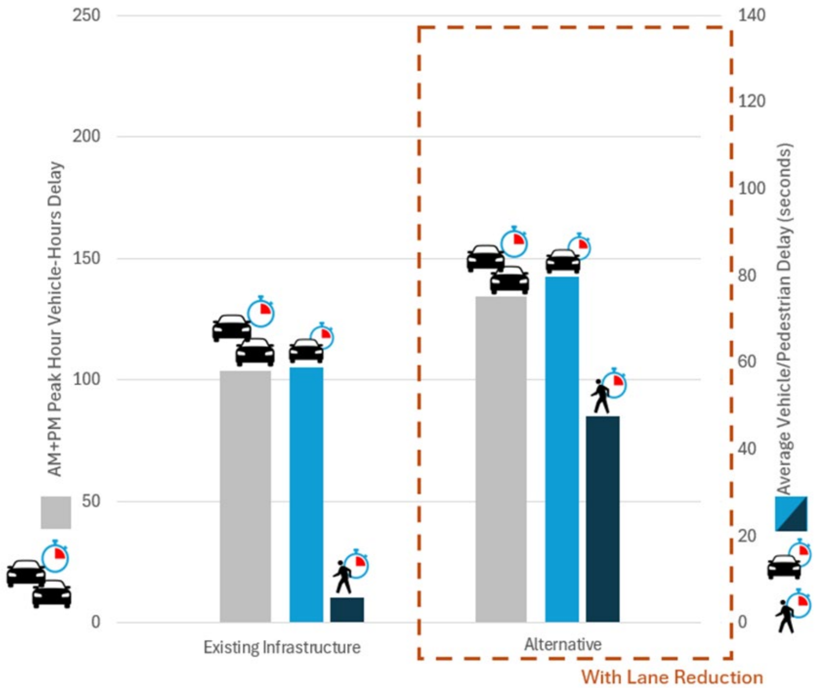
Due to the reduction in pavement, the Signalized Control option may have fewer constructability, maintenance, and permitting concerns, with some consideration to the cost of construction.

Figure 4-69: Constructability Evaluation Criteria for the Preble Circle Option

Constructability Criteria	Existing Infrastructure	Signalized Control
Construction Cost	N/A	—
Constructability	N/A	✓
Maintenance Concerns	—	✓
Environmental Permits/Complexity	N/A	✓

Upon final analysis, the Signalized Control option provides significant benefits compared to the existing infrastructure in the area.

Figure 4-70: Final Analysis of the Preble Circle Option



Central Section Climate Resilience Final Analysis

At this stage of the process, additional resiliency and ecology evaluation criteria were integrated to further differentiate the options assessed. These additional evaluation criteria are:

- Plant Migration: The process of plants moving locations or environments to adapt to changing water conditions
- Wave Migration: The process of dissipating wave energy through structures or natural features

The Tide Gate option, along with other actions south of the bridge, and the flood barrier north of the bridge on the bay side, would mitigate coastal flooding up to the 2070 DFE. This option assumes the inclusion of BWSC's proposed addition of stormwater infrastructure, providing mitigation for long-term stormwater flooding in the Northern section of the corridor. However, some stormwater flooding may be a significant problem in the Central section, as there would be limited gravity to discharge stormwater at high tide.

The Tide Gate option would not improve the potential for plant migration in response to sea level rise relative to existing infrastructure. The gate could be designed to be adapted to manage tidal flow and water levels inside the basin to optimize salt marsh survival, but this is not proposed as it would impact navigation and could exacerbate water quality impairment.

When closed, the Tide Gate option would mitigate waves that would otherwise propagate under the Beades Bridge and impact the west shore of the basin (the I-93 embankment). The basin side of Malibu Beach may still be impacted by smaller waves depending on wind direction; however, wave reflection off the west shore would be decreased when the gate is closed. During minor and major storms, the closed tide gate may cause wave reflection on the bay side and increase beach scour in areas north or south of the bridge.

With the No Tide Gate option, raising the basin-side beach/dune/berm, along with other actions south of the bridge, and the flood barrier north of the bridge on the bay side would mitigate coastal and stormwater flooding up to the 2070 DFE.

This option could be designed with optimized basin-side grading to allow for salt marsh migration. However, the higher height of the basin-side dune/berm may create steeper slopes, making it less conducive to marsh migration compared to the hybrid option. This option could also add dune vegetation where none exists currently.

The raised beach/dune/berm on the basin side of Malibu Beach would mitigate the limited exposure to waves that could impact this shoreline. However, it would not mitigate waves that propagate under the Beades Bridge and impact the west shore of the basin (the I-93 embankment).

The Hybrid option features a less frequently opened tide gate, along with raising the basin side beach/dune/berm to some lesser elevation, other actions south of the bridge, and the flood barrier north of the bridge on the bay side, which would mitigate coastal and stormwater flooding up to the 2070 DFE.

This option could be designed with optimized basin-side grading to allow for salt marsh migration in response to sea level rise. The lower height of the basin-side dune/berm would allow for gentler slopes compared to the tide gate option, making it more conducive to marsh migration. This option could also add dune vegetation where none currently exist.

Based on these factors, the Hybrid option scores highest for resiliency and ecology.

Figure 4-71: Resiliency and Ecology Evaluation Criteria for the Flood Gate Options

Resiliency and Ecology Criteria	Existing Infrastructure	Tide Gate	No Tide Gate	Hybrid
Effects on Environmental Resources	✗	✗	—	✗
2070 Coastal Flooding	✗	✓	✓	✓
2070 Stormwater Flooding	✗	✓	✗	✓
Impervious Surface	✗	✗	✓	✓
Plant Migration	✗	✗	✓	✓
Wave Mitigation	✗	✓	✓	✓

Although proposed in all of the build options, the flatter slope of the Hybrid option may allow more trees to be planted sustainably. In addition, the No Tide Gate and Hybrid options are estimated to have the highest potential for placemaking opportunities. No major impacts are anticipated due to the nature of the work to construct each option.

Therefore, compared to the existing infrastructure, the Hybrid option scores highest for placemaking.

Figure 4-72: Placemaking Evaluation Criteria for the Flood Gate Options

Placemaking Criteria	Existing Infrastructure	Tide Gate	No Tide Gate	Hybrid
Placemaking/Open Space	✗	–	✓	✓
Visual Effects	N/A	N/A	N/A	N/A
Consistency with Plans	✗	✓	✗	✓
Disruption to Neighborhoods	✓	✓	✓	✓
Recreational Access	–	–	✓	✗
Shade Trees	✗	–	–	✓

Given how frequently the gate would be closing, wear and tear on the gate would result in higher maintenance costs. The No Tide Gate option would be relatively low maintenance given the limited exposure to waves that could cause significant erosion. However, sediments that may migrate into the basin could marginally increase the need for navigational dredging. Despite less anticipated wear and tear from less frequent gate closures, maintenance costs for the gate portion of the Hybrid option are assumed to be very high; maintenance costs associated with the raised beach/dune/berm should be relatively low.

Environmental permitting complexity would be high for the Tide Gate option due to the lack of precedent for permitting these types of structures under the modern state regulatory system, potential water quality impacts, and the inclusion of a tide gate within U.S. Army Corps of Engineers (USACE) jurisdiction. Regulators would require significant modeling analyses and other studies as part of permitting reviews and, if approved, may require post-construction monitoring and reporting.

The No Tide Gate option is less complex to permit compared to the options involving the tide gate. While still complex due to proposed alterations to the existing coast, a key issue would be how the raised beach/dune/berm would impact existing salt marsh resources.

The Hybrid option score is driven by inclusion of the tide gate. Given the reduced frequency of closures, this could be seen by permitting agencies as an impact minimization measure. However, with this option, the permitting agencies would also be focused on impacts of the raised beach/dune/berm on existing salt marsh. If nourishment below the high tide line is proposed, USACE permitting and MassDEP water quality certification will be required.

Based on these factors, the No Tide Gate option would have the fewest constructability concerns.

Figure 4-73: Constructability Evaluation Criteria for the Flood Gate Options

Constructability Criteria	Existing Infrastructure	Tide Gate	No Tide Gate	Hybrid
Construction Cost	N/A	✗	✓	✗
Constructability	N/A	✗	✓	–
Maintenance Concerns	✗	–	✓	–
Environmental Permits/Complexity	N/A	✗	–	✗

Two options were assessed facing toward Dorchester Bay Boston Harbor. These options both offer a way to attenuate sea level rise and wave action in the zone expected to experience the greatest level of wave energy from the ocean between the Beades Bridge and the Savin Hill Yacht Club.

The Retaining Wall option involves creating a simple revetment—either an exposed wall or a wall covered by a berm—facing the ocean to provide protection from the ocean and features a new walking path along the shore. A revetment located seaward of a vertical barrier could reduce wave overtopping of the vertical barrier by raising the elevation of the vertical structure and would offer few opportunities for plants to migrate.

The Living Shoreline option involves a more naturalistic solution in which the ocean floor slopes gradually up closer to shore, and vegetation and other features slowly dissipate wave action. This would likely involve adding fill into Dorchester Bay. This option could be designed with optimized bay-side grading, sediment, and plantings to create new salt marsh and dune vegetation and allow for migration in response to sea level rise. The Living Shoreline would include beach nourishment and dune creation and enhancement that, depending on their scale, would reduce wave heights reaching the primary flood barrier. However, it may not provide the same robustness of wave erosion and damage protection as a retaining wall.

Compared to the Existing Infrastructure, the Living Shoreline option has the most resiliency benefits.

Figure 4-74: Resiliency and Ecology Evaluation Criteria for the Harborside Options

Resiliency and Ecology Criteria	Existing Infrastructure	Retaining Wall	Living Shoreline
Effects on Environmental Resources	—	—	✓
2070 Coastal Flooding	✗	N/A	N/A
2070 Stormwater Flooding	✗	N/A	N/A
Impervious Surface	✗	—	✓
Plant Migration	—	✗	✓
Wave Mitigation	✗	✓	✓

Though both options would have a limited impact on neighborhoods and increase recreational access, the Living Shoreline option creates additional opportunities at the shoreline and introduces a seashore environment, enhancing placemaking and visual effects in the area. Based on these factors, the Living Shoreline option has the greatest placemaking opportunities.

Figure 4-75: Placemaking Evaluation Criteria for the Harborside Options

Placemaking Criteria	Existing Infrastructure	Retaining Wall	Living Shoreline
Placemaking/Open Space	✗	✗	✓
Visual Effects	✗	✗	✓
Consistency with Plans	—	✓	✓
Disruption to Neighborhoods	✗	✓	✓
Recreational Access	✗	✓	✓
Shade Trees	✗	—	✓

The Retaining Wall option would require little maintenance, whereas the Living Shoreline would be subject to erosion as it absorbs and redistributes the energy of waves during major storms. Therefore, periodic renourishment and replanting would be required.

Despite this need for some maintenance, the Living Shoreline would be less complex to permit than a retaining wall, especially if portions of Morrissey Boulevard are determined to be barrier beach,[23] but there would still have some permitting considerations due to proposed alterations to existing coastal wetlands.

Compared to the existing infrastructure, the Living Shoreline and Retaining Wall options would have the least maintenance concerns, with the Retaining Wall option involving additional some considerations to cost, constructability, and permitting.

[23] Barrier beaches are portions of beach and dunes that provide storm and flood protection and habitat for plants and wildlife.

Figure 4-76: Constructability Evaluation Criteria for the Harborside Options

Constructability Criteria	Existing Infrastructure	Retaining Wall	Living Shoreline
Construction Cost	N/A	✓	—
Constructability	N/A	✓	—
Maintenance Concerns	✗	✓	✓
Environmental Permits/Complexity	✓	✗	—

Based on the analysis and feedback received, the following are the locally preferred intersection components for the full Morrissey Boulevard corridor:

- Neponset Circle - Modified DCR Design
- Freeport Street - Modified DCR Design
- Bianculli Boulevard - DCR Design
- First Street - Signalized Control
- Preble Street - Signalized Control

4.5 Preliminary Cost Estimate

An important aspect of evaluating any proposed effort is understanding the potential costs of implementing it. For this study, a conceptual cost estimate was prepared for two time frames: the current year (2024) and the estimated year of expenditure. The estimated year of expenditure provides an understanding of the impact of construction delays due to escalation.[24] The 2036 year of expenditure assumes that it would take approximately one year to select a consultant, five years to complete the project development and design process, and approximately five years to construct.

Please note that these estimates do not constitute a commitment of construction funding.

The components of the estimate are categorized according to the divisions outlined in the Federal Highway Administration FP-24 Standard Specification, facilitating straightforward comparisons with future project specifications and drawings.

In addition, the following assumptions have been included:

- The cost estimate reflects the level of detail and completeness of the information included as part of the conceptual design prepared to date.
- The cost estimate is grounded in the expected expenses for the area, encompassing both material and equipment costs. Labor costs are determined according to the prevailing rates specified by the Davis Bacon Act. Material Unit Pricing is derived from vendor quotes, historical cost data, estimator judgement, and published cost books.
- Labor unit pricing is derived from estimated labor production rates and crew sizes. The formula for labor cost is calculated as follows: Labor Cost = (Quantity / Labor Production

[24] Construction cost escalation refers to the increase in costs that can occur over the duration of a project due to factors such as inflation, material price hikes, and changes in labor rates.

Rate) x Labor Rate. The labor production rate represents the number of units of work that can be accomplished by an individual within a defined timeframe, typically measured in hours or days. This rate varies depending on factors such as trade, project type, weather conditions, job supervision, installation complexity, and other considerations. The most up-to-date Davis Bacon prevailing labor rates for Boston, Massachusetts are applied.

- The contractor's significant construction equipment expenses encompass rental, transportation, on-site handling, operational, and maintenance costs, and have been distributed to their respective line items.

Outlined below are the steps for developing the cost estimate:

1. Process the component items and quantities – The first step in the cost estimation process involves determining the components and anticipated quantities that may be needed for the project, including any necessary earthwork and structures. Once these items have been determined, U.S. Department of Transportation and FHWA specifications are referenced to match the detail needed for the estimates and identify any additional component items and quantities that may be necessary. Available resources, including developed plans, concepts, and renderings, are then used to make component item and quantity assumptions and identify major incidental items and constructability, phasing or site challenges that could impact the unit costs.

2. Process item components into individual activities – The second step involves determining the activity details and quantities for the component items.

3. Assign activity level pricing to determine opinion of construction costs – The third step includes assigning the appropriate labor force needed, determining the appropriate equipment to perform the activity, and assigning the necessary materials and costs to perform the activity.

4. Determine and assign percentage-based costs – The fourth step involves determining the contractor's mark-up and components.[25] As part of this step, appropriate percentages for contingency costs are determined and assigned to each FHWA work category. A percentage of the construction cost is also assigned to capture the anticipated costs of professional services and fees.

5. Process costs into design quantities and concepts – The last step involves developing a high-level project summary of the quantities or concepts, assigning a year of expenditure cost to the design concepts summary, and estimating future costs following the anticipated time for design and procurement.

Based on these assumptions, a range of estimated costs were developed in three segments: Neponset Circle to Freeport Street, Freeport Street to Bianculli Boulevard, and Bianculli Boulevard to Columbia Road.

[25] Contractor's mark-up is determined by reasonable assumptions of a contractors' overhead costs and profit.

Figure 4-77: Preliminary Cost Estimate

Construction Cost Range (Year of Expenditure)	Neponset Circle to Freeport Street	Central Section	Bianculli Boulevard to Columbia Road	Total Cost
Low End of Range (2036)	$115,000,000	$65,000,000	$93,000,000	$273,000,000
High End of Range (2036)	$115,000,000	$141,000,000	$96,000,000	$352,000,000

The 2024 base construction cost estimate ranges from $182 million at the low end to $234 million at the high end; the 2036 year-of-expenditure construction cost estimate ranges $273 million at the low end to $352 million at the high end. The variation between the low end and high-end estimates is primarily determined by the differing flood gate and harborside options in the central section.

4.6 Final Cost Estimate

Based on feedback and additional review, the initial assumptions were updated to assume design, permitting, and financing was accomplished within a shorter time period. As a result, the estimated year of expenditure estimates are between $205 and $304 million.

Figure 4-78: Final Cost Estimate

Construction Cost Range (Year of Expenditure)	Neponset Circle to Freeport Street	Central Section	Bianculli Boulevard to Columbia Road	Total Cost
Low End of Range	$99,000,000	$56,000,000	$80,000,000	$235,000,000
High End of Range	$99,000,000	$122,000,000	$83,000,000	$304,000,000

Chapter 5: Findings and Recommendations

This chapter summarizes the findings of the study, outlines short- and long-term recommendations for the study area, and documents additional themes that arose during the process.

5.1 Key Findings

Resiliency. Flood mitigation measures could be implemented along the coastline and Dorchester Bay Basin to protect critical infrastructure and inland neighborhoods. Coastal resilience measures should focus on nature-based solutions and explore opportunities to reintroduce and improve native ecosystems. Any future design permitting processes for the reconstruction of Morrissey Boulevard should coordinate with local stakeholders, including the Savin Hill Yacht Club, on climate change and coastal flooding.

Permitting Considerations. Environmental permitting is expected to be complex and could require additional time in the project development process.

Stakeholder Coordination and Considerations. The infrastructure in this area is owned by various jurisdictions including but not limited to MassDOT, DCR, the MBTA, the City of Boston, cultural and academic institutions, utilities providers, and private developers and landowners. As any projects move forward, all parties should coordinate to ensure ongoing and upcoming efforts are aligned. In addition, existing utilities and potential future needs, roadway and green space plantings, signage, vehicle design speeds, and construction diversions should be considered.

5.2 Recommendations

Based on the study findings and input from stakeholders, the following are the preferred intersection components for the full Morrissey Boulevard corridor:

- Neponset Circle - Modified DCR Design
- Freeport Street - Modified DCR Design
- Bianculli Boulevard - DCR Design
- First Street - Signalized Control
- Preble Street - Signalized Control

Figure 5-1: Corridor Layout from Neponset Circle to south of Victory Road

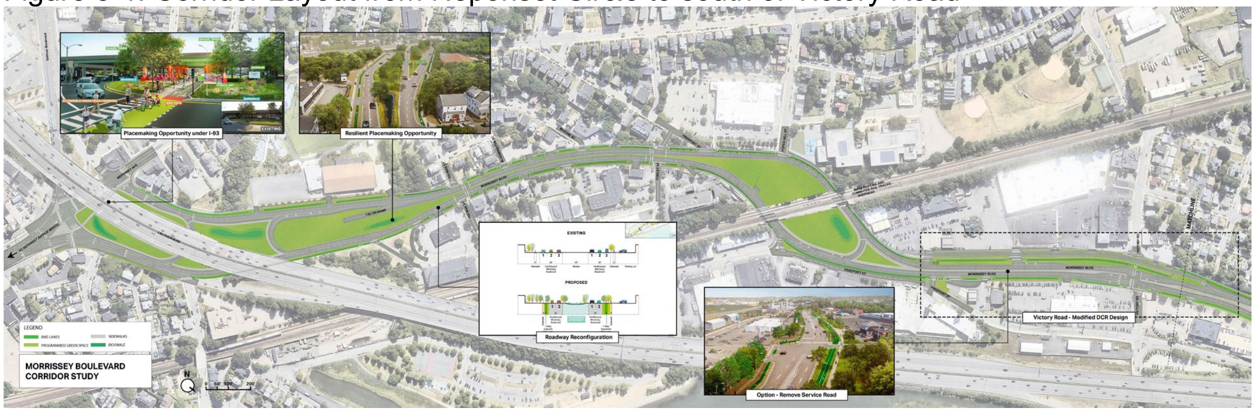


Figure 5-2: Corridor Layout from Freeport Street and Victory Road to south of Bianculli Boulevard

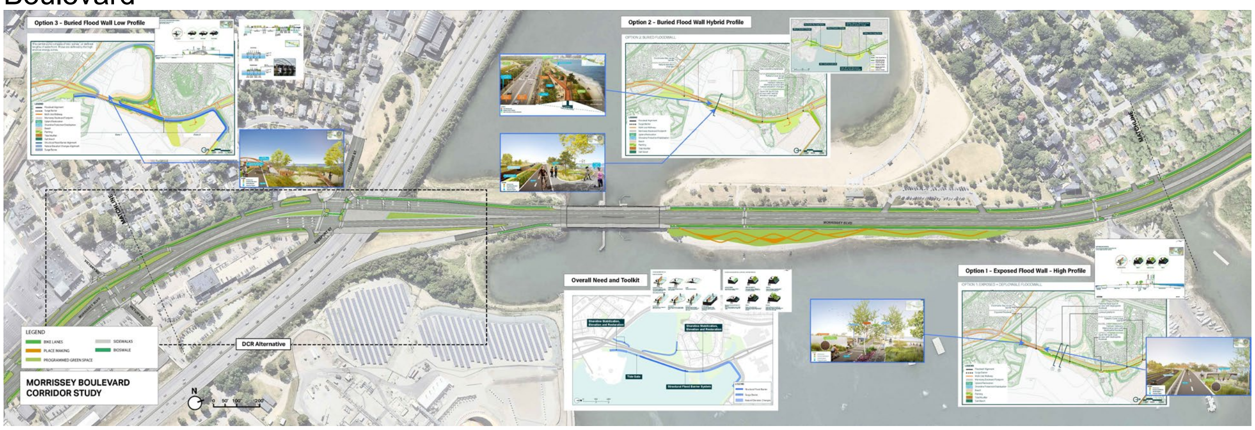


Figure 5-3: Corridor Layout from south of Bianculli Boulevard to Columbia Road

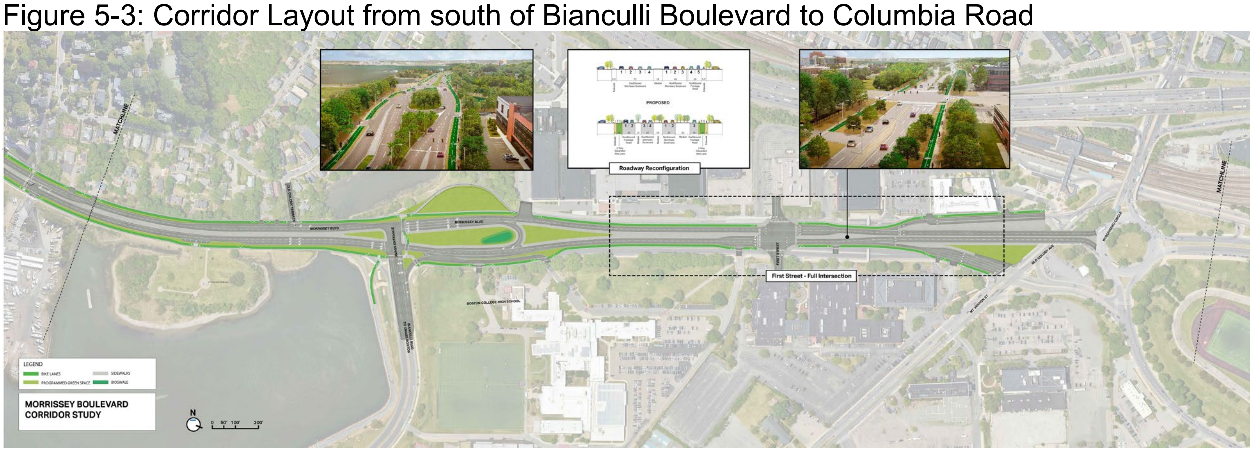


Figure 5-4: Corridor Layout from Columbia Road to Preble Street

Short- and long-term recommendations were developed to meet the goals of the study and improve the public realm, mobility, connectivity, safety, and climate resiliency.

5.2.1 Short-Term Recommendations

In order to best meet the study goals and advance the development of Morrissey Boulevard reconfiguration, the following short-term activities are recommended:

- Evaluate the benefits and challenges of implementing new east-west connections, such as a full signalized intersection at Morrissey Boulevard and Conley Street to increase access to the Port Norfolk neighborhood. Connections at additional points along the corridor could also be further evaluated, such as the current U-turn at Popes Hill Circle and options for placement of a U-turn near Savin Hill to evaluate vehicle connectivity for the community.
- Evaluate and examine quick-build safety improvements that could potentially be advanced, such as lighting, flex posts and curb extensions at existing key intersections, such as Preble Circle and the U-turn near Divine Rink.

5.2.2 Long-Term Recommendations

In order to best meet the study goals and advance the development of Morrissey Boulevard reconfiguration, the following long-term activities are recommended:

- MassDOT and DCR will coordinate with the City of Boston to initiate a project or phased projects to reconstruct the Morrissey Boulevard corridor, based on the ability to secure and dedicate funding for the roadway reconstruction and potential flood mitigation measures.
- Respective agencies will continue to formally convene following this Commission process to advance a coordinated approach to corridor investments and projects.

5.3 Project Development Process

For a project or projects resulting from the Morrissey Boulevard Corridor Study, subsequent steps would require additional interagency coordination, including determining a project proponent or proponents to move these projects through project development and funding.

A general transportation project development process is outlined below.

Step 1: Project Need Identification

For any proposed transportation improvement, the project proponent leads an effort to define the problem, establish project goals and objectives, and define the scope of the project need. The outcome of this effort is to determine whether the project requires further planning or is already well supported by prior planning studies.

Step 2: Planning

The purpose of this step is to identify issues, impacts, and approvals that may need to be obtained so the subsequent design and permitting processes are understood. The level of planning needed for a project varies widely depending on complexity.

The Morrissey Boulevard Corridor Study completed Step 1 and Step 2 of the process.

Step 3: Project Initiation

This step further defines the scope, timeline, costs, and project management responsibility for the project. If the project is programmed for funding through an MPO, the MPO will also conduct a review that includes a project evaluation based on the MPO's regional priorities and criteria. The MPO may then assign its own project evaluation criteria score, a Transportation Improvement Program (TIP) program year, a tentative project category, and a tentative funding category.

Step 4: Design, Permitting, and Right-of-Way

The outcome of this step is to have a fully designed and permitted project ready for construction. The sections below provide information on several potential elements of this step of the project development process, including anticipated environmental documentation and permitting.

Design: There are three major phases of design for transportation projects. The first is Preliminary Design, also referred to as 25 percent Design. The major components of this phase include a full survey of the project area, preparation of base plans, development of basic geometric layout, development of preliminary cost estimates, and submission of a Functional Design Report. Preliminary Design is often completed in conjunction with Environmental

Documentation and Permitting. The second is 75 percent Design. At this stage of design, more detailed plans are developed and the necessary permits are completed. The third is 100 percent Design.

The major components of this phase include preparation of a subsurface exploratory plan (if required), coordination of utility relocations, development of temporary traffic control plans through construction zones, development of final cost estimates, and refinement and finalization of the construction plans.

Environmental Documentation and Permitting: The project proponent will be responsible for identifying and complying with all applicable federal, state, and local environmental laws and requirements.

Depending on the nature of a project and its funding sources, it could require federal, state, or local environmental review. If a project or projects in this corridor were to be federally funded, it would need to adhere to the National Environmental Policy Act (NEPA) and evaluate the anticipated environmental impacts of a project. This could require a categorical exclusion, environmental assessment, environmental impact statement, or other federal permits, such as the Section 404 Clean Water Act.

As much of the Morrissey Boulevard corridor falls under the jurisdiction of the Commonwealth of Massachusetts, Massachusetts Environmental Policy Act (MEPA) review may also be necessary. Similar to NEPA, MEPA requires an evaluation of a project to determine the environmental consequences and mitigation measures required for proposed infrastructure improvements. Any future potential projects in this corridor may require at least an Environmental Notification Form (ENF), and Draft and Final Environmental Impact forms depending on the outcomes of the review process.

Given Morrissey Boulevard falls within the jurisdiction of the City of Boston, municipal review and permitting would also be required. With the climate resilience improvements put forth as part of this study, review by multiple municipal agencies may be necessary. For example, the City of Boston Conservation Commission is subject to review projects applicable to Municipal Code Section 7-1.4 – Wetlands Projection and Climate Adaptation if the Conservation Commission deems a project likely to have significant impacts on wetlands, water resources, flood-prone areas, or adjoining upland areas.

There are also additional permitting and review processes that could be required for this corridor, including – but not limited to – the following:

- Massachusetts Wetlands Protection Act– Wetlands Notice of Intent
- Section 401 of the Federal Clean Water Act – 401 Water Quality Certification
- National Pollutant Discharge Elimination System Remediation General Permit
- EPA Construction Stormwater General Permit
- Massachusetts Historical Commission (MHC)
- Massachusetts General Law Chapter 21E and the Massachusetts Contingency Plan (MCP)
- Massachusetts General Law Chapter 91, the Massachusetts Public Waterfront Act

As part of next steps, project proponents would coordinate with relevant agencies to identify all required documentation and permitting as appropriate for a project or projects in the corridor.

Public Outreach: Continued public outreach through the design and environmental process is essential to maintain public support for the project and to seek meaningful input on the design elements. The public outreach is often in the form of required public hearings conducted at project design milestones but could also include public meetings to engage those interested in and affected by a proposed project.

Right-of-Way: A separate set of right-of-way plans is required for any project that requires land acquisition or easements. The plans must identify the existing and proposed layout lines, easements, property lines, names of property owners, and the dimensions and areas of estimated takings and easements.

Step 5: Programming

Programming of funding can occur at any time during the process from planning to design. Potential funding sources are detailed in the following section of this chapter.

Step 6: Procurement

Following project design and programming of a transportation project, the project proponent typically releases a Request for Responses for project construction, which is also often referred to as being advertised for construction. Bids are then reviewed, and a contract is awarded to the qualified bidder.

Step 7: Construction

After a construction contract is awarded, the project proponent and the contractor should develop a public participation plan and a temporary traffic control plan for the construction process.

Step 8: Project Assessment

The purpose of this step is to receive constituents' comments on the project development process and the project's design elements. The project proponent can apply what is learned in this process to future projects.

5.4 Potential Funding Sources

This section provides an outline of potential funding programs for Morrissey Boulevard corridor projects. In considering alternative funding strategies, further research and consultation with the appropriate federal or state agencies would be required.

5.4.1 Formula and Discretionary Funding Sources

Formula funding sources are based on set parameters with a specific apportionment programmed by fiscal year, respective to the agency responsible. Applicable formula funding sources may include the following subsections:

Regional Transportation Improvement Program, managed by the Boston Metropolitan Planning Organization

The Regional Transportation Improvement Program (TIP) is a capital plan outlined by the MPO for a five-year horizon period, dedicated to projects in the Boston MPO region. The TIP includes all anticipated transportation projects that will receive federal funding over the next five years. This funding often includes apportionment for projects carried out by MassDOT, as well as the MBTA and other entities.

Surface Transportation Block Grants

A Surface Transportation Block Grant (STBG) is a source of funding applicable to both highway projects (including bridges) and transit projects. Two percent of each state's share must be set aside for "Transportation Alternatives" such as "pedestrian and bicycle facilities, recreational trails, safe routes to school, community improvements such as historic preservation and vegetation management, and environmental mitigation related to stormwater and habitat connectivity."[26]

The following are federal transportation programs funded most recently in the Infrastructure Investment and Jobs Act (IIJA) of 2021:

- **Traditional Highway and Highway-Related Funding Programs** - Allocated to projects through the MPO and state-level Transportation Improvement Program (TIP) process. In general, the maximum federal share is 80 percent; exceptions are noted below. A key feature of the FHWA program structure is the transferability of funding among programs.[27]
- **National Highway Performance Program (NHPP)** - The NHPP is the largest of the core FHWA programs, covering a wide range of construction, reconstruction, and improvement work on roads and bridges within the National Highway System. The NHPP is a formula program, one of several apportioned to the state each fiscal year.[28]
- **Highway Safety Improvement Program (HSIP)** - The HSIP covers a wide range of highway safety improvements designed to avoid or mitigate collisions and injuries. Among potential areas of applicability is "intersection safety improvements…including multimodal roundabouts". The HSIP is a formula program with a 90 percent federal share.
- **Transportation Infrastructure Finance and Innovation Act (TIFIA)** – The TIFIA is a credit program that provides funding support for regionally and nationally significant projects. Large-scale surface transportation projects, such as highway projects, are eligible under this program and can be applied for by state or local entities and private entities (if applicable). The nature of TIFIA is that it can be available on a supplemental basis if there is difficulty securing alternate funding.
- **Building Resilient Infrastructure and Communities** - This is a Federal Emergency Management Agency (FEMA) grant program that aims to reduce hazard risk and increase resilience. It provides funding for eligible activities that reduce or eliminate long-

[26] https://www.fhwa.dot.gov/bipartisan-infrastructure-law/ta.cfm

[27] For example, with respect to STBG: "A State may transfer up to 50% of STBG funds made available each fiscal year to any other apportionment of the State, including the National Highway Performance Program, Highway Safety Improvement Program, Congestion Mitigation and Air Quality Improvement Program, National Highway Freight Program, Carbon Reduction Program, and Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) Formula Program. Conversely, subject to certain limitations, a State may transfer up to 50% of funds made available each fiscal year from each other apportionment of the State to STBG." (https://www.fhwa.dot.gov/bipartisan-infrastructure-law/stbg.cfm).

[28] Unless otherwise indicated, Massachusetts apportionments are from https://www.fhwa.dot.gov/bipartisan-infrastructure-law/docs/Est_FY_2022-2026_Apportionments_Infrastructure.pdf (final page, "FY 2026 Estimated Program-by-Program Apportionments").

term risk to people and property from future disasters and/or natural hazards, such as in the case of Morrissey Boulevard flood vulnerability. This is a FEMA-reviewed annual grant program with competitive grant applications. Funding can be allocated toward flood risk production programs and projects that mitigate flood risk.

- **Hazard Mitigation Assistance Grant Program –** These grants, also administered by FEMA, provide funding for eligible long-term solutions that reduce the impact of disasters in the future. Massachusetts Emergency Management Agency (MEMA) conducts annual sub-grant programs, pending the availability of federal funds, that are allocated to planning and mitigation projects in advance of potential disasters.
- **Congestion Mitigation and Air Quality (CMAQ) -** CMAQ is another flexible source of funding applicable to highway and transit projects that help attain or maintain air quality standards. CMAQ would be potentially applicable to certain elements of the Morrissey Boulevard corridor. Eligible CMAQ activities include projects to improve traffic flow (and thus reduce idling emissions), such as redesign and signalization of intersections. CMAQ can also fund multimodal access improvements, such as pedestrian, bicycle, and shuttle connections to JFK/UMass Station.

5.4.2 Discretionary and Loan Sources

Discretionary funding sources stem from transportation grants that are allocated through a selection and review process and are administered by a variety of entities based on set criteria. These grants have an application process with specific deadlines. Additionally, loan sources may be drawn on from a variety of entities to sponsor and fund projects.

Municipal Vulnerability Preparedness Action Grant

The Municipal Vulnerability Preparedness Action Grant is administered by the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) and provides support for cities and towns in the Commonwealth to plan for climate change and implement resiliency priority projects. Projects may include but are not limited to feasibility, design, permitting, or construction projects.

District Improvement Financing

Massachusetts General Law Chapter 40Q defines District Improvement Financing, which is a funding strategy that can advance improvements for quality of life and infrastructure in a given area. Municipalities may designate development districts with boundaries within their respective municipalities that may consist of parcels of land and buildings or structures. When designating a development district, the municipality must also adopt a development plan for the area that allows incremental tax revenues from new private investments to be allocated for future public improvement and economic development projects within the district. DIF does not institute a new tax or tax rate but codifies a set amount of tax revenues from private investment toward district improvements.

Coastal Resilience Grant Program

The Massachusetts Office of Coastal Zone Management administers the Coastal Resilience Program to provide financial and technical support for local and regional efforts to increase coastal resiliency, such as enhancing natural resources and providing storm protection. Grants are available for a range of coastal resiliency approaches under five categories: vulnerability and risk assessment, public outreach, proactive planning, retrofit and relocation, and shoreline restoration. The program is open to municipalities, nonprofit organizations, and federally recognized Massachusetts Tribes.

National Coastal Resiliency Fund

The National Coastal Resiliency Fund (NCRF) invests in nature-based solutions that protect coastal communities and enhances habitats for fish and wildlife. This program invests in ecological conservation projects that restore, increase, and strengthen natural infrastructure such as coastal marshes, wetlands, and barrier islands to help mitigate the impacts of storms and other coastal hazards. The NCRF is administered by the National Fish and Wildlife Foundation (NFWF). To be eligible for funding under NCRF, any projects advanced would need to be emblematic of NFWF conservation efforts.

5.5 Additional Considerations

The following are key themes arose during this process and should be considered by the entities responsible for each respective item.

Environmental Concerns - Environmental concerns were a key theme throughout this study, both as they relate to pressing current ecological issues, such as potential contaminants in Dorchester Bay Basin and sediment buildup that could be dredged. Dredging activities require coordination across multiple agencies, including the Massachusetts Department of Environmental Protection (DEP), which oversees permitting requirements for dredging projects. Additionally, the Massachusetts Executive Office of Economic Development manages the Massachusetts Dredging Program, which is a capital grant program that provides funding to coastal municipalities for saltwater dredging. Should concerned parties, such as DCR, DEP, the City of Boston, or other entities decide to move forward with evaluating the need for dredging in Dorchester Bay Basin or its environs, coordination would be required across these multiple agencies to move a dredging project forward and secure funding.

Additionally, state and city coordination is required surrounding other important potential projects, such as supporting increased reliance on the BWSC drainage system. The BWSC is working on upgrades to the existing drainage system in the study area, which includes outfall pipe upgrades to manage discharge and stormwater. BWSC is also planning for future-year flood mitigation measures, such as potential tide gates at Pattens Cove and the Beades Bridge.

DCR is advancing flood resilience projects in the area of Morrissey Boulevard, such as new pump stations. Projects resulting from the Morrissey Boulevard Corridor study can build on these efforts in securing funding and advancing design for flood mitigation measures, such as berms, once a consensus is reached by the neighborhood and decision makers.

Flood Mitigation - Flood protection is being advanced outside of the central section (Bianculli Boulevard to Freeport Street), leaving this area as a key flood pathway for storm surge to enter the study area. With community involvement and the anticipated future severity of climate change flooding, it is crucial that decision makers coordinate with the community to make decisions on flood mitigation measures.

Similarly, such measures may need to balance the potential severe flooding, environmental assets, and placemaking opportunities, which include the potential for expanding recreation and transportation assets and enhancing existing ones. Additionally, ecological benefits could be realized through implementing nature-based solutions that mitigate stormwater flooding, improve environmental concerns, and contribute to healthy coastal ecosystems and biodiversity.

Future Project Development Considerations - Multiple themes pertinent to future potential project development arose during this study. These included evaluating the changes that could be necessary to existing utility systems on and adjacent to Morrissey Boulevard, such as electrical lines and drainage systems, potential additional wayfinding signage to navigate key corridor connections, and planting treatments (increased tree cover and planting native species).

Connectivity and Accessibility - The area of Morrissey Boulevard is home to numerous recreational assets in Dorchester, such as Malibu Beach, Tenean Beach, the Boston Harborwalk, and several yacht clubs. Throughout the study, community members expressed a desire for improved connectivity to these recreational resources as well as ensuring the connections are accessible and ADA compliant.

Similarly, Morrissey Boulevard facilitates regional travel north and south to and from Boston. Morrissey Boulevard bisects Dorchester neighborhoods, which also rely on it in their daily life. As a result, considering current and future transportation needs while also improving additional east-west connections across Morrissey Boulevard arose as a key theme.

The alternatives produced as part of this study incorporate increased east-west connectivity points for vehicles and non-vehicle travel modes. As any concepts are advanced through project development, opportunities to identify additional cross points for pedestrians and vehicles and enhance the safety of these communities should be considered.

Ongoing Efforts – A number of projects are planned or are currently in development in the area, including Dorchester Bay City, the Mary Ellen McCormack redevelopment, the Kosciuszko Circle and I-93 Columbia Road Interchange project, and the Beades Bridge project. As a result, it will be necessary for stakeholders to coordinate project timelines and tasks.

5.6 Next Steps

As part of the next steps, recommendations from this study should be advanced. As part of any primary next steps, project proponents should be identified to progress future efforts.

While this report outlines potential improvements for the entirety of the corridor, the alternatives could be advanced in stages. Phased construction stages could also allow for funding to be secured as applicable to respective corridor sections, as well as designating sections that could have additional permitting challenges. Corridor improvements that could align with mitigation for future development projects could also be identified by project proponents.

The work of the Morrissey Boulevard Commission and the Morrissey Boulevard Corridor Study represent key foundational steps for future potential improvements to the Morrisey Boulevard corridor. With continued interagency coordination and community collaboration, changes to the corridor could be advanced to improve current and future transportation conditions, mitigate flooding, address environmental challenges, and enhance quality of life for Boston residents.